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TWICE DURING the past two years the writer has been called upon to assume control of the editorial columns of the ENGINEERING AND MINING JOURNAL; first during the last illness and after the death of Richard P. Rothwell, and lately after the retirement of Dr. David T. Day and the appointment of Mr. Edward W. Parker on the Anthracite Strike Commission. On neither occasion was such control sought; but it was accepted as a necessity of the existing situation, and without shrinking from the responsibilities involved. In turning over the chief editorial management to Mr. T. A. Rickard, who assumes charge with the next number, I may be permitted to speak a word for myself and my associates of the old staff of the JOURNAL, who have ably supported their temporary chief.

On both the occasions referred to the work was taken up with the limitations involved in the uncertainty of its duration. What these are can be better understood on the inside than on the outside, but readers can appreciate at least a part of them. There has been, however, a fixed purpose on the first occasion to maintain and on the second to restore the high standard fixed by the late Richard P. Rothwell. As to how far this purpose has been carried out, the readers of the JOURNAL must be the final judges. For myself and my associates, I have to say that we are ready to accept all fair criticism and do not fear comparisons. The work has been hard, and for months was done at high pressure; but it has been done, and to the best of our ability.

Thanks are due to the contributors and correspondents who have so well supported the management; and with all of them I hope that past cordial relations will continue.

In conclusion I may say that it is with entire satisfaction that I turn over the chief editorial control to Mr. Rickard; and that he will have the cordial support of the old staff in endeavoring to make the ENGINEERING AND MINING JOURNAL better each year than it has been in the past. FREDERICK HOBART.

THE MEETING of the American Society of Mechanical Engineers in New York recently was largely devoted to a savage attack on the metric system. It does not appear, however, that any particular importance is to be attached to the so-called action. The conservatives, who have been all along opposed to change and progress, rallied in considerable force at a meeting otherwise thinly attended, and for the time being had everything their own way. The proceedings certainly did not represent the opinions of a majority of the members, and we are sure that a great many will regret that a noisy minority should have managed to make the Society ridiculous in the eyes of the world.

A NEW TRADE has been opened in an experimental way through the purchase by the Dominion Steel Company of a quantity of iron ore from the mines of Swedish Lapland. The completion last year of the railroad from the mines to the port of Ofoten,

gave those mines an outlet to the Atlantic which has already been utilized in making shipments to Great Britain. The plan proposed for the shipment of this ore to Cape Breton furnaces, involves the shipment of return cargoes of Canadian coal. If this can be carried out, it will, of course, affect a material reduction in the cost of shipping the ore. It is somewhat doubtful, however, whether the Canadian consumption will permit the shipment of any very large quantity of coal abroad.

WE ARE PLEASED to see that the Grand Jury in the Telluride District in Colorado is showing a commendable activity in endeavoring to find out and punish the perpetrators of the Collins murder and other outrages. A number of additional arrests have been made, including Vincent St. John, the president of the Telluride Miners' Union, and these cases will be brought to trial as soon as possible. St. John is indicted on two charges of murder, one of assault with intent to commit murder, and one of assault with intent to commit robbery. The other arrests are of men supposed to be concerned with St. John in the cases now under investigation. It is to be hoped that the trial of those indicted will be prompt and that the present action will have a salutary effect in breaking up a condition which had become intolerable.

LATE EUROPEAN advices note the formation of a great iron and steel and steel combination, which is to include all the important works in Austria-Hungary. The new organization is not a trust in our sense of the term, but a "Kartel," or syndicate, under which each establishment is worked separately under the supervision of the central board, which regulates the output and fixes the prices. The new kartel includes practically every important iron and steel interest in the Dual Monarchy, such as bars, plates, rails, nails, and wire. It will include 23 concerns, the combined capital of which is about 280,000,000 kronen. The agreement is for 10 years, running until 1912. The Austrian and Hungarian kartels have been organized separately, but they will work jointly. The Austrian organization has 18 members, and the Hungarian 5. This is the most important agreement of the kind yet made in Austria-Hungary, and it is quite possible the Government may have something to say about it.

THE STRIKE of the coal miners in France is now practically at an end, although some local disagreements remain to be settled. These relate chiefly to variations in local rates, and to the refusal of some companies to take back men who had been active in promoting the strike.

France is to have a Coal Strike Commission of its own, as a result of the late movement, the Chamber of Deputies having appointed a special commission from its members to investigate the causes of the conflict and the conditions of working in the mines. The Socialists and others suc-

ceeded in adding some amendments to the resolution appointing the Commission, which seem rather curious. Thus the first project the Committee will examine relates to the organization of a system by which the miners shall participate in the profits of the mine, under penalty of the colliery owners losing their concessions. The Chamber voted urgency for this proposition, which will naturally meet with strong opposition from the operators.



THE YUKON REGION seems to be passing through its transition period with less trouble than might have been expected. The substitution of workings on a large scale, with heavy capital for the individual operations which characterize a new placer mining country, has begun. It is, however, proceeding quietly, and the small operators are still successful and prosperous enough to make them an important element. While some hydraulic work has been done, the conditions of the country do not seem to favor the belief that hydraulic mining will be a very important element in the region. Dredging in the rivers and creeks was tried this season with such success that next year it is probable a large number of dredges will be at work, notwithstanding the drawback of the very short working season. Already much machinery for dredge work is on the ground, ready for next year.

A feature of this season was the large number of locations of quartz claims made, over 4,000 having been filed. Of course, a large proportion of these will amount to nothing; but it looks as if a good deal of exploration and development work will be done next year on these claims.



THE PURCHASE of the Union Steel Company's property by the United States Steel Corporation is referred to in our news columns. The Union Steel Company was itself a consolidation of the Union Steel Company, whose works were at Donora, near Pittsburgh, and of the Sharon Steel Company, with plant at Sharon, Pa. The consolidated plants are sold to the Steel Corporation for \$45,000,000, to be paid in bonds secured by mortgage upon the properties. The transfer includes all cash assets and a large working capital.

In some quarters this transaction has been taken as evidence that the United States Steel Corporation has entered upon a new policy of absorption, and that it intends to buy up all its possible or probable competitors. We do not think that such an inference is justified by the facts of the present purchase. There were special reasons for the transaction, which may not exist in other cases. The Union Company's plants for making wire, sheets, tubes and tin-plate will supplement those of the Steel Corporation, or perhaps take the place of some of the older ones, and strengthen the combination in the direction in which it has been weakest and most open to competition. Moreover—and this was probably one of the strongest arguments for the purchase—the Union Company controls some valuable iron ore properties on the Marquette and Mesabi ranges, the possession of which will materially strengthen the Steel Corporation's position in the Lake Superior region. All of these considerations doubtless combined to make the deal a desirable one.

THE DISPUTE between the German Coke Syndicate and the blast furnaces still continues. The Syndicate has refused, as we have already noted, to reduce the price of blast furnace coke, and the rate fixed for contracts for 1903 is 15 marks (\$3.57) per ton on cars at the ovens. This is the same price that is charged for the current year, and only 2 marks lower than the high price of 1900 and 1901. Some slight reduction was made in foundry and broken coke, but these have been of no importance to the furnaces. The price is still one-half more than was charged up to 1898, and the furnace owners not unreasonably hoped that some allowance would be made in view of the heavy decrease of the price of pig iron. The Coke Syndicate, however, held its position so strongly that it was able to refuse all concessions. The only offset which the ironmakers will obtain is an increase in the bounty on iron exported, which will be under the new agreement, 2½ marks for each ton of pig iron and 10 marks for each ton of wrought iron or steel sold for foreign consumption. This bounty is paid jointly by the coal mining and iron syndicates, and the Coke Syndicate contributes a small proportion owing to the connection with the coal mining syndicate. The results of the negotiations are, however, very unsatisfactory, and there is talk of an appeal to the Government.



#### DIVIDED COUNSELS.

Mining companies as aggregates are capable of all the folly which human nature in detail is apt to exhibit. An Australian correspondent has drawn our attention to the comedy at Mount Lyell. In that rich copper district of Tasmania there are two large mines; one is owned by the Mount Lyell Mining and Railway Company, the parent organization of the region, and the other is the property of the North Lyell Copper Company. These properties are in a metallurgical way opposite and complementary; the first contains an enormous mass of sulphide ores, carrying barely 2 per cent of silica, while the other is characterized by an impregnation of bornite in quartzite, yielding an ore which carries 75 per cent silica. Although the distance separating the two mines is only half a mile, and they are connected by rail, nevertheless, they have persisted in declining, the one to use the basic flux absolutely necessary to the treatment by smelting of a very siliceous ore, and the other to buy on fair terms the siliceous mixture required for satisfactory concentration by matte smelting. This absurd situation has grown out of an original feud between the organizers of the two corporations, and it has progressed so far that the North Lyell Copper Company has spent \$2,000,000 in railway, docks, wharves, etc., all of which would have been unnecessary if a suitable agreement had been made with its neighbor. At the same time the mine has been robbed in the effort to turn out copper for shipment to England. It was originally intended to select the rich ore and concentrate the remainder, and then smelt the two classes of product in a reverberatory, but this has not been done, the smelter being first erected and then the concentrator, and affairs so mismanaged that both are failures. In this fiasco there crops up again that old pernicious source of trouble, namely, the friction between a local board of directors and the London board. This has hurt many

an Australian undertaking, and ordinarily results in divisions to which the mine is too often eventually sacrificed.



#### THE CASE AGAINST TRADE UNIONISM.

In an address on "Labor Unions from an Educator's Point of View," delivered before the Colonial Club, of Cambridge, Mass., on November 22, President Eliot, of Harvard University, amplified the expressions of opinion in a previous address, which had already become the subject of considerable comment. President Eliot reviews the problems arising from the avowed policy of the labor unions, which are certainly among the most serious of the day, in the calmest possible manner. He looks upon them as a scientist, absolutely without prejudice and bias because of commercial or political interest. He finds much to approve in what the unions have accomplished in behalf of those who labor with their hands, and conceives that they have great potentiality for further good, but on the other hand, he finds many misuses of power and the promotion of doctrines which are not only dangerous to society, but also are harmful to the men who adopt them. His presentation of the case against the declared policy of the labor unions is perhaps the clearest that has been made. It falls under these heads:

1. Limitation of the number of apprentices; the exclusion of the newcomer for the protection of the old hand.

2. Limitation of the day's output of the individual laborer, which is based on the theory that there is a definite demand for the product of any industry, and if that demand is satisfied by a portion of the laborers in the trade there must be another portion who can get no work.

3. The establishment of the uniform wage, putting the good workman and the inefficient one upon the same basis.

4. The resort to violence to compel yielding to demands, which is the only method open to the unions of the unskilled laborers.

President Eliot points out ably the fallacy of the theories on which these doctrines are founded, and in the injustice and danger of putting them into practice. He thinks the remedy for the difficulties which are constantly arising between employers and employees lies in arbitration and stipulated agreements, and considers that the latter may be carried out even if the labor unions remain unincorporated associations. With respect to that we do not have so much confidence. As at present organized the labor unions are irresponsible bodies, and no penalty can be enforced for failure to keep agreements, which is not fair to the other party, upon whom responsibility can be fixed. It would be highly desirable to require the labor unions to become incorporated, but to that they are opposed, dreading the action of the courts just as they dread the action of the executive arm of the law, and aim ever to paralyze it. The widespread distress

was caused by the recent coal strike has given the movements of the labor leaders a great prominence, and the time is now opportune to make progress toward the settlement of the labor question. Incorporation of the unions and faith-

ful execution of the existing laws against disorder and violence will do a great deal. It is time for the people who are not union members to stand up for their rights. The total number of union members in the United States cannot possibly be placed at more than 2,000,000 (Col. Wright is unable to count more than 1,700,000), and their actions are therefore those of an actual minority of workers.



#### THE CLOSING YEAR.

In the next number of the JOURNAL we propose to show the great achievements of the year now drawing so closely to its end. We intend to give, as in former years, a summary of the progress made during 1902 in the different branches of the mining and metallurgical industries. That it has been a great year for most of them, many of our readers know in a general way, if they do not appreciate the magnitude of the details, but these will be fully shown next week.

This week, however, as we draw near the close of the year, it may be well to follow the old custom, and to consider a little the mistakes that we have made, the faults that we committed during the past twelve months, and to see if we cannot draw from them some warning as to our best course for the new year. We have not space here to call attention to all of these shortcomings as fully as we might wish to, and there are only a few salient points which can be briefly touched upon.

As everyone knows, 1902 has been a year of unexampled business activity, and of enormous production in almost every line. It has also been a year in which we have intensified the process which was begun two or three years ago of consolidating business interests and of bringing together enormous aggregations of capital. Even before the year closes we have had serious warnings that this process has gone on too fast and too far; that we have locked up too much of our available floating cash in enterprises capitalized on the basis of a boom-period, liberally watered, even on that basis, and then pushed up on the stock markets to an excessive valuation. This cannot last, and as we have already said, we have had serious warnings that a period of liquidation is coming which will necessarily be painful in its results. The best that we can hope for is that it will be distributed over a considerable period of time and thus avoid the absolute ruin and distress which marks the track of a panic. You must remember that a boom cannot last forever and that the sooner we begin to take in sail and to prepare for emergencies, the stronger will be our position when they come.

Another point to which very few seem to "have paid attention is the rapidity with which we have been exploiting our resources and the extent also to which we have been locking them up, and placing their control in the hands of a few. Consolidation in a business way has its advantages which we have been among the first to recognize. It has also its serious disadvantages and dangers. Among the chief of these we count the fact which has attracted comparatively little notice, but to which we have more than once called attention to, and that is that the control of our iron ore supplies is quietly but certainly passing very largely into the hands of a single corporation. What this means, and what absolute control over business it will give to the managers of that corporation is a

startling reflection. The dangers attending such control must far overbalance the minor advantages of consolidation of business, and it is time that a halt should be called.

Another fault, this time of omission rather than commission, is that we have failed to look enough to the future in another direction. Our prosperity has been so great, and our home demand so large during the past year, that we have taken no thought of the possibility or rather certainty of a falling off in this demand a little later when the inevitable reaction comes. We have dropped altogether or in large part, the movement in favor of cultivating export trade which occupied such a prominent part a year or two ago. We have taken no steps towards cultivating trade with other countries or promoting reciprocally friendly relations which must be cultivated if trade is to grow. We cannot seek to enter the markets of the world while at the same time we bar out the world from our own, and it will not be long before we find that those markets are of far more importance to us than we at present imagine.

Much more might be said, but these will furnish material for serious thought for the present.



#### MARKET CONDITIONS.

*Iron and Steel.*—The iron and steel markets still remain quiet in view of the close approach of the end of the year, when time is usually devoted to stock-taking and other preparations for the business of the new year. New contracts are therefore few, but a demand still exists for pig-iron and steel billets for near-by deliveries which cannot easily be satisfied except by sales of foreign material. British and German agents are watching the market very closely and it is not difficult to place orders if parties are willing to pay the current prices.

The difficulties in transportation still continue, and complaints about slow deliveries of coke are widespread. The railroads seem to be making more effort to supply car and motive power than they have been doing recently, but cold weather and storms have interfered with traffic to a certain extent, and the blast furnaces are still sufferers.

It seems probable that after the new year opens, there will be a considerable pressure for structural steel on orders which have been held back in anticipation of some reduction in prices. That expectation has been generally abandoned and contractors for buildings will hasten to put in their orders at as early a date as possible. In steel rails also, while most of the orders for standard sections have been placed, there will be a rush for girder rails for the numerous trolley projects which are to be carried out next season.

*Copper.*—The copper market continues practically unchanged, the influence of the holiday season, limiting business and holding back orders until after the beginning of the year. As for two or three weeks past, however, there is no pressure to sell, and in fact many producers are not averse to a short rest. Stocks are not large, and the metal for immediate delivery is not over abundant.

*Other Metals.*—The little excitement in tin which marked the close of last week appears to have passed over, consumers' demands being fairly well satisfied. The price shows little change, fluctuations having

been rather narrow during the week. There is still, however, some discount on futures.

Lead remains unchanged with about the usual good consumptive demand. The fact is that this market has been steady so long that consumers buy only for their immediate needs and do not lay in any large stocks.

Spelter continues quiet, but buyers show signs of taking hold on the recent fall in prices, and it is anticipated that considerable business will be done after the turn of the year.

Silver has become somewhat dull again after the recent speculative rise. The short interest in London has mainly covered and the demand for actual deliveries continues light. There has been little or no buying in London for Indian account, the demand from that country having been mainly satisfied by recent large shipments made from New York to Bombay direct.

*Coal.*—The Western coal markets seem to be settling down a little, although the transportation conditions are still bad notwithstanding the close of late navigation and the liberation of the rolling stock which has been utilized in carrying coal to the Lake ports. The Lake season closes with little or no anthracite in stock in Chicago, and all the coal of that class which is consumed will have to be hauled by rail with a corresponding increase in freight rates. Most of the large cities in the West, however, report fair stocks of bituminous, and probably the better grades of this, such as Pocahontas and Hocking, will largely take the place of anthracite for the rest of the Winter.

The seaboard bituminous trade shows no material change, except so far as transportation from mines to tidewater has been interfered with by bad weather.

Nothing further can be said of the anthracite trade except that the companies are apparently endeavoring to distribute coal as widely as possible to meet the more pressing demands. No one is as yet supplied in full, and in consequence there is a good deal of complaint which could hardly be avoided.



#### PROPERTIES OF METALLIC SULPHIDES.—

J. Guinchant has investigated the electrical resistance of various metallic sulphides (*Comptes Rendus*, CXXXIV, 1224 to 1226), and in the course of his paper gives some figures of general interest. Lead sulphide melts at 1015° C, and boils at 1085° C. Tin sulphide melts at 1000° C., and boils at 1090° C. Ferric sulphide melts at 925° C.

#### DANGER IN MANUFACTURE OF HYDROGEN.—

Several fatalities occurred this year at Breslau, Germany, in the manufacture of hydrogen gas for filling toy balloons. The gas was made by the action of sulphuric acid on zinc. Investigation showed that the acid was arsenic-bearing and the highly poisonous arsenureted hydrogen was developed in the process. Fatalities have occurred in this country in the decomposition of slimes from the zinc boxes in cyanide mills, doubtless because of the same reason, the arsenic being derived possibly from the zinc, possibly from the sulphuric acid. The latter is the far more likely and calls attention to the advisability of being sure, that the acid used is free from arsenic. The purification of sulphuric acid from arsenic is so simple a matter that there is no excuse for putting on the market any acid that has not been thus refined, unless it be certain that it is to be used for a purpose in which it will not be dangerous.

### THE ANTHRACITE COAL STRIKE COMMISSION.

We noted in our report last week the closing of the miners' case before the Commission. The counsel for the operators then presented a statement, outlining their position and the facts which they will attempt to establish by evidence. They object, in the first place, to what they declare to be the acknowledged purpose of the United Mine Workers to establish a monopoly of the labor necessary to produce the coal supply of the nation, and they object also to any control of the anthracite coal business by a bituminous coal organization. The respondents will show, the statement continues:

"That after the settlement of the strike of 1900 there was an apparently concerted effort on the part of the miners to restrict the output of the mines, and to load fewer wagons or cars for a shift, instead of six or eight as before, and that this resulted in a reduction of output of the mines of over 12 per cent. . . . This restriction was for the evident purpose of preventing the producers from accumulating a stock of coal on hand to meet emergencies, such as floods, and strikes, and when the strike was ordered in May, there was less than one month's supply of coal in the market, showing that the strike was contemplated and planned a long time beforehand, and carried out without the slightest regard for the interests of the public. . . .

"That there is no similarity between the mining of bituminous coal and of anthracite coal, so as to make the wages paid to the bituminous miners a standard for the payment of wages to the miners of anthracite coal, . . . and that the rate of wages in the mines operated throughout the anthracite region is not 40 or 50 per cent lower than is paid to miners in the bituminous region, but is actually higher.

"That, as a rule, contract miners in the anthracite field earn \$600 per annum or more, and that many of them earn upwards of \$1,000 a year, and that all laborers are paid higher wages than those employed in other occupations of equal skill and training. . . . That the average earnings of all employees of manufacturing establishments, covering over 300 different classes, skilled and unskilled labor, is much below the average wage of the miners; that . . . the average wage of farm labor in Pennsylvania is about one-half of the miners' wage, and much less than the wages paid to laborers about the mines.

"That in no part of the State, outside of the large cities, are better educational facilities afforded than is offered to miners' children in these regions. The employees of the coal companies assess the coal lands, levy the taxes, generally to the full limit allowed by law, and expend the money in building up school-houses and equipping them better than in any other part of the country. They have a greater number of months' schooling per annum, and pay their teachers about double the amount paid in the agricultural districts of the country.

"It will be shown by reliable statistics and the testimony of physicians that mining is not an unhealthy occupation, and that, aside from accidents, its healthfulness compares favorably with all other occupations.

"As to the third claim made by the complainants, for the adoption of a system by which coal shall be weighed, and fixing a minimum rate per ton, it will be shown that in the larger part of the anthracite coal field, owing to the pitch of the veins and other conditions, it is not only impracticable, but almost impossible, to adopt such a system; that mining is now carried on by contract in this portion of the anthracite region, by which the coal is mined mostly by the yard, and that as all of the material, including rock and slate, must be brought to the surface, it is the only method that can be adopted.

"As to the claim for the reduction of the hours of labor, without any reduction of earnings, it

will be shown that miners and laborers do not now work eight hours, and that as to the miners, in a majority of cases, they work less than six."

A separate statement, in behalf of the independent operators, emphasized the point that the questions at issue are between the respective companies and their own employees. The claim was made also that, as a condition precedent to any award by the Commission in favor of the United Mine Workers, "there should be some substantial assurance on the part of such United Mine Workers that they will in the future refrain from in any way interfering with or molesting persons who wish to work in or about the mines, but who do not belong to the union."

The Commission has adjourned over until January 8, when the taking of testimony will be resumed. The evidence put in before adjournment related wholly to the treatment of non-union miners and workmen who refused to join in the strike.

### TYPES OF IRON BEARING ROCKS IN ONTARIO.\*

BY A. P. COLEMAN.

Although the iron ranges of the upper part of the Lower Huronian are far more extensively developed in Ontario than other varieties of iron-bearing rocks, yet examples of several other kinds of iron ore deposits are found in the province, and it will be of interest to characterize each type briefly.

The oldest of the iron-bearing rocks, as well as in all probability the most important, belong to the Lower Huronian, or Keewatin, as Lawson has named the rocks in the western end of the province; and among them we may distinguish three well-marked types, that of the iron range proper, which is apparently the uppermost group; lenses of magnetite interbedded with green schist, as at the Atikokan, and titaniferous magnetites associated with basic eruptives.

Parallel with these ancient western iron ore deposits we should perhaps place the magnetites of Eastern Ontario, which are associated with what are usually called Upper Laurentian rocks, really the equivalents of the western and northern Huronian so far as can be ascertained in comparing crystalline rocks of different characters and at wide distances from one another. It is possible, however, that the Grenville series is really Upper Huronian and that the conglomerates found in it are the basal Upper Huronian conglomerate, like those of the Hastings series, which is intermediate in position and character between the Grenville series and the rocks generally classed as Huronian. If so, the iron ores of the area between the Ottawa and the St. Lawrence should be classed as Upper Huronian.

The Upper Huronian of northern and western Ontario has not yet proved to be iron-bearing in any important degree, though the States to the south of Lake Superior appear to have valuable iron mines of this age.

Ascending to the Animikie, which is perhaps Lower Cambrian, we find the largest and most easily worked iron mines in the world in the Mesabi Range in Minnesota, but no workable deposits of this age have yet been discovered in Ontario, though thin sheets of ore are found near Thunder Bay at the base of the Animikie.

No important iron ores, such as the fossil ore of the Clinton rocks in New York State, have been discovered in the palæozoic rocks of Ontario, though some beds of the Medina, just below the Clinton, are red from the amount of hematite they contain, and small quantities of hematite have been found in the Clinton of Cabot Head. All the later rocks are absent from our province until the Pleistocene is reached.

Deposits of iron ore of two kinds occur in post-glacial beds, bog ore in various places, though mined only in Charlotteville township north of Lake Erie; and magnetic sand, widely found and

taken up as locations near Peninsula, north of Lake Superior, but not yet mined.

Putting the matter in tabular form, we have in Ontario the following types of iron ore deposits:

	Upper part of the Lower Huronian or Keewatin; Siliceous and sideritic iron ranges.
	Probably lower part of the Lower Huronian; Magnetite lenses in green schists.
Archaean.	Titaniferous magnetite in basic eruptives.
	Grenville series, probably Huronian.
	Magnetite.
	Hematite.
Animikie.	Probably Cambrian; Impure siderite and limonite.
Pleistocene.	Post-glacial magnetic sand. Bog and lake ores.

Each type of deposit may now be briefly described, mentioning localities where it is found in Ontario.

The most widely spread of the iron-bearing rocks of Ontario, as well as of the adjoining States, are the siliceous ones, commonly of jasper or chert or white or gray granular silica, finely interbanded with magnetite or hematite, the whole usually more or less crumpled or brecciated and standing nearly vertical. The unchanged iron range rock seldom carries iron enough to be an ore, running usually below 35 per cent, though some magnetic banded ores in Commerce township, west of Thunder Bay, seem almost rich enough to be mined. Nor are the siderites often associated with them considered pure enough to be used as ores, since they are generally quite siliceous and contain considerable quantities of pyrites. Possibly some of them, as at Hematite Mountain, if roasted would make serviceable ores. On the other hand the secondary ore bodies, chiefly hematite or hematite mixed with limonite, formed in special pitching troughs of the underlying schists or eruptives, are often of excellent quality. At present the only mine working in Ontario on a deposit of the sort is the Helen Mine at Michipicoton, of which so much has been said that further description is not required. The siliceous iron range rocks occur in practically every Lower Huronian area in Ontario, and have now been traced, with breaks of importance only where Laurentian rocks intervene, all across the northern half of the province.

The lenticular bodies of magnetite interbedded with green schist and eruptives are best known at Atikokan, where they extend for miles parallel with the strike of the schists and in a nearly vertical attitude. They contain no jaspery or granular silica, are not associated with siderite or graphite slate, and seem to be of a totally different origin from the iron range rocks proper; perhaps representing original deposits in the schists or segregations from schists rich in iron.

The only indication that they occupy what were once open fissures is the finding of small amounts of carbonates with them; but the amounts are too small to signify much. The only impurities in this type of ore are admixtures of the adjoining silicates, which are of an easily fluxable kind, or pyrites which often occurs in considerable quantities, but might be removed by roasting. The ore is generally hard and massive. Assays of samples from the Atikokan Range, made in the laboratory of the Geological Survey, Ottawa, show from 64.55 to 68.03 per cent of iron, with no titanium. There is every likelihood that millions of tons of high grade magnetite will be mined on the range in the future, though only exploratory work has yet been done.

The other Lower Huronian or Keewatin ores are also magnetites, but of a very different type, being strongly titaniferous and occurring as ultrabasic segregations in such rocks as gabbro or diabase, with associated chlorite and other schists.

\* Abstract of paper in Report of the Bureau of Mines of Ontario, 1902.

### THE CAUVERY FALLS POWER PLANT.

One of the largest and most important power transmission plants in the mining field is that just completed at the Cauvery Falls in the State of Mysore in India, which will furnish power to the mines of the Kolar Gold-field. Mysore is one of those Native States which still remain in India, having their own governments, but strictly under British control. The Kolar Gold-field is in this State, and its exploitation has been very successful, a number of the mines having yielded large profits to their owners, while the output of the district reached a total of \$9,422,000 in gold last year. The Cauvery River is one of the largest in Southern India, and the Falls presented a point where a great water power could be utilized at a moderate cost.

The power plant which has just been completed there will furnish some 6,000 horse-power to the Kolar mines, about 90 miles distant. This power will be used exclusively in mining work, and is the largest plant of the kind yet established in an Eastern country. For the description which follows we are chiefly indebted to a series of articles in the *London Engineer*. It possesses a further interest for us from the fact that the electrical apparatus was furnished from the United States.

The first steps towards utilizing the power of the Cauvery River were taken in June, 1899, when one of the State engineers, Captain A. J. de Lotbiniere, R. E., made inquiries at the Kolar Gold-fields as to the amount and cost of coal and wood used throughout the various mines. He was much surprised at the large amount expended on this item, and at once recognized that the gold-fields would form a suitable market for sale of power. The managers of the mines—Messrs. J. Taylor & Sons, of London—were approached with a view to the mines being supplied with electrical power in place of steam, and they at once expressed themselves ready to discuss terms with the Mysore Government for the supply of electrical power.

The late Dewan—Prime Minister of the State—of Mysore, Sir K. Sheshadri Iyer, and his chief engineer, Col. D. McNeil Campbell, threw themselves heartily into the scheme. The British Resident in Mysore, the Hon. Col. D. Robertson, also fully approved of the project. In order to satisfy the Mysore Government that there was not an element of uncertainty or speculation attached to the scheme—that is to say, that the result of experience and actual practice in the transmission of power fully authorized the expenditure of the large capital which the undertaking would involve—Capt. de Lotbiniere was directed to proceed to America, and after carefully inspecting the transmission schemes in operation in that country and Canada, he came to the conclusion that the scheme was feasible and certain of success. He was also directed to approach the leading manufacturers of electrical plants in Europe and America, and obtain rough estimates and proposals from them, and to obtain expert opinion regarding the scheme from Profs. Forbes and Unwin.

The Government of Mysore being satisfied on the reports of Capt. de Lotbiniere that the scheme was practicable and feasible, a ten years' agreement was entered into with Messrs. J. Taylor & Sons, on behalf of the mines, for the sale of the electrical power to the various mining companies. Having now settled for the sale of the power for a period of 10 years, the project was finally submitted by the Government of Mysore to Lord Curzon, the Viceroy of India, for his approval to its execution.

It may be mentioned that all through the period taken up by these preliminaries the question of the minimum flow of water in the Cauvery River was being carefully investigated by the officers of the Mysore Public Works Department. The result proving satisfactory, and the Viceroy's approval having been obtained, it was finally decided to carry out the proposal, and orders were issued to this effect in July, 1900, or less than one year after the conception of the scheme. As a result of Capt. de Lotbiniere's previous inquiries, the Mysore Government

entered into a contract with the General Electric Company, of Schenectady and New York, for all electrical plant and appliances; Messrs. Escher, Wyss & Co., of Zurich, Switzerland, for all hydraulic plant; the Ingersoll-Sergeant Drill Company, of New York, for all electrically-driven air compressors, this last-mentioned firm to work as subcontractors for the General Electric Company, who were responsible for the delivery and erection of the air compressors. All contracts provided for the supply, delivery and erection of the plant, and for its maintenance by the supplying firm during the first year's operation.

The engineering staff of the Mysore Government employed on the works are: Col. D. McNeil Campbell, chief engineer; Capt. A. J. de Lotbiniere, superintendent engineer; Lieut. J. Hunter, resident engineer, and a staff of six assistants; Capt. Thomson, secretary and consulting engineer for the scheme in London.

The time occupied in constructing river works, channels, power and transformer stations, erecting line and compressor buildings, etc., was 22 months. The greatest number of work people employed at any time was 5,000. The whole of the necessary

formed the people, through a devotee, that any one assisting in the undertaking would die forthwith. It so happened that malarial fever was very prevalent at that time, and added to this an outbreak of cholera occurred, the result being that the people disappeared in all directions, and it was only with the greatest difficulty that others could be procured on the assurance that the new god, being imported in the shape of the machinery, was much stronger than the old one who guarded the Falls. For erecting the electrical machinery the General Electric Company, of Schenectady, supplied a staff of 13 trained experts under the direction of Mr. Axel Ekstrom with Mr. A. C. Jewett as his senior assistant. Mr. Cullen was placed in direct charge of the erection of the generating plant, and Mr. Gibbs in a similar position regarding the distribution plant throughout the Kolar Gold-fields. Escher Wyss & Co. sent out Messrs. Muller and Bosshardt as their erectors for the hydraulic plant, with two English assistants from Mehan & Co., of Glasgow, to erect the penstocks. These were supplied under a sub-contract by this firm.

The Cauvery River divides into two branches at Sivasamudram and forms the Hegoora Island. On



CAUVERY FALLS, MYSORE.

works in India, river dams, supply channels, fore-bay, generating station, transformer house, motor sheds, and compressor buildings, etc., also carriage of plant, surveys, wooden poles for the transmission line, and local labor for the erection of the transmission line and electrical and hydraulic plant, were undertaken by the Mysore Public Works Department. The Mysore Government also undertook to build all the necessary foundations for plant and masonry works of all descriptions necessary for the stability of the transmission line, and machinery to which the electrical power was to be applied throughout the gold-fields. The nearest railway station is 30 miles from the site of the head works, and the transport difficulties were very considerable, as traction engines were not procurable in India. Eventually a combination of elephants and bullocks was found to be the most satisfactory means of hauling the plant; ascending the hills, the bullocks pulled in front, and two elephants pushed behind. Some of the loads weighed 14 tons.

There was a great difficulty at first in collecting and keeping labor at the site of the head works; later on the reason for this was discovered. It appeared that the natives believed that the god of the Falls was very irate at the idea of any of the river water being diverted from his falls, and therefore in-

both these branches falls are situated, namely, the Burr Chakki and the Gangan Chakki. Neither of these falls has a vertical drop of more than 140 feet; but the river bed for a couple of miles above and below the falls has a very considerable drop. It was decided to take advantage of this fact, and to draw the water from a point  $1\frac{1}{2}$  miles above the falls; whence it is conveyed by service channels to a site favorably situated for a generating station. This resulted in a clear fall of over 400 feet being obtainable from the tail of the channels to the river bed beneath. In order to generate the required horse-power, 6,250 at the wheels, the hydraulic contractors demanded 190 cubic feet per second for their turbines. It was therefore decided to construct two channels, each capable of delivering 250 cubic feet per second. Two channels were constructed in order to provide against accidents, and to allow of silt clearing and repairs being carried on without in any way interfering with the supply to the turbines. The channels, each  $3\frac{1}{2}$  miles in length, are reveted throughout their length with dry stone, backed with 6 inches of gravel; depth of water, 5 feet; fall, 1 in 5,000; width of bed, 18 feet; side slopes, 1:1.

In order to concentrate the dry weather supply in the river into the western branch, from which the channels take off, a low masonry dam was built

across the mouth of the eastern branch. This serves to force the necessary water into the western branch. On the western branch, a second low masonry dam was built, with a draft channel and head sluices, for the supply of the service channels. Both dams are sufficiently low to allow the floods to pass over them, without interfering with the ordinary course of the river. Any discharge in the river above 600 cubic foot-seconds passes over the dams. Large scouring sluices have been constructed in front of the head sluices. These sluices serve to carry away the heavy sand and gravel from the entrance to the channels when the river is in flood. Ample tunnels

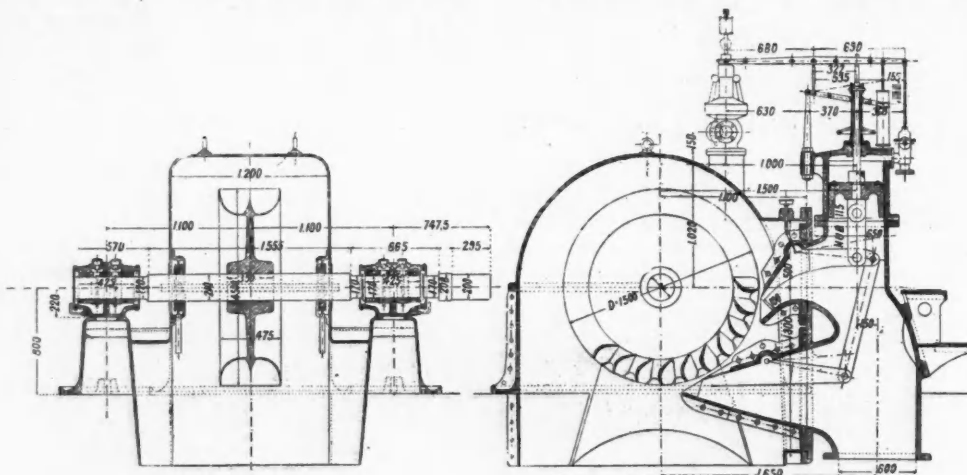
Six generators have been provided of 750 kilowatts each. Five only will be required to deliver 4,000 horse-power at the receiving end of the line, the remaining one being spare.

The generators are of the General Electric Company standard type, with revolving fields and stationary armatures. The high voltage winding is stationary, and subject to no strain due to centrifugal force or vibration. The revolving part contains no winding which has a difference of potential of more than 60 volts; this low voltage for excitation permits the use of strip copper winding on the fields, which has the advantage of securing the most per-

tors, and three will serve as spares. The transformers are arranged in groups of three each, each group controlled on the low-tension side by a triple pole oil switch, and on the high-tension side by three single pole double-break 40,000 volts oil switches, one switch for each phase or leg.

In series with these oil switches is a high potential knife switch, mounted on a separate panel, with large marble barriers between each panel. The lever for operating the oil switch is also mounted on this panel, the oil switch being placed directly under, and enclosed in, a brick cell on the floor below. All of the oil switches, both high and low tension, are placed on the floor below and directly under the switchboards, and connected to the operating levers on the panels by wooden rods. The air blast type transformer was selected as being free from fire risks, which the oil cooled transformer is open to. Two blowers, each capable of providing sufficient supply of air for cooling all the transformers, have been provided. These blowers are coupled direct to  $7\frac{1}{2}$  horse-power induction motors. The switchboard for the air blast transformers is placed in the same room as the transformers.

The transformers are placed in a single row, which requires a building somewhat larger than would be needed if the transformers were placed in a double or triple row. The advantage of a single row in simplifying the high-tension wiring was considered sufficient to warrant the increased size of the building. The high-tension wires first enter into a small room in which the lightning arresters are placed. From this room the wires are led through an opening in the wall to the top of the high-tension switchboard, which is situated in the gallery above the transformers, thence to the switches on the switchboard panels, and down through the floor to the oil switches in the cells below, from the oil switches through a partition or dividing wall to the high-tension side of the step-up transformers. The wires leading from the low-tension terminals of the transformers are brought through the base of the transformers into the air duct under the floor to the bus-bars directly under the low-tension switchboard. It will be noticed that, with this arrangement, the course of the wires from the high-tension line to the main distributing switchboard is very direct, and also that the wires leading from the high-ten-



TURBINE AND GOVERNOR, CAUVERY FALLS PLANT.

for passing surface drainage water beneath the channels are provided, as well as overflows, or waste weirs.

Owing to the configuration of the ground it was necessary to have three drops of between 6 and 7 feet in the channel bed. This sacrifice of head might have been obviated, either by carrying the channel on an embankment, or by the substitution of pipes, but after due consideration it was thought preferable to sacrifice the head, and retain the channels on solid ground. The channels terminate in a forebay situated on the brow of the bluff overlooking the generator station. This forebay contains the necessary apparatus for controlling the flow of water to the steel penstocks, three in number, which carry the water from the channels to the turbines in the generating station. The forebay also contains a filter for providing clear water for working the turbine governors.

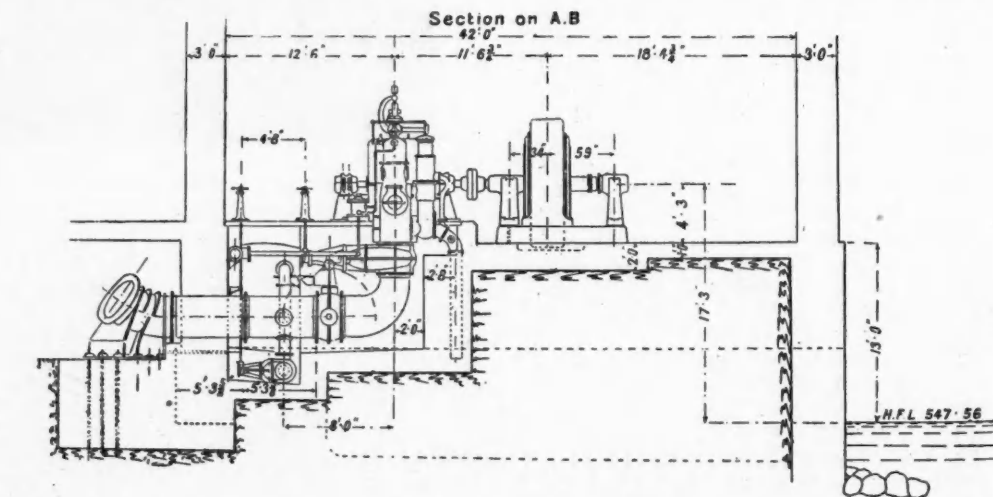
The electrical plant, designed and furnished by the General Electric Company consists of two sections. The first is that for generating the power and transmitting it 91 $\frac{3}{4}$  miles to the distributing station; the second is that for distributing and utilizing the power throughout the various mines on the Kolar fields.

As the power is used almost entirely for operating induction motors, and owing to the length of the line and to the fact of practically no lighting power being required, a frequency of 25 cycles was adopted. This frequency is specially suited for induction motors. At this frequency the loss of power in the line—calculated at 12 per cent—is low, as also the drop in voltage due to self-induction, and the power factors of the motors, and therefore of the line, should be high. If at any time arc lighting is desired, motor generators or frequency changers can be installed.

Generators producing a voltage of 2,200 were selected; this is low enough to permit of the use of bar winding in the generator, and high enough to limit the size of the conductors leading from the generators to the transformer house, situated at a distance of 1,000 feet on the bluff overlooking the generator house. For transmission purposes a line voltage of 30,000 was adopted, as experience has proved this to be perfectly feasible; it also allows of a comparatively small conductor being used, and prevents undesirable loss in the line.

fect mechanical structure. One edge of each turn of the field winding is exposed, and air is forced through the core and winding of the armature by the revolving poles. The speed chosen was 300 revolutions per minute, which was that recommended by the turbine makers.

Two exciters of 75 kilowatts each are provided; these are of the multipolar type, with carbon brushes, directly connected to special turbines. They are wound at 110 volts and compounded, so as to maintain a constant potential at all loads. The speed



CROSS SECTION OF GENERATING STATION, CAUVERY FALLS.

is 465 revolutions. Each exciter is capable of furnishing sufficient current for the excitation of the whole six of the generators, and also for the auxiliary lighting of the generating and transformer stations.

On account of the unhealthy position of the generating station, the main operating board is placed in the step-up transformer station, which is situated on the high bluff overlooking the generating station and 1,000 feet distant from it. Twelve step-up air blast transformers of 400 kilowatts each are provided, nine of the transformers will be required to transform the current of five 750-kilowatt genera-

tion switchboard to the transformers are protected by the high-tension switchboard gallery and partition wall. No fuses, circuit breakers, or other automatic devices have been provided for protecting the line transformers or generators. With the arrangement of circuits described such devices appear to be unnecessary. The wires leading from the generators to the switchboard are taken up the hill in a masonry duct—7 feet by 5 feet inside—provided with stone shelves on which the wires are carried. The duct is roofed in with flagstones, and is provided with stone steps from top to bottom; skylights are inserted at every 60 feet.

Lightning arresters are provided in the transformer stations at each end of the line. They are of the General Electric type, and each arrester is separated from its neighbor by a stone slab partition.

The transmission line consists of two separate and independent lines of three wires each. Each line is carried on composite poles of wood and iron. The poles are placed at intervals of not more than 130 feet. The lines run parallel to one another, and are 60 feet apart. For purposes of repairs one line will be cut out and service carried on the remaining one at a double-line loss, or the loss may be kept down to normal by raising the voltage to 34,000, but this high voltage will only be used if the shut-down is to be for a short period.

The section of the copper transmission conductor is equivalent to No. 0 Brown & Sharp gauge, the total weight of conductor used being 395 tons. One of the transmission lines also carries a metallic cir-

work; but assisted by Mr. H. D. Rice, an officer of the Mysore Department of Public Works, and three American line erectors, the work was completed in ample time. There are five river crossings. Special stranded bronze cable was used for these spans, some of which are of 600 feet.

The transmission line terminates at the step-down transformer house, a large stone building prominently situated on high ground about the center of the gold-fields. This building is very similar in all its details to the step-up transformer station at the generating end of the line.

There are 12 transformers in the building. The high-tension windings are designed for 26,000 volts potential, and the low-tension windings for 2,300 at full load. Each transformer has a capacity of 350 kilowatts. The total kilowatt capacity of the switch station is therefore 4,200 kilowatts; but as three transformers are kept as spares, the working ca-

the generators are directly connected—and automatic hydraulic patent governors. Each turbine is guaranteed to give off 1,250 horse-power—brake—at the coupling, under the following conditions: Net fall, after deducting all losses of pressure, equal to 382 feet 7 inches; water supply, 2,230 cubic feet per minute, or 37.2 cubic feet per second, running at a normal speed of 300 revolutions per minute. Also two Escher, Wyss & Co.'s patent high-pressure turbines with horizontal shafts, automatic hydraulic patent governors, each turbine guaranteed to give off 144 brake horse-power at the coupling connecting the turbine and exciter dynamo.

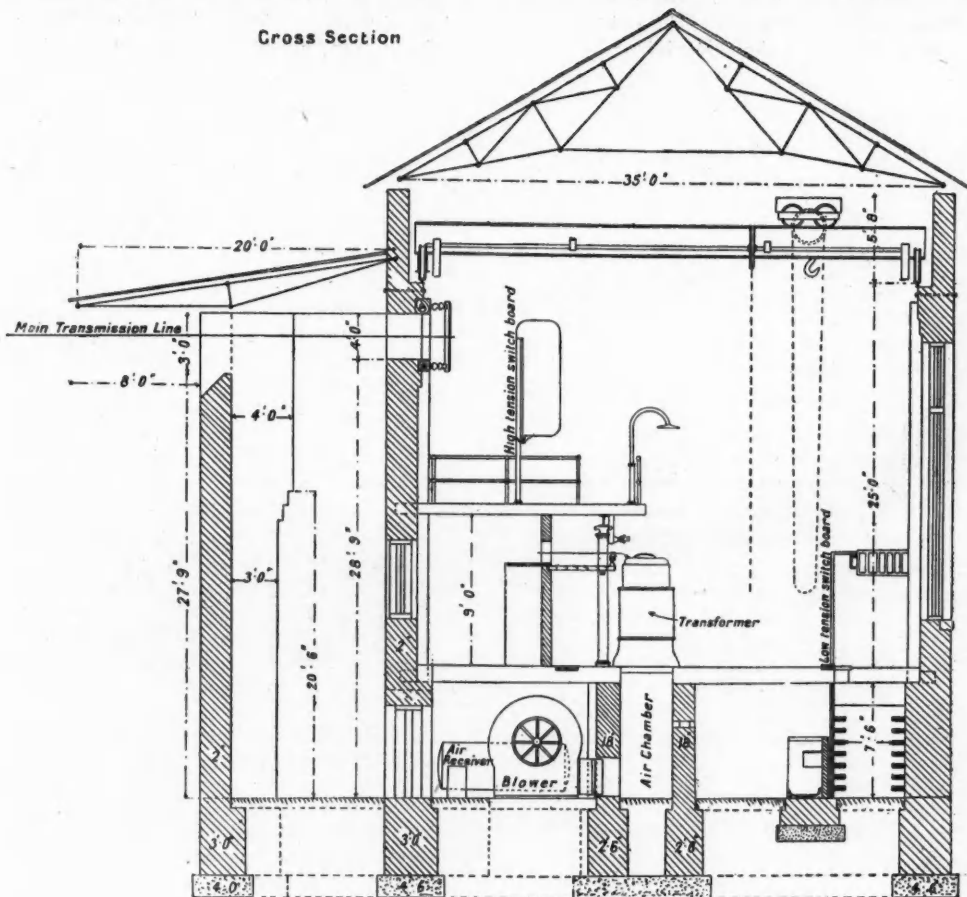
The guarantee of efficiency was, for the turbines, 80 per cent at full gate; for the hydraulic governors, the normal speed of turbines to be kept constant within 2 per cent on sudden variation of loads of 10 per cent, and within 4 per cent on sudden variation of load of 25 per cent. The water pressure in the pipes to be kept constant within about 5 per cent of the normal pressure under sudden variations of load, on sudden closing of the gates of the turbines.

Three steel penstocks are provided for carrying the water to the turbines; these penstocks are 900 feet in length, and each one is made up of piping varying in diameter from 45 inches to 36 inches, namely, 36 inches, 39 inches, 42 inches and 45 inches. The variation in diameter was given to enable the pipes to be conveniently packed for carriage from Europe.

In the step-down transformer station at the gold-fields a separate feeder panel is provided for each of the mines served with electrical power. The electrical equipment of these 10 mines consists of 33 motors, with a total capacity of 4,205 horse-power, of which 11 motors are to operate crushing mills; 12 with an aggregate capacity of 2,550 horse-power, to operate air compressors; five to operate hoists; two to operate stone crushers; one to operate a triplex pump; two to operate machine shops. The above embrace practically all conceivable applications in connection with mining.

The motors supplied by the Government for operating the mining machinery are of the simplest possible construction, and are so easy to handle that they may be considered to be practically "fool proof." All motors of 200 horse-power and smaller sizes are of the induction type, without any brushes, collectors or commutators to take care of. Sizes from 200 to 100 horse-power are wound for 2,080 volts, connected directly to the distributing mains, and all smaller motors are wound for 220 volts with small step-down transformers used between the distribution mains and the motors. Three synchronous motors, one of 400 and two of 300 horse-power, are used to drive air compressors, these were adopted in order to raise the power factor of the system. The poles supporting the distribution circuits are of the same type as those used on the main transmission line. The total weight of copper used in the distribution system, which is about 10 miles in length, is 182,300 pounds.

**DETERMINATION OF TELLURIUM.**—G. Frerichs finds (*Journal praktischer Chemie*, LXVI, xvii, 261 to 262) that the reduction of tellurium dioxide and tellurous acid to metallic tellurium by means of sulphur dioxide occurs only when the solution is mixed with from half its bulk to an equal bulk of strong chlorhydric acid, and then only after several hours' heating and passage of the gas, but in the simultaneous presence of sulphur dioxide and iodohydric acid the reduction is immediate and complete, even in the cold. To the solution of about 0.3 gram of tellurium dioxide in sulphuric or chlorhydric acid diluted to 100 c.c., add 1 to 2 grams of potassium iodide, heat to boiling and add about 50 c.c. of a solution of sulphur dioxide. Pass through a weighed filter, wash with water containing sulphur dioxide and finally with alcohol and ether, dry at 100° to 105° C. and weigh.



CROSS SECTION OF TRANSFORMER HOUSE, CAUVERY FALLS.

cuit telephone on two hard-drawn copper wires, of 0.0052 square inches in section. The transmission lines are transposed three times in the full distance, and the telephone line every fourth pole. The two lines are normally connected in multiple, and switches are provided by which either one of the lines can be disconnected. These switches are not intended for opening the circuit under load, but only for transferring the load from one line to another, or connecting the two lines in multiple. In case it is desired to open the circuit under load, it will be necessary to throw open the oil switches on the low-tension side of the transformers, which are specially designed to open the circuit under heavy induction loads. It was not considered necessary to provide switches for opening the high-tension line under load. The porcelain insulators, 24,000 in all, have been each tested under a pressure of 60,000 volts for one hour. These insulators were made in Italy.

The transmission line was erected in nine months, under the supervision of Mr. S. Huston, an American engineer, whose services were lent by the General Electric Company. Transport difficulties, climate and dense jungle presented obstacles to rapid

capacity is 3,150 kilowatts, or 4,222 horse-power, leaving 1,000 kilowatts in reserve. The transformers are of the air blast type, the two blowers—one spare—for cooling being 80 inches, operated by  $7\frac{1}{2}$  horse-power induction motors.

Each mining property has a separate feeder panel to its outgoing leads. Each panel is equipped with an oil switch of the automatic release type, recording and indicating wattmeters, and an additional ammeter for those circuits which carry synchronous motors. By this arrangement a complete record can be kept of the work performed during any given period, or for instantaneous observations, and the power factor of the synchronous motor circuits can be obtained at any time. All stations are equipped with an air compressor and tank for cleaning the apparatus. Air is used at 100 pounds per square inch, and pipes are laid throughout all the buildings to which hose can be attached. All stations are also equipped with overhead traveling cranes and electric lamps.

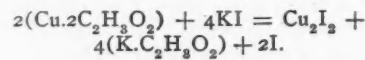
The hydraulic plant supplied and erected by Escher, Wyss & Co., of Zurich, on the general designs of Mr. Alph. Steiger, consists of six high-pressure turbines, with horizontal shafts—to which

## THE COPPER ASSAY BY THE IODIDE METHOD.\*

By ALBERT H. LOW.

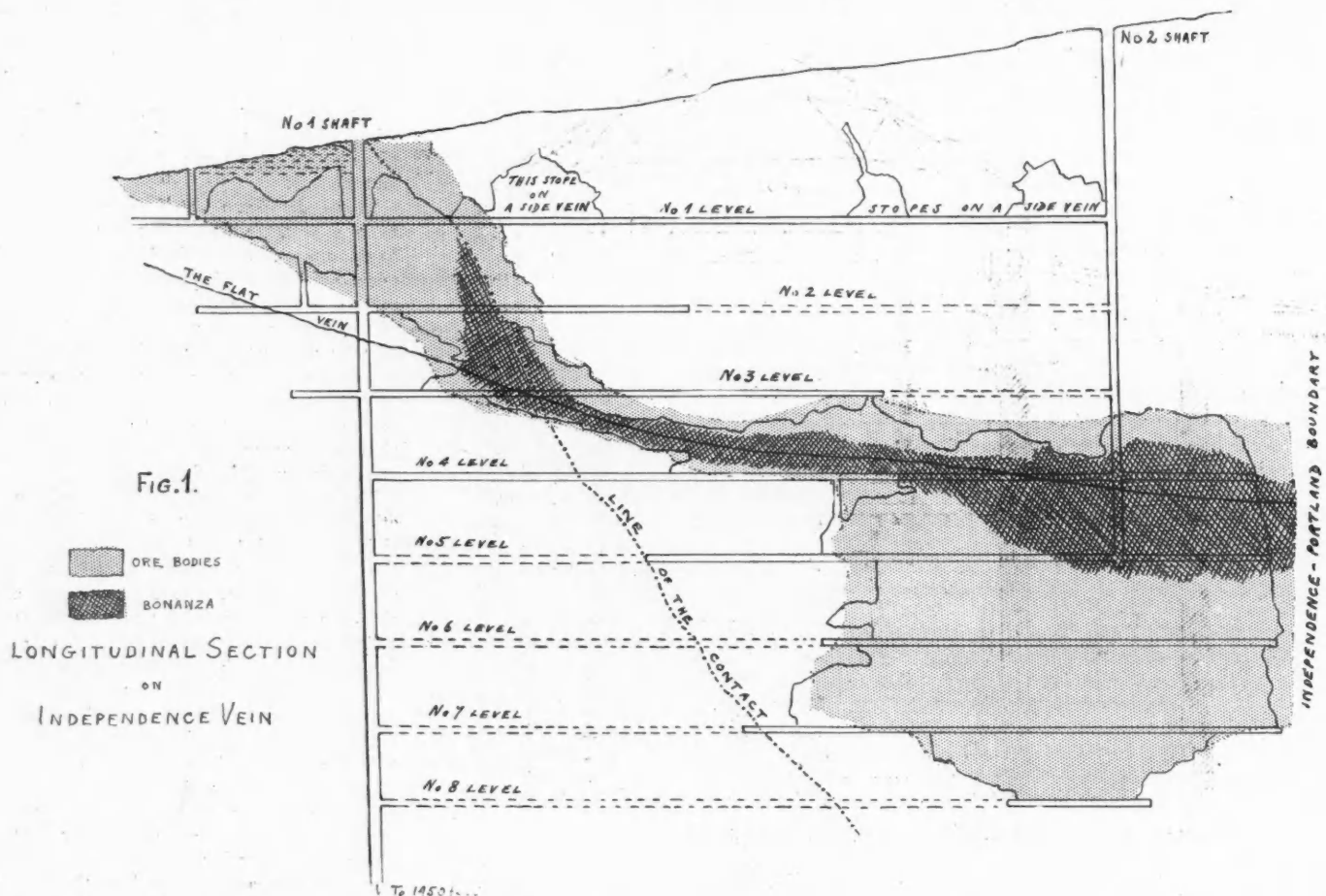
From time to time the writer has seen statements reflecting on the accuracy of the iodide method for copper. The strictures are undoubtedly, in the main, perfectly just, according to the experience of their authors. When the writer first published his modification of the method, the preliminary experiments and the actual assaying of many ores seemed to justify all the statements then made. Continued use of the method, however, upon all kinds of material, eventually resulted in the discovery of slight inaccuracies under certain conditions not always recognized or understood at the time. Much attention has naturally been paid to the elimination of these troubles and apparently with success. As a result, the assay as now carried out in the writer's laboratory, while essentially the same as originally described, is nevertheless different in many of its details. It appears to leave but little to be de-

the copper as hydroxide or oxide. Now add strong acetic acid in slight excess, perhaps 3 or 4 c.c. of the 80 per cent acid in all, and boil again for a moment if necessary to redissolve the copper. Cool to room temperature and add about 3 grams of potassium iodide, or 6 c.c. of a solution of the salt containing 50 grams in 100 c.c. Cuprous iodide will be precipitated and iodine liberated according to the reaction



The free iodine colors the mixture brown. Titrate at once with the thiosulphate solution until the brown tinge has become weak and then add sufficient starch liquor to produce a marked blue coloration. Continue the titration cautiously until the color due to free iodine has entirely vanished. The blue color changes towards the end to a faint lilac. If at this point the thiosulphate be added

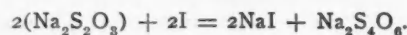
a flask of 250 c.c. capacity add about 6 c.c. of strong nitric acid and boil gently nearly to dryness. Then add 5 c.c. of strong hydrochloric acid and again heat. As soon as the incrustated matter has dissolved add 6 c.c. of strong sulphuric acid (sp. gr. 1.84) and boil until the more volatile acids are expelled and the fumes of sulphuric acid are coming off freely. This is best done over a naked flame. Allow to cool, add 25 c.c. of cold water and heat the mixture to boiling. Allow to stand, hot, until any anhydrous ferric sulphate is entirely dissolved and then filter to remove more especially any lead sulphate. Receive the filtrate in a beaker about 6 centimeters in diameter. Wash the flask and filter with either hot or cold water and make the volume of the filtrate about 75 c.c. Place in the beaker a piece of sheet-aluminum prepared as follows: Cut a strip of stout sheet-aluminum 2.5 centimeters wide and about 14 centimeters long, and bend this into a triangle so it will stand upon its edge in the beaker. The same aluminum may be used repeatedly, as it is but lit-



sired on the score of accuracy, and is perhaps of sufficient general interest to warrant publication.

**Standardization of the Thiosulphate Solution.**—Prepare a solution of sodium thiosulphate containing about 19 grams of the pure crystals to the liter. Standardize as follows: Weigh accurately about 0.200 gram of pure copper foil and place in a flask of about 250 c.c. capacity. Dissolve by warming with 5 c.c. of a mixture of equal volumes of strong nitric acid (sp. gr. 1.42) and water and then dilute to about 50 c.c. Boil for a few moments to partially expel the red fumes and then add 5 c.c. of strong bromine water and boil until the bromine is thoroughly expelled. The bromine is to insure the complete destruction or removal of the red fumes. Remove from the heat and add a slight excess of strong ammonia water. Ordinarily it suffices to add 7 c.c. of ammonia water of 0.90 sp. gr. Again boil until the excess of ammonia is expelled, as shown by a change of color of the liquid and a partial precipitation of

drop by drop and a little time be allowed for complete reaction after each addition, there is no difficulty in hitting the end-point within a single drop. One c.c. of the thiosulphate solution will be found to correspond to about 0.005 gram of copper, or about 1 per cent in the case of an ore where 0.5 gram has been taken for assay. The reaction between the thiosulphate and the iodine is



Sodium iodide and tetrathionate are formed. The starch liquor may be made by boiling about 0.5 gram of starch with a little water and diluting with hot water to about 250 c.c. The liquor should be homogeneous and free from lumps or grains. It should be used cold and must be prepared frequently, as it does not keep well. The thiosulphate solution made from the pure crystals and distilled water appears to be quite stable, showing little or no variation in a month under reasonable conditions.

**Treatment of Ores.**—To 0.5 gram of the ore in

tle attacked each time. Add one large drop of a mixture of equal volumes of strong hydrochloric acid and water, cover the beaker and heat to boiling. Allow to boil from 7 to 10 minutes, which should be sufficient to precipitate all the copper in any case, provided the bulk of the solution does not much exceed 75 c.c. Avoid boiling to a very small bulk, as in that case some of the precipitated copper may redissolve. The aluminum should now appear clean, the precipitated copper being detached or only loosely adhering. Remove from the heat and wash down the cover and sides of the beaker with cold water. There is danger of the finely divided copper being slightly oxidized and dissolved during the subsequent washing. To prevent this, and at the same time to precipitate any traces of copper still remaining in solution, add about 15 c.c. of strong hydrogen sulphide water. If the copper in the ore does not much exceed 20 per cent proceed as follows: Decant the supernatant liquid through a 9-centimeter filter. Add 10 c.c. of strong hydrogen sulphide water to the residue in the beaker and then trans-

\* From the *Journal American Chemical Society*, November, 1902, XXIV, xi, 1082 to 1086.



fer the liquid and precipitate to the filter. Wash thoroughly with cold water, without delay, to avoid oxidation. Now place the clean original flask under the funnel. Pour over the aluminum in the beaker 5 c.c. of a mixture of equal volumes of strong nitric acid (sp. gr. 1.42) and water. Any adhering particles of copper will be thus dissolved. Heat to boiling, but do not prolong the latter or the aluminum will be unnecessarily attacked. Pour the hot acid very slowly over the precipitate on the filter so as to dissolve all the copper, lifting the fold if necessary. Now, without washing, pour 5 c.c. of a cold, saturated, aqueous solution of bromine into the filter and then wash the beaker and filter with hot water. Finally remove the filter and open it. If there remains a residue that might possibly contain copper it may be rinsed into the flask. The bromine has several functions. It cleanses the separated sulphur left on the filter, it insures the highest state of oxidation of any arsenic or antimony present, and it also effects the complete destruction or removal of the red fumes, which is a matter of great importance. If 5 c.c. of bromine water are insufficient to impart a permanent tinge to the filtrate, more must be added. Boil the filter, which usually does not exceed 75 c.c. in bulk, to thoroughly expel the excess of bromine, but avoid boiling to such a small bulk as to cause decomposition of bromides, etc. Remove from the heat and add ammonia water in slight excess (ordinarily 7 c.c. of strong ammonia). Boil off the excess of ammonia, as shown by the change of color of the solution, and then acidify with acetic acid, again boiling if necessary to redissolve any precipitate containing copper. The addition of 3 or 4 c.c. of the 80 per cent acid does no harm, but is not necessary except in the presence of sufficient arsenic to cause a precipitate of copper arsenate. This may require considerable acetic acid for its solution, perhaps 10 c.c. If not mostly dissolved at this stage, it is taken up slowly later on and the titration may become very tedious before the true end-point is finally reached. Proceed with the acetic acid solution, after cooling to room temperature, precisely as described in the standardization of the thiosulphate and calculate the percentage of copper from the amount of the latter required.

In titrating low percentages of copper great care should be taken not to pass the end-point. Always work slowly towards the end and stop short of complete decolorization and then continue only when the liquid, after standing a minute or two, still persists in a tinge of color.

With high percentages it is usually advisable to wash the precipitated copper by decantation instead of on the filter. Proceed as follows: Transfer the liquid and copper in the beaker (to which hydrogen sulphide solution has been added) to the original flask and set the beaker and aluminum aside temporarily. Allow to settle, decant through the filter and wash the copper three or four times by decantation, the first time with hydrogen sulphide water and then with cold water, using about 20 c.c. each time. Now place the flask and residue under the funnel, heat the 5 c.c. of acid in the beaker as before and pour it through the filter. Do not add the bromine for the moment, but remove the flask, replacing it under the funnel with the beaker, and heat the acid until all the copper is dissolved and the red fumes are mostly expelled. Now return the flask under the funnel, add the bromine, proceed with the washing of the beaker and filter, and continue as described above.

Owing to the fact that the end-point is somewhat sharper as the amount of copper present is less, the operator may perhaps find it advantageous in the case of very rich material to take only 0.25 gram instead of 0.5 gram for assay. As there seems to be no difficulty in doing accurate work

by either plan, this is perhaps best left a matter of choice.

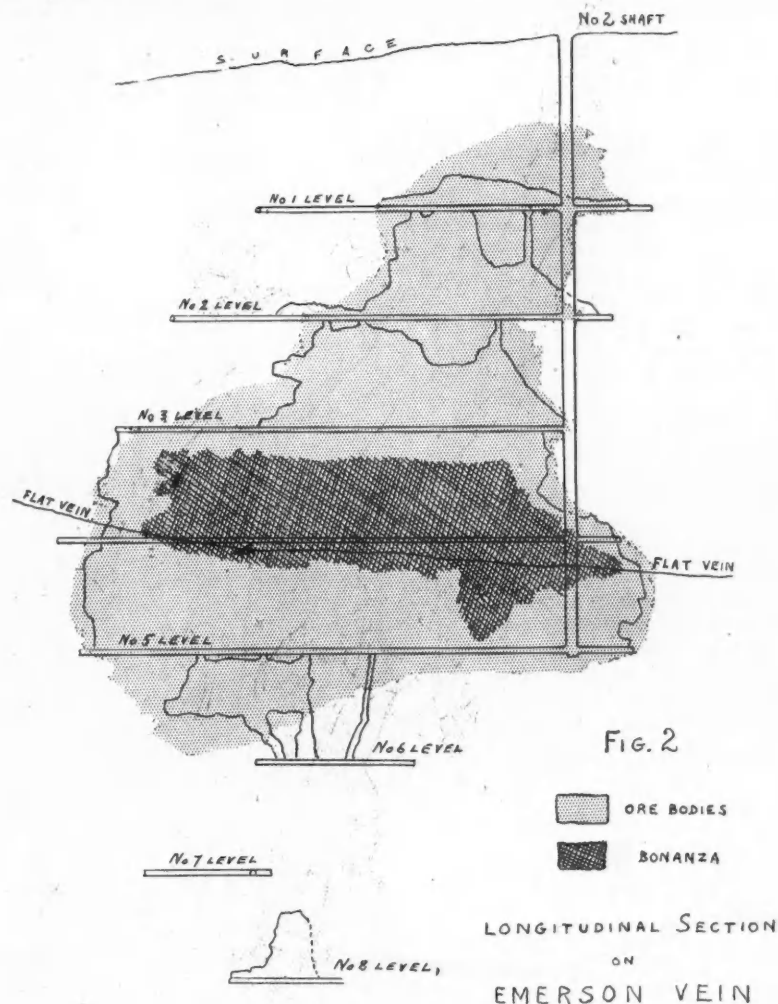
*Notes.*—According to the equation previously given, 0.5 gram of copper requires 2.62 grams potassium iodide. While direct experiment shows this to be apparently true, yet when only the theoretical amount of potassium iodide is present the reaction is slow, and, in fact, does not appear to proceed to completion until during the titration which is thereby unduly prolonged. It is best, therefore, always to use an excess, but as the iodide is expensive the quantity used should be governed by the amount of copper present, which can always be estimated approximately. Allow, say, 1 gram potassium iodide for every 15 per cent copper, when 0.5 gram of ore is taken for assay. It is convenient to prepare a solution containing 50 grams of potassium iodide in 100 c.c. A 2 c.c. pipette will thus deliver 1 gram of the salt. No error will be introduced in a doubtful case by adding more potassium iodide after the titration is apparently finished and resuming the

mence with. The coal to be used is very clean, and of a superior quality. No pitch will be used in the process, the agglomerants used being residual oils from the Assam Company's own refineries with other ingredients to give them greater consistency. Very satisfactory tests have already been made for this purpose.

#### AN EXAMPLE OF THE LOCALIZATION OF RICH ORE

By T. A. RICKARD.

The Independence Mine, at Victor, in the Cripple Creek District, has produced, up to date, over \$13,000,000 worth of gold, from which a profit of nearly seven and a half millions has been won. This production has been made, for the most part, during the last eight years; of the totals mentioned two-thirds has been extracted during the last three and a half years. At this time of writing the old workings\* are practically worked out and therefore they afford evidence, of scientific value, concerning the conditions which may modify or determine the distribution of ore in lodes.



operation if the blue color is thereby restored.

Zinc and silver do not interfere with the assay. Lead and bismuth are without effect, except that by forming colored iodides they may mask the approach of the end-point before adding starch. Arsenic and antimony, when fully oxidized as described, have no influence. The return of the blue tinge in the titrated liquid after long standing is of no significance, but a quick return, which an additional drop or two of the thiosulphate does not permanently destroy, is usually an evidence of faulty work.

**COAL IN ASSAM.**—The Assam Railways and Trading Company, Limited, which owns extensive coal mines in Assam, has decided to adopt machinery for briquetting the small coal, and has placed the order with Messrs. Yeadon, Sons & Co., Leeds, England, for one of their latest improved briquette plants to produce 100 tons per day to com-

During the last two years certain illuminating suggestions concerning the formation of local enrichments in veins have been brought forward by authoritative geologists; the theories in which they have been embodied have received keen attention from mining engineers, to whom the solution of the problem was obviously of great practical importance. Among others, I have collected a few data; of these the most interesting were obtained in the well-known mine, the richness of which has been emphasized in the first paragraph of this contribution.

The testimony obtained is summarized in the drawings which are presented herewith; three of these (Figs. 1, 2 and 3) represent longitudinal sections along the three principal veins worked in the mine and known as the Independence, Bobtail and Emerson lodes. The relations of these to each other, their strike and their dip, are indicated in the map

\* The writer expresses no opinion whatever concerning the new workings opened up during the past year.

(Fig. 4), which also shows the subordinate members of an intricate series of gold veins. A flat vein crosses the whole series and the crossing of it with the members of the series coincides with a notable enrichment, the character of which it is my purpose to discuss.

Before doing so, however, it will be necessary to afford further data concerning the conditions observed in the mine. In the first place, it is evident that there are two systems of vein-fracture, the In-

dependence system, which has a strike nearly due north, with an almost vertical dip, and the Bobtail system which strikes west of north, with a strong dip to the west. To the former belong the Independence, the West Independence, the Grant, and the East veins, while to the latter belong the Bobtail, the Emerson, the Drury, and the West Bobtail veins. The Independence cuts through the Bobtail and Emerson, that is to say, the ore-streak of the

former can be traced as it crosses the two latter lodes, but the amount of faulting cannot be determined, and it is, in all probability, very slight. This is characteristic of the Cripple Creek region. The ore composing these veins differs in various parts of the mine because the veins penetrate a diversity of volcanic rocks, but it cannot be said that any vein has a mineralization distinguishing it from another belonging to the same system or to the other system. What difference there may be is more

importance during March, 1900. In June it had been cut at so many points that I was able to trace it with certainty through the principal workings for a distance of over 700 feet. Subsequently, it became an important source of ore supply.

This flat vein consists of one or more streaks of ore following a set of fractures which have an average dip of  $18^{\circ}$  north. Irregularities of dip are frequent and can be described as producing a billowy or rolling contour. The ore varies in thickness from a thin seam, a few inches wide, to a series of parallel streaks extending over a thickness of twenty feet. The vein usually exhibits a band of brecciation, that is to say, even in the andesite breccia it can be seen that the flat vein is built up of fragments of broken breccia. This is illustrated by Fig. 5, which shows the flat vein as seen at the fourth level on January 21, 1901. In this instance the vein was well defined by the two walls, the upper one exhibiting a distinct parting and a thin shell or casing, while along the lower boundary there was a "frozen" contact, that is, there was no parting or selvage. The matrix of the vein-filling was fine-grained, built up of breccia similar to the outer country, but more silicified; in this ground-mass there were large fragments of rocks, the varieties granite, phonolite and andesitic breccia being readily distinguishable. On account of disseminated fluorite the vein was darker than the enclosing rock; this effect was also emphasized by the presence of small grains of iron pyrite. No distinct vein-quartz was discernible. At the place where this sketch was made there was no ore. Another illustration, and one which is typical of the flat vein where it is ore-bearing, is shown in Fig. 6, drawn on March 6, 1900. Here there are three or four streaks, the uppermost (A B) being built up of an almost solid seam of tellurides of gold—calaverite and sylvanite.

The flat vein was first recognized in the bottom of the third level, on the Independence lode, and shortly afterwards it became an important factor in the stopes at the northern end of the fourth level where it crosses the Bobtail lode. Stopes were finally extended on this flat vein at intervals on its dip from near the granite-breccia contact, just above the third level, to the north end of the mine, where it passes into the neighboring Portland Mine at a point about 20 feet below the fourth level. It passes southward through the contact into the granite and was cut in the Washington shaft, which is 700 feet south of the No. 1 shaft. In its approach to the surface, however, the flat vein becomes weak and frays out into a mere series of stringers. It is thus traceable in the Independence Mine for a length of over 1,500 feet.

Upon the map (Fig. 4) I have marked the area which has been stoped upon this flat vein.\* It will be seen that stopes extend from 50 feet west of the Independence vein to a line 80 feet east of the Emerson. The rich parts of the flat vein are evidently connected with the verticals, as the other veins may be termed in contradistinction. Three hundred feet is the maximum width of stope. Even at those places where the flat vein itself has been too poor, or too small, to be profitably stoped it has exercised a notable enrichment upon the verticals where it encounters them. This is emphasized by the stope-sections given in Figs. 1, 2 and 3, where the richest parts or "bonanzas" are shown to coincide with the vicinity of the flat vein. If this result had been noticeable in regard to one lode alone it might well have been deemed a mere coincidence, but when it is confirmed by similar effects on the two other lodes it becomes valuable testimony. In Fig. 1 it is noticeable that the bonanza ore followed the contact for a short distance above the place where the flat vein cuts through. This led, in the early days of the mine, to the supposition that the "contact," a word of good omen in Colorado on account of the experience of mining at Leadville, would prove to be the determining factor in the distribution of rich ore. At the fourth level this idea was negated. Subsequent ex-

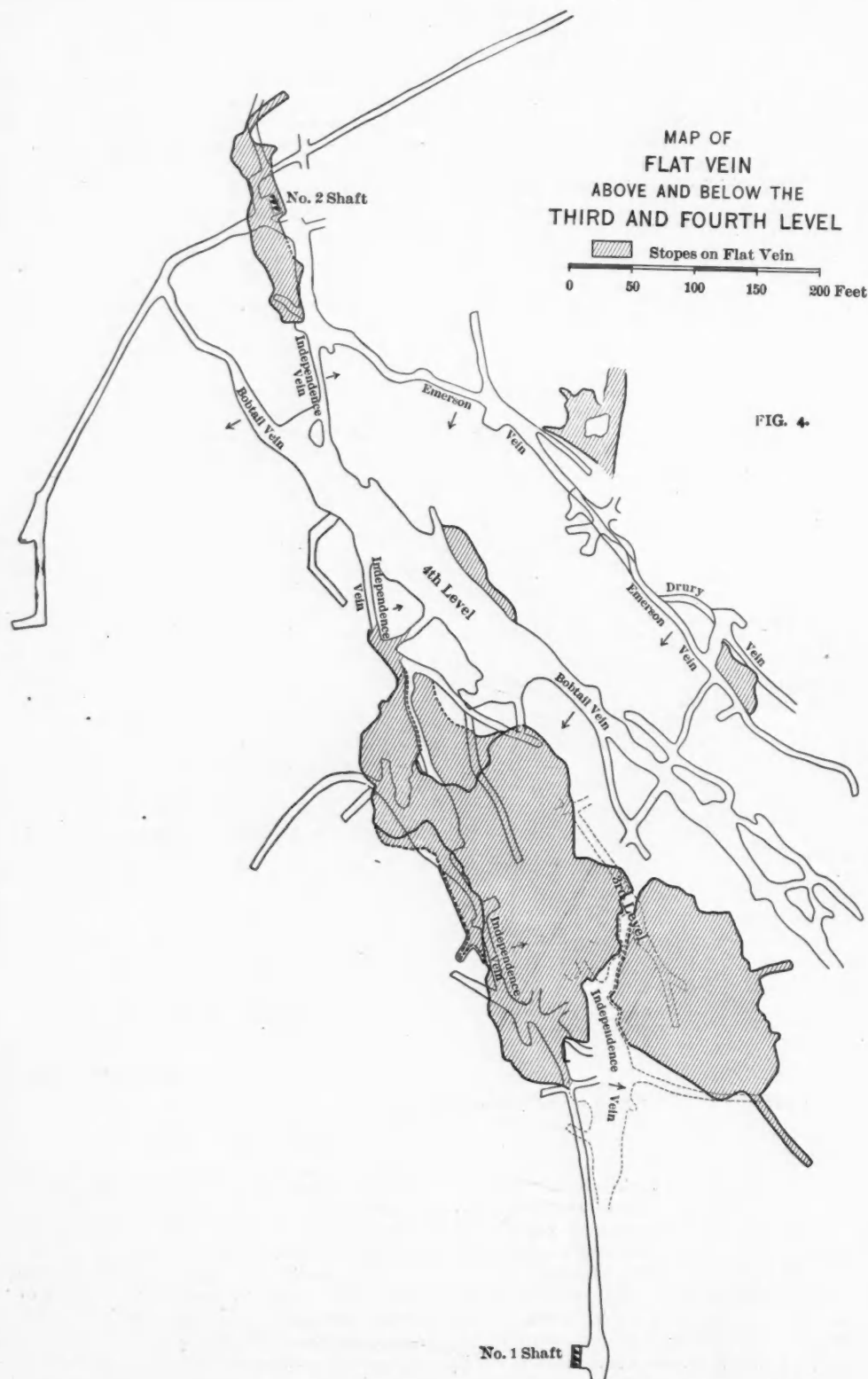


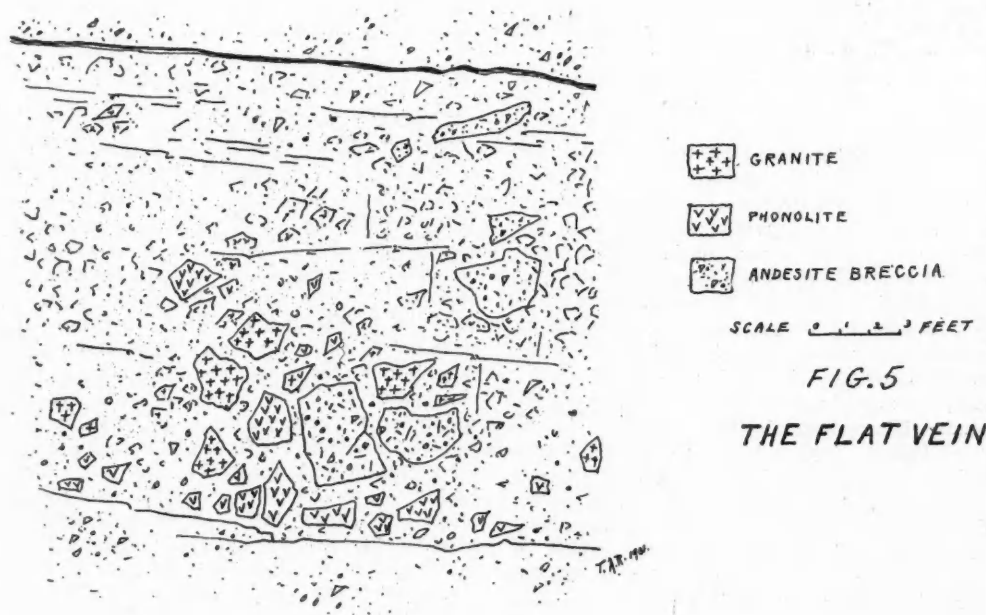
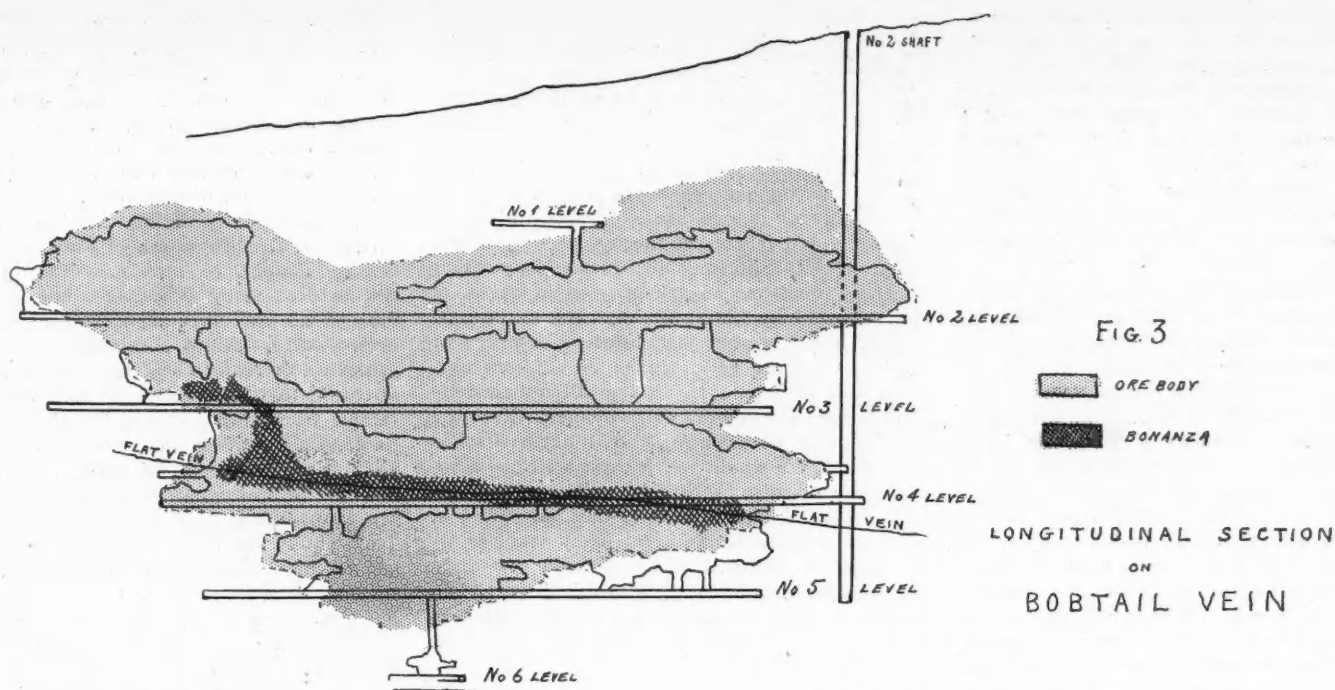
FIG. 4.

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former can be traced as it crosses the two latter lodes, but the amount of faulting cannot be determined, and it is, in all probability, very slight. This is characteristic of the Cripple Creek region. The ore composing these veins differs in various parts of the mine because the veins penetrate a diversity of volcanic rocks, but it cannot be said that any vein has a mineralization distinguishing it from another belonging to the same system or to the other system. What difference there may be is more

importance during March, 1900. In June it had been cut at so many points that I was able to trace it with certainty through the principal workings for a distance of over 700 feet. Subsequently, it became an important source of ore supply.

\* This map was prepared in August, 1902.



Oxidation extends from surface to a little below the third level, but the ores are irregularly and sporadically oxidized to a greater depth, there being no well-defined boundary line between the oxidized ores of the upper levels and the lower horizon of sulphide ores. Oxidation is observable down to 960 feet; this is also the lowest depth at which any noteworthy body of pay-ore has as yet been found.\* It has been the general experience, in stoping the half dozen veins intersected by the workings of this particular mine, that oxidation frequently coincides with exceptional richness in the ore.

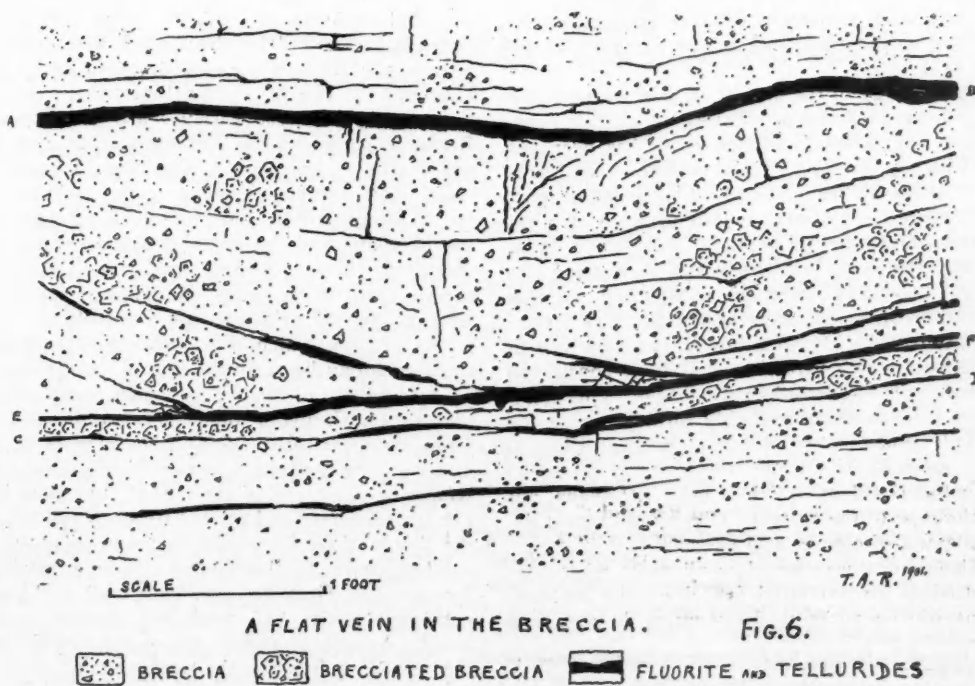
There is a good deal of obscurity covering the precise relation of the flat vein to the "verticals." In the first place, neither one nor the other is palpably dislocated at the crossing and, in the second place, the mineralization of both is similar in kind. By close observation of the behavior of one of the ore-streaks of a vertical vein where it meets a well-defined seam forming a part of the flat vein, it can be seen that each preserves its identity at the intersection; neither, apparently, is faulted, and the fracture or parting followed by the ore can be traced uninterruptedly in both instances. This points to the con-

\* As I am informed by the late manager, Mr. H. A. Shipman.

plorations demonstrated that it was quite erroneous.

The crossing of the Independence and Emerson lodes proved a very rich place in that part of the line of intersection which was near the flat vein. In Fig. 1 a cross marks the phenomenally rich spot which became known, underground, as "The Jeweler's Shop." Similarly, in Fig. 3, the corresponding place on the Emerson lode is marked. It will be observed that the intersection of these two veins caused a deepening of the bonanza zone, as measured from the line of the flat vein.

On the Independence lode the main ore-body reached the surface, but the outcrop was not very rich; the ore-bodies of the Emerson and Bobtail lodes did not reach daylight, at least they became too poor to be mined. These facts are interesting in themselves. Furthermore, the Bobtail and Emerson ore-bodies dwindle away below the fifth level, while in the case of the Independence lode profitable ore has not been stoped in quantity below the eighth level. The bonanza ore of the verticals occurred in a zone which traversed the ore-bodies already described. This zone was coincident in its position with the flat vein and extended from the third to the fourth levels of the mine, reaching upward, occasionally, to above the second and, rarely, downward to the fifth, as indicated on the sections.



clusion that the deposition of the ore was contemporaneous. However, the two sets of fractures followed by the ore need not necessarily be of the same age. The marked brecciation which characterizes the line of the flat vein suggests very decided movement, but the verticals have not been disrupted or shifted at their intersection with this band of brecciation. Therefore it must be that the flat vein is the older, and was already formed when the fractures identified with the verticals came into existence.

This evidence suggests the hypothesis that subsequent to the formation of both sets of fractures, namely, those now followed by the flat vein and the verticals, respectively, there occurred a period when ore-bearing waters found their way along them and thus started the mineralizing agencies at work. Subsequently, the oxidizing waters of the surface found their way down the verticals and dissolving part of the gold carried by the ores of the upper zone they precipitated it when, at the encountering of the flat vein, they met with structural conditions which retarded further descent, by favoring a lateral spread of the solutions. That this result was brought about in late geological time is evidenced from the relation of the ore-bodies to the surface contours of to-day, and by the absence of any notable dislocation of the ore-streaks. To this may be added the observation that the zone of richness is at the level of the groundwater level and a short distance—200 feet—below it.

#### THE EASTERN ONTARIO GOLD BELT.\*

By PROF. WILLET G. MILLER.

The belt or strip of country in southeastern Ontario along which auriferous deposits have been found at various points extends from the township of Belmont in Peterborough County eastward across the counties of Hastings, Ad-dington and Frontenac, and into the western part of Lanark, a distance of about 70 miles.

It is only within the last four or five years that gold mining may be said to have been carried on successfully in this field. This is owing to various causes, chief among which are the refractory character of the ore in some of the deposits and the lack heretofore, to some extent, of technical skill and sufficient capital. Owing to the fact that the ore of certain of the deposits which have been worked is decomposed near the surface of the ground, thus being rendered free milling, companies have been organized to work such deposits under the belief that the precious metal could be extracted by ordinary means. After working downwards, however, the ore has been found to be not adapted to free-milling plants, and thus numerous attempts have ended in failure, until recently when companies of sound financial standing and with experienced managers have entered the field.

The geology of the district may be summarized as follows: A series of diorites, crystalline limestones and various schistose rocks has been cut through by granite. This granite now forms most of the higher hills and ridges in the district, the diorites and accompanying metamorphic varieties occupying the valleys and lower lying areas. Overlying all the rocks mentioned are areas, here and there, of undisturbed Silurian limestone of the Black River and Birdseye formation, together with, occasionally, small outliers of sandstone which heretofore has been considered to belong to the Potsdam formation. This sandstone was, however, probably formed during the period immediately preceding the deposition of the limestone, and is thus higher up in the series than the Potsdam, which is now in Canada, put at the base of the system. Glacial and recent deposits are, of course, also present.

The granite was found in all cases where opportunities were offered for observing the relations of the rocks to be younger in age than

either the diorite or crystalline limestone, the latter two rocks being cut by dikes of granite and its fine-grained variety, felsite.

The relationship existing between the diorite and crystalline limestone in the more western part of the belt was not so clear as in some of the more eastern exposures. In the vicinity of the old marble quarry on the outskirts of the town of Madoc diorite dikes, together with dikes of granite and felsite cut through the crystalline limestone. The diorite is also seen to be younger than the limestone on the Mississippi River, in the township of Clarendon and elsewhere. Of course, it is possible that different outcrops of diorite along the belt may be of different age. Some may be older than the crystalline limestone while others are undoubtedly younger. Since the gold deposits in association with these diorites throughout the whole belt possess so close a resemblance to one another, especially in the occurrence of a high percentage of mispickel in many of them, it would seem likely that the diorites are of one age. It is also possible that there are granites of different ages in this district. To determine this definitely would, however, take much more time than the writer had at his disposal.

The term diorite is here used in a comprehensive sense to cover a considerable variety of dark, fine grained to coarse grained, massive and schistose rocks. The granite along some parts of the belt is also quite different in appearance from that along other parts. The typical granite of Marmora and Madoc is different from that of Kaladar and other townships. The granite passes into syenite in the northern part of Methuen township and in other localities.

Most of the gold deposits occur near the contact of the diorite and granite, although some important ones are found at a considerable distance from the granite. It would appear that the cavities occupied by the deposits owe their origin to the shrinkage of the granite on cooling which has caused fractures to be formed in the rocks near the contact. The cooling mass of granite was apparently tougher than the rocks near the contact. Hence fractures were produced in the latter when the granite began to contract. The openings now occupied by the gold ores evidently did not originally possess the width which they at present show. They may at first have been represented by narrow cracks, which in course of time became enlarged by circulating waters dissolving away portions of the surrounding rock.

The granites, diorites and associated crystalline rocks to which reference has been made are classified as Archaean, and, according to the nomenclature adopted by the Canadian Geological Survey, the granites are considered to be Lower Laurentian. The crystalline limestones and accompanying schistose varieties are put into the Grenville series of the Laurentian. It may be added that at one time it was thought some of these metamorphosed sedimentary varieties of the Hastings District were of different age from the Grenville and the name Hastings series was given to them. Recent work has, however, shown that the so-called Hastings series is of similar age and origin to the Grenville.

The relation which this sedimentary series of the Laurentian bears to the Huronian remains to be determined. The area in which rocks of the two series, Grenville and Huronian, have been found to occur most closely associated is in the district lying between lakes Temiscaming and Kippewa. Outcrops of the typical Huronian, Jasper conglomerate and related rocks, are found on the shores of the former lake. Some miles to the southeastward, on the Kippewa River, crystalline limestone of Grenville age, associated with garnetiferous gneiss and nepheline syenite is exposed. A mass of granite and gneiss occupies the area lying between the two points.

#### DETERMINATION OF ANTIMONY IN HARD LEAD.

F. W. Kuster, Ph. Siedler and A. Thiel have been investigating the method of estimating the percentage of antimony in hard lead by determining the specific gravity (*Chemiker Zeitung*, XXVI, 1107, November 19, 1902). Hard lead consists chiefly of lead and antimony, with only small percentages of impurities, and theoretically the specific gravity of the alloy should vary according to the proportion of lead and antimony. George Faunce, of Pittsburg, Pa., investigated this subject many years ago, and published a table giving the percentage of antimony, but the present investigators obtained incorrect results in the use thereof. They state that Faunce called attention to the necessity of observing that the sample be perfectly dense, but this is not easy to determine. They find, however, that shrinkage cavities may be avoided by very gradual and careful cooling, and metal of uniform density can be obtained. Sixteen determinations of the alloy of 80 per cent Pb and 20 per cent. Sb gave a mean specific gravity of 9.977, the extremes being 9.982 and 9.972. According to Faunce the specific gravity increases or decreases 0.06 for each per cent of antimony. As many as 16 determinations can be made in an afternoon with a liability of error of not more than 0.05 per cent Sb. The small percentages of copper, arsenic and iron, which exist in hard lead, do not significantly affect the result.

DEMAND FOR AMERICAN SUPERPHOSPHATES.—The following has been received from United States Consul G. H. Jackson, of La Rochelle, France, under date of November 19, 1902: "The demand for American superphosphates has greatly increased; there have been received at this office letters from several countries, including Germany and Italy, which show that there is an opening here for American enterprise on an extensive scale. I understand from three letters that more than 50,000 tons of superphosphates could be placed at once. In some instances, it would be better to ship the manufactured article direct from the United States. In other instances, it might be well for American capital to establish factories in the countries where phosphates are required, and where the local works have not sufficient capacity to supply the market. Thousands of tons of Belgian fertilizers of this nature are now received at La Rochelle."

BRICKS IN SOUTH AFRICA.—Under date of November 5, 1902, United States Consul-General W. R. Brigham writes from Cape Town: "Bricks are among the most expensive articles in this city. I am informed that they are sold for \$22.50 to \$27.50 per 1,000, and they are so poorly made that they have to be plastered with stucco to keep them from being destroyed by the action of the weather. I have seen some very rough bricks, shipped from England, which are harder than those manufactured here. I have not been able to find out the price, but they are more expensive than those locally made. It seems to me that if some good brick manufacturers close to our coast, in New Jersey or Maryland, would investigate this matter, they would find a large margin for profit. Bricks here are usually 2½ inches thick, 4½ inches wide, and 9 inches long, although I have seen some that are only 2 by 4½ by 9 inches. An American, who uses a great many bricks in building ice plants in this and other cities in this colony, told me he could sell 1,000,000 bricks per week here if he had such hard vitrified bricks as are made in the United States, for these would not have to be plastered. Building is very much retarded on account of the shortage of brick."

\* Abstract of paper in the Report of the Ontario Bureau of Mines for 1901.

### THE HIGHLAND ORE DRESSING MILL, BRITISH COLUMBIA.\*

By ERNEST R. WOAKES.

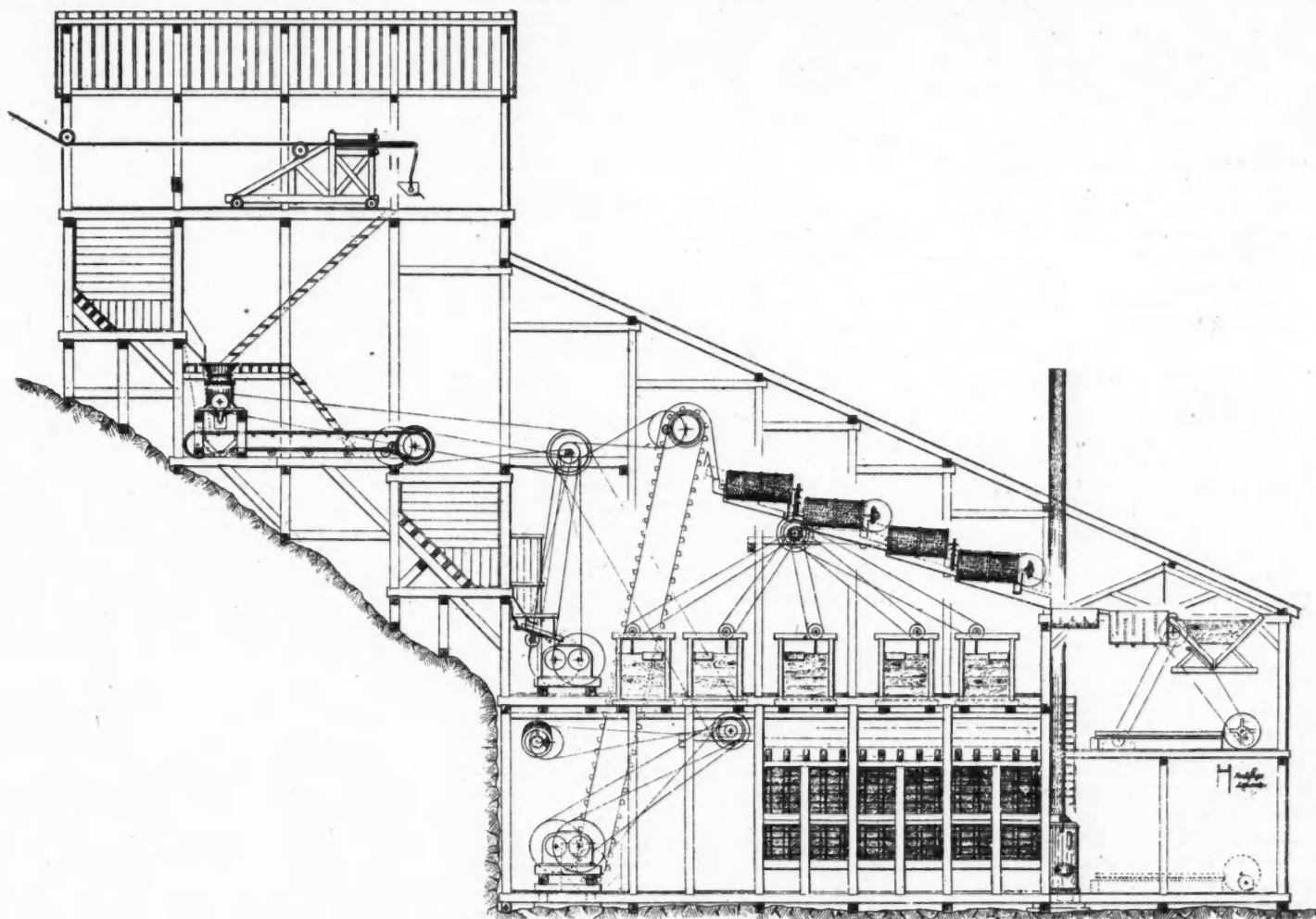
This mill was built for the Highland Mining Company, of Ainsworth, B. C., in 1901. The ore is galena and quartz, with some pyrite, pyrrhotite and blende. It contains about 0.5 ounce silver per unit of lead, practically all of the silver value being carried by the galena. The ore is brought down from the mine, a distance of 4,700 feet, by a Hallidie aerial tramway. At the upper terminal are separate bins for concentrating and clean ore; the brakes and automatic loader are worked by one man at that end. At the lower terminal, directly over the mill, there is an automatic dumping and self-righting device, by means of which the buckets are dumped as they come

the object being to run the tramway, crusher and conveyor, during day time only; thus two men operating this part of the plant are only required to work one shift. If it is necessary to sort out clean ore on the belt conveyor, an extra man is required during the day shift; any ore so sorted out is dropped directly into a chute that delivers it into the clean ore bin in basement.

The coarse rolls are fed by an inclined trough of sheet steel, a little narrower than the face of the rolls, which is operated by a revolving cam, bumping it against an adjustable stop, and a spring to give it the forward motion. The coarse rolls are 26 by 15 inches, Gates make, and are driven at 85 r. p. m. The coarse rolls set about 3 feet above the jig-floor, which is the second story of the mill. Directly below the coarse rolls

to a 2-compartment Herz jig, which has sieves 34 by 22 inches, and throw adjustable up to 4 inches. The material finer than 11-16 inch goes also to a 2-compartment jig. The other trommels are 72 inches long. They are covered respectively with  $\frac{1}{4}$ -inch round punched steel, 3 millimeters round, and 16-mesh slot. They each deliver their sized products to their respective jigs. Of the latter, there are three 3-compartment and two 4-compartment. The screens are 36 by 24 inches, and eccentrics adjustable from 1-inch to 3-inch throw. The concentrates from all of them pass into bins below the jig floor of the mill. Only the fine jigs make hutch-work.

The undersize from the last trommel passes to a set of four hydraulic classifiers, which are modifications of the Lake Superior trough type. They



SECTIONAL ELEVATION OF HIGHLAND CONCENTRATOR.

over the ore bin and right themselves again before starting on the return journey to the mine. The bins below the lower terminal are so arranged that concentrating ore is dumped before the buckets pass round the lower tail sheave of the tramway, and clean ore is dumped into a separate bin after the buckets have passed this sheave. When clean ore is being shipped over the tramway, it requires a man at the lower terminal to attend to the dumping and righting of the buckets. The clean ore passes directly through a chute to a lower bin on ground floor of mill, whence it can be handled by the same cars and arrangements as are used for shipping the concentrates.

From the upper ore bin the concentrating ore passes over an inclined grizzly directly into a 3 D Gates crusher, which discharges the crushed ore upon an 18-inch belt conveyor, which delivers it into a second storage bin immediately above the coarse rolls. Up to this stage the capacity of the plant is double that of the rest of the mill,

\* Abstract of a paper read before the Institution of Mining and Metallurgy, London, November 20, 1902.

there is a trommel, 36 inches diameter, and 40 inches long, covered with steel plate punched with  $\frac{3}{8}$ -inch holes. The oversize goes to rolls No. 2 (26 by 15 inches, run at 95 r. p. m.), which set on the ground floor, to one side of the elevator. The undersize from the  $\frac{3}{8}$ -inch screen, together with the product of rolls No. 2, goes to the elevator, which delivers to the train of trommels. On the other side of the elevator, corresponding in position to No. 2 rolls, there is a third set, 26 by 15 inches, 105 r. p. m., which recrush middlings from jigs Nos. 3, 4, 5, 6 and 7. The elevator is inclined, 48.5 feet centers, head wheel 48 inches diameter, boot-wheel 36 inches, belt 14 inches wide, 8-ply, buckets 12 by 6 inches, spaced 17 inches apart. The speed of the elevator is 350 feet per minute. There are four trommels, coupled up in sets of two, which are driven separately. In each case the driven trommel drives the ore above it by means of spur gearing. The trommels are cylindrical, 36 inches diameter. The first is 80 inches long, divided into four sections, of which two have  $\frac{1}{4}$ -inch holes and two 11-16 inch. The oversize from this trommel goes

consist of a double V trough, divided into hopper-shaped sections of increasing area. The pulp flows through the inner trough, passing over the divisions from one section to the next. Clean water is admitted into the space between the two troughs near the top of each section. There is an opening in the bottom of the inner trough, in the center of each section, and opposite to the opening a piece of  $1\frac{1}{2}$ -inch pipe passes through the outer trough, discharging the heavier material which settles against the rising current of water. The product of the first two classifiers goes to the two 4-compartment jigs. The other two classifiers feed Wilfley tables. The overflow from the classifiers goes to two pointed boxes, the first of which is 6 by 3 by 3 feet, divided into three compartments, respectively 18 inches, 24 inches, and 30 inches long, while the second is 8 feet square at the top and 5 feet deep. In the former the current is arrested by partitions and "diving" boards, the coarsest product being drawn off in the 18-inch compartment. The opening in the bottom of each pointed box is connected with a goose-neck, which controls to a certain extent the

quantity of water delivered with the pulp. The pulp is washed on Wilfley tables, of which the mill has six in all. The overflow from the second pointed box goes as tailings.

The mill is run by water power, a 4-foot Pelton wheel being placed on the top floor. It works under a head of 450 feet. The water discharged from it is caught in a tank and is used for concentrating purposes. A 2-foot Pelton wheel operates the Wilfley tables and the electric light dynamo. The mill is heated by steam from a 10 horse-power boiler.

In the construction of the mill there were used 290,400 feet of lumber and 118 twelve-light windows. The sides of the building are of two thicknesses of 1-inch dressed boards, with paper between. The roof is of corrugated iron. The grading was begun at the end of August, 1900. The carpenters began work September 15, 1900, and the mill was completed and in operation January 18, 1901. The total cost was as follows: Machinery and hardware, \$16,693; freight and

they contracted to pay him a royalty on all the ore shipped from their mines in the vicinity during a term of 20 years, the right to which, however, the seller—who was superintendent of the purchaser's mines—should forfeit if he voluntarily quit such employment during the term. It was held that it was an implied condition of such contract that the company should continue to operate its mines with reasonable diligence during the term, and that its ceasing to operate the same was a breach of such condition, for which the seller was entitled to recover. In case of failure to pay royalty for 90 days after written demand, he had a right to call for a reconveyance of his property, upon repaying the cost price. The money consideration named was \$1, but the real cost to the company had been \$3,500, made up of incumbrance on the property and obligations of the seller which the company had taken care of at the time. It was held that the tender of \$1 was insufficient, and that he must repay the \$3,500. The company having stipulated to pay a royalty of \$1 per ton on ore mined and shipped had no authority

of the State of New York. Pages, 192; with maps and illustrations. Price, 50 cents.

*New York State Museum. Bulletin 58. Guide to the Mineralogic Collections of the Museum.* By Herbert P. Whitlock. Albany, N. Y.; published by the University of the State of New York. Pages, 148; illustrated. Price, 40 cents.

#### BOOKS REVIEWED.

*Elektro-Metallurgie.* Third Edition. 1902. By Dr. W. Borchers. Leipzig, Germany; S. Hirzel. Pages, 288; illustrated.

This is the third edition of Dr. Borchers' well-known work, which is the standard in its subject. It has been entirely rewritten, but it is only the first section which is now published, and we shall defer further notice until receipt of the whole. The present volume treats of magnesium, lithium, sodium, potassium, calcium, strontium, barium, beryllium, aluminum, the cerium group of metals, copper and nickel.

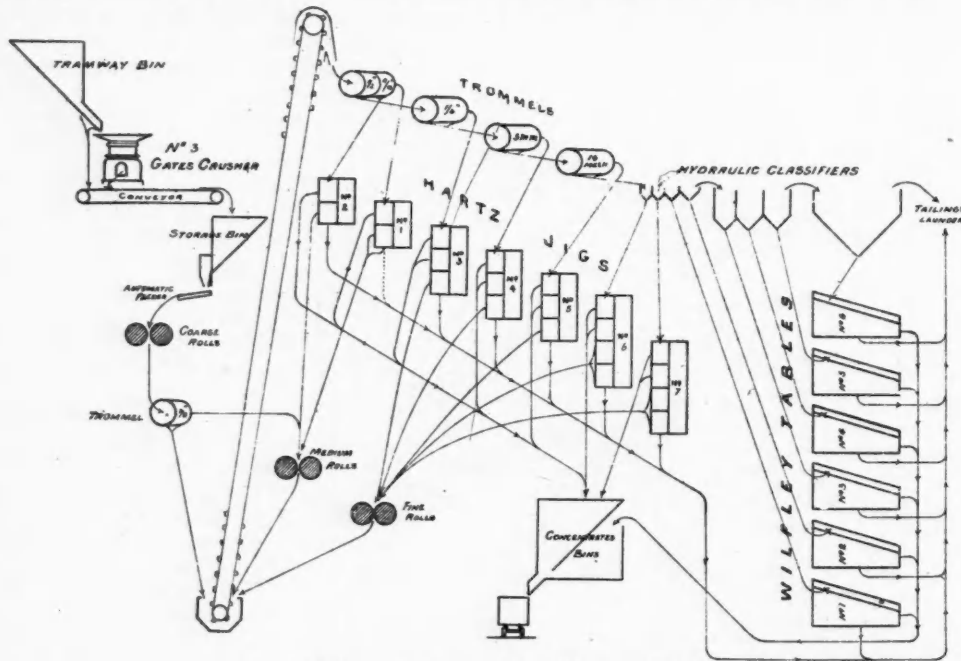
*Jahrbuch der Elektrochemie.* 1901. Eighth Yearly Volume. Edited by Dr. Heinrich Danneel. Halle, Germany, 1902; Wilhelm Knapp. Pages, 728; illustrated. Price (in New York), \$8.50.

This is the eighth volume of the well-known year book inaugurated by Doctors W. Nernst and W. Borchers, and edited by them until 1901. They were obliged then to give it up because of the pressure of their other duties. This change, together with an increase in the size of the volume, explains the tardiness of its publication this year, which it is hoped to remedy in the next year. The present volume is prepared on much the same lines as its predecessors. It is divided into two sections, one treating of progress in theoretical electro-metallurgy and the other of the applied art. Dr. Danneel has enjoyed the collaboration of several well-known electro-metallurgists, including Dr. M. Muggan, Dr. F. Harms, Dr. P. Askenasy, F. von Kugelgen, Prof. Dr. K. Elbs and Prof. Dr. W. Borchers, each of whom contributes important portions of the book, though the largest part is due to Dr. Danneel himself.

*Die Darstellung des Chroms und Seiner Verbindungen mit Hilfe des Elektrischen Stromes.* By Dr. Max Le Blanc. Halle, Germany, 1902; Wilhelm Knapp. Pages, 108.

This is the third in a series of monographs on applied electrochemistry published under the direction of Viktor Engelhardt. It presents a complete review of what has been done practically and experimentally in the production of chromium up to the end of 1901, and will be a useful work of reference to any one who is interested in the subject. Inasmuch as the production of chromium has not yet become of much practical importance a good deal of attention is necessarily directed to the various projects for obtaining the metal as embodied in numerous patent specifications. Such an analytical digest of the latter is in itself a valuable work, apropos of which a quotation may be made from page 10 of the book under notice.

"Criticism may be made as to the propriety of incorporating in a monograph of this kind the details of some apparently fantastic patent specifications, but after mature deliberation I have answered in the affirmative, since the line between the promising and the unpromising is not always easy to draw, and many a one may contain among much chaff some kernel of gold which may serve as the crystallization point for some later work, and, at any rate, they will serve as valuable guides in subsequent patent applications. Every one who has had experience with the latter is aware of the stumbling-blocks that are frequently encountered in some careless observation to which a previous inventor has given scarcely any thought, or has remained ignorant of its importance."



FLOW-SHEET, HIGHLAND CONCENTRATOR.

freight, \$4,127; lumber, \$3,591; wages and salaries, \$11,555; total, \$35,966. The contour of the ground and character of the bedrock were such that no masonry was required. According to contract the mill was to be of 100 tons capacity per 24 hours, but it has actually proved to be 180 tons. At present it is worked only day shift, requiring three men, besides the foreman and smith (the latter assisting in loading the concentrates), and a night watchman, who also attends to running the electric light plant. The cost of dressing per ton of ore under the above conditions is 29 cents per ton, including loading the concentrates.

It is estimated that if the plant were run at full capacity the cost would be only 16 cents per ton. The efficiency of the mill has been determined by taking samples of the feed to the coarse rolls every 15 minutes for a period of several months, and tailings samples with the same frequency. The results, checked by the lead and silver recovered in the concentrates showed a saving of 81.5 per cent of the lead, while the average tailing assay for silver was only 0.6 ounce per ton. The assays for lead were made by wet analysis.

#### RECENT DECISIONS AFFECTING THE MINING INDUSTRY.

SPECIALY REPORTED.

**CONSTRUCTION OF ROYALTY CONTRACT AND RESCISSION OF CONTRACT.**—A party conveyed certain property to a mining company, in consideration of which

to reduce this amount on account of the inferior quality of the ore, the royalty being measured by the quantity and not the quality; nor, although the royalty was, no doubt, to be calculated on refined and cleaned ore, had it the right to make a deduction or dockage on the quantity, provided the ore shipped had been treated to the usual process of cleaning.—*Sharp v. Behr* (117 *Federal Reporter*, 866); Circuit Court of the United States, for Pennsylvania.

#### BOOKS RECEIVED.

In sending books for notices, will publishers, for their own sake and for that of book buyers, give the retail prices. These notices do not supersede review in a subsequent issue of the *ENGINEERING AND MINING JOURNAL*.

*Statistical Register of Western Australia.* Compiled in the Registrar-General's Office. Perth, W. A.; Government Printer. Pages, 784.

*Mineralogy. An Introduction to the Scientific Study of Minerals.* By Dr. Henry A. Miers. London; Macmillan & Co., Limited. New York; the Macmillan Company. Pages, 584; illustrated. Price, \$8, net.

*The How and Why of Electricity. A Book of Information for Non-technical Readers.* By Charles Tripler Child. New York; The Electrical Review Publishing Company. Pages, 128; illustrated. Price, \$1.

*New York. Twentieth Report of the State Geologist.* Dr. Frederick J. H. Merrill, State Geologist. Albany, N. Y., 1902; published by the University

## CORRESPONDENCE.

We invite correspondence upon matters of interest to the industries of mining and metallurgy. Communications should invariably be accompanied with the name and address of the writer. Initials only will be published when so requested. Letters should be addressed to the MANAGING EDITOR. We do not hold ourselves responsible for the opinions expressed by correspondents.

*Retaining Ink on Glass.*

Sir: In regard to this subject, and the several letters you have published about it, I would say that Mr. J. N. Esselstyn, of the Michigan College of Mines, prepared a model of the Salisbury Mine, for this company, by running sheet gelatine over the glass plates, which were 24 by 36 inches, upon which he used ordinary India inks.

The model was very successful

GEO. R. JACKSON.

Assistant Mining Engineer, Cleveland-Cliffs Iron Company.

Ishpeming, Mich., Dec. 12, 1902.

*Secondary Enrichment at Cripple Creek.*

Sir: Mr. Bancroft's suggestive communication in your issue of December 6 calls for some remarks. On what authority does he state that "gray copper" is almost always a product of secondary enrichment? I have always understood that deposits of gray copper are as much primary ores as those of any other sulphides. The fact of secondary enrichment in many veins has long been known to us as practical miners, but the theories only recently formulated by many able geologists. One should be cautious, however, in applying this theory to the occurrence of all rich ore bodies at depth.

Copper does not occur in any of the oxidized portions of the Cripple Creek veins (with one exception only, the Cheyenne vein of the Isabella Company), and one cannot believe that it could have been originally deposited, then leached out and have left no trace whatever of its former existence. Many, perhaps most of the Cripple Creek shafts have passed through poor zones in sinking on their veins, but some of these could be accounted for as well on the hypothesis of being between ore shoots as on that of impoverishment through leaching. The variation of the underground water level is, I think, an adequate explanation of the leached zone without assuming so multiplex a system of underground circulation as so ably described by Van Hise.

No proof has yet been adduced that the gray copper found in the deep workings of Cripple Creek mines is so exceedingly rich in gold. The ores I have seen are invariably complex, calaverite and pyrite forming a much larger proportion of the metallic minerals than tetrahedrite, and no careful separation has been made into their constituent parts before assay. Stibnite also occurs in places here, but in no case where carefully separated from the associated sylvanite, calaverite, and pyrite, and then assayed, has it yielded gold in payable values.

Without anticipating too far the conclusions in a paper on "The Present Conditions of Cripple Creek," now under preparation, I may say these veins indicate as greater depth is attained a decided increase in various metallic sulphides, and a probable series of zones, each characterized by a special predominance of chemical or mineralogical features differing from those of the zones above and below. The occurrence of gray copper appears to mark the upper limit of one of these zones. It is true that this zone is characterized also by very rich ore, secondary quartz, and many vugs or cavities, lined with this secondary quartz having imbedded therein numerous large and perfect calaverite crystals.

A great many of these veins are not "loose and porous in the upper portion," but, on the contrary, peculiarly close, narrow, and dense, and so tight is the main vein crevice in many places as to be easily mistaken for a mere joint in the coun-

try, and cause much speculation as to how the solution traversed such a channel.

The top portion of the rich zone which is now being explored in these veins appears to be about 9,100 feet above sea level, but this is not an uniform horizon.

CHAS. J. MOORE.

Cripple Creek, Colo., Dec. 11, 1902.

*Pyritic Smelting.*

Sir: It has been generally accepted as a fact that the main reactions of pyritic smelting are represented by the following three formulæ:

- (1)  $\text{FeS}_2 + \text{heat} = \text{FeS} + \text{S}$
- (2)  $\text{FeS} + 3\text{O} = \text{FeO} + \text{SO}_2 = 113.6 \text{ K}$
- (3)  $2 \text{FeO} + \text{SiO}_2 = \text{Fe}_2\text{SiO}_4 \times \text{calories}$

(See Roberts-Austen's *Introduction to the Study of Metallurgy*, Hoffman's *Lead Smelting*, Peter's *Modern Copper Smelting*.)

The first reaction is undoubtedly true to a greater or less degree, depending on the access of air to that part of the furnace in which the reaction takes place and necessarily varying from time to time, but in the main it holds good. The presence of sulphur distilling from, and burning on top of a freshly added charge has been frequently noted.

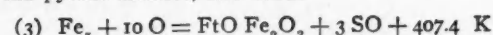
The second reaction, however, obtained its acceptance in the days of lead smelting, reducing atmosphere in copper work and roasting furnaces, where it was a minor reaction, as in the first two cases, or represented a possible step, as in the last, and where the nature of the atmosphere in which the reaction took place was distinctly different from that of the modern pyritic furnace.

When applied to the latter it fails to explain the peculiarities of the process and thereby condemns itself. When combined with (3) it undoubtedly give us the general results obtained both as to products formed and heat generated, but it does not show us how those results are reached. Not only that. It is at variance with the known properties of the elements concerned. Thus ferrous oxide freshly formed oxidizes spontaneously in the presence of air at ordinary temperatures, being heated to incandescence by the reaction (Roscoe & Schoerlemmer). Nevertheless, by the formula we are supposed to assume that a lump of sulphide ore after being heated so that it loses one-half its sulphur in the neutral atmosphere of the upper part of the ore column will be oxidized to an unstable compound of the above properties in the presence of an excess of highly heated air.

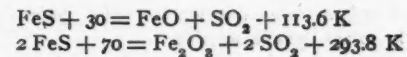
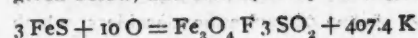
These conditions are not assumed without consideration. Thus at Val Verde, Arizona, where the charge carried several per cent of arsenic, the fumes for the first five minutes after its introduction into the furnace were colored dark orange by the presence of arsenic sulphide, a condition which would not exist in the presence of an excess of air. Also at Keswick, Cal., I have noticed the burning of gases (distilled sulphur) from the furnace top where the air currents from the charging doors met them.

At the tuyere level, on the other hand, there is a very large excess of heated air. In fact, the formation, not of ferrous oxide, but of magnetic oxide, has been observed at this point (Peters) even in the presence of much sulphur and sulphur dioxide.

This is, in my opinion, the primary reaction in the pyritic furnace, and reads



$\text{Fe}_3\text{O}_4$ , or  $\text{FeO Fe}_2\text{O}_3$ , magnetic oxide, is the most stable of the iron oxides. It is formed by the rapid oxidation of iron (Roscoe & Schorlemmer) and iron sulphide (as shown below), and by heating ferric oxide to high temperatures and is the most exothermic of the three reactions given below, and consequently most probable:



The figures are from Robert-Austen's *Introduction to the Study of Metallurgy*.

That this is the reaction is borne out by some experiments on the roasting of heavy sulphides conducted by the writer.

The material carried from 42 to 45 per cent sulphur and about one per cent silica and the product contained from 2 to 5 per cent sulphur, or which from 0.3 to 4 per cent existed as sulphides. Owing to the presence of Zn that in the smaller amounts was probably due to ZnS, that in the higher amounts was due to a different cause. The roasting was conducted entirely without the use of fuel, and thus approached the pyritic furnace in the character of the atmosphere in which the reactions took place.

It was observed that when the process was conducted at a low temperature it was accompanied by the formation of ferric oxide, magnetite and sulphates. As the temperature was increased by increased oxidation per unit area and the conditions of the pyrite furnace approached, the amount of magnetic oxide in the product increased until the latter seemed wholly  $\text{Fe}_3\text{O}_4$ , although no analysis was made to check the physical properties; simultaneously there was a disappearance of the sulphates and most of the ferric oxide.

Attempts at separation by a magnetic separator failed, as the whole mass was strongly magnetic. No metallic iron was present.

These facts seem to prove that the natural product of the sulphide is magnetic oxide, and certainly mattes from the pyritic charge carry more of that substance than ordinary, and it is frequently found in the basic slags.

In this connection it is well to observe that for accurate work the average smelter sample of slag is totally unreliable. A sharp chilled siliceous slag will take up one per cent of metallic iron from the buckboard and smelter, and more if the board happens to consist of a rather soft casting.

If any one doubts this large estimate, let him take a piece of slag, buck part to 100 mesh, as usual, on the board and take the other part and pulverize a few grams in an agate mortar. Treat both samples (5 grams) with neutral copper sulphate solution until copper is no longer precipitated, and determine the iron in the two solutions.

Assuming the above reactions, we require the following additional reactions to complete the process:

- (a)  $2 \text{Fe}_3\text{O}_4 + \text{SiO}_2 = \text{Fe}_2\text{SO}_4 + 2 \text{Fe}_2\text{O}_3$
- (b)  $3 \text{Fe}_2\text{O}_3 + \text{heat} = 2 \text{Fe}_3\text{O}_4 + \text{O} = -66.6 \text{ K}$

Both reactions take place at high temperatures only. They explain the tendency of pyritic furnaces to wall accretions. Magnetic oxide, of course, has a high fusing point, and we have  $\text{CaO Fe}_2\text{O}_3$  calcium ferrite formed by the combination of the ferric oxide and lime, and similarly magnesium, zinc, and copper ferrites, all with high fusing points.

They also explain the tendency to a sudden chill, for if the temperature drops momentarily below that required for the reaction, there will be no opportunity for recovery.

It also explains, as was pointed out to me by Mr. J. W. Bennie, of the Shannon Copper Company, the requirement of a small amount of coke, which could be consumed in the reduction of the ferric oxide formed, and with which the furnace would then run well, although below the temperature required for reaction (b).

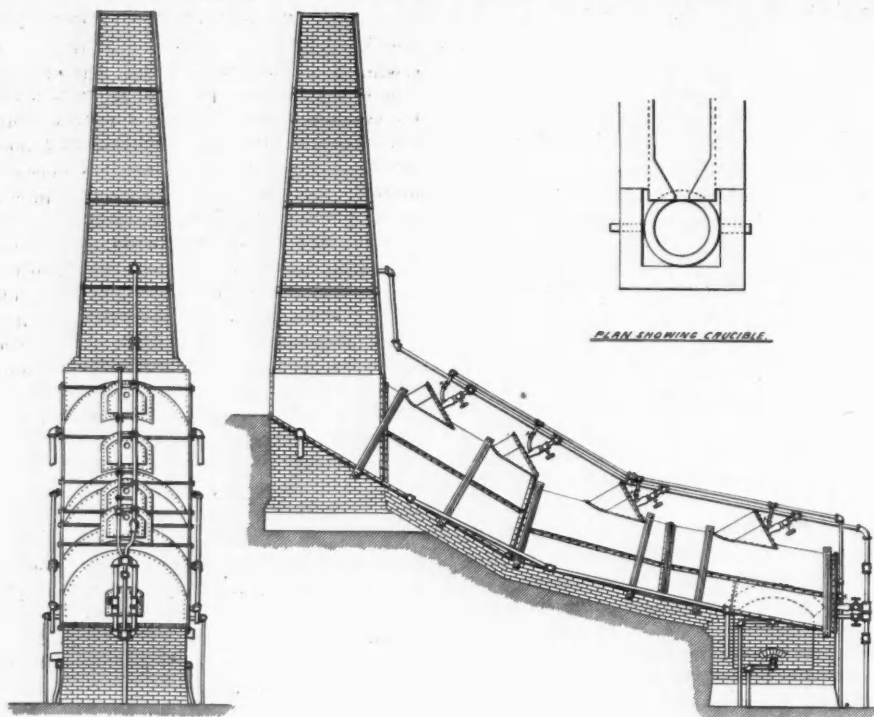
Thus at Val Verde  $3\frac{1}{2}$  per cent of coke was found to be best where there was 12 per cent of iron estimated as  $\text{Fe}_2\text{O}_3$  by the above reaction. This amount of coke is, to be sure, several times the theoretical, but was required by the probable

consumption of a large portion to  $\text{CO}_2$  before reaching the place where needed.

The reactions also explain the failure of the attempts made to use oil through the tuyeres, and also seems to indicate the impracticability of the use of oil in the pyritic shaft. This is be-

seen in use was of 60-mesh, and this was a torture to the spirit. In the same mill the next larger size was a 40-mesh (brass wire cloth), which was only ordinarily troublesome, and that mesh is not uncommonly used in cyanide mills. Perhaps screening through 40-mesh is about the

in general sort the ore particles according to their settling capacity against a rising current of water. These contrivances are quite simple and can be constructed on the spot (there are no basic patents), while special designs are made by almost every manufacturer of milling machinery. We cannot undertake to say which is the most efficient, or rather, which one would be the most efficient in your particular case, as to which you should consult a practicing engineer. Prof. Richards' series of papers on Ore Dressing in the various volumes of *The Mineral Industry* will give you a great deal of information on this subject. We do not know of any system of screening under water, at least not in this country, but in Sardinia they use shaking screens, which are set over a pointed box in such position that on the downward movement the sieve just touches the water sufficiently to free the holes, but 0.5 millimeter size, which would be something between 24 and 30-mesh, is the finest sifting that is tried.



FRONT ELEVATION

SIDE ELEVATION

RIVEROLL'S SMELTING FURNACE FOR CRUDE OIL FUEL.

cause the oil is not required as a fuel for the heat units it contains, but for local reducing action, and to obtain this it would be necessary to use a large excess, which in turn would forfeit the oxidizing atmosphere, and there would no longer be the necessary feature of the pyritic process.

What is required is an oxidizing atmosphere with local reduction of one of the side products at or near the tuyeres, and that can only be obtained by a solid fuel.

CLARENCE A. GRABILL,

Needles, Cal., Nov. 25, 1902.

#### QUESTIONS AND ANSWERS.

Queries should relate to matters within our special province, such as mining, metallurgy, chemistry, geology, etc.; preference will be given to topics which seem to be of interest to others besides the inquirer. We cannot give professional advice, which should be obtained from a consulting expert, nor can we give advice about mining companies or mining stock. Brief replies to questions will be welcomed from correspondents. While names will not be published, all inquirers must send their names and addresses. Preference will, of course, always be given to questions submitted by subscribers.

*The Copper Blast Furnace for Iron Smelting.*—

Is it possible to smelt iron ore in a copper blast furnace, such as the Herreshoff?—K.

*Answer.*—Neither the construction nor the proportions of the copper blast furnace adapt it to the reduction of iron ore to pig iron.

*Concentration of Corundum.*—We are concentrating our mineral to a product 98 to 99 per cent pure. As you are aware, the tables do more perfect work if the ore fed to them has first been properly sized. If we could obtain a method of dividing material from 16 to 200-mesh into, say, 10 different sizes, it would greatly facilitate our process. The adhesion to each other of grains that are simply wet makes it impossible to do this under the ordinary conditions, but it should be possible to do it if the ore were totally submerged in water. What information can you give us on the subject?—C. C.

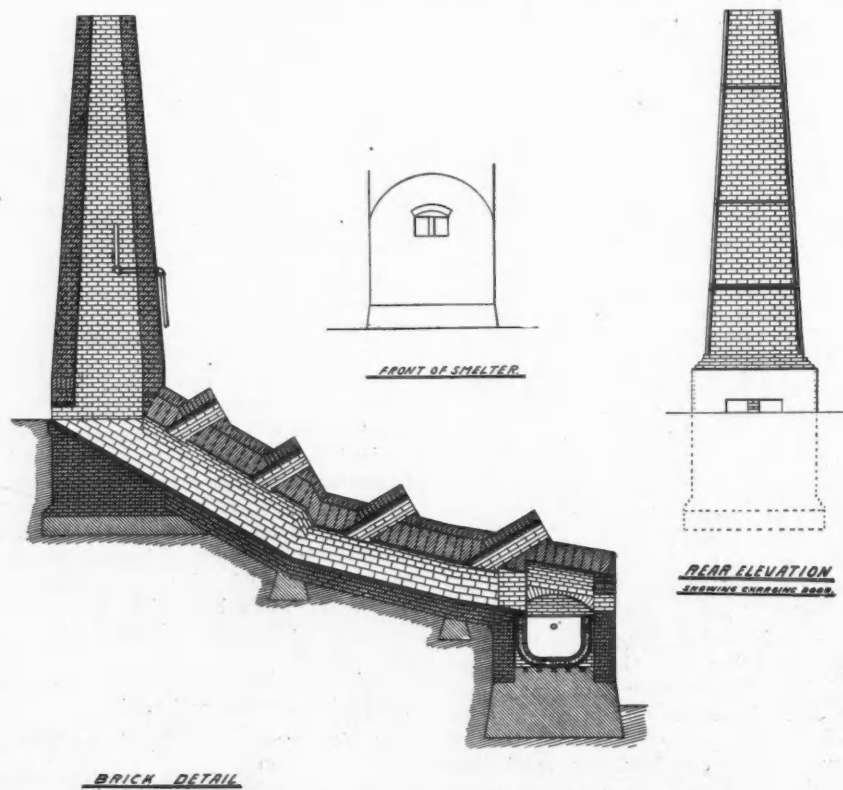
*Answer.*—Very fine screening is a troublesome process in ore dressing. The finest we have ever

limit of practicability, and the general tendency is to avoid going anywhere near so far, the minimum adopted by many being 1 millimeter, which would correspond approximately to 14-mesh,

#### SMELTING IRON ORE WITH CRUDE OIL AS FUEL.

The use of oil as a fuel in smelting iron ore has been frequently suggested and tried in an experimental way, but has not so far proved a commercial success, for reasons which are readily understood. Our attention has been called to a process devised and tested experimentally by Mr. E. Riveroll, of Los Angeles, Cal., and we give herewith drawings of his furnace, which are very clear and will be readily understood. It is only necessary to say that the ore and flux are introduced through a charging door directly under the stack, and pass down the inclined bottom of the furnace, the molten metal and slag being collected in the crucible at the lower end, from which they can be tapped off. The oil is introduced, with steam, through a number of jets placed on top of the furnace, as shown. The furnace described is 40 feet in length and 2 feet in the clear, inside.

Test runs have been made with this furnace, but it is not yet in use on a commercial scale. We give



FRONT OF SMELTER.

REAR ELEVATION  
SHOWING CHARGING DOOR.

BRICK DETAIL

RIVEROLL'S SMELTING FURNACE FOR CRUDE OIL FUEL.

standard steel wire cloth. Further subdivision of the ore for treatment on a series of tables (as to the advisability of which you are quite right) is done by means of hydraulic classifiers, which

below the inventor's statement in his own words, showing what he claims. We must say, however, that statements of the cost of producing iron cannot be accepted at all until the furnace has been in regu-



lar use, producing pig iron, for a sufficient time to show commercial results. For the present it is given as the latest experiment in this line, open to discussion and criticism by iron makers and furnace experts.

The inventor's statement, as furnished to us, is as follows: "It is a method for reducing iron ores by the use of crude oil as the only fuel. The great importance of the invention lies in the fact that no coke or any other auxiliary fuel is required to act as a reducing agent, or to hold up the charge. The inventor has applied for patents in the United States, Mexico, Canada and several other countries.

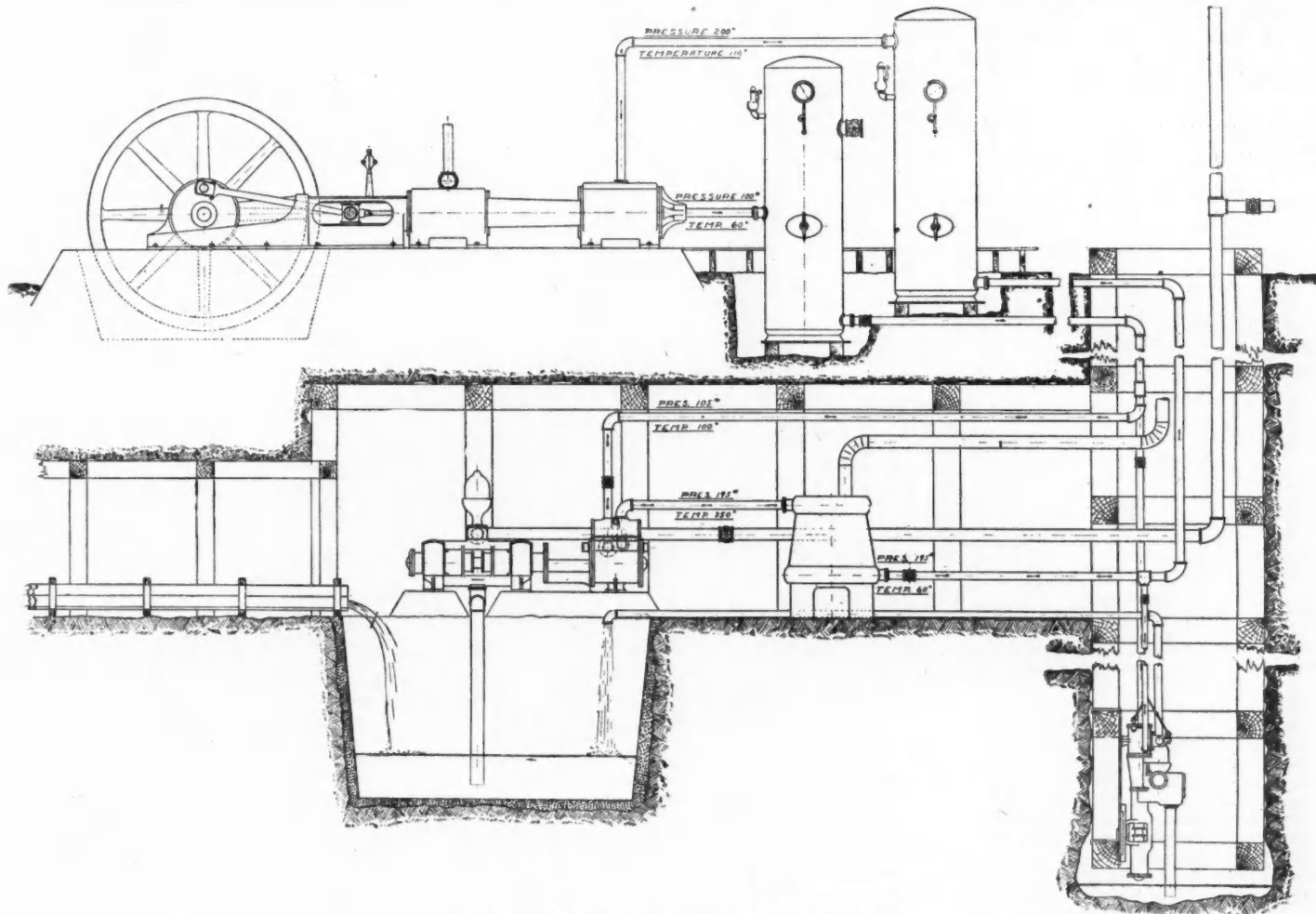
"During the past decade numerous attempts have been made throughout the West to accomplish this end. It is true, pig iron has been secured by experimenters with oil as fuel; but in no case has more

ran from the spout in a steady stream and then the furnace was shut down, as its unqualified success had been demonstrated to the entire satisfaction of all concerned. The resultant slag consisted of 45 per cent silica and alumina, 50 per cent of lime and 5 per cent of iron and other elements.

"The chief claim urged by the inventor in favor of his smelter is its economy. Taking the experimental run referred to above as the basis of this claim, the following figures taken at the time furnish sufficient data to substantiate all claims of economy: The analysis of iron ore used showed metallic iron, 56.7; silica and alumina, 13.3; sulphur, 1.4. The analysis of the limestone (flux) was: Lime, 52.5; silica, 6.3. The quality of oil was specific gravity, 20.5. Two barrels of this oil were necessary on an average to reduce one ton of the charge. With oil

pressure and sufficiently cool to allow of an economic line of compression in reaching the high pressure. The general scheme of the system is shown in the accompanying drawing.

Following is a brief description of the machinery employed in the Bisbee West Plant. Steam is supplied by a 60 horse-power horizontal return tubular boiler burning fuel oil. This boiler supplies a 30 horse-power hoist, and the air compressor of the pumping plant. The main compressor is one built by the Ingersoll-Sergeant Drill Company, and is one of their standard straight-line type, with the exceptions that the air end was built a little heavier than usual, and that the piston inlet was enclosed in a bracket fitted for pipe connection to the return system. The steam cylinder of this compressor is 16 inches in



DENSE AIR SYSTEM OF POWER TRANSMISSION.

than 150 pounds of the charge been reduced at one time, and even then coke or charcoal had to be introduced to the extent of 10 per cent or thereabouts in order to bring about the necessary chemical reaction. Heretofore all efforts to produce this important material in commercial quantities using only crude oil as fuel have failed because of the apparently insurmountable difficulties in the way. Chief among these was the getting rid of the oxygen in the iron ores and the application of the heat directly upon the entire body of the ore to be reduced.

"This process is both simple and inexpensive, being less complicated than the cupola or upright style smelter and requiring none of the cumbersome machinery incidental to the hoisting of both ore and fuel to the top of the flue.

"On August 19 of this year Mr. Riveroll made a trial run in his 50-ton capacity experimental smelter at Tropic, Los Angeles County, California, in the presence of Prof. Joseph Kirkham, general manager of the Pacific Art Tile Works, and several other responsible parties. This run was so successful as to place the invention beyond the bounds of mere experiment. For more than a half hour molten metal

wholesaling in the West for 60 cents per barrel and the cost of ore (not to be less than 50 per cent metallic iron) not more than \$3 per ton, pig iron can be produced for \$10 per ton or less."

#### THE "DENSE AIR" SYSTEM OF POWER TRANSMISSION IN DEEP MINE PUMPING.

By D. A. McNeill.

There has been recently installed at the Bisbee West Copper Mining Company's shaft No. 1 a pumping plant using air as a means of power transmission. This plant was installed by the John Wigmore & Sons Company, of Los Angeles, Cal., and is operated under patents which they control. They have named the principles of these patents "The Dense Air System of Power Transmission." This dense air system has as its object the use of the difference in pressure between two confined air bodies. A compressing engine is used to maintain the greater pressure by raising that of the low-power body of air and delivering it to the high-power body. In operation the low-pressure air is sufficiently above atmospheric

diameter by 18 inches stroke, and is furnished with an adjustable Meyer cut-off valve. The air cylinder is 12¼ inches diameter by 18 inches stroke. The regular poppet inlet and discharge valves supplied by the manufacturer are used. From this compressor, two lines of pipe are led to the shaft, about 60 feet distant, and then to the 700-foot level. The high-pressure line is 2½ inches diameter, while the return or low-pressure line is 3 inches diameter. In the high-pressure line is an air receiver 36 inches diameter by 8 feet, and also a reheater of sufficient size to heat the air to 300° F., the reheater being on the 700-foot level adjacent to the pump and the receiver on the surface near the compressor.

The low-pressure, or return line, is continuous from the exhaust of the pump to the inlet of the compressor. The pumps used were built by the Cameron Steam Pump Company, and are of their standard station and sinker types. The station pump has an air cylinder 16 inches in diameter by 18 inches stroke, and a center packed plunger 6½ inches diameter by 18 inches stroke. This pump raised the water from a sump on the 700-foot level

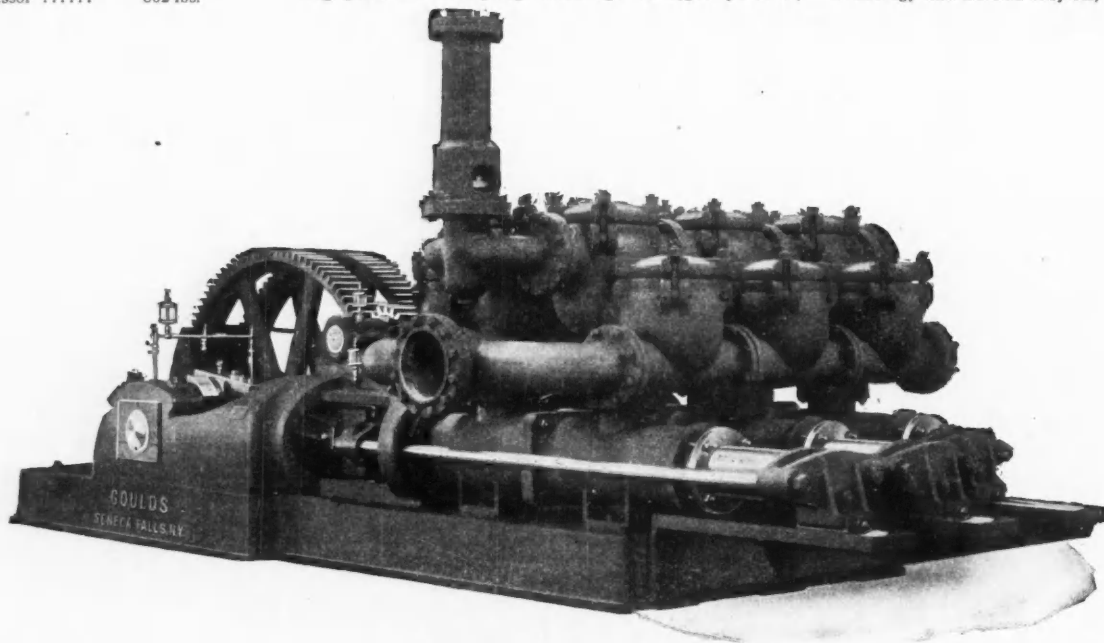
to a tank 40 feet above the collar of the shaft, giving an average lift of 750 feet. A vertical sinking pump 10 by 5 by 13 inches is also included in this installation, but was not operated during the test given below. Its duty is to lift the water to the sump on the 700-foot level from the shaft bottom. A small compressor 6 by 6 by 6 is connected to the low-pressure return line, its duty being to supply sufficient air to overcome leakage from the pipe lines and stuffing boxes of the machines, in this manner keeping the quantity of air in the system constant. In the following test the reheater was not used. This reheater was designed to burn gasoline, but it was found that it was impossible to do so, as there was not sufficient air in the pumping station, which is very small, to support combustion. If this reheater could have been used the efficiency of the plant would have been at least 20 per cent better than that shown by test. In the following table will be found the average results of a series of tests of this plant made September 14, 1902:

Duration of tests .....	1 hour each.
Average steam pressure at throttle of compressor .....	81 lbs.
Total steam used by compressor .....	802 lbs.

September 20. The supply of fuel oil was exhausted and, there being no other fuel obtainable, it was necessary to shut down the plant. Before more fuel oil was secured—a matter of three or four days—the water had risen in the mine almost to the 200-foot level, putting the pump about 500 feet under water. When the boiler was fired up and the compressor started, the pump started with the compressor, as was shown by the water from the discharge pipe. It required about 48 hours of continuous running to pump the water down to the pump level. During this time the pump worked under water at its greatest capacity and continuously.

#### A TRIPLEX PLUNGER MINE PUMP.

The accompanying illustration shows a pump of the triplex plunger type, made by the Goulds Manufacturing Company, of Seneca Falls, N. Y., for mining and other purposes. Pumps of this type are made in different sizes from 3¼ to 12-inch plunger, all 16 inches stroke, and with working pressures varying from 150 to 1,500 pounds,



GOULD TRIPLEX MINE PUMP.

Average R.P.M. of compressor .....	52.3
Average R.P.M. aux. compressor .....	20
Average R.P.M. pump .....	39.8
Average pressure: inlet to compressor .....	83 lbs. gauge.
Average pressure: discharge from compressor .....	158 lbs. gauge.
Average pressure: inlet to pump .....	152 lbs. gauge.
Average pressure: exhaust from pump .....	92 lbs. gauge.
Average temperature: inlet to compressor .....	69° F.
Average temperature: discharge from compressor .....	162° F.
Average temperature: inlet to pump .....	89° F.
Average temperature: exhaust from pump .....	52° F.
Average ft.-lbs. per minute shown by indicator cards, steam end compressor .....	1,075,300
Average ft.-lbs. per minute steam end aux. compressor .....	22,300
Total average ft.-lbs. per minute shown on steam ends of compressors .....	1,097,600
Average ft.-lbs. air end compressor, as shown by indicator cards .....	1,045,100
Average ft.-lbs. air end auxiliary compressor .....	19,500
Total ft.-lbs. air end of compressors .....	1,064,600
Total water pumped .....	833 cu. ft.
Cubic ft. of water pumped per minute .....	13.88
Average lift .....	750 ft.
Total ft.-lbs. per minute in water pumped .....	649,584
Efficiency of ratio between ft.-lbs. of work in air cylinder of compressor and air cylinders of pump .....	70.6%
Efficiency or ratio of ft.-lbs. shown by indicator cards on steam end of compressors and ft.-lbs. of work in water actually pumped .....	59.2%
Duty or ft.-lbs. of work in water pumped per 1,000 lbs. of steam used .....	48,600,000

From this test it is very readily seen that the efficiencies are exceptionally high for a deep mine pumping plant.

One incident in regard to this plant showing its adaptability to deep mining operation occurred

corresponding to elevations from 350 to 3,500 feet. The small sized plunger operates at 36 revolutions per minute, and a working pressure of 1,500 pounds, delivering about 3½ gallons to each revolution of the crank-shaft, while the 12-inch plunger pump at a working pressure of 108 pounds and at 36 revolutions per minute will deliver 47 gallons to each revolution of the shaft.

In making these pumps great care is exercised as to material and finish. The forged steel crank-shaft is made in two pieces, each having a single throw with a gear at the inner end. These two gears carry the center crank-pin. The crank-shaft bearings are babbitted, and have wedge and screw adjustments. The pump is fitted with double gearing. The pinions are semi-steel castings and machine cut, while the large gears are of charcoal iron, also machine cut. Power for driving may be applied at either side of the pump. For electric motors, intermediate gears and an auxiliary shaft are used. The cross-heads have adjustable shoes, which are properly babbitted and run in board guides. The connecting rods are of forged steel, and have bronze boxes with strap heads and wedge adjustments at each end. The plungers are of hard cast iron, turned and ground true. The valve-boxes are separate charcoal iron castings, and the valves are of bronze with leather or rubber faces. Suction or discharge connections can be made at either side of the pump, as convenient.

COAL IN INDIA.—Indian papers of recent date report that a discovery of coal has been made in Banganapalli State, in the Kurnool District of British India. Several trial pits have been sunk, and at depths of 20 to 30 feet good seams of coal have been struck. The appearance and quality of the coal seem to be strikingly similar to the coal from the Singareni mines farther north. As far as can be ascertained, this new coal-field is of considerable area, and the coal is within easy reach of the surface. The new field is 5 miles from the nearest railway station, Rangapuram, on the Billary-Kistna line, but the road is hilly and bad. The discoverer of the coal is a native of Madras, who has obtained a comprehensive lease for working it and other minerals from the Nawab of Banganapalli in return for certain specified royalties.

#### PATENTS RELATING TO MINING AND METALLURGY.

##### UNITED STATES.

The following is a list of patents relating to mining and metallurgy and kindred subjects, issued by the United States

Patent Office. A copy of the specifications of any of these will be mailed by the ENGINEERING AND MINING JOURNAL upon receipt of 25 cents.

Week Ending December 9, 1902.

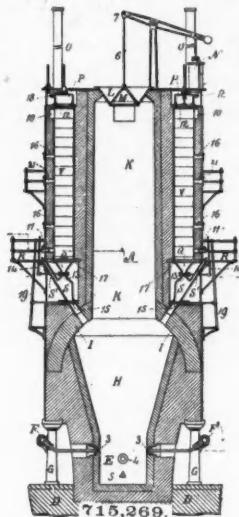
715,238. PROCESS OF REFINING LEAD AND ZINC FUME.—Frank L. Bartlett, Canon City, Colo., assignor to the United States Smelting Company. A process of refining zinc and lead fume which consists in subjecting a collected mass or body of the fume to the action of heated carbonic-dioxide gas.

715,244. PNEUMATIC TUNNELING SHIELD.—Theodore Cooper, New York, N. Y. The combination with a tunneling-shield of an after bulkhead therein comprising a conically-shaped trough having its axis parallel with the axis of the shield and extending rearwardly from the cutting edge of the shield at or near which its forward edges attach.

715,253. PUMP FOR OIL-WELLS.—Arthur B. Gahagan, Glade Mills, Pa., assignor of two-thirds to John A. Hughes and Charles W. Douth, Glade Mills, Pa. In an oil-well pump, the combination with the working barrel, of a hollow bottom portion adapted to engage with the interior of said barrel, a liner connected to said bottom portion and provided with a contracted portion therein so as to form passage-ways through the sides of the same communicating with a chamber therein and leading directly into the interior of the barrel, a reciprocating plunger within said liner and passing through a stuffing-box at the upper end thereof, a check-valve at the upper end of said bottom portion, a cage surrounding said check-valve having openings therein leading to the interior of said liner, and a check-valve above said openings in said cage and within the chamber of the liner, said cage having a seat at the upper end thereof for the last-named check-valve and such seat or

upper end acting to limit the upward movement of the first-named check-valve.

715,269. FURNACE FOR SMELTING IRON.—Henry A. Jones, New York, N. Y., assignor to Jones Direct Process Steel Company, Jersey City, N. J. The combination with a blast-furnace having a crucible for molten metal, a flaring fusion-chamber above the crucible, a cylindrical chamber above the fusion-chamber and of smaller diameter than

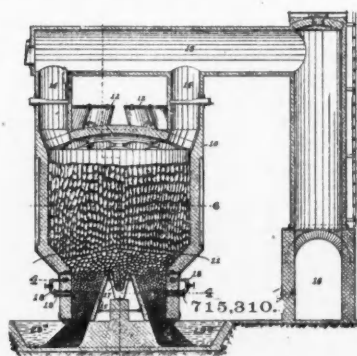


the upper part of the said fusion-chamber, and a series of equally-spaced vertical recesses in the furnace-wall, of zigzag deoxidizing ore-retorts in said recesses and heating-flues between said retorts, burners for supplying gas and air thereto within said recesses, means for covering said retorts, receiving-hoppers beneath the deoxidizing-retorts and devices connecting the receiving-hoppers with the upper part of the fusion-chamber for delivering the deoxidized ore to the furnace.

715,271. METHOD OF MANUFACTURING PEAT FUEL.—Robert A. Kellond, Chicago, Ill., assignor to Charles Carroll Bartlett, Chicago, Ill. A process of manufacturing peat into blocks for fuel, which consists in first, preparing the raw material by relieving it of the preponderance of moisture and reducing it to a finely-divided state and moderate condition as to temperature; second, compressing the material thus prepared and while it contains moisture in excess of the atmospheric degree, into hard, dense blocks; and third, imparting to each block an outer coating, envelop or crust composed of the fixed carbon and tarry and oily constituents of the peat by a searing operation involving the application of intense heat only to the material at and near the surface of such blocks.

715,281. ELECTROLYTIC APPARATUS.—Joseph Matthews, Kings Heath, and William Davies, Selby Park, England. Improvements in electrolytic apparatus consisting essentially of an outer tank or vat having an inner tank or vat of perforated insulating material with a revolving drum mounted therein having a number of radiating arms or rods passing through and supporting an outer circular face of insulating material with electrical connections to the cathode and anode parts of the apparatus in the manner and for the purpose.

715,310. GAS-PRODUCER.—Martin Van Buren Smith, Philadelphia, Pa., assignor, by mesne assignments, to the American Stoker Company.—In a gas-producer, the combination of a chamber constructed to contain a body of incandescent coke, an underfeed-stoker mounted in the lower end of said chamber for feeding green fuel upwardly

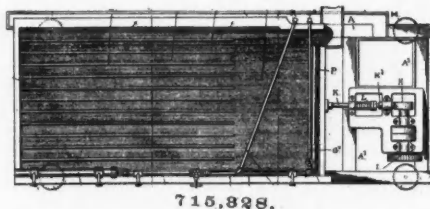


therein for replenishing the coke as the latter becomes consumed, a refuse-discharging leg at the side of said stoker through which ash resulting from the combustion may be continuously discharged, and means for supplying air to said chamber adjacent to the combustion zone of the green fuel.

715,311. PROCESS OF GENERATING PRODUCER GAS.—Martin Van Buren Smith, New York, N. Y., assignor to the American Stoker Company, N. Y. A method of generating producer-gas from coal, which consists in maintaining a volume of incandescent fuel from which free air

is excluded, in injecting into the incandescent fuel two columns of air insufficient in volume to support complete combustion, in feeding below the volume of fuel and between the injected air a continuous supply of green or fresh fuel, and in continuously withdrawing the resulting ash formed by the combustion.

715,328. ORE CONCENTRATOR.—George E. Woodbury, San Francisco, Cal. An ore-concentrating table having the principal portion of its working surface divided into longitudinal channels by standing strips and the portion at



and near the concentrates-discharging end undivided, the surface both between and beyond the standing strips being finely grooved and said grooves running in the general direction of the standing strips.

715,358. MANUFACTURE OF VARIOUS ARTICLES FROM COPPER OR COPPER ALLOYS.—George A. Dick, London, England, assignor to the American Brass Company, Waterbury, Conn. A process of making hollow bars, tubes and other tubular articles of copper or copper alloys consisting in heating the copper or copper alloy to a high temperature, substantially such as specified, and then forcing the same, in its heated and plastic condition from a pressure-chamber through a die and around a short mandrel thereat, cutting or dividing the metal during its passage to the die, protecting the cut surfaces from contact with the air and bringing such surfaces together again while so protected, in the die, under heavy pressure, so that they may again unite.

715,366. METHOD OF DRYING AIR FOR BLAST-FURNACES.—James Gayley, Pittsburg, Pa. A method of drying air for blast-furnace use, which consists in precipitating the greater portion of the moisture therefrom by refrigerating the air to 0° C. and then in eliminating or substantially eliminating the remainder of the moisture from said air by bringing the cold air into contact with material having an affinity for water.

715,371. CONVEYOR.—John H. Hahn, Sargent, Mo., assignor to Joseph A. Jeffrey, Columbus, Ohio. In a cable conveying apparatus, the combination of a single centrally-arranged wire cable, flights, secured to the cable and adapted to push or convey material from point to point, said attachments or flights being relatively elongated, narrow, plates or bars extending laterally in both directions from the cable, and the supporting wheels, each having the inward-tapering peripheral flanges on each side, the cross-bars extending transversely across the space between said flanges and having in their outer edges aligned, centrally arranged, grooves for the cable, and the peripheral surfaces extending continuously from one cross-bar to the next, all of said parts being arranged substantially as set forth, whereby the said elongated flights will when they impinge upon the wheel, if they are out of proper position, act to turn themselves on the axis of the cable, and also guide the cable to the grooves in the cross-bars.

715,406. TUNNEL-ROOF.—James C. Meem, Brooklyn, N. Y., assignor of one-half to Borough Construction Company, Brooklyn, N. Y. A roof or shield for tunnels comprising a plurality of compression members, superposed arch members, chord-stiffeners abutting the compression members, and means for hindering the parts together.

715,414. WIRE-ROPE TRAMWAY.—Arthur Painter, San Francisco, Cal., assignor to Holland M. Barstow, Napa, Cal. In a wire-rope tramway, a rope-clip provided at one end with a spherical head adapted to be connected to a traveling bucket, and at the other end with means for connecting it to the rope.

715,441. FLUID-PUMPING AND FLUID-ACTUATED MACHINE.—William C. Vandegrift, San Francisco, Cal. In a device of the character described, a main shaft, a runner secured to said shaft, a casing surrounding the runner, flanges projecting from the inner surfaces of the casing, stationary blades projecting from said flanges toward the runner, movable blades carried by the runner and projecting from each side thereof toward the casing and on opposite sides of the stationary blades, and rings carried by each set of the movable blades, the inner surfaces of the rings being substantially in line with the inner surface of the flanges.

715,448. CONVEYOR-SHAFT HANGER.—Freeman R. Willson, Jr., Columbus, Ohio, assignor to Joseph A. Jeffrey, Columbus, Ohio. A shaft-hanger composed of two parts divided in substantially the longitudinal plane of the hanger-shank, said parts being shaped to inclose the shaft-bearing, and means for securing said parts together, in combination with the shaft-bearing inclosed in said parts.

715,449. CONVEYOR.—Freeman R. Willson, Jr., Columbus, Ohio, assignor to Joseph A. Jeffrey, Columbus, Ohio. In an elevating or conveying apparatus, the combination of an endless conveyor, buckets thereon, supporting means for said conveyor, a loading-boot containing the lower end of the conveyor and having guides for the same, and sep-

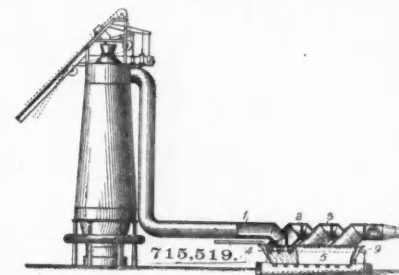
arate yielding tension means for drawing downward independently the two sides of the conveyor.

715,471. CONVEYING APPARATUS.—Frederick R. French, San Francisco, Cal. The combination of a pair of trolley-carriers; traction-ropes connected therewith; means supporting said trolley-carriers and forming a trackway therefor; a trolley intermediate of the pair of trolley-carriers and suspended by and between the supporting means thereof; and a fall-line.

715,505; 715,506; 715,507 and 715,508. ELECTRIC FURNACE.—Henry N. Potter, New Rochelle, N. Y., assignor to Geo. Westinghouse, Pittsburg, Pa. An electric furnace, consisting of a tube composed of a mixture of dry electrolytes constituting the conducting portion of the furnace, the said tube being provided with confronting electric-circuit terminals arranged in pairs at opposite ends of the tube, and the said pairs of terminals being symmetrically spaced.

715,509. END SUPPORT AND CIRCUIT-TERMINAL FOR CARBON-TUBE FURNACES.—Henry N. Potter, New Rochelle, N. Y., assignor to George Westinghouse, Pittsburg, Pa. The combination with a tube constituting a furnace-body, of suitable terminals at each end supported upon diaphragms.

715,519. BLAST-FURNACE.—Rollin C. Steese and Edward L. Ford, Youngstown, Ohio. A blast-furnace plant having in combination, a series of pockets, a series of passages



extending from one pocket to the next, said pockets having water-walls transverse of the line of discharge of gases into the pockets and a gas-pipe connected to the first pocket of the series.

715,538. AMALGAMATOR.—William F. Bedell, Kaslo, Canada, assignor, by direct and mesne assignments, of one-half to Duncan McPhail and Theodore Frederick Adams, Kaslo, British Columbia, Canada. An amalgamator, comprising a tank for containing mercury and having in its bottom a central cone provided with outlets for the escape of water and sand, said outlets leading from the sides of the cone out through the bottom of the tank, a hollow shaft stepped in the cone, and hollow reaction-arms extending from the lower end of the said shaft downwardly to the lower portion of the tank and having their lower ends extending horizontally.

715,584. WELDED CAST-METAL PROCESS.—William Kent, Covington, Ky. A process of making composite crystalline and fibrous metal by arranging in an ingot-mold a series of filaments or pieces of wrought-iron, then pouring in and around the same molten "cast" or high-carbon iron heated to a temperature just sufficient to weld the two metals together, and afterward rolling and working the ingot to further incorporate and distribute the wrought metal through the cast metal, and break down the form of the wrought pieces whereby the mass retains the hardness of cast-iron while possessing a woven fibrous internal structure of thoroughly-incorporated laminae of oxid and soft iron.

715,592. OPERATING MELTING-FURNACES.—William W. Lobdell, Wilmington, Del. A mode of effecting uniformity in the operation of melting-furnaces using an air-blast consisting in passing the air for said blast in intimate contact with water, whereby it is delivered to the furnace throughout a run in a substantially uniform condition as regards the percentage of moisture contained in it.

715,625. PROCESS OF OBTAINING METALLIC ALUMINUM OR OTHER METALS BY ELECTROLYSIS.—Girolamo Taddei, Turin, Italy, assignor to the Societa Italiana di Applicazioni Elettriche, Turin, Italy. A method of obtaining a metal from its compound, which consists in separating sodium from its chloride, while at a high temperature, by electrolysis, then decomposing the oxide of the metal treated while hot, with the chlorine from the first step, whereby a chloride of the metal is formed, and then decomposing the said chloride by the hot sodium vapor from the first step, whereby sodium chloride is formed and the metal treated set free, said operation being continuous.

715,626. APPARATUS FOR OBTAINING METALS BY ELECTROLYSIS.—Girolamo Taddei, Turin, Italy, assignor to Societa Italiana di Applicazioni Elettriche, Turin, Italy. An apparatus having an electrolyzing vessel or bath, a heater under the same, a chlorinating vessel, a heater under the same, a pipe connecting the upper part of the said bath with the lower part of chlorinating vessel, a substituting vessel, a pipe connecting the said bath with the substituting vessel, a pipe connecting the upper part of the chlorinating vessel with the substituting vessel, and a pipe for carrying the gases from the last-named vessel.

## PERSONAL.

Mr. Victor Clement has been in New York City.

Mr. Samuel Newhouse has decided to spend the winter in Denver, Colo.

Mr. Auguste Mattez, of Denver, Colo., has been in New York City.

Mr. W. E. Alexander has returned to Denver, Colo., from an extended visit to Idaho.

Mr. A. Graves, of Denver, Colo., is in Carbo, Sonora, Mex., looking after mining interests.

Mr. J. W. Malcolmson, formerly at Chihuahua, Mex., has opened an office at El Paso, Texas.

Mr. Arthur Goodall, of San Francisco, is now manager of the Fremont Mine at Amador City, Cal.

Mr. C. L. Wright, of Omaha, Neb., has gone to Colombia, S. A. He expects to return shortly.

Mr. William G. Vint, from Alaska, passed through New York City last week on his way to London.

Mr. George Collins is engaged in looking after mining interests in Gilpin and Clear Creek counties, Colo.

Mr. A. M. Welles has returned to Denver, Colo., from a trip to the Pacific Coast on professional business.

Mr. F. W. Fosberg, manager of the Corbin concentrator, recently returned to Helena, Mont., from the East.

Mr. Albert Ladd Colby, of the Bethlehem Steel Company, has returned from a 3 months' trip to Europe.

Mr. F. E. Drake, general manager of the Union Electricitats Gesellschaft, of Berlin, is now in the United States.

Mr. S. W. Mudd, one of Leadville's leading mine operators, has gone to California to spend a month with his family.

Mr. Percy Williams, of Salt Lake, Utah, who is acting for the Guggenheim Exploration Company, is in New York City.

Mr. F. P. Swindler, manager of the Duplex Mine, with headquarters in Searchlight, Nevada, was in Denver, Colo., recently.

Mr. L. C. Trent, until recently manager of the North Lyell Copper Company, Tasmania, is temporarily in New York City.

Mr. Lew Humphreys, of Central City, Colo., went to Durango, Mex., on examination work for Stratton's Independence, Limited, last week.

Mr. Elihu Thomson, of Lynn, Mass., has been elected non-resident professor of applied electricity at the Massachusetts Institute of Technology.

Mr. P. Ginther is manager of the Encinillas Mines, operating the Dolores y Annexas Mines, 45 miles from Santa Rosalia, Chihuahua, Mex.

Mr. Frank J. Sprague, of New York City, has returned from a trip to Europe, where he has been studying the electric railway situation.

Mr. L. Summers, the special Western representative of Samuel Hermanos & Cummings, of New York City, is in Denver, Colo., on business.

Mr. A. Buckbee, general manager of the Virtue Consolidated Mining Company, Baker City, Ore., has been in Montreal, Canada, on company business.

Mr. Charles Wilhelme, the general manager of the Velardena mines, Mex., recently severed his connection with the company. He is succeeded by Mr. W. Braden.

Mr. Richard Mead Atwater, Jr., passed through New York City last week on his way to British Columbia, after inspecting mines in the Malay Peninsula.

Mr. Ross B. Hoffman, of San Francisco, was in Denver a few days ago en route to Mexico, where he went to examine property for the Exploration Company.

Mr. A. M. Coleman, manager of the Keystone Hydraulic Mining Company, operating the Keystone Placer near Telluride, San Juan County, Colo., has been in Denver.

Mr. A. Chester Beatty has been in Montana to complete the examination of the Heinze copper properties. He expected to spend the holidays with his family at Denver, Colo.

Mr. Richard A. Parker is still at Las Vegas Hot Springs, N. M., whither he went to rest and recuperate last spring. He has practically given up all mining work until next spring and summer.

Col. B. F. Morley, manager and owner of the Mary Murphy property at St. Elmo, Colo., and the Buena Vista Smelter, was in Denver, Colo., last week. He has lately returned from a trip abroad.

Mr. W. D. Frederichs, a mining engineer in the service of the Mexican Mine and Smelter Company, of Mexico City, Mex., has resigned to accept the management of a mine in the State of Oaxaca.

Mr. T. L. Lyman, manager of the asbestos department of the H. W. Johns-Manville Company, New York, sailed on December 20 for Havana, Cuba, where he will remain about 2 weeks for the benefit of his health.

Mr. E. R. Emerson, one of the old-time mining men of Chaffee County, Colo., and formerly owner of the Sedalia Mine, has been in Denver on business. He is now interested in silver mines in the Monarch District.

Messrs. Gordon Douglass, civil engineer, and R. E. Palmer, mining engineer, who are connected with the Rio Tinto Mine in Spain, have been inspecting the open cut and caving system of mining used in the Lake Superior iron country.

Mr. George L. O. Davidson, of London, Eng., who recently spent a few weeks in Boulder, Colo., has sailed for Europe. He is interested in a company which owns a large tract of oil land adjoining some of the producing wells of Boulder, and also the Milan lode, adjoining the Livingston dyke.

Mr. John W. Dowling has resigned as superintendent of the Lacey-Buek Company's furnace at Trussville, Ala. He will have charge of the construction of the furnace being erected at Valley Head, Ala., by the Valley Iron Company. Mr. Dowling was for 12 years in charge of the furnaces at Bessemer, Ala.

Mr. D. H. Moffat has returned to Denver, Colo., from a several weeks' trip to New York City, having succeeded in financing the new Denver & Northwestern Railroad. Bids have been opened and contracts let for the construction of 36 miles of track northwest of Denver. This contract will require 4,000 men for several months, and work is to begin January 1.

Mr. J. H. Collins, of London, England, father of the late A. L. Collins, who was assassinated at Pandora, Colo., accompanied by his two sons, George and Edgar, visited Gilpin County, Colo., mines during last week. It is reported that Mr. Edgar Collins, who has resigned his position as superintendent of the Smugler properties at Telluride, Colo., will return to England, as will Mrs. Arthur L. Collins and children.

Mr. Pat McCann, one of the best-known mining men of Gilpin County, and manager of the Kansas-Burroughs, is dangerously ill at St. Joseph's Hospital, Denver, Colo., suffering from a blood clot on the brain. Mr. Richard Sykes, superintendent of the property, is acting as manager during Mr. McCann's illness. He is also looking after the welfare of Mr. McCann during his confinement in the hospital.

Mr. Forbes Rickard, who has been examining properties in Idaho for Eastern clients, has returned to Denver, Colo. He says that while nothing of extraordinary value has been found in the Thunder Mountain District, yet some good finds have been made in nearby camps, which promise to become good properties next season. The Thunder Mountain section is just now almost inaccessible on account of the snow and cold weather.

Mr. J. Walter Wells has resigned as Provincial Assayer for Ontario in order to specialize along certain lines affecting the industries connected with mining in Ontario. The special investigations will be conducted for the present at the Mining and Milling Laboratory of the Kingston School of Mines. The director of the Bureau of Mines of Ontario has placed Mr. A. G. Burrows, a former assistant in this laboratory in charge of the Provincial Assay Office, Belleville, Ont.

## SOCIETIES AND TECHNICAL SCHOOLS.

AMERICAN MINING CONGRESS.—This society, a reorganization of the International Mining Congress, has filed articles of incorporation, with an application for a charter, in Colorado. The articles of incorporation and by-laws were drawn up in Deadwood at a meeting of the executive committee, comprising President J. H. Richards, of Boise City; First Vice-President S. W. Russell, of Deadwood, S. D.; Second Vice-President E. R. Buckley, of St. Louis, Mo., and Secretary Irwin Mahon, of Carlisle, Pa.

The by-laws declare: "This corporation is formed for the purpose of advancing the mining and metallurgical industries in all their various branches within the United States; to assist in bringing about a more perfect co-operation between the Government of the United States and the development of mining and metallurgy; to encourage education in practical and scientific information in relation to mining, metallurgy and their allied industries; also to acquiring and disseminating trustworthy information bearing upon the development of the metallic and non-metallic mining resources of the United States; promoting a more co-operative tendency in the evolution of agriculture, mining, manufacturing, transportation and commerce; and for the particular purpose of bringing the mining men of the United States into closer relation and promoting a friendly feeling for one another through social intercourse.

While the committee was in session its members were the guests of the Black Hills Mining Men's Association. A meeting of the association was held during the committee session, and addresses were delivered by the members of the executive board of the mining congress.

The next meeting of the executive committee will be held at Deadwood in May or June, when arrangements will be perfected for the next session of the congress, to be held at Deadwood and Lead, S. D., September 7, 8, 9, 10 and 11, 1903. At the time of the next meeting national headquarters will be opened in Deadwood, to remain open until the close of the session of the congress.

AMERICAN CHEMICAL SOCIETY.—The 27th general meeting will be held in Washington, D. C., in connection with the meeting of Section C of the American Association for the Advancement of Science, beginning December 29 and ending January 3. The sessions will all be held in the large lecture hall of the Medical Department of the Columbian University. The following is a general outline of plans for the meeting so far as matured:

Monday, December 29, 1902.—Morning, 9 a. m., meeting of the council of the American Association for the Advancement of Science in the Assembly Hall of the Cosmos Club; 10 a. m., first general session of the American Association for the Advancement of Science, in Lafayette Theater; 11.30 a. m., organization of Section C, in the lecture room, second floor of the Columbian University Medical School; 11.45 a. m., opening session of American Chemical Society in the same room. Afternoon, 2.30 p. m., address of Vice-President H. A. Weber before Section C of the American Association for the Advancement of Science, Columbian University Medical School; 4 p. m., visit to liquid air plant of the Columbia Liquid Air Company. Evening, 8 p. m., address of the retiring president of the American Association for the Advancement of Science, Prof. Asaph Hall, U. S. N. Place of delivery not yet determined. At the conclusion of the above address the council of the American Chemical Society will meet in one of the rooms of the Columbian Medical School.

Tuesday, December 30.—Morning and afternoon; 9 a. m. and 2 p. m. Sessions of the American Chemical Society in the lecture room of the Columbian Medical School. These sessions will be for the presentation and discussion of papers, and for business. Evening, 7.30 p. m., address of the retiring president, Prof. Ira Remsen, in the large lecture room on the first floor of the Columbian University Medical School; 9 p. m., subscription dinner, open to all chemists of the American Chemical Society and Section C, at \$3 per plate, Hotel Barton, east side of Fifteenth Street, near H Street.

Wednesday, December 31.—Morning, session in same place as before, in charge of Section C; 12 m. to 2 p. m., Christian Heurich, president of the Heurich Brewing Company, has, in the name of that corporation, invited the visiting chemists to inspect their brewing plant and to partake of a luncheon or repast: 2.30 p. m., session in charge of Section C. In the evening a complimentary smoker will be tendered by resident members of the Chemical Society of Washington to all visiting chemists. This will be held in the New Willard Hotel, corner of Pennsylvania Avenue and Fourteenth Street. No arrangements have as yet been made for the remaining days of the week, aside from the daily sessions.

## INDUSTRIAL NOTES.

The Stilwell-Bierce & Smith-Vaile Company, of Dayton, O., has secured a substantial contract for filter presses for Mexico.

The Worthington branch of the International Steam Pump Company, of New York City, is reported to have secured a large contract for pumps for London.

Wonham & Magor, of New York City, have placed an order with the Lidgerwood Manufacturing Company for a large double drum steam derrick hoisting equipment.

The Brown Hoisting Machinery Company, of Cleveland, O., is reported to have secured a large contract for machinery, to be shipped to Buenos Ayres, Argentina.

The Philadelphia Pneumatic Tool Company, of Philadelphia, Pa., recently got a large contract for pneumatic tools for shipment to the German Navy Yard at Kiel.

The Pierce Well Engineering and Supply Company, with offices at No. 136 Liberty Street, New York City, is reported to have secured some substantial contracts from South Africa.

The Oil Well Supply Company, of Pittsburg, Pa., is about shipping 900 tons of 3-in. to 9-in. pipe to the east coast of Sumatra. The pipe will be utilized in connection with an oil refinery.

The Ingersoll-Sergeant Drill Company has secured an air compressor order through the American Trading Company, of New York City, for machinery to

be installed in the shops of the Hokkaido Government Railways.

The Holthoff Machinery Company, of Cudahy, Wis., through T. Fielding, its Denver agent, has an order for 15 cyanide tanks, weighing 210 tons, from the Telluride Reduction Company, Colorado Springs, Colo. for a new mill.

The Ingoldsby Automatic Car Company, of St. Louis, Mo., has secured an order for 30-inch gauge, 22,000 lbs. capacity, steel cars. These cars will be built by the American Car and Foundry Company at its Detroit, Mich., plant.

W. T. Hiscox & Co., with offices at No. 26 Cliff Street, New York City, has secured a contract for furnishing material for a 10-in. pipe line 10 miles long for the mines of the Greene Consolidated Copper Company at La Cananea, Mex.

The Pacific Window Glass Company's factory has begun work at Stockton, Cal., under Superintendent J. Hurrie. This is the only factory for window glass in the West. The sand comes from Alameda County. Stockton has the largest supply of natural gas in California.

A. V. Kaiser & Co., of Philadelphia, Pa., have purchased the entire plant, etc., of the Cuban Steel Ore Company, of Cheriocro, Cuba, which includes 23 miles of telegraph wires, rails, three locomotives, 100 cars, steel viaducts, bridges and piers, scows, hoisting engines, cableways, 26,000 ft. of 3-in. water pipe, etc.

The Descubridora Mining and Smelting Company, with offices in New York City, has placed a contract for pumps with the Allentown Rolling Mills, Allentown, Pa., for installation in its Mexican mines. The pumps will be 4-in. by 12-in. horizontal ones, having a capacity for operating 200 gal. per minute against a vertical lift of 600 ft.

The Otis Elevator Company's recent contracts include 10 hydraulic passenger elevators for the extension of the Manhattan Life Insurance Company's building, New York City; 8 hydraulic passenger and 2 hydraulic freight elevators for the Barclay Building, New York City, and 4 hydraulic passenger elevators for Frederick Loeser & Co., Brooklyn, N. Y.

The Pittsburg Coal Company has given order for 6 150-h.p. tubular boilers for use at its various mines, to the Pittsburg Gage and Supply Company, of Pittsburg, Pa. The Penfield Coal Company, Penfield, Pa., has placed an order for a 40-h.p. Chandler & Taylor engine and a 50-h.p. horizontal tubular boiler with the Pittsburg Gage and Supply Company.

Fairbanks, Morse & Co., through their Salt Lake branch, have sold a 22-h.p. gasoline engine for the Blue Bird Mine in Beaver County, Utah; a 12-h.p. gasoline hoist for Col. E. H. Freudenthal, of Pioche, Nev.; 25-h.p. Fairbanks-Morse steam hoist for the Minola Company, of Park City, and a gasoline hoist for the Sevier Consolidated Mine, of Gold Mountain, Utah.

The Wilgus Manufacturing Company, of San Francisco, Cal., has recently installed at the Angels Mine, of Angels, Cal., apparatus for burning oil. The mine has been paying \$5.50 for wood per cord, and oil costs \$1.20 per bbl. in the tanks at the mine. Roughly speaking, 2 bbls. of oil are expected to equal 1 cord of pine wood. On this basis the mine will save about 55 per cent in cost of fuel.

The Tallyday Steel Pipe and Tank Company, of Waterloo, Ia., states that among other large orders booked within the last few days it has secured an order for 8 car-loads of its special K. D. galvanized steel storage tanks, and also recently made a large shipment to Argentina, S. A. The order of 8 car-loads of tanks is for prompt shipment, and the company has booked a number of large orders for delivery in the early part of 1903.

The Lidgerwood Manufacturing of New York City, has secured a contract from the Canadian Pacific Railway for 6 ballast unloading equipments of 25 tons capacity each. The Huon Timber Company, of Glasgow, Scotland, has placed an order with the Lidgerwood Company for a complete steam logging plant, which is intended to be shipped to Tasmania for handling timber logs. Hitherto such work has been done by horses. The equipment will have 100 h.p. capacity.

The burr slot screen is a relic of the time when sheets were punched by hand and holes gauged by a common needle. Most screens are now punched without burrs. Another relic of old times is the tinned screens, as tinned roofing plates were used. Tinned plates are still used in 10 by 14 in. and 14 by 20-in. sheets in sectional frames. The tin is burned off before using. The American Engineering Works, Chicago, Ill., states that it makes many burr slot screens and many tinned screens in compliance with orders, but as an improvement, punches the black pick metal instead of the tinned metal to save the trouble of burning off tin, and also is substituting thin hard steel sheets punched with fine holes. These screens, the company says, have the free discharge which caused millmen to favor tinned screens, require less

frequent change and give more wear for the money than black sheets.

J. W. Duntley, president of the Chicago Pneumatic Tool Company, is back in Chicago, Ill., after a successful European trip. His principal object in making the trip was to establish on the Continent a new plant for the manufacture of pneumatic machinery. He made arrangements for the erection of a new plant at Fraserburg, in Aberdeenshire, Scotland, which will cost approximately \$175,000. The necessary machinery will be purchased in this country. The business of the company has now reached such proportions as to make present facilities totally inadequate, and necessitated the building of an additional factory abroad despite the fact that the company already has 2 large factories in Europe. Mr. Duntley also made an arrangement with a large German factory to manufacture his company's tools on a contract. Mr. Duntley brought back with him nearly 2,500 orders for pneumatic appliances. The detail of skilled mechanics sent abroad a few months ago to introduce pneumatic tools in Europe is meeting with very gratifying results, but especially in foreign shipyards. The men now are devoting their attention to the shipyards of Germany, and succeeded in having the Chicago Pneumatic Tool Company's tools adopted as the standard in 7 yards. Requests have been received to send these men to France, Spain and Italy. The German Emperor evinced considerable interest in the exhibitions made in the German imperial shipyards, personally inspecting the work on several occasions.

#### TRADE CATALOGUES.

Boiler shop and ship builders' tools, such as heavy duty rolls, punches, shears and hydraulic riveters are described in a pamphlet of 32 pages published by Wickes Brother, of Saginaw, Mich.

The St. Louis center beam driller for use with a detached steam or gasoline engine is stated to be especially adapted for use where a drilling outfit of large capacity is needed in a swampy country, or where transportation is difficult. It is manufactured by the St. Louis Well Machine and Tool Company, of St. Louis, Mo., and is described in a neat booklet, which gives full specifications of various size outfits with a capacity up to 3,000 ft. The company deals in drilling rig supplies of all kinds, including wire and manila rope, and carries in stock portable boilers and the Warren drilling engine.

Mr. Randolph Brandt, of New York City, issues a little pamphlet of 24 pages, describing the packings, gaskets, hose, belting and engineers' and mill supplies, he manufactures or carries in stock. The list includes Selden's patent packing made of a specially woven cotton duck, saturated with lubricating materials and wound under pressure on a round rubber cord; Zena packing of oval form with a flat gum core wound with the best cotton duck and lubricated with graphite and mineral lubricants; also Brandt's piston-packing, especially intended for pumping hot liquids. Brandt's triple expansion gaskets are claimed to give better results for high steam pressure than any other on the market. Mr. Brandt also carries in stock rubber pump valves to suit all classes of work.

The Goulds Manufacturing Company, of Seneca Falls, N. Y., has issued an attractive pamphlet of 160 pages, containing numerous fine half-tone cuts. The pamphlet gives some general information about pumps and pumping, and then proceeds to describe the triplex power single acting pumps, which are made in a great variety of styles and sizes by the Goulds Company for all uses from boiler feeding to running hydraulic elevators or for mine use, and general water supply purposes. The low duty pumps are suitable for pumping in mills and factories, for supplying railway tanks, etc., while the heavy duty pumps are suitable for running hydraulic cranes and presses, and similar work. The company manufactures a portable triplex pump, horizontal, acting with outside plunges that is mounted on an iron truck. This pump is especially designed for pumping mine sumps. The company makes also an electrical sinking pump, double acting, with outside packed plungers for working against heads up to 300 ft. Another pump is especially designed for pumping mud, oils, chemicals and heavy solutions about factories and industrial works. Besides its line of triplex pumps, the Goulds Company manufactures rotary and centrifugal pumps. The rotary pumps driven by grooved frictional gear, are specified and approved by underwriters for protection against fire. The centrifugal pumps are intended for elevating large quantities of water under low heads as in open cut excavations, or for irrigation purposes. The Gould Company manufactures in addition power driven plunger pumps and pumps for deep well service.

#### GENERAL MINING NEWS.

**Petroleum Production.**—Notwithstanding the fact that \$1.51 for crude oil is a high price, the pro-

ducers of Pennsylvania oil have been unable to find sufficient new production to meet the increased consumption. In November the consumption of the Pennsylvania product exceeded production by 329,484 bbls., and the excess consumption of the Lima product amounted to 268,423 bbls., a total reduction in stocks of 597,907 bbls., which compares with a net decline of 591,693 bbls. in October.

#### ARIZONA.

##### COCHISE COUNTY.

(From Our Special Correspondent.)

**Tombstone Consolidated.**—The deepest shaft is down 650 ft., and 6 men are employed on the 3 8-hour shifts in the bottom. The company is erecting a 3,500-gal. oil tank, and will use oil as fuel under the boilers.

##### GRAHAM COUNTY.

(From Our Special Correspondent.)

**Arizona Copper Company.**—The works are in full and successful operation, handling large quantities of low-grade porphyry ore from Humboldt Mountain.

**Chase Creek Copper Company.**—This company, in which McCornick, of Salt Lake, Utah, is reported to be interested, is developing sulphide ores.

**Clifton Consolidated Mines, Limited.**—This company has 60 locations on the range west of the San Francisco River, covering copper-bearing veins and porphyry dikes. Surveys are being made for patents. French capital is interested, and L. A. Dunham is general manager. The company is driving an 8 by 8 ft. tunnel to be 1,700 ft. long, intended for double track and electric locomotives. Electric drills are used. A second tunnel on the west side of the mountain is now in 800 ft., and has developed some bonnite in porphyry. A smelter at the river is projected.

**Clifton District.**—Great activity in mining and prospecting now prevails about Clifton. The hotels are crowded with mine superintendents, experts and representatives of machinery and mine supply houses. A representative of a German establishment seeking consignments of copper matte for refining has been here.

The New England, Standard, Home Copper Company, Santa Rosa and Coronado Copper Company are prominent among the less important companies. The Antietam has shipped 100 tons or more to the Arizona Copper Company, and claims to have an ore pile of 600 tons of 8 per cent ore.

The railway from Clifton to Lordsburg is in splendid condition. Many of the long trestles have been filled in with the rough tailings from the jigs, so as to present a solid road-bed across ravines.

The railway from Clifton to Metcalf is now equipped for passenger service, and trains are run regularly between these two places.

**Detroit.**—Mining is suspended. The foundations for greatly enlarged and fully equipped machine shops are well under way, and the management expects to be able to make all needed repairs to locomotives, and even to build new ones if necessary.

**Shannon.**—The construction of the concentrating works below Clifton is progressing. The steel framework of the building is a conspicuous object from the railway.

**Stevens Copper Company.**—This company, incorporated and owned chiefly in Maine and Connecticut, is prospecting the Copper Bluff claim on the porphyry dike on the east side of Chase Creek.

##### MOHAVE COUNTY.

(From Our Special Correspondent.)

**German-American.**—The mines belonging to this company in San Francisco District, but under hand lease to a French company, are having development work pushed.

**Gold Standard Company.**—This company has several men at work in the lower end of the Chimehuevis Mountains opening gold and copper prospects.

**Leland-Mitchell.**—This mine, near Mellen, is installing a gasoline-driven compressor for driving air drills in the tunnel.

**Midnight.**—This mine, at Chloride, has sent a car-load of ore to the smelter at Cerrillos, N. M. The mine belongs to the St. Charles Brothers & Babcock.

**Oro Plata.**—Grading for the new mill for this mine in Todd Basin is about completed, and machinery is arriving at Mineral Station.

**Pinkham.**—This mine, at Nigger Head, belonging to the Schee Brothers, has temporarily closed down.

**Swiss-American Company.**—This company, in San Francisco District, is doing development, on a number of claims.

#### CALIFORNIA.

##### PLACER COUNTY.

(From Our Special Correspondent.)

**St. George.**—George and Lee Pease, near Yankee Jims, have applied to the California Debris Commission for a license to run this mine by hydraulic method, tailings to be stored behind a dam in Devils

Canyon Creek, which drains into the American River.

SACRAMENTO COUNTY.

(From Our Special Correspondent.)

**Green Valley Mining Company.**—This company has been incorporated to operate in Green Valley, near Folsom. The directors are George B. Campbell, J. D. Powell, H. W. Prindle, F. L. Dean and M. A. Jenkins, of Sacramento, which is the principal place of business.

TRINITY COUNTY.

(From Our Special Correspondent.)

**Union Consolidated Gold Mining Company.**—This company at Abrams, H. J. Osborne, of Los Angeles, Cal., president and manager, and Matthew McIlwaine superintendent, owns several mines, among which the Dorleska has been paying very well of late and in it a large body of richer ore has been uncovered.

TUOLUMNE COUNTY.

(From Our Special Correspondent.)

**Eagle Shawmut Mining Company.**—This property at Chinese Camp, owned by John Rosenfeld's Sons, of San Francisco, employs 280 men. The 100-stamp mill is crushing 500 tons of ore daily, and an addition of 100 stamps is contemplated. The vein is 161 ft. wide at the 1,500 level. The chlorination plant is quite extensive.

**Mapes.**—This group of mines, near Sonora, has been bonded to William L. Holmes, of Detroit, Mich., and the necessary machinery will be at once installed. George W. Mapes is superintendent.

**Moody.**—At this mine at Big Oak Flat the buildings, etc., are being repaired, and there is every indication of a resumption of work.

COLORADO.

(From Our Special Correspondent.)

As a result of the report of the grand jury at Telluride, 9 arrests have been made for murder and riot, including President St. John, of the Miners' Union, and other prominent members of the Union. Other arrests will follow, until all the suspects in connection with these outrages are brought to book. Though the trial of the suspects will not occur until next June, the effect of this action by the officials of San Miguel County will be to materially increase the confidence of the law-abiding element in that section.

The terrorism excited by the lawless acts of the striking rioters at the Smuggler-Union Mine in July, 1901, and kept alive by the aggressive attitude of ill-advised labor leaders, up to the assassination of Manager Collins, is ending. This is largely due to two causes, the empanelling of the grand jury to inquire into and fix the responsibility for the outrages was the first, and the selection of two fearless deputies from Wyoming by Sheriff Rutan. The lawless element saw that public sentiment was aroused, and the machinery of the law was in fearless hands. The two Wyoming men, Mildrum and Reynolds, are not toughs or bad men, but are simply men of nerve and experience, who, in a varied career, have run to earth many desperadoes, and do not fear such cattle. As a consequence the bulldozing tactics of the union leaders are being discredited, and law-abiding citizens feel that a turn for the better has come.

Mr. Bulkeley Wells, the vice-president and general manager of the Smuggler-Union Company, has gone to Boston, where he will spend the holidays. He said that the local situation was so improved that the company has decided to start up the Pandora Mill and the Smuggler-Union and Contention properties on December 27, with about one-half of the old force, or a total of approximately 300 men. Of this number 200 will be employed on the Smuggler-Union proper as a day shift. Mr. Wells ridicules the yarns printed in Denver dailies about his being escorted around camp by a bodyguard of armed men. He says they are mere figments of the space writers' imagination. O. B. Kemp, the new superintendent, is the only man who has accompanied Mr. Wells around the camp, and neither of the gentlemen was armed.

The impression among the better informed mining men in Telluride is that when the trials of the indicted men occur in June convictions will follow, as the evidence on which the indictments were based appears conclusive. It is gratifying to mining men throughout the State that so healthful a change of sentiment has occurred. It shows that control of the great mineral wealth of the San Juan country will not be permitted to repose in lawless hands.

The financing of the Moffat road has stimulated a number of kindred enterprises of considerable magnitude. Among these is the reorganization of the old Atlantic & Pacific Tunnel, which attained some unpleasant notoriety years ago through the generous advertising of "Brick" Pomeroy. The new company has undertaken to go through the main divide at the base of Gray's Peak, through Kelso Mountain, west of Argentine pass. They will begin work in the holdings of the old tunnel company, which is one mile in from the portal. The estimates show that the completion of the work can be secured inside of

3 years. A New York syndicate, under the new name of the Denver & Salt Lake Railroad Company, will push the work. The main work of the tunnel will be on a transportation basis, affording a short line from Denver to the coast, through the heart of the mineral country of Colorado, more than 150 miles shorter than any existing route. The new company is incorporated for \$5,000,000, divided into preferred and common stock, a portion of which will be set aside to take care of the old stockholders in the original company. A sub-company is to be formed to exploit any veins cut.

The new Colorado & Ohio Smelter at Salida has blown in another furnace, making its present capacity approximately 600 tons per day. It is receiving 100 tons of limestone per day from the quarry at Garfield, the major supply of its ore coming from Leadville.

The Woods Investment Company, the Gold Coin Mining Company, the Columbine Victor Mining and Tunnel Company, the United Mines Transport Company, the Mount Rosa Mining and Milling Company, and the South Gold Coin Mining Company are defendants in a suit filed in the United States Circuit Court in Denver by Perry Brown, of Lake Mills, Ia. The amount asked for in the complaint is \$245,000, and a reconveyance of all the property of the Mt. Rosa Company, which it is alleged has been illegally alienated by the Woods Investment Company.

President Burns, of the Portland Mine, at Cripple Creek, reports the uncovering in the 600 level of an ore shoot 40 ft. wide and 75 ft. long, running \$40 a ton.

BOULDER COUNTY.

(From Our Special Correspondent.)

**Boulder County Mineral Output.**—The output for 1902 is estimated at approximately 10,000 tons of ore, containing gold values of \$790,000, silver values of \$46,000, and lead values \$6,000. Besides this there was produced gold bakes and retorts worth \$50,000, making an estimated total of precious metal values of \$892,000.

The yearly coal production is greater than 1,000,000 tons. The Northern Coal and Coke Company producing alone over \$700,000 tons.

The mineral oils have yielded products estimated at between \$15,000 and \$20,000 in the last 6 months.

**Mining Deeds.**—L. S. Stapp to J. H. Dickson, one-half interest in White Cloud lode, Central District; H. McDonough to S. L. Davidson, Belmont lode, Sugar Loaf District; F. L. Williamson to Mary A. McAllister Last Chance and Mammoth Page lodes, Sugar Loaf District; George Kirkbride to Wellington Gold Mining and Milling Company the Nickel King group, consisting of 5 lode claims in Gold Hill District.

**Morning Star.**—A rich strike is reported in this mine at Ward.

**Wall Street Gold Extraction Company.**—The large mill of this company at Wall Street made a trial run recently, but was forced to close down, owing to some trivial break. It is expected to be running full blast by January 1.

**Wano.**—There are about 30 ft. of ore in this mine at Jamestown. Its average value is about \$35 per ton. The management is under the supervision of A. H. Brown. The owners are Eastern men, who intend building a mill to treat the lower grades.

CLEAR CREEK COUNTY.

**Alinude.**—A 13-ton car-load of Alinude first-class ore is reported to have brought \$4,130, or an average per ton of \$315. This ore came from the noted Haggart & Co. lease, in the 1,000-ft. or lowest level of the mine at Georgetown.

**Kelley Tunnel.**—Phenomenal values are reported in a strike in this tunnel at Georgetown on the property of the Georgetown Mining, Tunnel and Transportation Company. B. F. Kelly is manager. The ore carries high values in gold, silver and lead, and is thought to be an extension of the Jesse M. vein. The vein was cut at a point 1,815 ft. from the surface, and has been prospected for 12 ft. The tunnel employs 40 men.

**Mendota.**—The third level of this mine at Georgetown, showing 3 ft. of high-grade galena ore. The Frostberg level shows an 18-in. streak of rich lead ore. The Mendota Mill is turning out a large tonnage of concentrates. Louis Block has started operations on his Frostberg lease.

GILPIN COUNTY.

(From Our Special Correspondent.)

**Mining Deeds and Transfers.**—Hal Sayr et al. to C. W. Pollard, the Hampton and Rainbow lodes, Russell District; J. M. Brown et al. to J. J. Gray et al. the Bimetallic lode, Wisconsin District; Edward Davis to K. J. Williams et al., portions of the Portage and Randolph properties, Russell District; Julia Galligan et al. to the Wizard Gold Mining Company, the Galligan placer claim, Central District. M. Chesney et al. to Angelo Rosetti, 2-3 interest in Bright lode, Wisconsin District; Etta M. Baldwin to New Na-

tional Tunnel Mining and Milling Company, the Merchant lode, and tracts A. B. and C. in Gregory District; James H. Reilly to the Benzie Investment Company, one-half interest in Elizabeth lode, Lake District; Andrew Hedman to Phillip Pressler, one-sixth interest White Spar lode, Pine District; the Little Kingdom Mining Company to Stephen Tresscott, the Teddy R. lode, Lake District; T. A. Hatfield et al. to the Penobscot Mining Company, the Penobscot, Drumlunmons, Harlacher Dewey, Myrtle Belle and Hamble lodes, Independent District.

**Banta-Hill Consolidated Mines Company.**—Arrangements, it is believed, will be perfected whereby operations may be resumed, and the company's financial affairs adjusted. The company owns 234 acres of patented ground, and had made a very favorable showing, considering the developments. Eastern stockholders are interested. It is expected that facilities, for handling the concentrating ores will be furnished at an early date. The ores carry about one-half in gold, the balance being silver, lead and copper.

**Buckhorn Extension.**—Dorner & Co., leasers on the property until it was sold for \$20,000 a few days ago, have received returns from one car-load to the smelters, which gave net \$30.53 per ton, while a car-load of ore commonly sent to the mills gave net values of \$8.73 per ton. The property is reported looking better every day. W. H. George, Central City, is interested.

**Costoria Gold Mining Company.**—A 22-h.p. gasoline hoister, of Fairbank, Morse & Co.'s make, has been delivered to the Hall ranch property, and the new shaft buildings are about completed. B. M. Myers, Central City, is manager.

**Mammoth & Spruce Mountain Mining Company.**—This company, organized with a capital stock of \$1,000,000 has purchased several claims in the Black Hawk District, and has options on others in Gregory and Nevada District. Shaft buildings and machinery will be installed on the Eagle claim at once, and work commenced.

**Miner's Ore Sampling Company.**—This new sampling works at Black Hawk has suspended operations on account of not having a market for its ores. The company was organized about 8 months ago, and local men subscribed for the stock. Arrangements were made with an independent smelter in the Black Hills to handle the sulphide ores from this county as they were needed to mix with siliceous Dakota ores. All went well until a couple of weeks ago, when the local men had difficulty in getting settlements, and a number of cars were lost during transit. Investigation proved that the independent smelter had been promised all the sulphide ores needed by the smelter trust, and rates had been made which were much more satisfactory than the Black Hawk sampling works could make an account of the long haul.

**Town Topics Gold Mining Company.**—Free gold ore has been found in the old workings east of the Mitchell shaft at a depth of 130 ft., and the ores from the 330 level have jumped from 4 to 11 oz. gold per ton. M. D. Draper, Central City, is superintendent.

SAN JUAN COUNTY.

(From Our Special Correspondent.)

**Mining Transfers.**—Otto Brudel to C. N. Merrill, Highland Queen lode; Ellen Plantz to Edith Manners, Edith lode; Eugene Parsell et al. to Edward N. McIntyre, Bonanza River lode; C. A. Freeman to the public trustee, San Juan Queen et al. lodes; B. O'Driscoll to Henry Miller, Peace-Pipe et al. lodes; E. C. Condit to B. O'Driscoll, Pride of Eureka lode; W. W. Newton to August Fast, Eclipse lode; Henry Arangini to A. Grebles, Delano lode; Frank A. Hayes to N. C. Meriel, Washington et al. lodes.

**Edith.**—Mrs. J. T. Manners has purchased this claim on Tower Mountain from Mrs. Edith Plantz, and will begin development soon.

**Galty Boy.**—A small force will be employed during the winter on repair work.

**Golden Wedge.**—Judge Abbott has opened a 10-ft. vein of good milling ore, with some high-grade lead carbonates.

**Gold King Mining and Milling Company.**—The output for November from the Gold King Mill, near Silverton, was 1,300 tons of concentrates. The force will be increased by 100 men as soon as the upraise now being driven is completed.

**Gold Tunnel and Railway Company.**—A new contract for 100 ft. of driving has been let on the Oro tunnel, near Silverton. Hand drills will be employed during the winter.

**Mammoth Tunnel and Mining Company.**—This big bore is advancing rapidly. Its exit from the mountain will be near the town of Red Mountain. It will cut the properties of the Oliver Reduction Company, Kendrick & Gelder Smelting Company, and Mammoth Tunnel Company at 3,000 ft. depth. The company is composed of Maine and Pittsburg, Pa., parties.

**Notaway Mining Company.**—Another vein, supposed to be the Keystone or Manhattan, has been

encountered and the tunnel will be driven to the Alethea vein.

**Ocom Paul.**—Dutton & Gibson have opened a vein 32 inches in width of good gray copper ore, with good gold and lead values. The claim is in the Red Mountain District.

**Royal Mining Company.**—The vein has been cut in this company's ground near Silverton at 1,060 ft. in a perpendicular depth of 750 ft. Drifting is being pushed both ways on good ore, with occasional rich pockets. The main tunnel will be driven 60 ft. further to cut the Mazepa vein, and the blind lead cut some weeks ago is also being developed with good results.

**Silver Ledge Mill.**—This mill at Chattanooga is closed for a few weeks, pending the installation of a steam plant, made necessary by the irregularity of the winter water supply. The product lately has been 2 car-loads per day of concentrates from 200 tons of crude ore, averaging \$12 per ton. The company employs 85 men.

#### SAN MIGUEL COUNTY.

(From Our Special Correspondent.)

The men arrested under the indictments returned by the grand jury, which investigated recent outrages committed by union miners, include Vincent St. John, president of the miners' union; Sam Reed, a Cornishman, and James Rouer, an Italian; miners employed at the Tomboy Mine, John E. Conn, a Finn; a saloon-keeper, George Washburn, an American; employed at the Four Metals Mine. The saloon kept by Conn and a man named Smith, who was recently sentenced to a term in the State prison, is said to have been the rendezvous of the rioters.

#### TELLER COUNTY—CRIPPLE CREEK.

**Accident.**—The shaft house was recently wrecked by an explosion of dynamite, which was being warmed near the boiler. A number of carpenters are repairing the damage, and work will soon be resumed. The property is on Foley Hill between the Pointer and Red Spruce.

#### LOUISIANA.

##### CALCASIEU PARISH.

(From Our Special Correspondent.)

**Acome Supply Company.**—This company's well, at Bayou Lecom, is being drilled by N. E. Wright. It is now 200 ft. Indications good.

**Southern Pacific Railway.**—This company is having 4 wells drilled near Crowley locality by T. J. Wood.

**Welch Oil and Development Company.**—This company, at Welch, has a 50,000-bbl. tank nearly completed, and the Southern Pacific is putting in switches and loading racks. The oil is required for immediate consumption.

The Rice City Oil Company well has been started.

The Denver-Beaumont Company and Southern Pacific Railway wells at Welch are going down rapidly.

#### MARYLAND.

##### ALEGANY COUNTY.

**Rock Vein Coal Company.**—This company has been reorganized to develop coal holdings near Eckhart. The reorganization, which took place at Berkeley Springs, the main office, was necessary on account of Ohio men acquiring a large interest. They are J. L. Bushnell, F. S. Harwood and C. L. Bauer, of Springfield, all being on the board of directors, with G. W. Biser, A. Amond, S. F. Shelly, A. L. House, T. H. B. Dawson, Allen M. Mendenhall, of Berkeley Springs; J. Frank Fields, of Hancock, Md., and R. P. Camden, of Parkersburg, W. Va. Mr. Bauer has been chosen president of the company, which has \$200,000 capital.

#### MICHIGAN.

##### COPPER—HOUGHTON COUNTY.

(From Our Special Correspondent.)

**Baltic.**—The 4th head at the new mill will stamp rock from the Baltic Mine as soon as it is released by the Champion.

**Calumet & Hecla.**—This company has installed 3 improved electric pumps in No. 7 shaft of the Hecla branch. They are from the Jeanesville Iron Works Company, of Jeanesville, Pa. If results are satisfactory more will be installed to replace pumps now in use.

**Champion.**—The remaining portion of the 3d head has arrived from the Nordberg Manufacturing Company, of Milwaukee, Wis. The 2d head is nearly installed, and will go into commission at once.

**Lake Superior Smelting Company.**—This company has put the cupola at the Dollar Bay Smelter in blast again. It closed down several months ago, owing to the exhaustion of the supply of anthracite coal.

**Oscicola.**—A committee appointed at a meeting of the Lake Superior stockholders has issued a circular wherein the movement to secure a change of management is outlined and advanced by various arguments. Proxies are solicited.

**Quincy.**—This company is casting from certain grades of mineral carrying silver, which are shipped East for electrolytic refining.

#### COPPER—KEWEENAW COUNTY.

(From Our Special Correspondent.)

**Mohawk.**—No. 1 shaft at this mine is sinking to the 8th level. Drifting on the 7th level for the fissure vein of mohawkite is under way.

#### COPPER—ONTONAGON COUNTY.

(From Our Special Correspondent.)

**Adventure.**—Henry F. Key has been appointed superintendent of the new stamp mill at Edgemere. He has been in charge since work on the plant started. Some changes in the construction and equipment of the plant are being made by representatives of the Allis-Chalmers Company, of Chicago, Ill. Two heads are in commission, stamping between 900 and 1,000 tons of rock daily, and are being gradually worked up to normal capacity. It is expected that the 3d head will be ready February.

**Michigan.**—A shaft is sinking to the 11th level, and B shaft is nearly down to the 12th level. Heavy copper continues to show in the lower levels.

**Victoria.**—Inclement weather is delaying the work on the power canal leading from the dam at Glenn Falls to the stamp mill site. The ground freezes so rapidly that it is difficult to make solid embankments along the canal. The property will not begin producing as soon as expected.

#### IRON—MARQUETTE RANGE.

**Champion.**—The United States Steel Corporation is reported to have purchased this mine at Champion, and the large tract of adjoining iron ore lands, for a reported consideration of \$2,000,000.

**Section Sixteen.**—The fire in this mine at Ishpeming is out. Comparatively small damage has been done to the workings.

#### MINNESOTA.

(From Our Special Correspondent.)

The average cargo of ore taken at the Duluth & Iron Range docks at Two Harbors, this year, was 4,680 gross tons, an increase of 320 tons over last year.

Improvements will be made to several of the upper lake ore docks this winter, and at both Duluth and Two Harbors considerable new work will be done. The contract for a new dock for the Great Northern at Duluth has been let to the Butler Brothers Company, and the substructure, consisting of 7,300 long piles, is now going in. The dock and approach will be 2,300 ft. long, and the height will be about the same as the company's No. 2 dock, 73 ft. above mean water line. It will probably be ready for use early the coming season.

It is reported, seemingly on good authority, that the Mesabi Range ore-bearing lands belonging to the Great Northern and Northern Pacific roads, excepting such as have been leased to operating companies by the Great Northern, will be turned over to the United States Steel Corporation. This will give the United States Steel a closer hold on the situation than the purchase of every furnace and mill in the United States and secure it ore for a very long period. How much ore these lands contain is not known, but that it is far more than 100,000,000 tons, is a pretty safe possibility. It will leave very little desirable ore land outside the ownership of some steel making concern. The Great Northern has leased these lands to the Steel Corporation on a royalty basis, and is to have the haul of ore over its own line to Lake Superior. It is this haul for which Mr. Hill has been steadily gathering in ore lands for the past 4 years.

#### IRON—MESABI RANGE.

(From Our Special Correspondent.)

The mines of the Donora Mining Company and Sharon Ore Company will be turned over to the United States Steel Corporation in a few days, and will probably be operated by the Corporation's district managers, the Sharon Sweeney and Penobscot, by Pentecost Mitchell, of the Hibbing District, and the Donora by M. S. Hawkins, of the Mountain Iron. Changes in mining methods at the Penobscot inaugurated by the Donora Company the past few weeks will probably be continued by the new owners, especially as they show a marked economy over former methods.

**Commodore.**—This mine, idle for some time, is now being reopened. New boilers, pumps, hoists, etc., are on the way, and will be installed at once. The mine is very wet, and a large pumping plant is required. Old No. 3 shaft, which has been abandoned, will be equipped again. E. D. McNeill will be in charge.

**Edmund Iron Company.**—This company has filed options for leases on 4 State tracts in sections 10, 11 and 12, T. 58, R. 19, and drills are at work there. Some ore was found last summer. The option calls for the purchase of the leases at prices ranging from \$40,000 for a 160-acre tract down to \$10,000.

**Penobscot.**—This mine shipped this year 219,000 tons, little more than its annual allotment, to the National Steel Company.

#### IRON—VERMILION RANGE.

(From Our Special Correspondent.)

**Explorations.**—On this range explorations are more active than in many years, with numerous important concerns looking for ore. The Oliver Iron Mining Company has one drill in 19 and one in 14, 62 R. 14. Another will probably be put into section 14. The Mahoning Ore and Steel Company has one drill in 27, and another in 14, T. 63, R. 11. Robert White-side has a drill in section 15, same town. This is the Section 30 town. The Sharon Ore Company has 2 drills in sections 3 and 4, T. 62, R. 10, and will soon have another. Messrs. Vail & Sweeney have one drill in section 24, T. 63, R. 12. There are 4 drills working close to the city of Ely, 2 east and 1 west of the town, while a fourth is on lands between the Pioneer Mine and Long Lake.

On section 25, T. 63, R. 12, and on section 30, T. 63, R. 11, there will soon be anywhere from 6 to 10 drills, if all rumors are true, but so far nothing has been done there. The Mahoning Ore and Steel Company will drill on section 25, and the Section 30 Company adjoining. The Mahoning Company is also to place several drills east of Ely soon.

**Oliver Iron Mining Company.**—All the mines of this range are very busy stocking ore. The Soudan shipments will probably be greater than this year, and the Ely mines are expected to make a considerable increase, excepting perhaps the Chandler. Five hundred men are employed at the Pioneer, one shaft operating, 400 at the Chandler, 2 shafts working, and about as many at the Sibley, Savoy and Zenith combined, each of which has 1 shaft in operation. At Soudan there are 550 men at work, with 3 shafts in operation.

#### MONTANA.

##### MADISON COUNTY.

**Broadway.**—This group consists of four patented claims, the Bowery, Delaware, Maryland and Victoria, 1½ miles north of Silver Star. The properties are owned by F. R. Merk, of Twin Bridges. The Bowery is developed by 2 shafts 600 ft. deep, six levels from 300 to 1,000 ft. long and a tunnel 1,100 ft. long. The present lessee, the Law Mining and Milling Company, has sunk a winze 115 ft. below the 550-ft. level. Two ore shoots having an average width of 8 ft. and sampling \$22, are reported exposed. A 20-stamp mill and a 50-ton cyanide plant are on the property.

**Iron Rod Mining Company.**—The Iron Rod Mine, near Virginia City, belonging to this company, is under lease to Charles Dahler. It is developed by a perpendicular shaft 600 ft. deep, tapped by 2 tunnels, one 1,200 ft. and the other 1,400 ft. The ore body is from 6 in. to 2 ft. wide. The Hudson is the most promising group of 7 patented claims owned by the Iron Rod Mining Company. The old Iron Rod Mill was built many years ago to treat the ores from the company's mines. It was originally purely a stamp mill. Now it has 15 stamps, with a capacity of 35 tons. It is equipped with 4 frue vanners, and has a cyanide annex that during the past 4 years has treated 30,000 tons of tailings by cyanide. After January 1 it will treat the output from the Hudson and other properties. The mill is operated by Charles Dahler, Sr.

#### NORTH CAROLINA.

##### GUILFORD COUNTY.

(From Our Special Correspondent.)

**Oak Mill.**—This mine, 2 miles from High Point, has been sold. It carries a 7-ft. vein of chalcocopyrite, bornite and covellite, reported to yield 18 per cent copper and 0.2 oz. gold. The Henry Johnson, a mere prospect, only 25 ft. deep, has also changed hands. Both mines are on the line of the Southern Railroad. There is a prospect of some more sales after New Year.

#### OHIO.

##### BELMONT COUNTY.

**Belmont Coal Mining Company.**—This company, which recently purchased about 7,000 acres of Pittsburgh No. 8 coal in this county, from C. Trolls & Sons, and has since been operating the Black Diamond and Ohio & West Virginia mines at St. Clairsville Junction and the Glen Mine at Glencoe, has removed its headquarters from Glencoe to Pittsburgh, Pa. The company has arranged to market its own coal instead of selling it through the Baltimore & Ohio Coal Company at Columbus, O. The tipples, machinery and equipment of the Glen Mine is calculated to handle 2,000 tons of coal per day. Twenty 2-story, slate-roofed houses have been erected at Glencoe, and more will be added. The Adena branch of the Wabash Railroad runs through the property for about 4½ miles. Thomas K. Maher, formerly of Philadelphia, is president, and Capt. Alfred Hicks, of Pittsburgh, is treasurer.

**Youghiogheny & Ohio Coal Company.**—A big mine back of Bridgeport has been opened. This company now owns 13,000 acres of land near Bridgeport, extending out to Mt. Pleasant, and has begun improvements that

will require a year to complete. More than 1,000 diggers will be employed, and the total output of the mines will be several thousand tons daily.

## OREGON.

## BAKER COUNTY.

**Bonanza.**—Preparations are being made for starting up the 40-stamp mill at this mine, near Sumpter. The plant has been closed since the management commenced sinking the main shaft last summer. A depth of over 400 ft. has been added since then, and now there is a large territory to stope from. The shaft is being lowered 200 ft. further.

**California.**—The concentrating plant at the California is nearing completion. The installing of the machinery will require some time. The new building is 3 stories high.

**Columbia.**—At this mine, near Sumpter, an electric plant is being installed to furnish power for the mill and the hoist. It will generate 200 h.p. The building will be located down the hill from the mill.

**Cougar.**—The new roasting plant, near Sumpter, has had a trial run, and is to start work.

**Golden Wizard.**—The shaft is down 140 ft. A large new pump has been purchased, as well as a hoisting plant, capable of a depth of 1,000 ft. The erection of a mill is talked of.

## PENNSYLVANIA.

## BITUMINOUS COAL.

**Beech Creek District.**—In November shipments were 589,845 short tons coal, and 15,896 tons coke; total, 605,741 tons. From January 1—11 months—shipments were 6,112,705 tons coal, and 187,729 tons coke; total, 6,300,534 tons.

**Colonial Coke Company.**—The holdings of this company at Smock, Fayette County, have been sold to T. S. Lackey and other Uniontown men for \$275,000. The plant consists of 75 acres of coal, 230 acres of surface and a coking plant. The new owners will get possession January 1, and will at once enlarge the capacity of the plant.

**Riverview Coal and Coke Company.**—This company has purchased large blocks of coal lands in Fayette County, near Lock No. 7. A battery of 100 coke ovens will be built at once. In addition to these purchases the William Schroyer farm of 142 acres and the Woolsey farm of 149 acres were taken over and negotiations have been opened for the purchase of the Jacob Cover lands. It is said the company will expend about \$1,000,000 during 1903 in improvements.

## SOUTH DAKOTA.

## LAWRENCE COUNTY.

(From Our Special Correspondent.)

**Cleopatra Gold Mining Company.**—Drifting has started on quartzite from the bottom of the 250-ft. shaft.

**Oro Hondo.**—The main shaft is down 160 ft., and is sinking at the rate of about 100 ft. per month. The company has the third largest hoisting and sinking plant in the Black Hills. It consists of 2 large boilers, a double-drum hoist, 12-drill Norwalk compressor, electric light plant, blacksmith shop, etc. The work is in charge of George M. Nix, who is vice-president and general manager of the company. The average assay value of the ore taken out at the 150 ft. level is given as \$4.80 per ton. It is the purpose of the company to erect a large stamp mill and a cyanide plant to treat the tailings. Work on the stamp mill will start in the spring. Work is being done on the south end of the property near the Old Porth Mill on Golden Crown No. 2 claim.

**State Code of Mine Signals.**—Thomas Gregory, State mine inspector, is endeavoring to have the South Dakota Legislature enact a law establishing a system of mine bell signals for use in all the mines of the State.

**Two Johns Gold Mining Company.**—A shaft has started to connect with the lower tunnel workings. It is following a diamond drill hole.

## TEXAS.

## BEXAR COUNTY.

(From Our Special Correspondent.)

**South Texas Oil Company.**—This company, while drilling for oil 14 miles west of San Antonio, struck gas at 1,100 ft. Mud and stones were thrown out in large quantities, but no oil. The roar of the escaping gas can be heard several miles.

## DALLAS COUNTY.

(From Our Special Correspondent.)

**Dallas Fuel and Oil Company.**—This company's well is down over 1,300 ft., and no oil found. It will be drilled 300 ft. deeper.

## HARDIN COUNTY.

(From Our Special Correspondent.)

**Saratoga Oil Field.**—W. E. Brice, well No. 3, came in strong a few days ago, throwing oil and mud as high as the top of the derrick, but was quickly got under control. The well is 1,630 ft. deep and widens

the field considerably. The Byrd Syndicate reports that its No. 2 has reached a good flow of oil at 726 ft., and that the well will be finished off and a new well started close by, which will be sent down 1,200 ft. or more.

**Sour Lake Oil Field.**—Atlantic & Pacific well No. 2, which has been plugged with sand for some months, has been equipped with a strainer, and is now pumping 250 bbls. per day. The J. M. Guffy Petroleum Company pipe line from Beaumont to Sour Lake will be completed by December 25.

George E. Hart, of Beaumont, has purchased 2½ acres of oil land from C. G. Parsons. Price, \$5,000.

## JEFFERSON COUNTY.

(From Our Special Correspondent.)

**Beaumont Oil Field.**—Oteri Oil Company's well No. 3, on Block 23, National Tract, was brought in a few days ago.

Water shipments have been very large so far this month. Three vessels, the *Strombus*, *Paraguay* and *Lukenbach*, took 100,000 bbls. Crude is getting scarcer every day, and it is reported that 50c. a bbl. was offered for 100,000 bbls.; in smaller quantities 40c. has been offered. The daily production of Spindletop is now less than 30,000 bbls. Wet weather has greatly hampered work, and it has been nearly impossible to haul machinery or pipe.

Shipments are holding up well, especially by water. Oil in tanks in small quantities brings 40 to 42c.; in 50,000 or 100,000 bbl. lots, 50c.; f. o. b. cars, 50c. to 55c. Pipe line charges from wells to cars have advanced from 2½c. to 3c. per bbl., and from Beaumont to f. o. b. vessels at Sabine to Port Arthur from 7½c. to 10c. per bbl. While oil has been rapidly advancing in price, oil company stocks have rapidly depreciated, until now there is practically no sale in Texas for speculative stocks, and only a very limited market for the few which have any real value.

**Beaumont Oil Field.**—The Texas Company has entered suits for large sums against the Saco Oil and Pipe Line Company and the Horseshoe Oil Company for non-delivery of contract oil.

The J. M. Guffy Petroleum Company has brought in a well in the Douthit tract, 500 ft. south of the famous Lucas gusher. The well is about 1,050 ft. deep, and was completed with a cable rig. The surrounding property is all under lease to the Guffy Company, so that this new territory will not occasion any flurry in land values.

**Port Arthur-Stillwell Oil Company.**—This company, at Port Arthur, has No. 2 well under way. No. 1 was dry.

## WASHINGTON.

## FERRY COUNTY.

(From Our Special Correspondent.)

**Iron Mountain Gold Mining Company.**—This company owns 3 claims, known as the Big 3 Group, on Iron Mountain. A 3½-ft. vein traverses the claims. It has a granite hanging and porphyry footwall. A 110-ft. cross-cut from a 100-ft. shaft intersects the vein, on which a drift runs 5 ft. each way on the vein. The quartz carries galena. The claims are 2½ miles west of the California Mine, on O'Brien Creek.

**Morning Glory.**—Returns are received from a car-load of ore shipped to the Granby Smelter from the dump, which shows the value to run \$21.60 per ton. Two more car-loads will be shipped immediately. As it is now known that all the ore will pay, orders have been received to ship it as broken, without sorting. The mine is looking well.

**Mountain Boy.**—A cross-cut tunnel intersects the vein, which is 6 to 12 ft. wide. A lot of 2,575 lbs., shipped to the Hall Mining and Smelting Company at Nelson, B. C., returned gold, 0.31, and silver, 662.6 oz. per ton; allowed 95 per cent, lead 36.8 per cent, allowed 90 per cent; copper, 2.6 per cent, and zinc, 4.5 per cent, not allowed. Freight and treatment, \$19.31. Net proceeds, \$407.82. The smelter withholds 10 per cent, and makes final settlement 90 days from date of assay, at prices ruling then. The claims are at Park City, 30 miles from Republic. The ore is hauled on wagons that distance, and thence by railroad. The wagon haulage is an extra charge.

## OKANOGAN COUNTY.

(From Our Special Correspondent.)

**Opal and Ben Harrison Groups.**—These, consisting of 14 claims, are reported sold to an Ohio syndicate, to be known as the Opal Gold Mining and Milling Company.

## WEST VIRGINIA.

(From Our Special Correspondent.)

It is stated that two French engineers, A. and P. Picard, intend to acquire large holdings of coal lands for the use of a big syndicate in Paris, representing more than \$40,000,000. The syndicate at present supplies much of the fuel for the French navy with fuel, and many of the country's factories.

The engineers are spending a few weeks at Wheeling.

## BOONE COUNTY.

(From Our Special Correspondent.)

**Rowland Land Company.**—This company intends to found a town and open coal mines near Raleigh. The company's capitalization is \$1,000,000. The incorporators: J. H. Rowland, of Port Deposit, Md.; J. Rowman Way, of Williamsport, Pa.; E. C. Colcord, of St. Albans, W. Va.; S. C. Rowland, of Baltimore, Md.; S. T. Foreman, of Williamsport, Pa., and John Wehrle, of Charleston, W. Va.

## FAYETTE COUNTY.

**Fayette Colliery Company.**—This company has elected the following directors: T. A. Dietz, Randolph Harrison, C. H. Lumsden, James E. Edmunds, S. E. Morriss, A. H. Burroughs, O. B. Parker, T. A. Jennings, Joseph Whitehead, A. P. Craddock and T. J. O'Brien. The directors elected the following officers: President, Randolph Harrison; vice-president, T. A. Jennings; general manager and treasurer, T. A. Dietz; secretary, J. Singleton Diggs. It was agreed to increase the capital stock and to have the name changed to the Lynchburg Colliery Company.

## HARRISON COUNTY.

(From Our Special Correspondent.)

**Pitcairn Coal Company.**—Pittsburg, Pa., men, Artemus Pitcairn, W. D. Hartupee, Charles Brown and others, have organized this company to develop a nice block of coal land near Clarksburg. The capitalization is \$300,000.

## MCDOWELL COUNTY.

**Union Coal and Coking Company.**—This company recently purchased 3,200 acres of coal lands on the projected line of the West Virginia Central Railroad. The company will erect 1,000 coke ovens. The original capitalization was \$10,000,000, which the directors recently reduced to \$2,500,000. William J. Le Pine, of Brooklyn, is president.

## WETZEL COUNTY.

**Pittsburg & Mapleton Coal and Coke Company.**—This company of New Martinsville is incorporated under the laws of West Virginia, with a capital stock of \$500,000. The company has contracts for 20,000 acres of coal land. This coal land is tributary to the Ohio River, and is also reached by the West Virginia short line. It is expected that all the coal hoisted will be sold along the Ohio River. Officers are: President, Alfred C. Ruby, of New Martinsville; vice-president, J. C. Trees; secretary, J. Lee Harne, of New Martinsville; treasurer, J. W. Kaufman.

## WISE COUNTY.

**Guest's Mountain Coal and Coke Company.**—This company has been organized at Wise Courthouse, Va., with \$500,000 capital. John C. Stamps, Henry G. Kyle, A. B. Rogan and B. F. Simpson, of Rogersville, Tenn., are the incorporators. They own 3,000 acres of coal lands.

## FOREIGN MINING NEWS.

## AFRICA.

## TRANSVAAL.

The output of the Transvaal mines in November is reported at 187,375 oz. fine gold, being 5,936 oz. more than in October. For the 11 months ending November 30 the total was 1,508,387 oz. fine gold, or \$31,178,359. In 1901 operations at the mines began in May, and the total reported from that time up to the end of November was 186,094 oz., or a little less than that for the month of November this year.

For the first time since the war a part of the gold product came from outside the Witwatersrand in October. In that month the output included 179,660 oz. from the Witwatersrand, and 1,779 oz. from outside, a total of 181,439 oz. In November the figures show 182,749 oz. from the Rand and 4,626 oz. outside, making the total of 187,375 oz. The outside production is chiefly from the Sheba Mine.

## ASIA.

## INDIA—MYSORE.

**Kolar Gold-field.**—The output of the mines for November is reported at 48,332 oz. crude, which is very nearly the largest ever made. For the 11 months ending November 30 the total was 466,213 oz. crude, against 481,279 oz. for the corresponding period in 1901, showing a decrease of 15,066 oz., or 3.1 per cent. The total this year was equal to 419,592 oz. fine gold, or \$8,672,967.

## AUSTRALIA.

## WESTERN AUSTRALIA.

The gold production in November is reported at 197,197 oz. crude, which is a record figure. For the 11 months ending November 30 this makes a total of 1,987,687 oz. crude, against 1,704,592 oz. for the corresponding period in 1901; an increase of 283,095 oz., or 16.6 per cent. The gold bullion reported this year was equal to 1,708,173 oz. pure gold, or \$35,307,930.



## CANADA.

## BRITISH COLUMBIA—BOUNDARY DISTRICT.

**Granby Consolidated.**—During the week ended December 12 the Granby smelter treated 8,113 tons of ore. The total treated to date is 573,654 tons. During the week just ended the mines at Republic, Wash., shipped 371 tons of ore via the Kettle Valley Line to the Granby smelter. The total shipments from Republic to date are 3,864 tons.

## ONTARIO—LAKE OF THE WOODS DISTRICT.

**Big Master.**—The fuel difficulty at the Big Master is over, and the stamp mill has started again. A supply of wood is being hauled in.

**Twentieth Century.**—The 20-stamp mill at this mine is now stamping rock.

## MEXICO.

## CHIHUAHUA.

(From Our Special Correspondent.)

**Ortiz Mining Company.**—Don Antonio Ortiz has organized this company in Chicago, Ill., to re-open the San Patricio Mine on a parallel vein 1 km., east of the Veta Colorada. It is one of the old historic mines of Parral.

## DURANGO.

(From Our Special Correspondent.)

Extensive coal deposits are reported found at Mier. Torreon people are interested in the lands, and steps are being taken to form a company to develop the property. The coal is reported to be of good quality, and the seams in places are 3 ft. thick.

**Velardena.**—A City of Mexico paper is authority for the statement that the Mexican Exploration Company, which lately bought these mines for \$5,000,000, silver, has arranged to spend \$1,000,000 in improvements. The mines are in two groups; one producing copper and the other silver and lead. For the copper mine 40 miles of railroad may be built, and for the silver-lead mines railways varying from 5 to 10 miles. The Veta Grande Mines in Parral, purchased by the same company, will also be developed by railways.

The additional copper mines acquired by the Mexican Exploration Company, near Jimenez, are the Jabosa and the Azul. The contract of sale is completed, but the transfers have not yet been made.

The State Legislature has passed a law that in the future all ores mined in the State be declared in the complete values of their constituents, and not merely as to silver and gold, as hitherto.

## GUANAJUATO.

**Carmen-Guanajuato Gold Mining Company.**—The Exploration Company, of New York, which recently developed the Guanajuato mining property, has acquired by purchase other mines in the same district which have been taken over by this new corporation. The directors are: Col. George R. Dyer, Charles N. King, J. Temple Gwathmey, Frederick G. Corning, Almet F. Jenks, William Boulbin, Jr., William Lawrence Green, F. H. Southwick and C. Van Rensselaer Cogswell.

## SONORA.

(From Our Special Correspondent.)

**Indiana-Sonora Copper Company.**—The Supreme Court of Mexico has decided in favor of this company, in the controversy with L. Lindsay, one of the stockholders. A controlling interest in the mine was sold to Phelps Dodge & Co. for \$750,000. Lindsay signed all the papers and returned to Mexico. With a man named Curtis and a Mexican, Lindsay tried to "hold up" the Indiana men for more than his share. Through a Mexican court of first instance, in Sonora, he gained an order under which Mexican troops took possession of the mine. When the affair was placed before the Mexican Government it was turned over to the Mexican Supreme Court, which decided that the mine should be turned over to the owners and that they be given full possession.

**Sonora Mining and Milling Company.**—A good strike has been made recently in the Penasco Quenado claim, belonging to this company, in the Altar District. W. E. Defty has made a report upon the matter, from which it appears that a shaft has been sunk through a deposit of low-grade silver and copper ore 30 ft. thick.

## TEPIC.

(From Our Special Correspondent.)

**Los Reyes.**—A New York syndicate has purchased the Los Reyes Mine for \$600,000. The ores are silver and gold-bearing.

## MINING STOCKS.

## Boston.

Dec. 23.

(From Our Special Correspondent.)

A general improvement is to be noted in the mining share list, small as yet, but better things are hoped for. Sentiment is becoming more bullish, and the New Year, it is expected, will bring a more active and higher market in copper shares. People who

have been very pessimistic regarding the copper situation are talking more hopefully. The rapid improvement in the price of Calumet & Hecla is considered significant, and the fact that a dividend of 7 shillings or \$1.70 has been declared by the Utah Consolidated Mines, Limited, has been declared is another hopeful sign. The declaration of the latter had no marked effect on the price of stock, as it had been thoroughly discounted.

Utah has risen \$2.25 to \$26, closing to-night with a 50c. recession from this price. Calumet & Hecla has advanced \$40 during the week to \$475, with no stock offering under \$500. It sold as low as \$420 per share a few weeks ago. Tamarack is also firmer, closing at \$145 bid, \$150 asked. Osceola is up \$3.50 to \$54. The opposition at the Lake is very aggressive, and bitterly opposed to the Bigelow management, as shown in the recently issued circular from that source. Perhaps the count up at the annual meeting in March may show why the property has been managed contrary to the best welfare of minority stockholders. Quincy has improved \$4 to \$108, but business is limited in this security.

Bingham Consolidated took on a burst of activity, and rose \$1.87½ to 29.37½, with subsequent reaction to \$28.50. General Manager McVitchie has been in the East conferring with the directors. Copper Range has not shown the animation expected of it, although it rose almost \$4 to \$57.25, reacting to \$56. The Copper Range Railroad is being extended to Lake Linden. United States Mining has advanced \$1.25 to \$22.12½ on what is considered good buying. Enough of this stock has been marketed of late to take up a \$100,000 note in the defunct Globe National Bank, which is considered a favorable factor.

Mohawk has been influenced by talk of poor mill returns, rather than by assessment talk. The latter is really considered a favorable point. The stock fell \$1.50 to \$36, but later rallied to \$38. The advance of \$3.25 in the price of Parrot Mining to \$25.50 is construed as favorable to the situation, as no dividend has been paid for over a year. Adventure advanced \$1.50 to \$14. The United States Coal and Oil Company has had another well come in, which produced 125 barrels the first 24 hours. The stock holds steady around \$14. Wolverine closed strong at \$59, and Atlantic is up \$1. Dominion Iron and Steel has varied from \$54.25 to \$58.50, closing at \$57.75. Old Dominion Copper is firmer, selling up to \$16.25 on the granting of the petition to have a commission appointed to take testimony in New York in the pending suit against A. S. Bigelow.

## Colorado Springs. Dec. 19.

(From Our Special Correspondent.)

The market has displayed very little change from last week, although the mining situation at Cripple Creek has improved considerably. The big mines are all trying to make the December tonnage as high as possible. It is officially announced that work on the new drainage tunnel will start by January 1. The tunnel will be 5,200 ft. long, tapping the main water course 1,000 ft. beyond the El Paso shaft. The cost of construction will be about \$78,000, all of which has been subscribed, so that nothing remains except to secure a few unimportant rights of way. This news is decidedly cheering. With the running of this tunnel it is proposed to go before the Legislature in January with a bill to create a drainage district in Cripple Creek, to afford a basis upon which the mine owners may work in the future when the time comes to project and run a second drainage tunnel, which will probably be 10,000 to 15,000 ft. long, and drain the district from 3,000 to 5,000 ft., according as one or the other of the schemes is adopted.

Portland shares declined from \$1.85 to \$1.75 during the week, the primal cause being the filing of a suit by J. D. O'Haire against James F. Burns, president, and the Portland Gold Mining Company, for a sixth interest in the mine and one-sixth of the gross output in the past 11 years. As the mine is worth to-day approximately \$6,000,000, and has produced \$12,000,000, Mr. O'Haire's one-sixth interest brings the damages up to \$3,000,000. He was one of the original locators, and brings the suit upon practically the same grounds as those on which James Doyle, the other locator, obtained a judgment of \$500,000 9 months ago. A secondary cause of the decline is the fact that the company has stopped pumping in No. 1 and No. 2 shafts, and allowed the workings to flood up to the 1,000-ft. level. In the face of this discouraging news regarding Portland, a new strike can be announced in the Captain vein series in the 6th level. Here an ore chute 40 ft. wide and at present 75 ft. long has been opened, the values of which are averaging \$40 a ton.

Acacia sold from 7½ to 7 this week, in keeping with the general weakness of the market. The annual report of the officers just issued shows that the company has on hand approximately \$28,000 in cash. As all the property of the company is leased, the directors are considering distributing a 1c. dividend, amounting to \$10,000, out of this sum. This, however, does not sound like good business, as the company will undoubtedly need all of its treasury to re-open the

property after the various leases expire. Isabella dropped from 30½ to 27½c., recovering to 28½c., with no reason given. The mine is pushing development, and with the lessees, is producing about 500 tons a month. Vindicator sold at \$1@\$.01, and was one of the notable examples of an advance this week. El Paso sold at 60½@61c. The officers of the company state that only 400 gal. of water per minute are pumped, although the impression is abroad that the mine is finding its water situation a little uncomfortable.

## Salt Lake City.

Dec. 19.

(From Our Special Correspondent.)

This week has shown an advance in the list of prices. The situation is more hopeful, and in face of holiday season coming on, the buyers and sellers seem quite pleased. The manipulation carried on in Martha Washington stock succeeded in squeezing the shorts; 252,549 shares were dealt in in this stock, and the price rose to 17c. before all shorts were satisfied, then fell to 2½c. The most active traders on the list this week were Ben Butler, 11,500 shares selling at 8½@7c.; California sold 43,000 at 26¼@22¼c.; New York Bonanza, 17,600, at 40@32c.; Sacramento, 14,200 at 31¼@27½c.; Wabash, 15,100 at 86@67c.; Ingot, 7,200 at 13@12c.

The week closed with the sale of 399,248 shares that brought \$114,256.

## San Francisco.

Dec. 13.

(From Our Special Correspondent.)

The boom in Comstocks which has been going on for two or three weeks past seems to be subsiding a little, although the volume of business still continues good. Caledonia has been the leader in the market this week, reaching its high point at \$2.80, but it has begun to fall off. Following this lead there was a weakening all along the line, which involved most of the stocks on the list. How much longer the present conditions are going to last is, of course, a matter of speculation. There has been really nothing in mining developments to warrant this boom, but it has been well engineered, and has drawn in more outside business than the mining stock board has seen for many a day. Sales have run up to over 20,000 shares daily, and on Tuesday of this week the total sales on the board were 21,325 shares, not including those on the informal board or on the street.

Some prices noted are: Caledonia, \$2.65@\$2.80; Consolidated California & Virginia, \$1.35@\$1.40; Ophir, \$1.35; Best & Belcher, \$1.05; Mexican, 63@65c.; Overman, 48@50c.; Sierra Nevada, 42@45c.; Hale & Norcross, 28@30c.; Potosi, 2½; Gould & Curry, 20c.

On the Oil Exchange business has also been more active than for some weeks past. Prices were generally higher, and a good deal of business was done at the advance. Peerless sold up to \$13; Home brought \$3.15, while Sterling was in demand at \$1.70; Central Point Consolidated sold freely at 68c., and there were considerable transactions in Four Oil at 59@60c. The larger amount of business was done in higher priced stocks, comparatively little demand being shown for the prospects.

## London.

Dec. 13.

(From Our Special Correspondent.)

The Rhodesian section continues to be the only division of the mining market that shows any sign of life. The return of the officials after their tour in Rhodesia is used as the excuse for stirring things up a bit. The opinions and prophecies of these gentlemen are freely quoted, but probably not 1 per cent of the utterances attributed to them are genuine. Meetings of some of the Rhodesian companies have also been held this week, and the speeches made by the directors and mining men have been in a hopeful vein. The copper deposits recently reported on are said to be turning out well. Altogether the market for Rhodesians has been bullish. In other sections of the market very little has been done. At this time of the year large numbers of yearly reports are issued and meetings of shareholders held, and often the markets are lively in consequence. This year the markets other than the Rhodesian have not been visibly affected.

A mine that has done fairly well for English shareholders is the Brilliant Gold Mining Company, of Charters Towers, Queensland. Since its formation in 1886 it has paid nearly £700,000 in dividends, which but for its unnecessarily high capital of £500,000 would have been an excellent result. For some years now the directors have been expecting the mine to be exhausted before long, but payable ore continues to be found. During the past half year, for instance, 5,000 tons were treated, yielding £20,000, at a cost of £7,000, allowing £13,000 to be distributed as dividends. The ore in sight will only supply the mill until March next, and the directors once more remind shareholders that they must not expect the mine to last longer. The sinking of the shaft is, however, being continued, so before then anything may happen. It is a company that is economically administered, and it is to be hoped that the property will continue in value.

The reports of copper companies continue to show decreased profits, due to the fall in the price of copper. The report of the Cape Copper Company, just published, shows that the company has been unfortunate in many ways. In the first place, a strike occurred last year at the smelting works at Brittonferry, and smelting and refining had to be suspended. During the period of inactivity the price of copper was falling rapidly, so that the delay in marketing the copper caused a serious loss to the company that should not have occurred. Then again the works, mines and railway in South Africa were damaged by the Boer raid into Namagualand, and operations were there suspended for some time. The large balance brought forward from the previous year has enabled the directors to declare a preference dividend, but there are no funds to provide a dividend on the ordinary shares. Things will improve next year, and the company will soon recover itself.

Of other copper companies, the Copiapo, of Chile, has been able to declare a dividend, but at the reduced rate of 3¼ per cent, being 1s 6d. per £2 share. The rates during preceding three years were 4s., 7s. 4d., and 12s. The variation reflects exactly the variation in the price of copper. No political or other disturbances have occurred, and the mine continues to be a good producer. The company was originally formed in 1836, and has returned its capital in the form of dividends many times over.

### COAL TRADE REVIEW

New York, Dec. 24.

#### ANTHRACITE.

It is now pretty evident that coal is to be in short supply for the greater part of this winter. The mines are getting out more than normal tonnages, but demand is so widespread, since most householders had little or no coal on hand by November 1 that what promises to be a fairly severe winter will keep consumption close up to production. Consumers at points beyond Cape Cod, in view of the high ocean freights that are likely to prevail for some time, as many coal carrying craft have been lost in the past few weeks, are likely to fare worst. Consumers at New York Harbor points and at Philadelphia, in spite of the nonsense printed by newspapers that should know better, are receiving proportionally their full share of the output, if not more.

The total output for November is given as 4,984,384 tons, compared with 4,697,329 tons in 1901. There total for 11 months is given as 26,101,459 tons, compared with 49,945,148 tons in 1901.

In the Northwest anthracite is in demand, and the supplies on the docks at the head of the lakes are diminishing rapidly. In Chicago territory buyers are offering inducements to secure prompt delivery, and at retail speculative coal is selling as high as \$15@ \$16. At wholesale, considerable coal is changing hands at \$10, though most companies are supplying regular customers at the normal price. Along the lower lakes coal is wanted.

The retail demand along the Atlantic seaboard eased up just a trifle for a few days, but with colder weather sales agents are having trouble. At Boston retail prices are \$9 for company coal and \$12 for speculative, with the supply of both kinds scanty, in spite of heavy arrivals late last week. At Providence public schools have closed on account of a fuel shortage. At New York retail prices range from \$7@ \$7.50 to \$12, the last named price being for coal produced by independent operators. The wholesale price shows corresponding variations. Speculative coal sells at \$9@ \$10. At Philadelphia soft coal is actually higher than anthracite. Retail prices for anthracite are \$6.75@ \$9. At Baltimore consumers have had little relief as yet, and there has been much complaint there and some real distress. This is, however, due in large part to very poor arrivals of soft coal for local use. The movement of coal at New York Harbor shipping ports has suffered from various causes, coal often being frozen in the cars, making unloading slow, barge rates are high, and berths for unloading are hard to get. The retail distribution of coal is calling for more carts and horses than are available.

#### BITUMINOUS.

In the Atlantic seaboard bituminous trade the demand for coal continues strong, with speculative prices ranging around \$7.50, f. o. b. New York Harbor points for Clearfield grades. Producers are worried by the very poor car supply, which for a day or two early this week was under 25 per cent of the demand. Producers, however, have the poor consolation that the supply can't be much worse, and any change must be for the better. Incidentally, it is reported that President Cassatt, of the Pennsylvania, is going to see if car supply at the mines cannot be improved by eliminating employees and officials who might be held responsible for some of the troubles of the past few months, and it is intimated that there will be great changes at the Broad Street office.

We understand that some concerns are looking after contracts for next year, probably to take advantage

of present high prices. Most of the contracts taken have been on a mine price basis, others have a special agreement covering prices in January and February.

Trade in the far East is calling for considerable coal, but is finding prices, f. o. b. shipping ports and coastwise freights, so high that English coal will be imported. It is understood that 100,000 tons have been bought in England. The firms taking this tonnage have the experience of the former importations to guide them, and know which coals to take and which to leave, and will thus get more satisfaction than before. Along Long Island Sound demand has been strong. On account of vessel captains preferring to charter for ports this side of Cape Cod, consumers along the Sound have been able to secure more coal than usual, and they are now in a comparatively easy position, so that barge freights from New York Harbor shipping ports to New Haven have dropped 15@20c. Consumers about New York Harbor have been receiving fair supplies, though they have had to buy considerable speculative coal within the past week. The all-rail trade is short of coal, and is seeking to secure it by offering very high mine prices.

Car supply at the mines is about 25 per cent of the number wanted. Transportation from the mines to tidewater is fairly prompt, coal coming through in about a week. In the coastwise vessel market large comparatively good supply, while small craft are scarce. The current rates quoted from Philadelphia are: Boston, \$2@ \$2.25; Providence and New Bedford, \$1.75 and \$2. From New York Harbor rates are: Sound ports and Providence, \$1.50@ \$1.75; Boston, \$3. Barge freights to New York Harbor points are 40@45c. alongside.

#### Note of the Week.

The report of the Baltimore & Ohio Railroad for the year ending June 30 gives the following particulars of the bituminous coal traffic of the company's lines:

	1901.	1902.	Changes.
Tons coal carried . . . . .	13,346,700	16,297,087	I. 2,950,387
Ton-miles . . . . .	2,688,330,974	3,148,727,528	I. 460,396,554
Average haul, miles . . . . .	201.4	193.2	D. 8.2

The average receipt per ton of coal carried last year was 68.02c., against 70.03c. in the preceding year. The decrease was due to the shorter haul, the average rate per ton-mile having been 0.352c. in 1902, against 0.349c. in 1901; an increase of 0.003c., or 0.9 per cent., last year.

Birmingham, Dec. 22.

(From Our Special Correspondent.)

The miners, in convention assembled this month, decided that no time would be wasted for the holiday season this year, hence it is believed that not more than three days will be lost this week and the furnaces will not have to bank fires because of the shortage of fuel or coke. During the past week all mines were operated hard in order to lay aside all the coal possible to tide over the holidays, both furnaces and manufacturing plants succeeding in filling quite a number of their bins.

During the past week there were two coal companies incorporated. The Midvale Mining Company, capital stock \$100,000, with Capt. A. M. Amerine, of Montgomery, at the head, will develop property near Walnut Grove in Etowah County. The De Sota Coal Mining and Developing Company, capital stock \$250,000, with B. C. Stevens, of Clayton, Mo.; Charles T. Robinson, of Sheffield, Ala., and Hume F. Jones, of Birmingham, incorporators, will develop coal lands in Jefferson County.

There is more coke being manufactured now in Alabama than ever before. About the middle of January the Sloss-Sheffield Steel and Iron Company should be able to have 100 of its new ovens at Flat Top in operation. The district needs between 1,000 and 2,000 more coke ovens than are under construction, or about completed, and there is talk of a large number being constructed.

The State of Alabama will, after January 1, 1903, be in charge of the convicts working in the mines, and will receive so much per ton for all the coal mined by this labor. The State will feed, clothe and guard the convicts after this month, and preparations to that end are now being made. Purchasing agents, guards, physicians and other help are being appointed by the Governor and the convict board. The Tennessee Coal, Iron and Railroad Company and the Sloss-Sheffield Steel and Iron Company will use this labor as they are now doing, being relieved of the guarding, clothing, feeding, etc., of the State's wards.

Chicago, Dec. 22.

(From Our Special Correspondent.)

Serious apprehensions are entertained by Chicago coal dealers of a famine of bituminous, the only kind available for the winter here. The last week has shown an inability on the part of the railroads to handle enough bituminous to supply even the demand caused by a cold wave of brief duration. There is now great scarcity of Eastern coals; Hocking, Youghiogheny and smokeless grades are practically out of the market. Nominal car-load quotations for these are: Hocking and Youghiogheny, \$5; Pocahontas and

New River smokeless, \$7 (an advance of \$1). Lump and egg, Indiana or Illinois, has advanced an average of 50c., being now on the average \$4, against \$3.50 a week ago (car prices). To Indiana and Illinois mines, Chicago producers must look for their chief supply until spring. An advance of 25 to 50c. for delivery at yards in the city was made to-day, the new price being \$1 a ton over car prices. Indiana and Illinois, for instance, cost the city buyer now \$5 on the average. This advance is opposed by some large wholesalers, but will probably remain.

There is no anthracite available for the wholesale trade. All shipments are now by rail, and the roads are not able to handle even the percentage allotted to the city at the mines, apparently. The trouble apparently is lack of coal cars. Anthracite is retailing at \$9@ \$12, the price depending on the dealer's stock and the customer's needs.

Cleveland, Dec. 23.

(From Our Special Correspondent.)

The movement of domestic coal is beginning to feel the effects of the shortage of cars. The decreased capacity of the railroad equipment, due to the cold weather, resulted in a shortening of the supply of coal, but not to the annoyance of consumers, as there is still enough for all practical purposes. The cessation of the movement to the lakes seemed to relieve the domestic market some, although there was such a general use for that railroad equipment that a specific benefit to any trade or community was out of the question. For this reason, while the market seemed a little easier, it could hardly be said that any marked improvement had been made. The prices have held firm for the last week.

The shippers of coal to the lakes who have been supplying the vessel owners with coal have given notice that they are contemplating an advance in the prices of fuel coal for next year. It is now the intention to charge 20c. a ton more than has been paid during this season. This will mean a good deal in the increased cost of running the boats on the lakes. There has also been some talk of increasing railroad rates, but that movement has again been put down by the conservative lines.

Pittsburg, Dec. 23.

(From Our Special Correspondent.)

Coal.—The demand for coal is unprecedented, and many orders are offered for Eastern shipment, which are rejected. The railroads have put an embargo on coal for the East, except for gas coal. Sales made this week are on a basis of \$4.75 a ton at the mine for run-of-mine coal. These rates are over \$3 a ton higher than the circular price. There will be a shortage of coal all winter, as the railroads will not be able to furnish the cars required to meet the demand. The railroad coal mines are operating a little better this week, but the production is not near the normal capacity of the mines. Fully 5,000,000 bush. of coal were shipped to down river ports by the Monongahela River Consolidated Coal and Coke Company during the week, and a large number of empty boats and barges were returned. All of the river coal mines are being operated to their full capacity.

Connellsville Coke.—The production keeps up, but shipments continue to fall off each week, and the outlook is anything but encouraging. High prices are paid for furnace coke in order to keep the blast furnaces in operation, but the railroads are not able to handle the freight offered, and many furnaces are badly crippled. In the past six weeks the shipments of coke from the Connellsville region have fallen off fully 2,000 cars. The Courier, in its last weekly report, gives the shipments for the previous week as follows: To Pittsburg and river tripples, 3,679 cars; to points west of Pittsburg, 4,674 cars; to points east of Connellsville, 1,357 cars. This was a decrease compared with the shipments of the previous week of 391 cars.

San Francisco, Dec. 20.

(From Our Special Correspondent.)

The coal trade continues steady but quiet, with no changes to report. A good deal of discussion is going on over the Progreso explosion and the quality of fuel oil put on this market.

Prices.—Current prices for Coast coals to dealers are unchanged, and as follows: Wellington, \$8.50; Southfield, \$8; Roslyn, \$7; Seattle and Bryant, \$6.50; Coos Bay, \$5.50; white ash, \$5. For Rocky Mountain coals, large lots, quotations are: Castle Gate, Clear Creek, Rock Springs or Sunnyside, \$8.50; Colorado anthracite, \$14. For Eastern and foreign coals, cargo lots, prices are: Pennsylvania anthracite, \$14; Cumberland, \$12; Welsh anthracite, \$13; cannel, \$9; Brymbo, \$7.50; Walsend, \$6.50.

Foreign Coal Trade, Dec. 24.

There is nothing new in the export trade. As to imports some foreign coal continues to arrive, on orders placed in October and November.

Exports of coal from Great Britain for the 11 months ending November 30 are reported as below, in long tons:

	1901.	1902.	Changes.
Coal .....	38,576,991	39,548,237	I. 971,246
Coke .....	742,257	614,638	D. 127,619
Briquettes .....	1,015,331	988,942	D. 26,389
Totals .....	40,334,579	41,151,817	I. 817,238

In addition to these exports there were 13,914,677 tons of coal sent abroad for the use of steamers engaged in foreign trade, against 12,445,281 tons in 1901; showing an increase of 1,469,396 tons this year.

Messrs. Hull, Blyth & Co., of London and Cardiff, report under date of December 13 that owing to the near approach of the Christmas holidays, combined with a considerable demand for prompt coal, prices, more especially for the best descriptions of coal, are decidedly firmer. Some of the best coals are now almost unobtainable for this year's shipment. Quotations are: Best Welsh steam coal, \$3.72@3.84; seconds, \$3.60; thirds, \$3.48; dry coals, \$3.48; best Monmouthshire, \$3.36@3.42; seconds, \$3.24; best small steam coal, \$2.10; seconds, \$1.98; other sorts, \$1.80.

The above prices for Cardiff coals are all f. o. b. Cardiff, Penarth or Barry, while those for Monmouthshire description are f. o. b. Newport, exclusive of wharfage, but inclusive of export duty, and are for cash in 30 days, less 2½ per cent discount.

There is no change to report in the outward freight market. Rates to Mediterranean ports continue firm, other directions quiet. Some rates quoted from Cardiff are: Marseilles, \$1.30; Genoa, \$1.38; Naples, \$1.36; Singapore, \$2.52; Las Palmas, \$1.44; St. Vincent, \$1.62; Rio Janeiro, \$2.28; Santos, \$2.52; Buenos Aires, \$1.86.

**IRON TRADE REVIEW.**

New York, Dec. 24.

The quiet incident to the close of the year prevails, and little business for future delivery is reported. There is a greater demand for pig iron for near-by deliveries, chiefly from manufacturers who have not received iron contracted for on account of delays at the furnaces. This is being met chiefly by imported iron.

The British export returns for the 11 months ending November 30 show exports to the United States as below, in long tons:

	1901.	1902.	Changes.
Pig iron .....	40,886	415,711	I. 374,825
Steel billets and blooms .....	12,222	46,049	I. 33,827

In addition to the above there were 17,406 tons of steel rails sent to the United States this year, against only 42 tons in 1901. Imports of pig iron into Great Britain from the United States were 10,591 tons for the 11 months, against 32,377 tons last year.

Birmingham, Dec. 22.

(From Our Special Correspondent.)

The pig iron market in Alabama during the past week has been very quiet, and is more so this week, as the holiday season comes on. There was but little, if any, inquiry. The furnace companies have been employed during the last ten days getting out all the iron they could, filling orders. The railroads are still short of equipment. The officials of the transportation companies have promised to do the best they could this week, but while much iron is likely to be moved out of this district between now and the end of the year, it is a certainty that not one of the companies will be able to show a clean sheet as to orders when the new year starts in.

The statement is made that after January 1, 1903, Alabama iron manufacturers sell all their iron f. o. b. cars, Birmingham, instead of delivered. In other words, the iron will be sold subject to freight rates, the changes in rates to be made by the railroads not to effect the producers. Heretofore iron has been sold f. o. b. cars at points desired by customers, freight rates in effect, at time when order is filed, being added to the price of iron. Announcement has been made already that roads north and west of the Ohio River will advance freight rates January 1 just 10 per cent. The Southern Iron Committee, which is composed of the railroads handling the iron from the Southern producing territory, has given protection to the manufacturers hereabouts up to March 15.

During the past week the Woodstock Iron Company at Anniston blew in No. 3 furnace with a daily capacity of 200 tons of iron, and the Williamson Iron Company's furnace in the city, which had an accident and had to blow out for repairs, started to making iron again. The furnace has a daily capacity of about 75 tons.

There has been but little selling recently. The consumers have turned in for the holidays. The production for the first half of the coming year has been well sold ahead.

The following quotations are given: No. 1 foundry, \$21@22; No. 2 foundry, \$20@21; No. 3 foundry, \$18.50@19.50; No. 4 foundry, \$17@18; gray forge, \$16.50@17; No. 1 soft, \$21@22; No. 2 soft, \$20@21.

In the manufactured iron and steel circles a little decrease in activity is again reported, and there will be a holiday period, covering several days. The steel production is holding up right along, and there is a

good demand. The plant of the Alabama Steel and Wire Company at Ensley has been in steady operation with no intimation of a general reduction, either in prices or in production. Foundries and machine shops are still crowded, and prospects are very good.

Chicago.

(From Our Special Correspondent.)

With the approach of the new year sales of pig iron are becoming somewhat larger, notwithstanding they are by no means up to the mark of two or three months ago. The principal dealing is in Southern, which is the only iron in market for any amount, either spot or for delivery in the middle of next year. Quotations are unchanged. For delivery six months or thereabouts hence, No. 2 Southern brings \$19, Birmingham, or \$23.15, Chicago, with No. 1 higher by 50c. and No. 3 lower by the same amount, for corresponding lots as to amount and time of delivery. The increased demand appears to be owing to the feeling by consumers of iron that they are under the old necessity of contracting for their raw material several months ahead, notwithstanding conditions that made them hold off for a time.

Northern is still selling somewhat in spot lots, picked up here and there, and there is also a little available for contracts up to July 1. Nominally Northern No. 2 is quoted at \$23@23.50 for next year's deliveries, with No. 1 as usual 50c. higher and No. 3 50c. lower for similar conditions as regards time and amount. Spot lots, meaning such as can be delivered within 30 to 60 days, bring \$26@28, for both Southern and Northern, and are much in demand.

Coke is a little harder to get, and sells at \$10 as soon as it can be had. The trouble with the coke supply is the old one of transportation; nobody can get enough, and the prospects are not bright, for an indefinite future. Not until spring makes the burden upon the railroads easier, do buyers of coke look for greater supply or lower prices.

Cleveland, Dec. 23.

(From Our Special Correspondent.)

Iron Ore.—The last shipments have been made for the season, and the figures have been compiled, showing the total to have been 27,039,059 tons by lake alone. If there is added to these figures the shipment by all rail and from the Michipicoten fields it is estimated that the total movement will have been about 27,800,000. There has been some talk of increased prices for next year, but the ore men have not met as yet, and there is also some talk of freights, but aside from the general concession that there ought to be higher rates next season for the vessel owners nothing has been done or said.

Pig Iron.—The buying of foundry for the present is to cover the immediate needs of the foundries. The buying for the first half is light, with a good deal to do yet, and the buying in this territory for the third quarter delivery is restricted to a remarkable degree. The situation seems to call for something to stir up the buyers, and this is not lacking, for there is a prospective shortage of pig iron due to the continued shortage of coke, together with the number of orders to be carried over into next year, that will appall the consumers. When the extent of the first half shortage is understood it is expected that a great rush of future buying will be started. The furnaces give the buyers until the middle of January. Meanwhile the prices have held steady at \$23 for No. 2, Valley furnace, for first half delivery, and \$21, Valley furnace, for second half delivery. The Southern furnaces have been off of the market for some time. They still quote \$20 Birmingham for No. 2. The bessemer and basic producers still refuse to quote for second quarter delivery until they know in what shape their order books will be when the furnaces are freed from the coke shortage. That rather annoying feature hangs on, and it is predicted that the worst of it is not yet, since it seems likely that the railroad car situation will get worse rather than better during January and February.

Finished Material.—The buying of structural steel seemed to lead the market this week, one Cleveland concern placing an order for 5,000 tons, which went in, for first half delivery, at the old association price of 1.60c., Pittsburg. Aside from this specifications on old contracts, which have been withheld of late, have been started again. The smaller mills are also needing orders, and are not quite so emphatic in their demands for high prices. However, they have not come down from the 2.25c. to 2.50c. price, except in a few instances, where as low as 1.75c. has been done. The jobbers are also getting top prices. The plate sales have been rather slow. The smaller mills are content now days with a price of 1.85c. at the mill, while the larger mills have nothing to sell unless some one goes back on his order. In this connection it is said that there were some suspensions of shipment within the last few weeks, but when the money market got stronger the orders were given to ship again. These shipments now are making the market a good deal stronger, and, in fact, all of the apprehension for the

steel trade seems to have disappeared. The old mills are getting 1.60c., Pittsburg. The bar iron market is stronger, one inquiry for 1,000 tons having been received yesterday, on which no price has been quoted. This deal, when it is made, will determine the market. The steel product is in good demand with bessemer, bringing 1.60c., Pittsburg, and open-hearth 1.70c., Pittsburg. The sheet trade is still weak, and there is little hope in some circles for an increase. The prices are weak, but without having broken. No. 27 is still commanding 3.10c. out of stock as a basis for other prices. The demand for billets is fair, with no very great activity, however. The prices hold at \$30, Pittsburg, for bessemer.

Old Material.—The market has continued weak, but without any break in the prices. It is evident, however, that very little business is being done.

Philadelphia, Dec. 24.

(From Our Special Correspondent.)

Pig Iron.—All market conditions continue exceptionally favorable. No developments have occurred during the past few days. Prices show an upward tendency on account of the announced advance of freights in iron and steel from January 1. The higher price of coke for the coming year is also a point. The influence of foreign pig iron on the American market is passive rather than active, owing to the anxiety of sellers and importers to make the most out of their opportunities. While foundry iron has not moved up, no good iron is selling at anything less. A few cases have transpired where inferior foundry has been contracted for at a little less than the prevailing rates. Some Southern makers are showing a little more disposition to yield to the views of buyers upon late deliveries. Importers say they have prospects for doing business in English iron in cargo lots at a little under \$18. German iron is quoted at about \$20. Quotations for American are given at No. 1 foundry in a general way, \$25; No. 2X foundry, \$23.50; inferior grades, \$23; No. 2 plain, inferior, \$22; gray forge, is strong at \$21.50 for the best makes.

Steel Billets.—Now that the pool has fixed matters up for the coming year there is nothing to do but to order in time if the price of \$32 is to be secured. A great many of our people have been paying all the way up to \$40 to \$50, and some even more.

Merchant Bar.—The restricted production continues to cause a good deal of trouble; mill owners have been disappointed in fuel. Quite a number of mills will have to run a month or so longer below their capacity. The effect upon the market is to keep prices at premium limits. Mill owners are averse to entering into contracts for long deliveries, as they can get better prices for anything they can furnish on call or for prompt delivery. Quotations are nominally 1.95c. for refined and 1.80c. for steel.

Tubes.—As only small orders are coming in, there is a close adherence to the present discounts.

Merchant Pipe.—Work on old contracts is being hurried through as fast as possible, and very little new business has been sent to the mills lately.

Skelp Iron.—Prices for skelp remain strong and the larger Western mills appear to be capturing the big contracts, as only the tailings are coming to us.

Merchant Steel.—The large Eastern consumers of merchant steel are postponing action and the agents of mills keep the reasons to themselves, whatever they may be.

Plates.—The renewal of the understanding as to plates is equal to serving notice upon large consumers that if they want to profit by the present price they must order in time.

Structural Material.—The renewal of the agreement among beam makers is also a notice upon the big and little buyers to chase in their orders soon. The trouble is a great many of them cannot do it. A great many have had to pay big prices during the past six months as they are practically unable to anticipate their requirements. It is said that the bridge builders are or soon will be ready to place very large orders for a big lot of new work, which was negotiated for about a month ago.

Old Rails.—Those who speak for the old rail interests here say that there are customers waiting for very large quantities of both iron and steel, but there are no present prospects of obtaining the supplies wanted. Quotations continue at \$21 for old steel rails and \$24 for old iron rails.

Scrap.—Large transactions are likely to take place in scrap in a few days.

Pittsburg, Dec. 23.

(From Our Special Correspondent.)

The closing week in the year shows no weakness in the iron and steel market, and there is a decidedly stronger feeling for next year. Pig iron is quiet as to sales, but quotations made for deliveries during the first half are higher than were named in contracts recently closed. Billets and heavy lines of finished products are as firm as a week ago, and in the lighter

lines prices are well maintained. The outlook is exceedingly encouraging, as there is enough business in sight to keep the mills in continuous operation in 1903, with the exception of the independent sheet, tin plate and wire mills. This is indicated by the fact that most of the outside pig iron production for the first half has been contracted for and orders have been placed for structural material and other finished steel products that will keep the mills busy until far into the summer. Besides the business already booked some heavy buying is expected soon after the opening of the new year. All steel rail orders now being taken care for delivery late in the year, and purchasers desiring earlier shipment are forced to go abroad. Deliveries of foreign pig iron and steel continue to be made here. Unless there is an improvement in the movement of coke and some assurance from the railroads that the requirements of the furnaces will be fully met during the coming year, there is no doubt but that heavy orders will be placed for foreign iron and steel. The deliveries of coke to the merchant furnaces during the last days of the week were very unsatisfactory, and a number of furnaces were forced to bank. The supply yesterday was fairly good, but pig iron production is less than had been expected. The United States Steel Corporation is not urging the closing of its offer to the merchant furnaces, but is still ready to exchange coke for iron at a sharp reduction. Owing to the changed conditions negotiations are off, and if renewed after the first of the year the price must be better than has been named. By the absorption of the Union and Sharon steel companies previous, the corporation secures one blast furnace at Sharon producing 400 tons daily, 2 under construction at that place and two almost completed at Donora. These furnaces will give the corporation over 2,000 tons of pig iron daily. Besides these, one furnace is being added to the Carrie group at Rankin and another at the Edgar Thomson group at Braddock. The taking over of the Union-Sharon holdings by the corporation caused considerable surprise, as reports that such a move was contemplated were positively denied. Negotiations were conducted with the greatest secrecy, and many of the officers here were ignorant of the deal until it was announced by Chairman E. H. Gary at Chicago last week. The feeling now expressed is that the move was a good one, as the ore and coal properties of the absorbed concerns are larger than had been believed. Besides obtaining additional ore the corporation removes a competitor in the wire market.

The Structural Steel Association, known as the beam pool, and the Steel Plate Producers Association, the plate pool, held meetings in New York during the week. Agreements were renewed for another year, and present official prices were reaffirmed.

**Pig Iron.**—The market this week is quiet, but quotations for future delivery are higher for bessemer pig iron. Merchant furnaces have made sales of bessemer for first half delivery at \$21.25, Valley, but are now asking \$22 for the same delivery. For first quarter shipment alone \$23@24, Valley, is quoted. Gray forge is quiet at \$20.75@21, Pittsburg, for any delivery next year, and foundry No. 2 is held at \$22.50 @ \$23, Pittsburg, for early delivery.

**Steel.**—Bessemer steel billets are firm at \$30, Pittsburg, and open-hearth are \$1 more. About 10,000 tons of structural material were sold during the week for delivery in six months. Heavy premiums are still offered for prompt shipment. Steel bar mills are ready to take orders for delivery in four months at the base price of 1.60c.

**Sheets.**—There is but little buying for future delivery, and the demand is only fair. No. 28 gauge black sheets are still quoted at 2.75c., and galvanized at 75, 10 and 2 1/2 per cent off.

**Ferro-manganese.**—There is but little buying being done, and the foreign product is still quoted at \$50 @ \$52.50.

**New York. Dec. 24.**

**Pig Iron.**—The market is quiet, with buying limited to current needs. We quote for 1903 delivery, Northern irons at tidewater: No. 1X foundry, \$23.75 @ \$24.25; No. 2X, \$22.75 @ \$23.25; No. 2 plain, \$21.75 @ \$22.25. For Southern iron on dock, New York, No. 1 foundry, \$24.75; No. 2, \$24.25; No. 3, \$23.75. Middlesboro No. 3 pig is quoted at \$18.50, in large lots, but for small lots and spot delivery, \$20 is obtained.

**Bar Iron and Steel.**—We quote for large lots on dock: Refined bars, 2 @ 2.05c.; common, 1.90 @ 1.95c.; soft steel bars, 2 @ 2.10c.

**Plates.**—Demand remains good, particularly from shipyards. We quote for tidewater delivery in carloads: Tank, 1/4-in. and heavier, 2.05 @ 2.20c.; flange, 2.15 @ 2.25c.; marine, 2.25 @ 2.50c.; universal, 2 @ 2.20c.

**Steel Rails.**—Standard sections are still quoted at \$28, f. o. b. mills for 1903 delivery; light rails, \$30 @ \$38, according to weight. Relaying rails are \$28 @ \$30 for heavy sections and \$33 @ \$35 for light sections.

**Structural Material.**—The demand is not as strong

as it has been. We quote for large lots at tidewater: Beams, angles, channels and tees, 2 @ 2.20c. For small lots and prompt delivery premiums are still paid.

**CHEMICALS AND MINERALS.**

(See also wholesale price-list on page 870.)  
New York, Dec. 24.

At the close of the year manufacturers are always busy taking stock, and balancing accounts to ascertain how prosperous business has been. Invariably profits have been satisfactory; in fact, are better than can be expected from the low prices booked for 1903 contracts. On the other hand, however, the chemical industry is making good progress, as will be seen by our annual reviews next week.

**Heavy Chemicals.**—Deliveries are good. Sales of domestic alkali over next fire are noted at 72 1/2 @ 75c., f. o. b. works. Caustic soda shows further 1903 sales at \$1.65 @ \$1.70, f. o. b. works. Exports of caustic soda from New York in the 11 months ending November 30 amounted to 1,959,277 lbs., which went to Mexico, Central and South America, and the West Indies. Bicarb. soda finds good buyers, and a better export trade is noted. In the 11 months ending November 30 the exports of bicarb. soda from New York amounted to 4,020,742 lbs., of which Great Britain received 1,657,362 lbs., Germany 67,200 lbs., Belgium 44,800 lbs., Australia and New Zealand 452,696 lbs., South Africa 136,820 lbs., and Japan 235,200 lbs., the balance going chiefly to South America. Bleaching powder is quiet.

We quote domestic chemicals, per 100 lbs., f. o. b. works, as follows: High test alkali, in bags, 82 1/2 @ 85c., for prompt shipment, and 72 1/2 @ 75c., for forward; caustic soda, high-test, \$1.90 @ \$1.95 for early delivery, and \$1.65 @ \$1.70 for futures; bicarb. soda, ordinary, \$1.25, and extra, \$3; sal soda, 55 @ 60c.; chlorate of potash, \$7.37 1/2 @ \$7.62 1/2 for immediate shipment, and \$7 @ \$7.12 1/2 for contracts; bleaching powder, next year's delivery \$1 @ \$1.20. For foreign goods, we quote per 100 lbs. in New York: Alkali, high-test, 90 @ 92 1/2c.; caustic soda, high-test, \$2.25; sal soda, 67 1/2c.; bicarb. soda, \$1.50 @ \$1.60; chlorate of potash, \$7.50 @ \$8 for prompt, and \$7 @ \$7.25 for forward; bleaching powder, prompt, prime brands, Liverpool, \$1.62 1/2, and contracts, \$1.25; Continental, \$1.25 @ \$1.37 1/2; contracts, \$1.20.

**Coppers.**—The combination has fixed prices for the first half next year at 37 1/2c. per 100 lbs. in bulk, and 42 1/2c. in barrels. Doubtless outsiders will sell at less.

**Acids.**—More demand for next year's delivery, and some fair-sized orders have been booked. Blue vitriol is weak and the tussle between importers and domestic makers waxing warm. Sales are being made at a lower range than has ruled in a long while.

Quotations per 100 lbs. are as below, unless otherwise specified, for large lots in carboys or bulk (in tank cars) delivered in New York and vicinity.

Blue vitriol	.....	\$4 @ \$4.25	Oxalic com'l...	.....	\$5.25 @ \$5.50
Muriatic, 18"	.....	1.50	Sulphuric, 50°	.....	13.50 @ 15.50
Muriatic, 20"	.....	1.62 1/2	"    "    "    "	.....	1.05
Muriatic, 22"	.....	1.75	Sulphuric, 60°	.....	18.00 @ 20.00
Nitric, 36"	.....	4.00	"    "    "    "	.....	1.20
Nitric, 38"	.....	4.25	"    "    "    "	.....	21.00 @ 23.00
Nitric, 40"	.....	4.50			
Nitric, 42"	.....	4.87 1/2			

**Brimstone.**—Spot best unmined seconds are nominal at \$24 per ton, while shipments are \$22.75 @ \$23.25, according to position. Best thirds are about \$1.75 less than seconds. Ocean freight from Sicily to the United States stands at 8s. 6d. (\$2.04).

**Pyrites.**—Conditions are the same as for some time past. Deliveries are on regular contracts, and prices continue firm. Charters from Huelva, Spain, are being booked at 10s. (\$2.40), January sailing.

Quotations for pyrites are f. o. b. Mineral City, Va.: Lump ore, \$5 per ton, and fines 10c. per unit; Charlemont, Mass., lump, \$5, and fines, \$4.75. Spanish pyrites, 13 @ 13 1/2c. per unit, New York and other Atlantic ports. Spanish pyrites contain from 46 to 51 per cent of sulphur; American, from 42 to 44 per cent.

**Nitrate of Soda.**—The market continues firm, spot being quoted at \$1.97 1/2 per 100 lbs., and futures, \$1.85 @ \$1.87 1/2, according to position. The New Tamarugal Nitrate Company reports a net profit of \$51,827 16s. 3d. (\$259,139) for the year ended July 31, 1902. With the exception of 1894 this is the largest year's profit in the company's existence. No dividends have been paid, however, owing to the heavy indebtedness.

The King George has arrived at New York with 28,700 bags, and the Jeseric at Baltimore with 49,000 bags.

**Sulphate of Ammonia.**—Firmer. Gas liquor on spot brings \$3.05 @ \$3.07 1/2 per 100 lbs., while shipments are quoted \$3.02 1/2 @ \$3.05.

**Phosphates.**—Chartering for export is quiet, though numerous vessels are being loaded for the European market. Miners are holding for better prices, but deliveries in the first half of next year will be made at rather low prices taken on contracts some time

ago. Fortunately ocean freights are low. Abroad business is reported quiet, owing to the approaching holidays. It is expected that the African mines will roll up a big tonnage in 1903, as they are being actively worked, and new deposits developed.

Phosphates.	Per ton F. o. b.	United Kingdom or European Ports.	
		Unit.	Long ton.
*Fla. hard rock (78 @ 80%)	\$.80 @ \$.85	6 @ 6 1/4 d.	\$9.48 @ 10.07
*Fla. land pb. (68 @ 73%)	3.00 @ 3.25	4 1/2 @ 5d.	8.85 @ 7.00
*Tenn. (78 @ 82%) export	3.25 @ 3.50	5 1/2 @ 6d.	8.58 @ 9.38
†Tenn., 78% domestic	3.00	.....	.....
†Tenn., 75% domestic	2.75 @ 3.00	.....	.....
†Tenn., 73 @ 74% domestic	2.30 @ 2.40	.....	.....
†Tenn., 70 @ 72% domestic	2.10 @ 2.25	.....	.....
†So. Car. land rock	..... @ 2.25	4 1/4 @ 4 1/4 d.	6.97 @ 5.98
†So. Car. river rock	2.75 @ 3.00	.....	.....
Algerian (63 @ 68%)	.....	5 1/4 @ 6 1/4 d.	7.15 @ 8.11
Algerian (58 @ 63%)	.....	4 @ 5 1/4 d.	5.70 @ 6.30
Algerian (53 @ 58%)	.....	4 1/2 @ 4 1/4 d.	4.95 @ 5.22

\*Fernandina, Brunswick or Savannah.  
†Mt. Pleasant, 10n vessels, Ashley River.

**Liverpool. Dec. 10.**

(Special Report of Joseph P. Brunner & Co.)  
The market for heavy chemicals is quiet, but at the same time there is a fair volume of business passing in some lines.

The exports of bleaching powder and sodas for the month ending November 30, according to Board of Trade returns just issued, are as follows: Bleaching powder, to United States, 56,523 cwts.; other countries, 21,867; total, 78,390 cwts. Soda ash, 137,521 cwts.; caustic soda, 123,987; bicarb. soda, 27,456; soda crystals, 26,293; saltcake, 127,539; other sorts, 32,300; total, 475,096 cwts.

Compared with the corresponding month of last year, the shipments of bleaching powder show a marked decrease, while soda ash, caustic soda and saltcake are much heavier, particularly in saltcake.

Soda ash is selling to a fair extent at the usual differential rates as to destination. For tierces, nearest range may be called about as follows: Leblanc ash, 48 per cent, £5 15s. @ £6; 58 per cent, £6 2s. 6d. @ £6 7s. 6d. per ton, net cash; ammonia ash, 48 per cent, £4 5s. @ £4 10s.; 58 per cent, £4 10s. @ £4 15s. per ton, net cash. Bags, 5s. per ton under prices for tierces. Soda crystals are in request and selling generally at £3 7s. 6d. per ton, less 5 per cent for barrels, or 7s. less for bags, with special quotations for certain export quarters. Caustic soda continues in demand and quotations are fully maintained, as follows: 60 per cent, £8 15s.; 70 per cent, £9 15s.; 74 per cent, £10 5s.; 76 per cent, £10 10s. per ton, net cash. Special quotations for certain export markets.

Bleaching powder is slow as regards export business, buyers holding aloof, and quotations for hardwood are nominal at £6 5s. @ £6 10s. per ton, net cash, with special quotations for Continental and a few other markets.

Sulphate of ammonia is in better demand and dearer at £12 @ £12 2s. 6d. per ton, less 2 1/2 per cent for good gray, 24 @ 25 per cent in double bags, f. o. b. here.

Nitrate of soda is selling more freely on spot, and prices have advanced to £9 5s. @ £9 7s. 6d. per ton, less 2 1/2 per cent for double bags, f. o. b. here.

**METAL MARKET.**

**Gold and Silver Exports and Imports.**

At all United States Ports in November and Year.

Metal	November.		Year.	
	1901.	1902.	1901.	1902.
Gold:				
Exports...	\$16,292,500	\$714,915	\$53,039,816	\$33,172,063
Imports...	7,431,678	3,836,307	51,970,358	39,801,245
Excess. E.	\$8,860,822	I. \$3,121,392	E. \$1,069,458	I. \$6,689,182
Silver:				
Exports...	\$4,689,301	\$3,764,674	\$50,914,919	\$43,727,779
Imports...	2,736,522	2,199,353	28,368,192	23,701,933
Excess. E.	\$1,952,779	E. \$1,565,321	E. \$22,546,727	E. \$20,025,846

These figures include the exports and imports at all United States ports, and are furnished by the Bureau of Statistics of the Treasury Department.

**Gold and Silver Exports and Imports, New York.**

For the week ending December 23, and for years from January 1:

Period.	Gold.		Silver.		Total Excess, Exports or Imports.
	Exports.	Imports.	Exports.	Imports.	
Week ...	\$5,000	\$222,984	\$22,940	\$60,897	E. \$63,539
1902.....	25 06 106	2,9 3 071	26 511,206	1,284,712	E. 47,354,529
1901.....	45,966,757	4,739,835	39,654,458	2,449,197	E. 69,352,188
1900.....	36 8 472	10,658,875	39,311 7 8	4,692,312	E. 60,655,117

The gold exported this week went to the West Indies; the silver principally to London. Imports of gold chiefly from France and the silver from Central America and the West Indies.

Financial Notes of the Week.

General business is quiet as the close of the year approaches. The speculative markets are still disturbed, especially by the scarcity of money. Heavy remittances have been made in settlement of loans from French bankers. These, however, have been met by bills for the most part, and no gold has been taken for export.

The statement of the New York banks, including the 59 banks represented in the Clearing House, for the week ending December 20, gives the following totals, comparisons being made with the corresponding weeks of 1901 and 1900:

Table with 3 columns: 1900, 1901, 1902. Rows include Loans and discounts, Deposits, Circulation, Specie, Legal tenders, Total reserve, Legal requirements, Balance surplus.

Changes for the week, this year, were increases of \$55,000 in circulation, and \$118,600 in legal tenders; decreases of \$3,509,900 in loans and discounts, \$5,875,200 in deposits, \$1,880,700 in specie, and \$293,300 in surplus reserve.

The following table shows the specie holdings of the leading banks of the world at the latest dates covered by their reports. The amounts are reduced to dollars and comparison made with the holdings at the corresponding date last year:

Table with 4 columns: 1901 Gold, 1901 Silver, 1902 Gold, 1902 Silver. Rows include N. Y. Assd., England, France, Germany, Spain, Netherlands, Belgium, Italy, Russia.

The returns of the Associated Banks of New York as of date December 20, and the others December 18, as reported by the Commercial and Financial Chronicle cable. The New York banks do not report silver separately, but specie carried is chiefly gold. The Bank of England reports gold only.

There has been a fair inquiry for silver the past week in which the East has joined. Exchanges have had more firmness in their tone, but for the next week or two the market is likely to lapse into holiday dullness.

The United States Assay Office in New York reports receipts of 76,000 oz. silver for the week.

Shipments of silver from London to the East for the year up to December 11 are reported by Messrs. Pixley & Abell's circular as follows:

Table with 3 columns: 1901, 1902, Changes. Rows include India, China, The Straits, Totals.

Receipts for the week were £55,000 in bar silver from New York, £16,000 from the West Indies, £5,000 from Chile, and £16,000 from Australia; total, £92,000. Shipments were £121,075 in bar silver to Bombay.

Indian exchange continues steady, the Council bills offered in London having been all taken at an average of 16.03d. per rupee. Buying of silver for Indian account continues light, while none at all is being taken for China.

The foreign merchandise trade of Great Britain for the 11 months ending November 30 is valued by the Board of Trade returns as below:

Table with 3 columns: 1901, 1902, Changes. Rows include Imports, Exports, Excess, Imports.

The gold and silver movement for the 11 months is reported as follows:

Table with 3 columns: 1901, 1902, Changes. Rows include Gold, Imports, Exports, Excess, Imports, Silver, Imports, Exports, Excess, Exports.

Of the silver imported this year £6,992,572, or 82.8 per cent of the total, was from the United States.

Prices of Foreign Coins.

Table with 3 columns: Coin, Bid, Asked. Rows include Mexican dollars, Peruvian soles and Chilean pesos, Victoria sovereigns, Twenty francs, Twenty marks, Spanish 25 pesetas.

OTHER METALS.

Daily Prices of Metals in New York.

Table with columns for Silver, Copper, Spelter, Lead, N. Y. Cts., S. I. Cts. Rows include December 18-24 with various metal prices.

London quotations are per Long Ton (2,240 lbs.) standard copper, which is now the equivalent of the former g. m. b. The New York quotations for electrolytic copper are for cakes, ingots or wirebars; the price of electrolytic cathodes is usually 0.25c lower than these figures.

Copper.—Owing to the approaching holidays the market has been rather quiet, but there is a strong undertone, and prices are again somewhat firmer. At the close we quote Lake copper at 11 1/2 @ 11 3/4 c.; electrolytic, in ingots, cakes and wirebars at 11 1/2 @ 11 3/4 c.; in cathodes, at 11 1/4 @ 11 3/4 c.; casting copper, at 11 3/8 @ 11 1/2 c.

The foreign market also again displayed considerable strength. Standard copper, which closed last week at £51 2s. 6d., closes this week at £51 5s. @ £51 7s. 6d., for spot, £51 12s. 6d. @ £51 15s. for three months.

The London Metal Exchange will be closed from the afternoon of December 24 until Monday, December 29.

Refined and manufactured sorts we quote: English tough, £54 @ £54 5s.; best selected, £55 5s. @ £55 10s.; strong sheets, £67 @ £67 10s.; India sheets, £69 @ £69 10s.; yellow metal, 6 1/2 @ 6 1/2 d.

Exports of copper from Atlantic ports in the week ending December 23 are reported by our special correspondents as follows: Great Britain, 250 tons; Germany, 40; Holland, 627; Belgium, 10; Panama, 80; total, 1,007 tons. Imports were 75 tons copper from Japan and 205 tons from Mexico; total, 280 tons.

Imports and exports of copper into Great Britain for the 11 months ending November are shown below, the total figures for exports showing the equivalents in fine copper; the figures are in long tons:

Table with 3 columns: 1901, 1902, Changes. Rows include Copper ore, Matte and precipitate, Fine copper, Total imports, Exports, Balance.

Of the imports this year, 804 tons ore, 13,537 tons matte and 40,559 tons fine copper, were from the United States; comparing with 1,026 tons ore, 18,242 tons matte and 17,368 tons fine copper last year.

Tin has been in very good demand throughout the week, in sympathy with the firmer advices from London. A good business has been done for spot as well as future delivery. At the close we quote spot at 26 1/4 c., December and January at the same price.

The foreign market, which closed last Thursday at £116 7s. 6d., declined on Friday to £115 12s. 6d., but opened very firm on Monday at £116 12s. 6d., advanced on Tuesday to £117 15s., and the closing quotations on Wednesday are cabled as £118 5s. @ £118 7s. 6d. for spot, £119 @ £119 2s. 6d. for three months.

Imports of tin into Great Britain, with re-exports, are reported as follows for the 11 months ending November 30, in long tons:

Table with 3 columns: 1901, 1902, Changes. Rows include Straits, Australia, Other countries, Total imports, Re-exports, Balance.

The loss in imports this year was chiefly due to the fact that a larger proportion of Straits tin went to the United States direct this year, instead of passing through British ports.

Lead is in steady demand, without any special feature. The ruling quotations are 3.95 @ 4.05, St. Louis; 4.05 @ 4.10c., New York.

The foreign market was very active, and the tendency seems to be somewhat easier. Spanish lead is quoted at £10 15s. @ £10 17s. 6d.; English lead, 2s. 6d. higher.

Imports and exports of lead in Great Britain for the 11 months ending November 30 are reported as below, in long tons:

Table with 3 columns: 1901, 1902, Changes. Rows include United States, Spain, Australia, Other countries, Total imports, Exports.

Balance 165,872 183,403 I. 17,531 The lead credited to the United States is chiefly Mexican and Canadian lead, refined here in bond.

Spanish Lead Market.—Messrs. Barrington & Holt report from Cartagena, Spain, under date of December 6 that the price of silver during the week has been 11.75 reales per ounce. Exchange has gone up by 32 centimos, making it 34.12 pesetas to £1. The local quotation for pig lead on wharf has been 57.50 reales per quintal, which on above exchange is equal to £9 9s. per ton of 2,240 lbs., f. o. b. Cartagena. Exports of pig lead were 600,000 kgs. to Glasgow.

Spelter has suffered a further decline, but at the lower value established consumers seem to take considerably more interest in the article, and a fair business has resulted. At the close we quote St. Louis, 4 1/2 c., New York 4.67 1/2 c.

The foreign market remains firm, good ordinaries being quoted at £19 17s. 6d., specials 5s. higher.

Imports of spelter, or metallic zinc, into Great Britain for the 11 months ending November 30 were 82,157 long tons, against 62,283 tons for the corresponding period in 1901; an increase of 19,874 tons, or 31.9 per cent.

Spanish Zinc Ore Market.—Messrs. Barrington & Holt report under date of December 6 as follows: Although the price of spelter continues firm and immediate business is being done at even higher prices than last month, nevertheless there seems to be a feeling that in the early new year there will be a fall in prices; consequently, buyers are showing considerable amount of caution in compromising themselves for forward business. Freight rates for zinc ores are also easier, the last rates paid having been 11 fr., Cartagena to Antwerp.

Antimony remains dull and depressed. We quote Cookson's, 9 @ 9 1/2 c.; Hallett's, 7 1/2 @ 7 1/4 c.; Hungarian, Italian, French, Japanese and U. S. Star, at 6 3/4 @ 6 7/8 c.

Nickel.—The price is now quoted by leading producers at 40 @ 47c. per lb., for large quantities down to ton lots, according to size and terms of order. The price for smaller lots, according to quality, runs as high as 60c. per lb.

Platinum.—Consumption continues good, and prices are firm. Ingot platinum in large lots brings \$19 per oz. in New York.

Chemical ware (crucibles and dishes), best hammered metal from store in large quantities, is worth 7 1/2 c. per grain.

Quicksilver.—Prices continue unchanged. The New York quotation is \$48 per flask for large lots, with a slightly higher price for smaller quantities. The London quotation is £8 15s. per flask, with the same figure named from second hands. In San Francisco, prices continue at \$45.50 @ \$46.50 per flask for domestic orders, while for export \$43.50 @ \$44 is quoted.

Imports of quicksilver into Great Britain for the 11 months ending November 30 were 2,487,671 lbs., against 2,639,572 lbs. in 1901; a decrease of 151,901 lbs. Re-exports were 1,396,770 lbs., against 1,897,992 lbs. last year; a decrease of 501,222 lbs.

Minor Metals and Alloys.—Wholesale prices, f. o. b. works, are as follows:

Table with columns: Metal, Price per lb. Rows include Aluminum, Ferro-Tungsten, Magnesium, Manganese, Mangan's Cop., Nickel-alum, Bismuth, Chromium, Copper, Ferro-Molyb'dum, Ferro-Titanium, Ferro-Titanum.

Average Prices of Metals per lb., New York.

Table with columns: Month, Tin, Lead, Spelter. Rows include January, February, March, April, May, June, July, August, September, October, November, December, Year.

Average Prices of Copper.

Table with columns: Month, New York Electrolytic, New York Lake, London Standard. Rows: January to December, Year.

New York prices are in cents, per pound; London prices in pounds sterling, per long ton of 2,240 lbs., standard copper.

Average Prices of Silver, per ounce Troy.

Table with columns: Month, 1902, 1901, 1900. Rows: January to December, Year.

The New York prices are per fine ounce; the London quotation is per standard ounce, .925 fine.

ASSESSMENTS.

Table with columns: Name of Company, Location, No., Delinq., Sale, Amt. Rows: Bingham Placer, Caledonia, Christmas, etc.

DIVIDENDS.

Table with columns: Name of Company, Date, Latest Dividend, Per Share, Total. Rows: Ala. & Ga. Iron pf., Am. Iron & Steel pf., etc.

STOCK QUOTATIONS.

NEW YORK.

Table with columns: Company and Location, par val, Dec. 17, Dec. 18, Dec. 19, Dec. 20, Dec. 22, Dec. 23, Sales. Rows: Alamo, Colo., Alice, Mont., etc.

†Assessment Paid.

Coal, Iron and Industrial Stocks.

Table with columns: Company, par val, Dec. 17, Dec. 18, Dec. 19, Dec. 20, Dec. 22, Dec. 23, Sales. Rows: Allis-Chalmers, U.S., Am. Agr. Chem., etc.

Total sales, 386,383 shares.

BOSTON, MASS.\*

Table with columns: Name of Company, par val, Shares listed, Dec. 17, Dec. 18, Dec. 19, Dec. 20, Dec. 22, Dec. 23, Sales. Rows: Adventure Con., Alameda, Amalgamated, etc.

Total sales, 82,188 shares.

PHILADELPHIA, PA. §

Table with columns: Name and Location of Company, par val, Dec. 17, Dec. 18, Dec. 19, Dec. 20, Dec. 22, Dec. 23, Sales. Rows: Am. Alkali Mich., Am. Cement, etc.

§Reported by Townsend, Whelen & Co., 300 Walnut St., Philadelphia, Pa. Total sales 13,704 shares.

STOCK QUOTATIONS.

COLORADO SPRINGS, COLO.\*

LONDON.

Dec. 11.]

Table of stock quotations for Colorado Springs, Colo. listing companies like Acacia, Alamo, Am. Con., Anaconda, Ben Hur, etc., with columns for par value, bid/ask prices for Dec 15-20, and sales.

Table of stock quotations for London, listing companies like Alaska-Treadwell, Anaconda, Arizona, etc., with columns for authorized capital, par value, last dividend, and quotations (buyers/sellers).

\*Colo. Springs Mining Stock Exchange. All mines are in Colorado. Total sales 86,270 shares.

COLORADO SPRINGS. (By Telegraph.)

Table of stock quotations for Colorado Springs via telegraph, listing companies like Acacia, Alamo, Anaconda, etc., with columns for par value and bid/ask prices for Dec 15-20.

PARIS. Dec. 11.

Table of stock quotations for Paris, listing companies like Acieries de Creusot, Firminy, Huta-Bank, etc., with columns for country, product, capital stock, par value, latest dividends, and prices.

ST. LOUIS, MO.\*

TORONTO, ONT. Dec. 20.

Table of stock quotations for St. Louis, Mo. and Toronto, Ont., listing companies like Am. Nettie, Catherine Lead, etc., with columns for shares, par value, bid/ask prices, and sales.

\*From our Special Correspondent.

Total sales, 4,500 shares.

SALT LAKE CITY.\*

Dec. 19.

Table of stock quotations for Salt Lake City, listing companies like Ajax, Ben Butler, Bullion-Beck, etc., with columns for shares, par value, high/low prices, and sales.

All mines are in Utah. \*By our Special Correspondent. Total sales, 385,428 shares.

CHEMICALS, MINERALS, RARE EARTHS, ETC.—CURRENT WHOLESALE PRICES. (See also Market Reviews.)

Table with multiple columns listing various chemical and mineral products such as Abrasives, Barium, Barytes, Bauxite, Bismuth, Bitumen, Bone Ash, Borax, Bromine, Cadmium, Calcium, Ceresine, Chlorine, Chrome Ore, Clay, China, Coal Tar Pitch, Cobalt, Cryolite, Explosives, Antimony, Arsenic, Asphaltum, Graphite, Gypsum, Iron, Lead, Lime, Magnesite, Magnesium, Manganese, Marble, Mercury, Mica, Mineral Wool, Nickel, Oils, Paints and Colors, Potash, Potassium, Quartz, Salt, Silica, Silver, Sodium, Sulphur, and The Rare Earths (Boron, Calcium, Cerium, Didymium, Erbium, Glucinum, Lanthanum, Lithium, Strontium, Thorium, Uranium, Yttrium, Zirconium).

NOTE.—These quotations are for wholesale lots in New York unless otherwise specified, and are generally subject to the usual trade discounts. Readers of the ENGINEERING AND MINING JOURNAL are requested to report any corrections needed, or to suggest additions which they may consider advisable.



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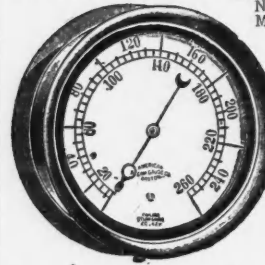
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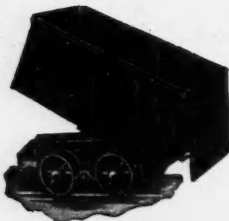
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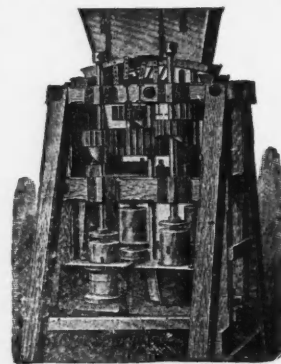


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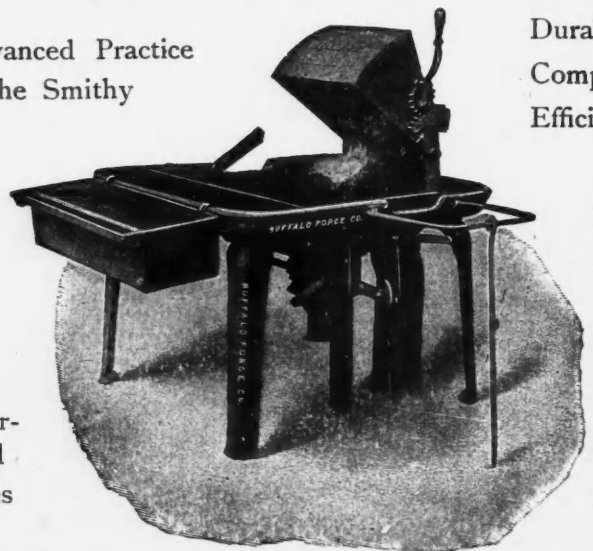
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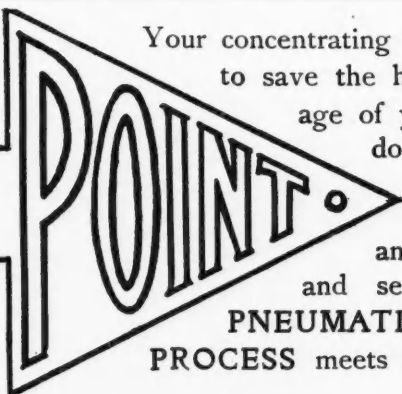
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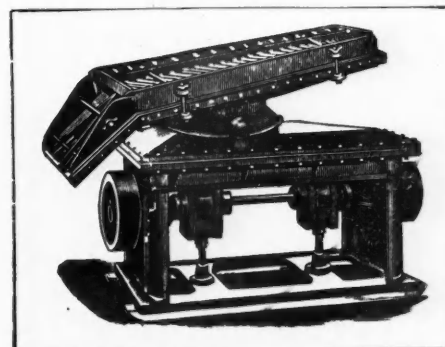
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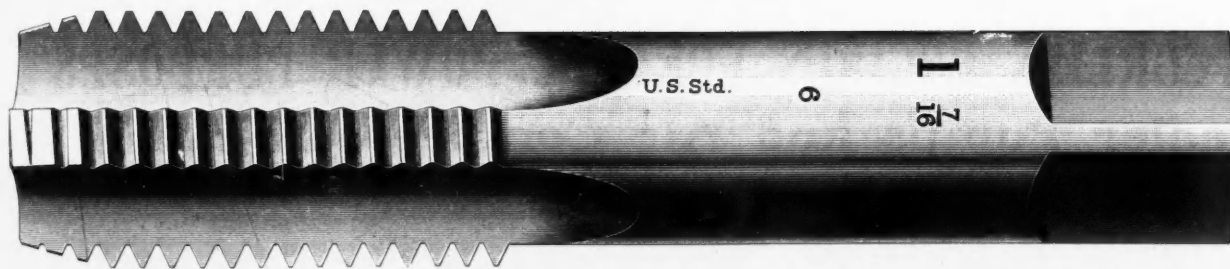
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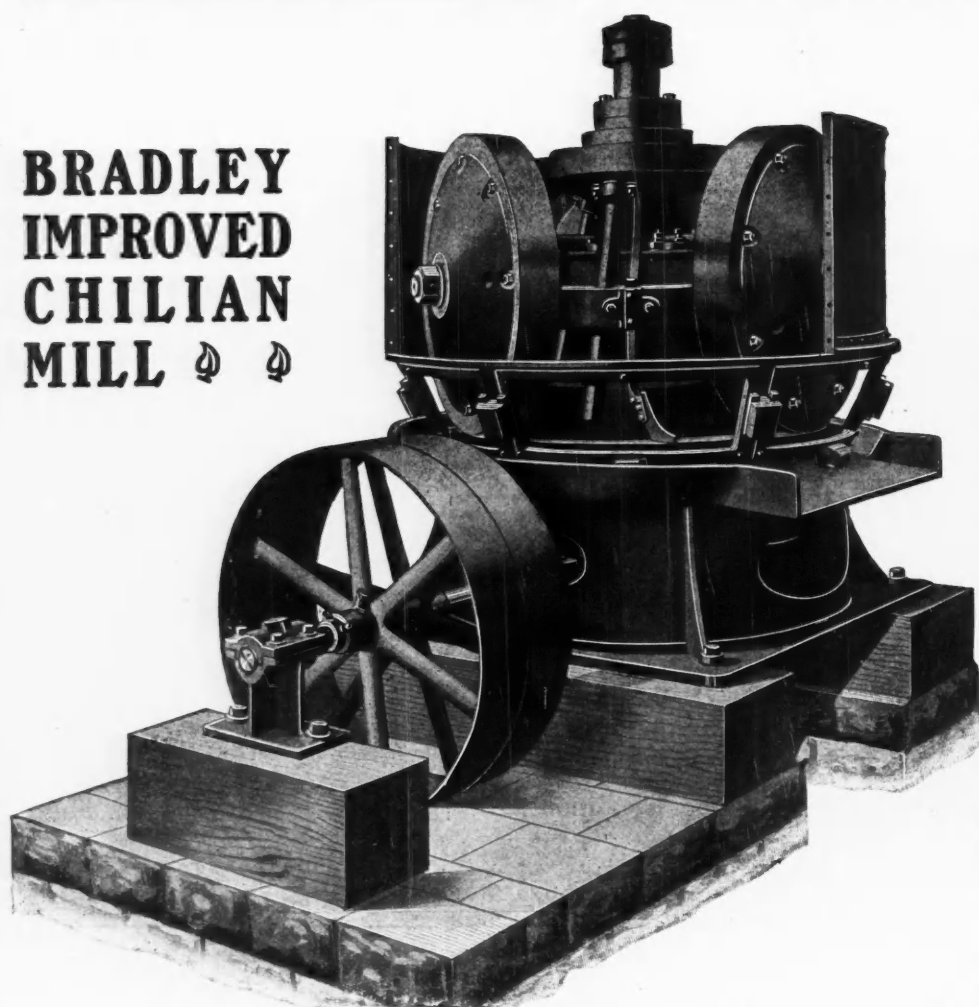
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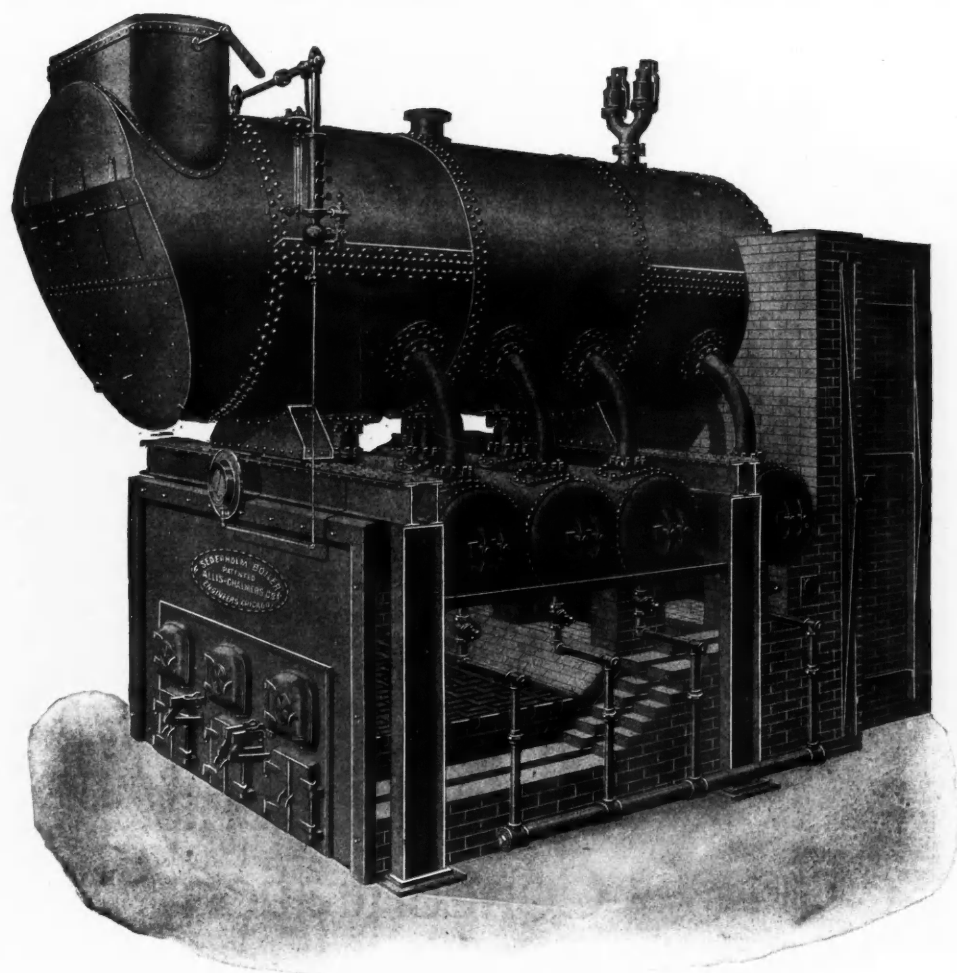
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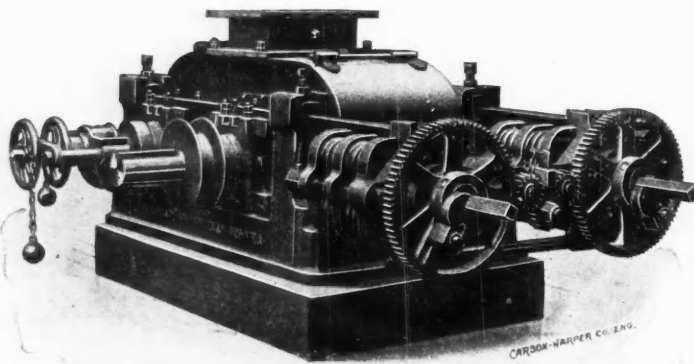
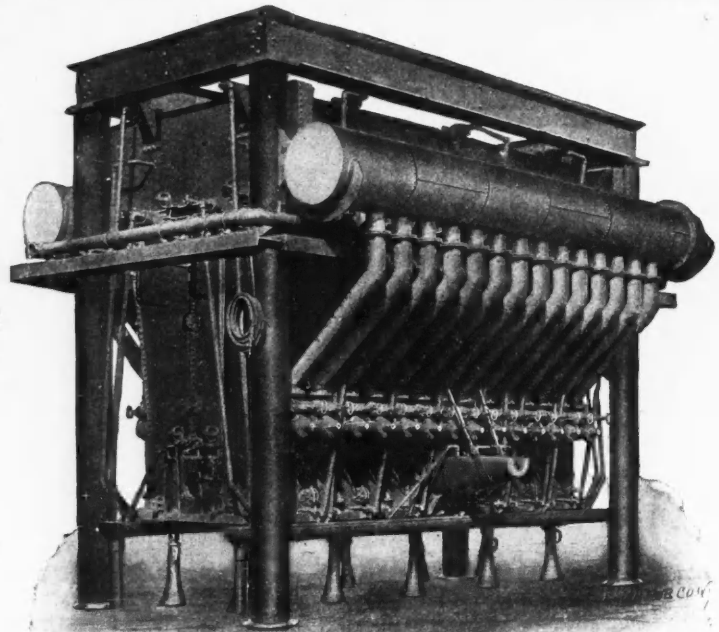
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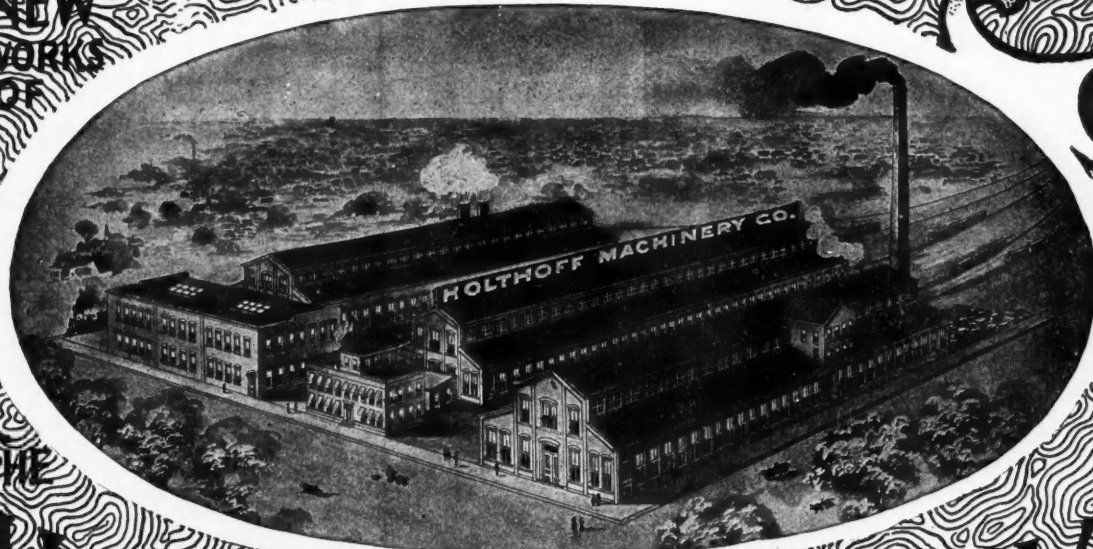
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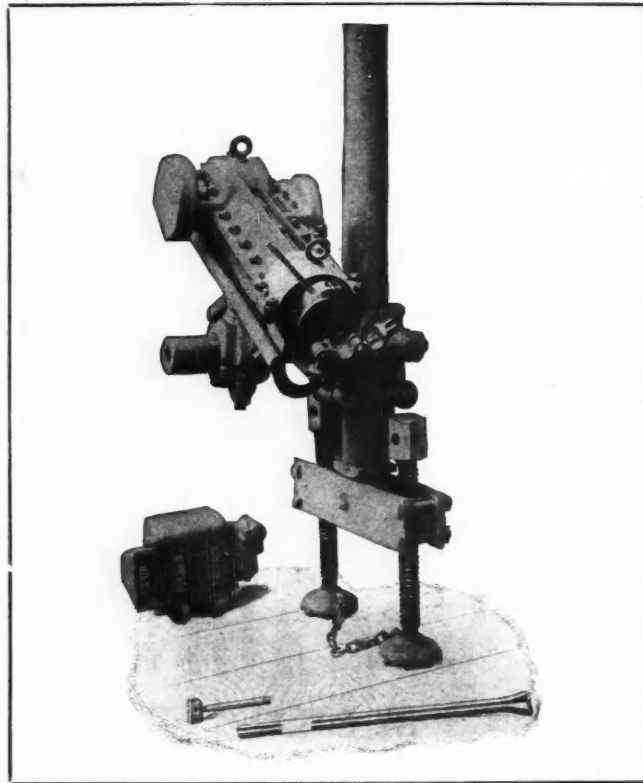
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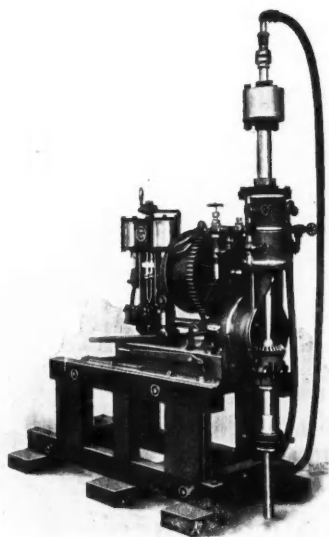
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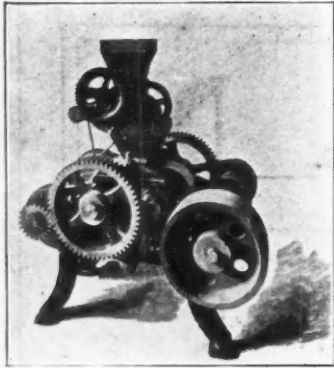


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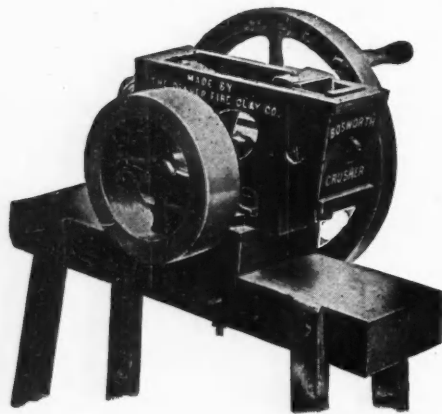
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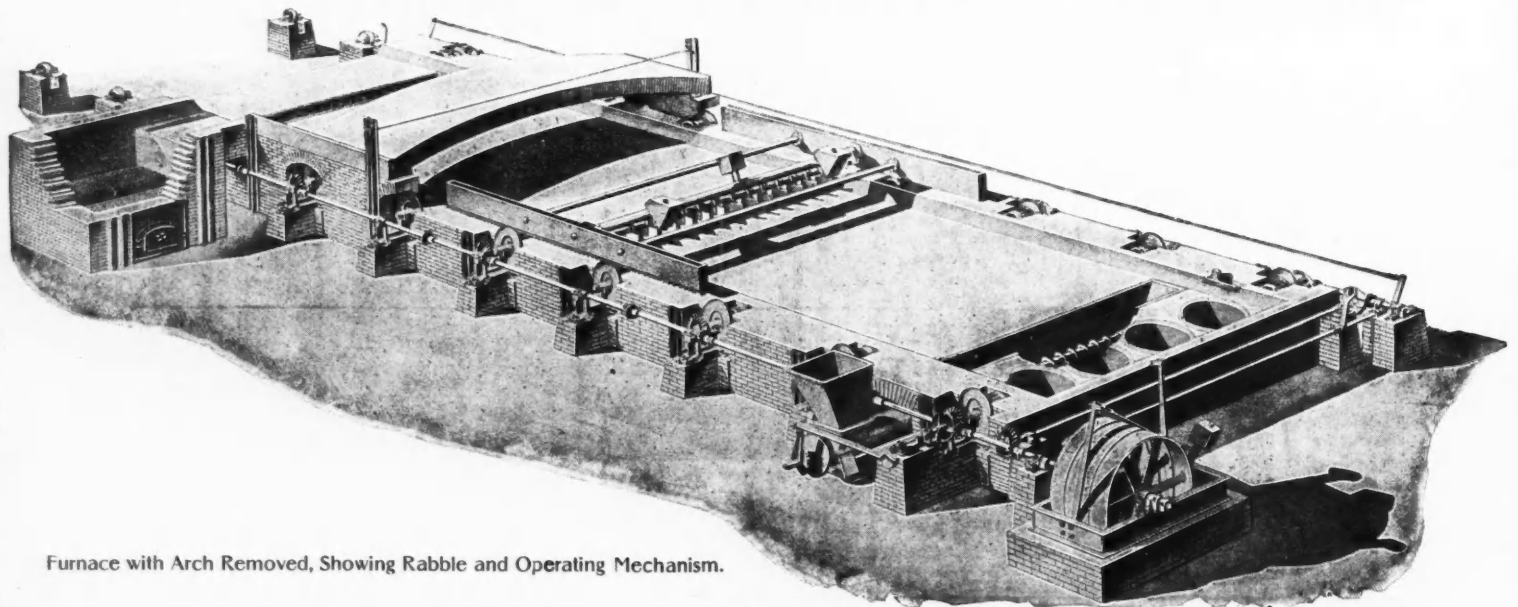
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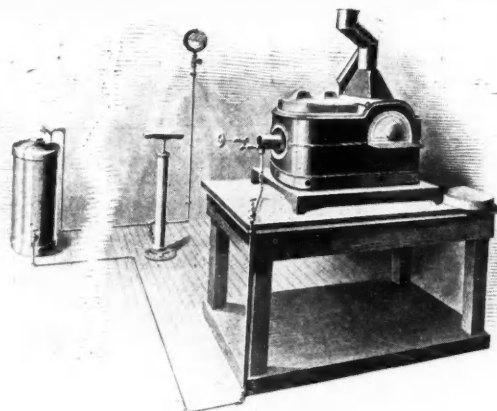
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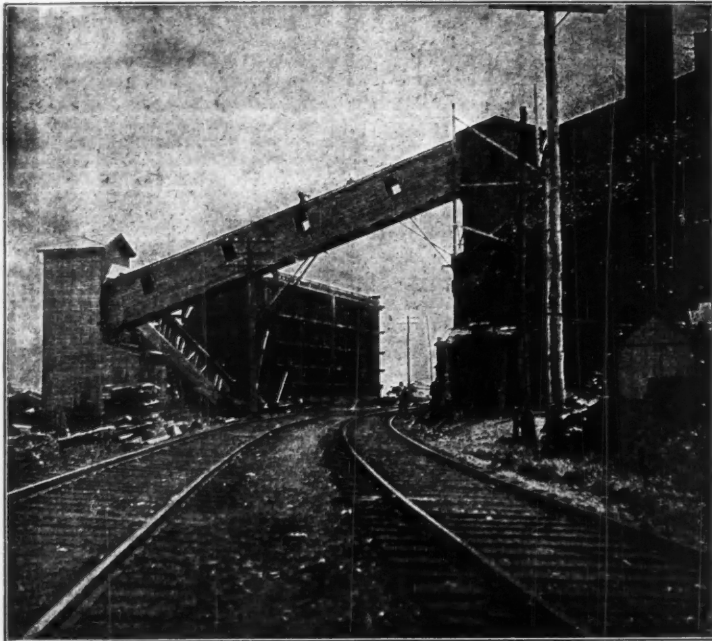
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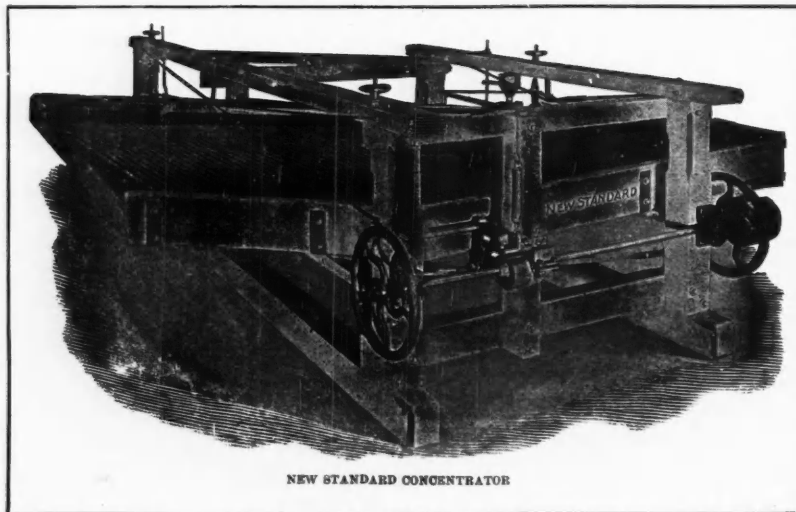
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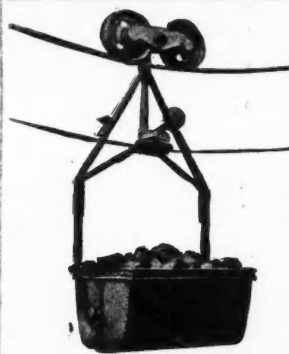
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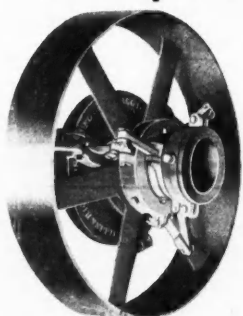
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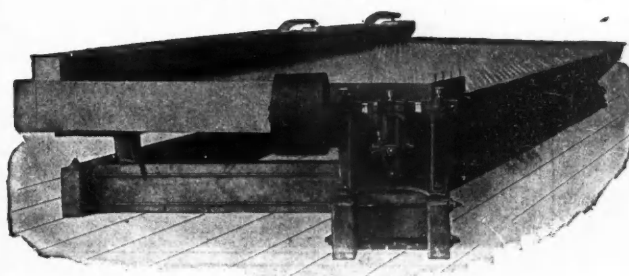
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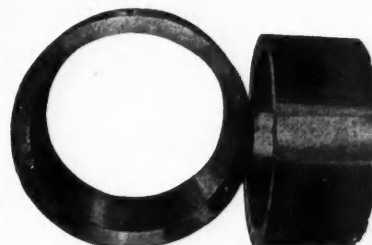
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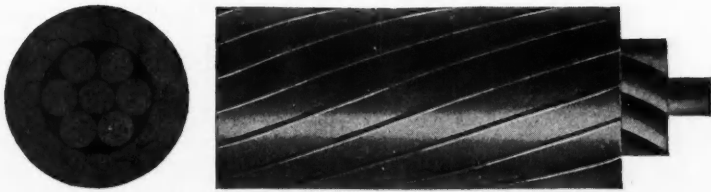
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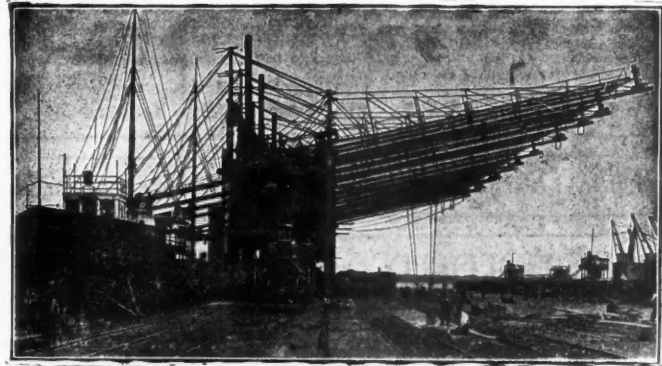
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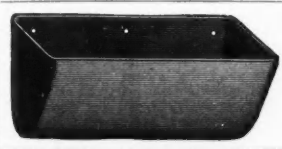
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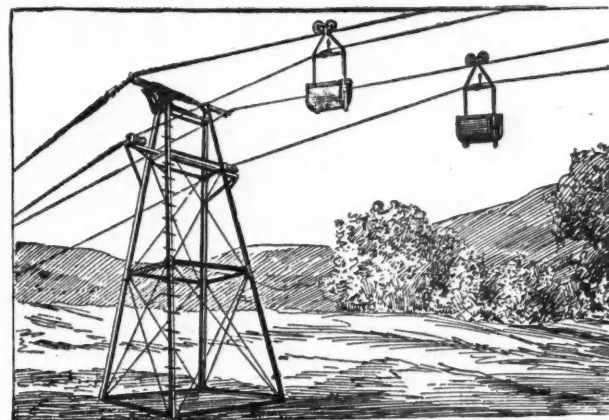
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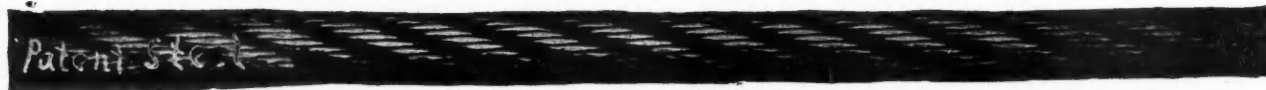
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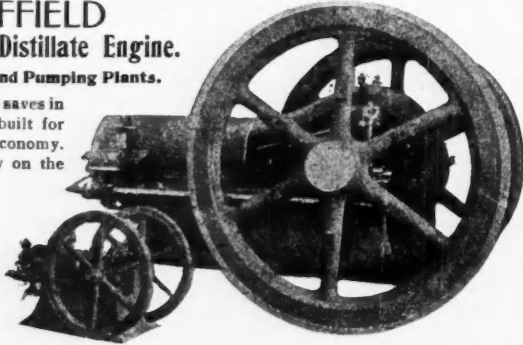
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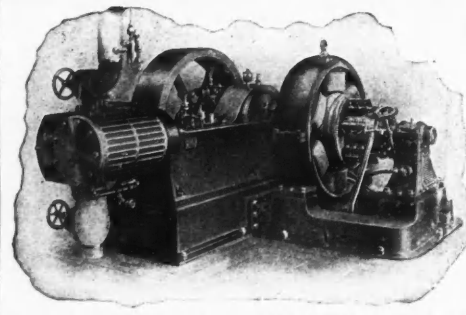
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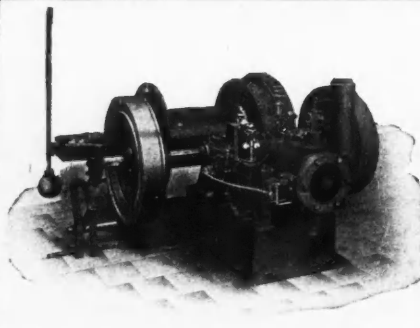
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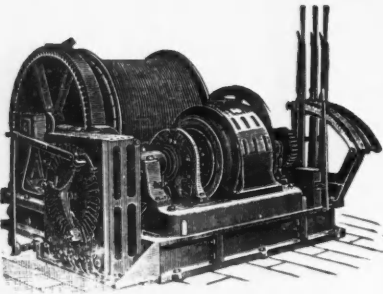
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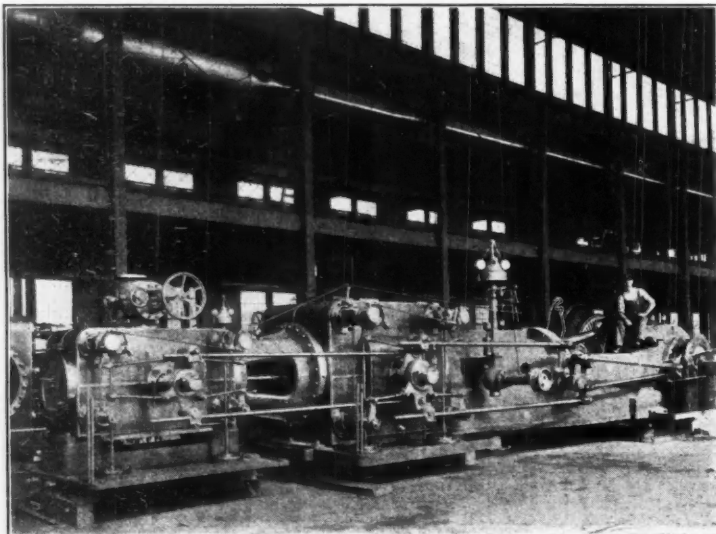
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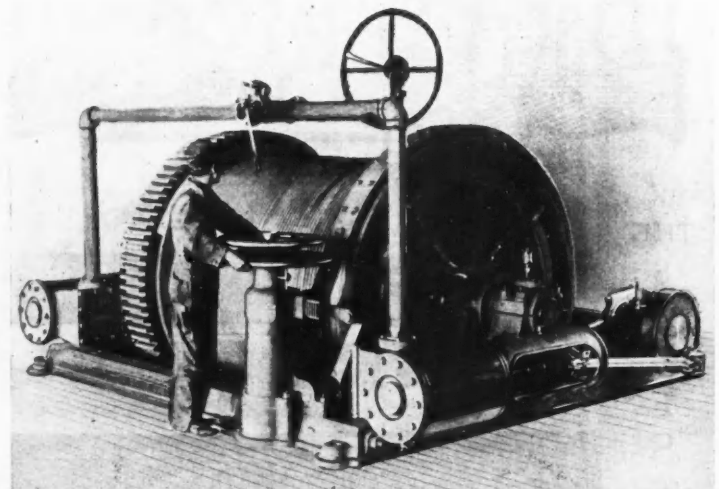
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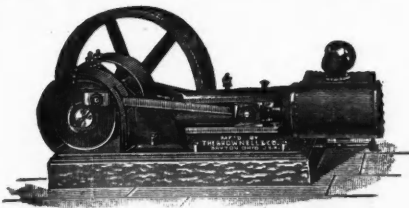


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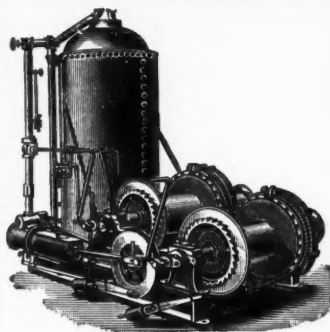
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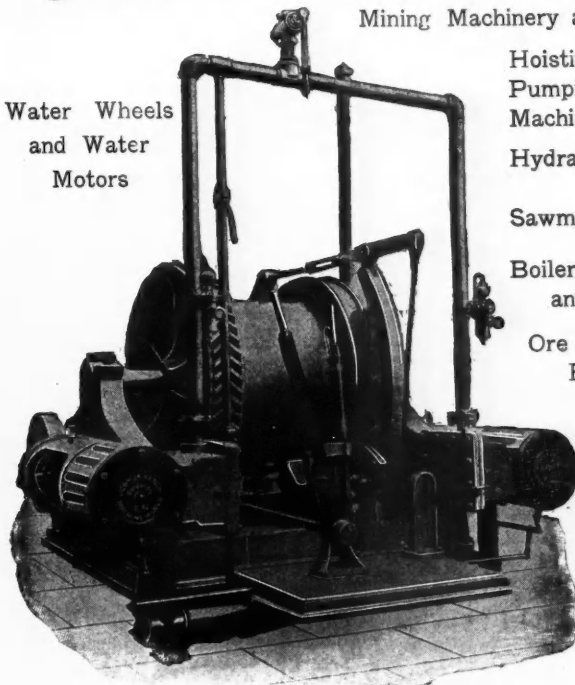
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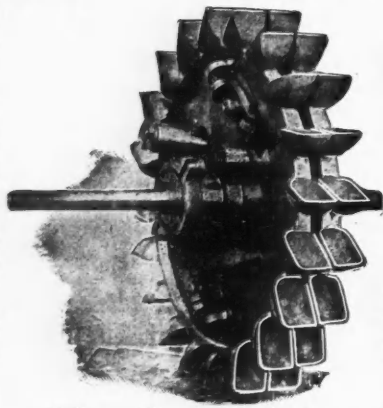
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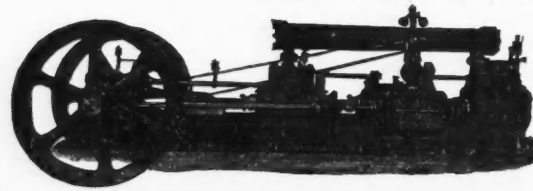
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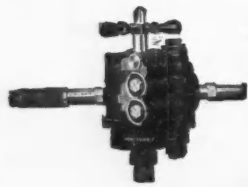
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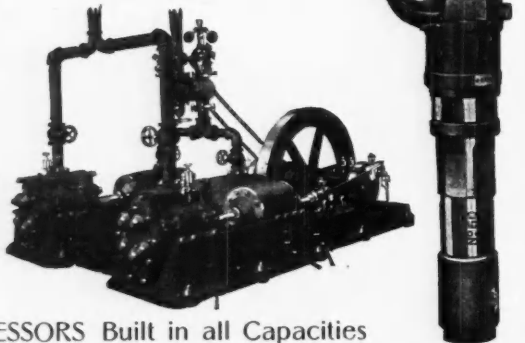
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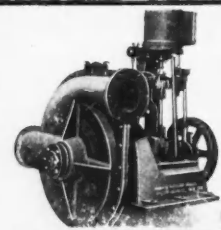
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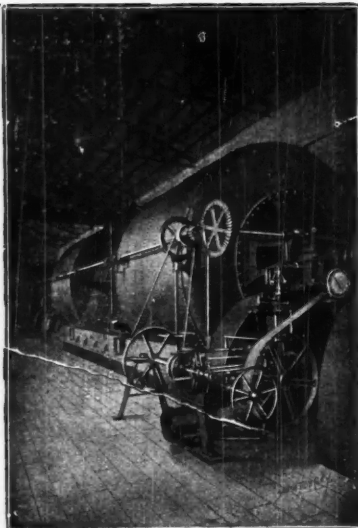
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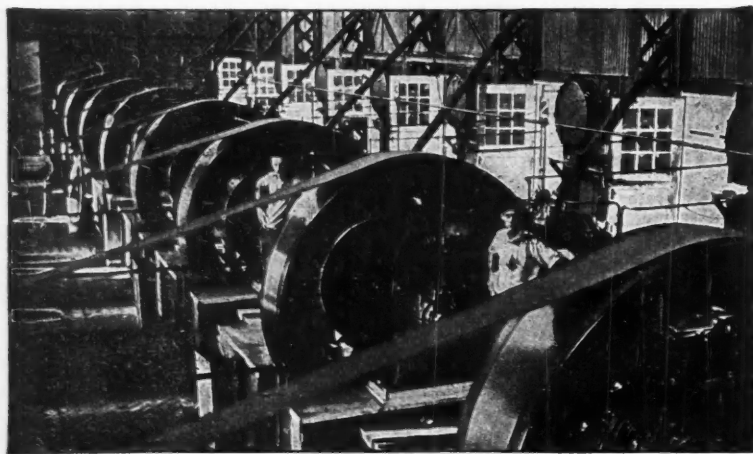
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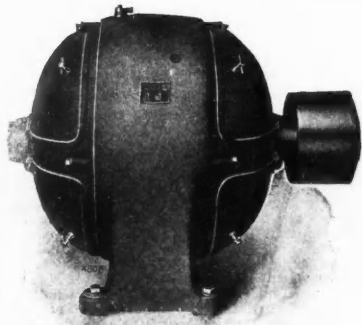
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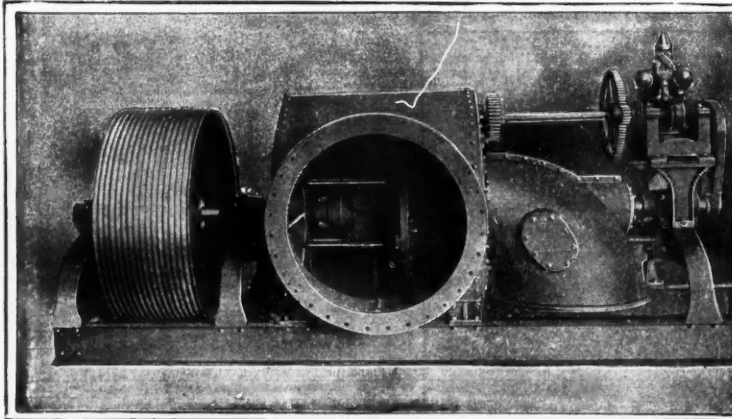
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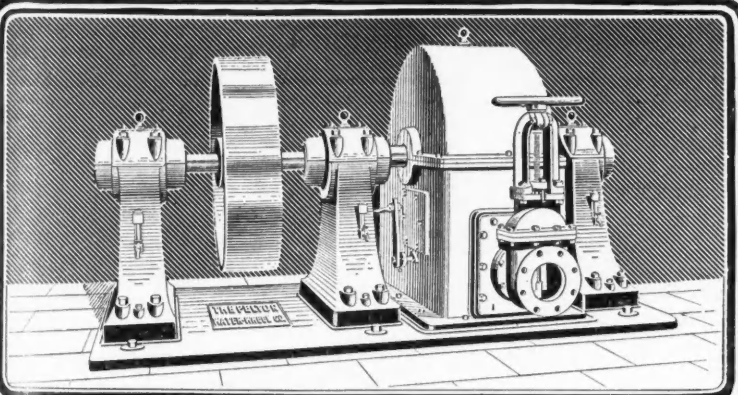
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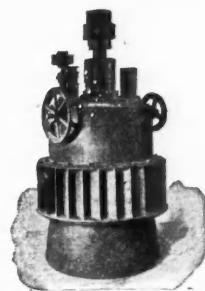
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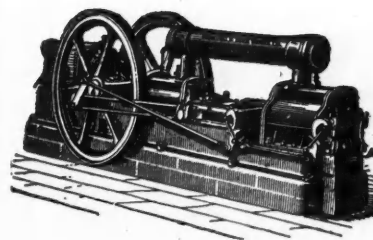
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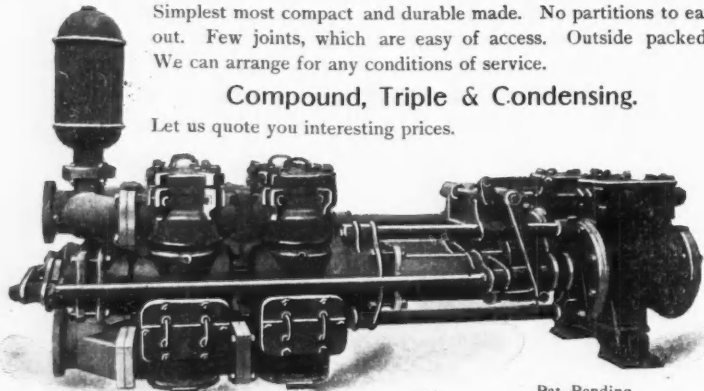
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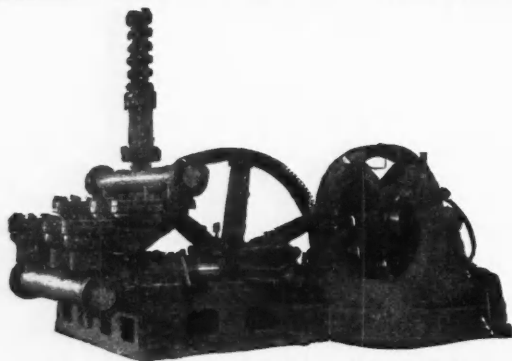
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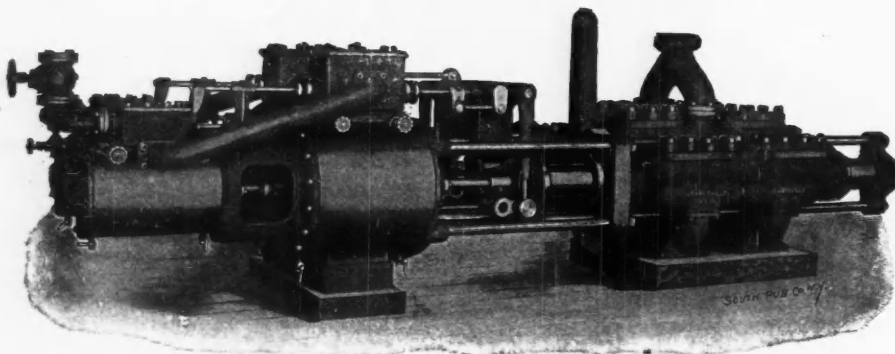
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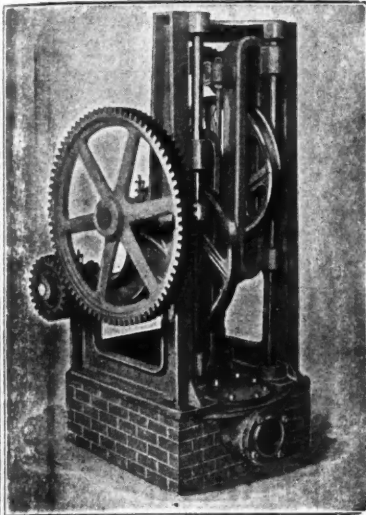
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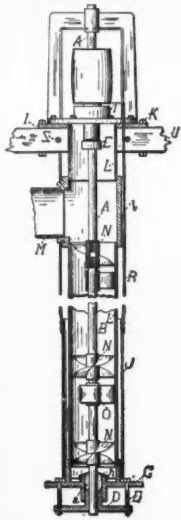
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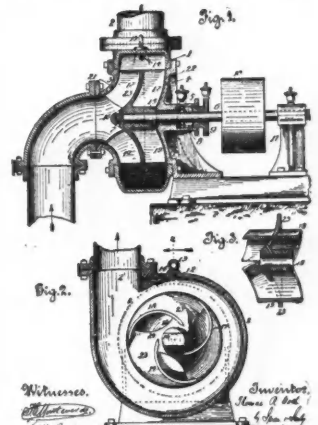
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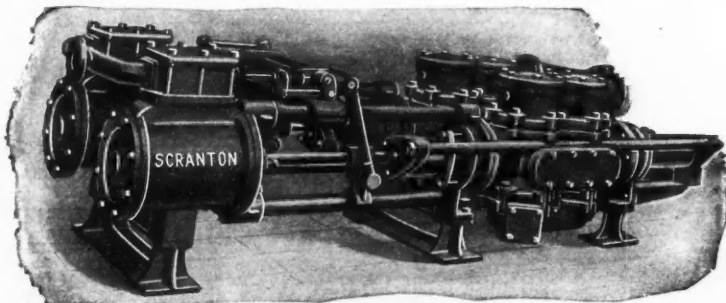
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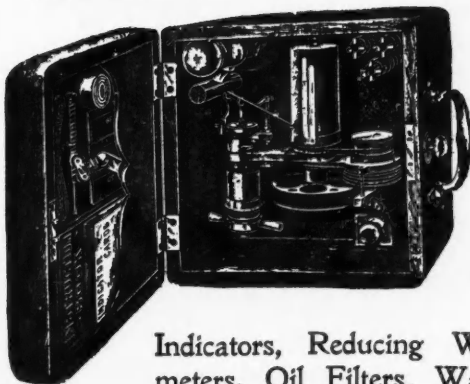
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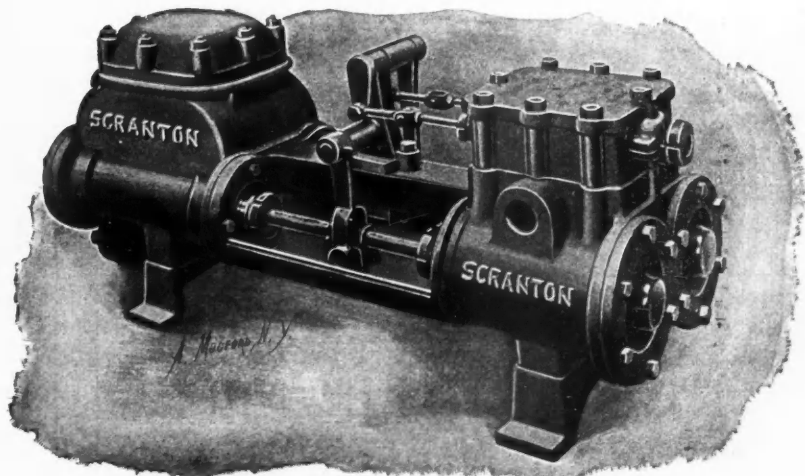
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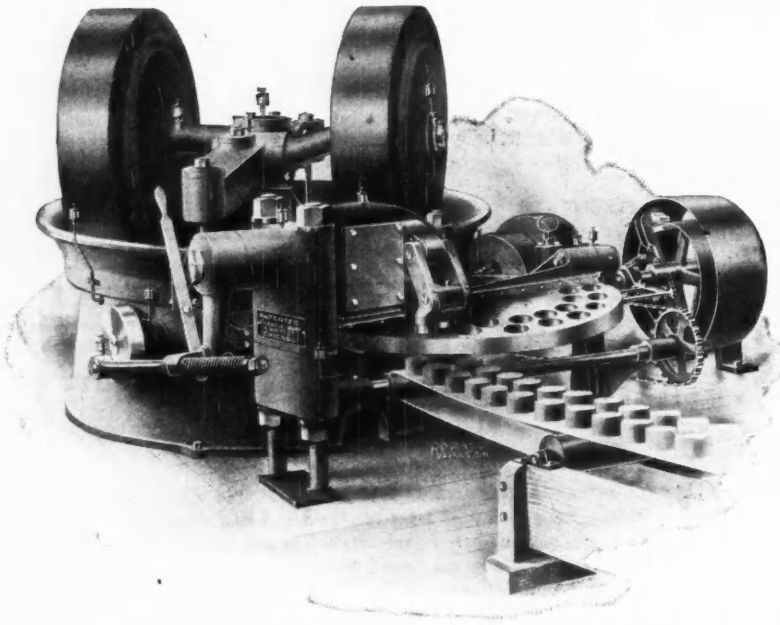
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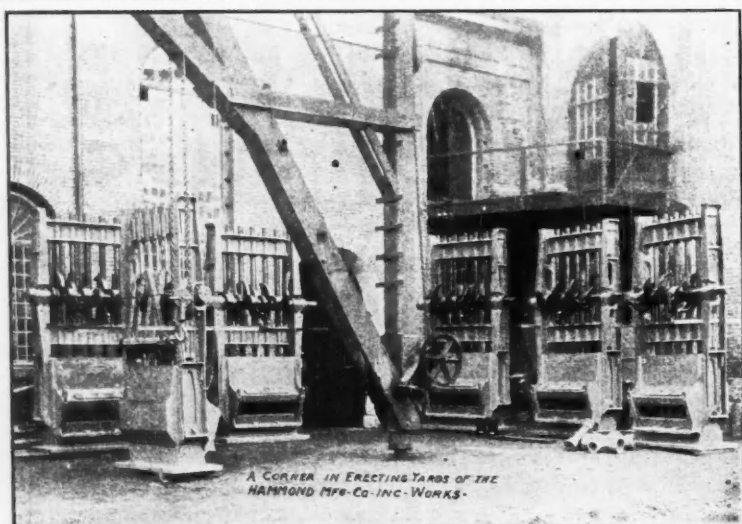
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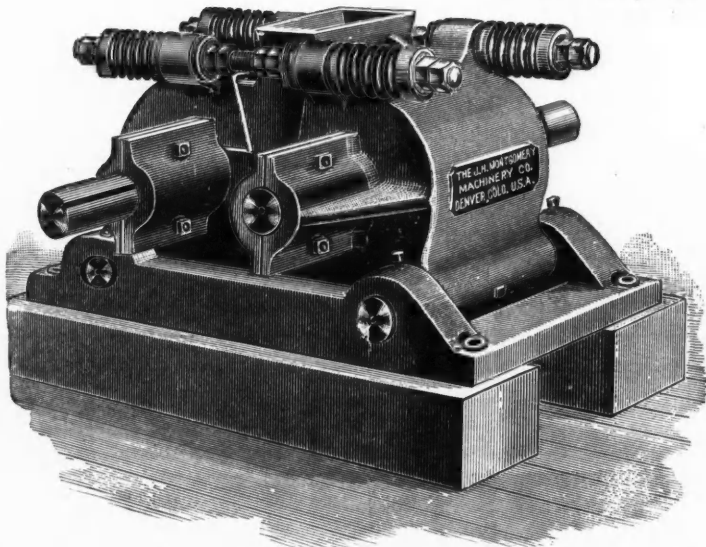
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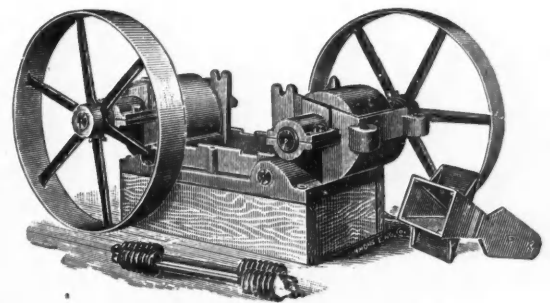
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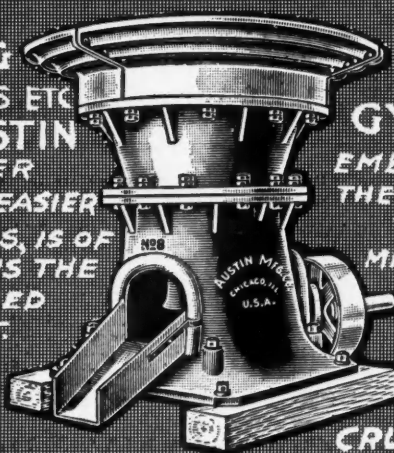
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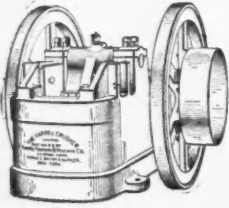
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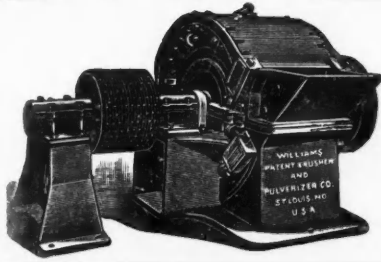
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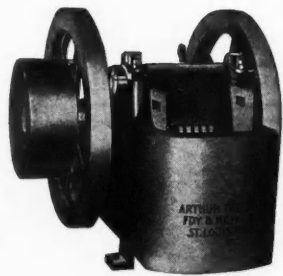




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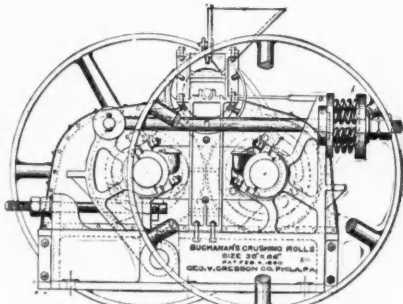
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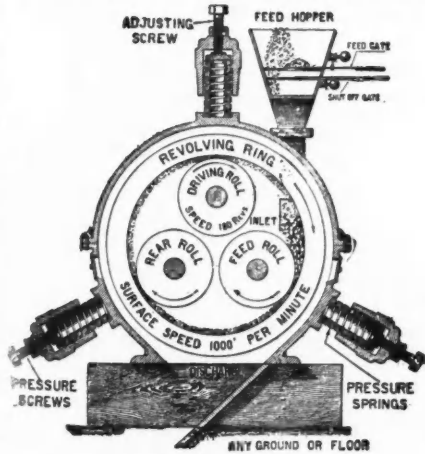
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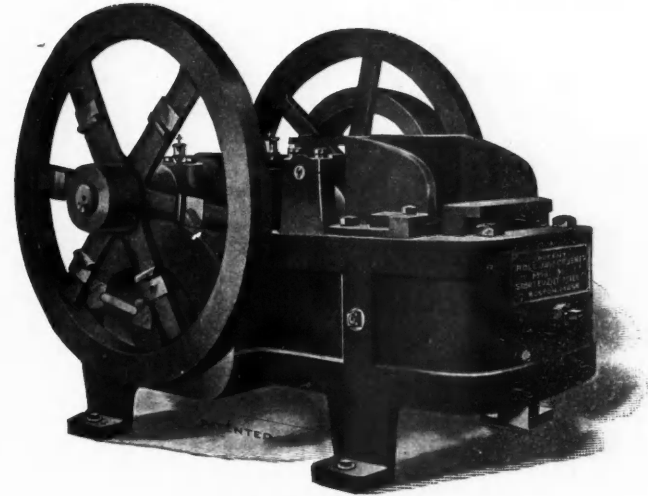
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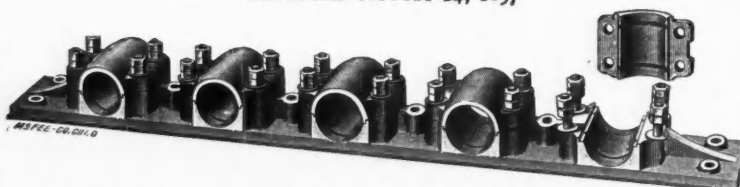
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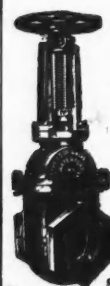
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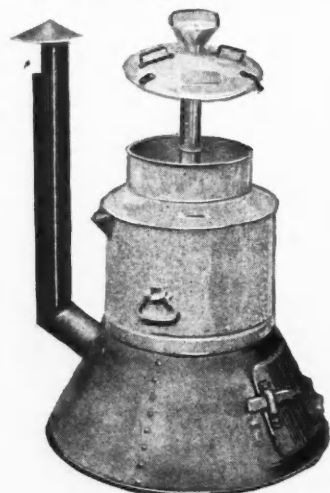
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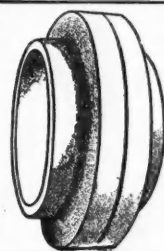
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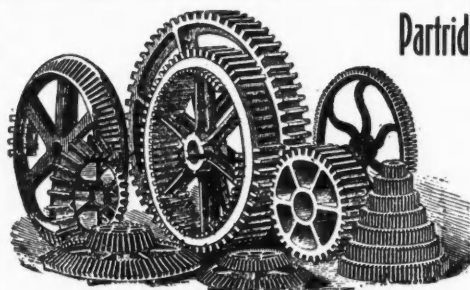
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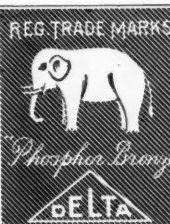
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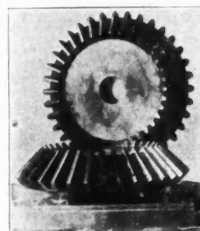
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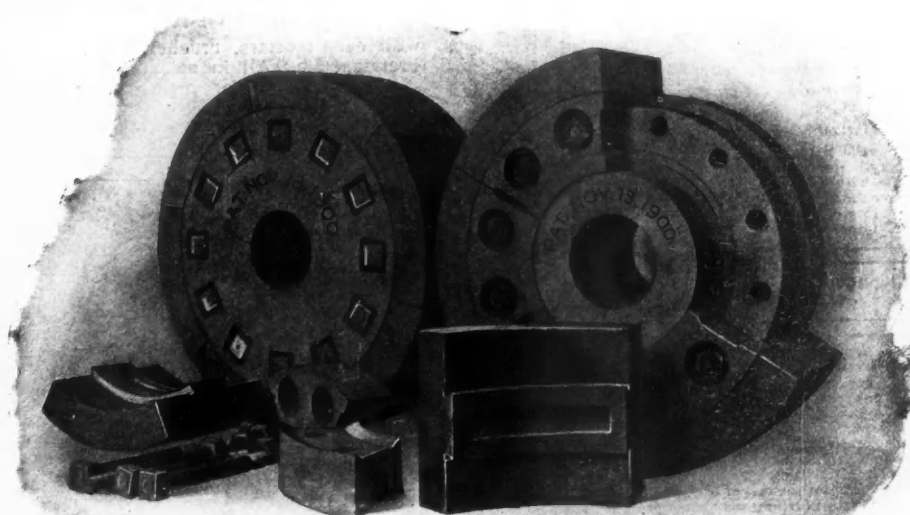
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 2—60x16 80-H.P. Horizontal Tubular.  
 1—54x16 70-H.P. Horizontal Tubular.  
 1—54x14 60-H.P. Horizontal Tubular.  
 1—48x16 60-H.P. Horizontal Tubular.  
 3—48x14 50-H.P. Horizontal Tubular.  
 1—48x12 45-H.P. Horizontal Tubular.  
 2—44x14 40-H.P. Horizontal Tubular.  
 1—44x12 35-H.P. Horizontal Tubular.  
 2—42x10 25-H.P. Horizontal Tubular.  
 1—48x11 1/2 60-H.P. Locomotive, Fire Box 34x45x62.  
 1—38x46 25-H.P. Locomotive, Fire Box 48x38x39.  
 1—42x90 25-H.P. Vertical Tubular.  
 1—36x84 15-H.P. Vertical Tubular.  
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 1—24x72 8-H.P. Vertical Tubular.  
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 1—J. I. Case, 10-H.P. Portable Engine and Boiler.

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### Engines

**Corliss Engines**  
 24x48 250-H.P. Fraser Chalmers, R.H., 70 rpm.  
 18x42 175-H.P. Bates Corliss, R. H., 85 rpm.  
 16x36 125-H.P. Wright Corliss, R. H., 90 rpm.  
**Horizontal Automatic Engines**  
 15x14 150-H.P. Armington Sims, C. C., 250 rpm.  
 13x13 90-H.P. Greene, 275 rpm.  
 12x14 84-H.P. Buffalo Automatic, C. C., 250 rpm.  
 10x15 50-H.P. Hendey-Meyer, L. H., 310 rpm.  
 10x16 50-H.P. Atlas, R. H., 190 rpm.  
 9x10 30-H.P. Ideal, C. C., 350 rpm.  
 8x10 25-H.P. Hendey-Meyer, C. C., 310 rpm.

### Horizontal Slide Valve Engines

13x16 50-H.P. Erie City, R. H., 150 rpm.  
 12x20 40-H.P. Atlas, R. H., 135 rpm.  
 11x16 45-H.P. Colo. Iron Wks., R. H., 150 rpm.  
 10x14 50-H.P. Nichols Post, Cut-off, R. H., 200 rpm.  
 10x16 40-H.P. Atlas, R. H., 190 rpm.  
 10x12 35-H.P. Brownell, R. H., 250 rpm.  
 9x12 25-H.P. Colo. Iron Wks., L. H., 175 rpm.  
 7x8 12-H.P. Denver Eng'g Wks., R. H., 180 rpm.  
 5x6 6-H.P. No Name, C. C., 150 rpm.  
 6x9 10-H.P. Horizontal Portable Engine and Boiler, C. C., 150 rpm.

### Vertical Engines

10x10 30-H.P. Chas. P. Willard, C. C., 200 rpm.  
 8x8 14-H.P. Nagel, C. C., 180 rpm.  
 5x7 8-H.P. Automatic, C. C., 300 rpm.  
 4x4 3-H.P. O. S. St. Louis, C. C., 250 rpm.  
 3x4 2-H.P. Automatic, C. C., 375 rpm.

### Pumps

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 18 1/2 x 8 x 12 Knowles Duplex Plunger.  
 16x8x12 Knowles Duplex Plunger.  
 14x7x12 Knowles Duplex Plunger.  
 16x7x16 Knowles Single Plunger.  
 12x5x12 Knowles Single Plunger.  
 12x7x10 Worthington Duplex.  
 8x5x10 Snow Duplex.  
 7x4x10 Davidson Single.  
 8x3x7 Knowles Single.  
 7x4 1/2 x 10 Knowles Single.  
 10x6x9 Deane Springfield.  
 9 1/2 x 5 x 15 Wilson Snyder Single.  
 12x12x12 Davidson Single.  
 6x8 1/2 x 6 Worthington Duplex.  
 10x5x13 Cameron Sinkers.  
 10x7x5x10 Knowles Sinkers.  
 6x5 3/4 x 3 3/4 x 10 Knowles Sinkers.  
 No. 5 Cameron Sinkers.  
 10x5x12 F. Morse Duplex.  
 11x7x12 Renshaw Sinkers Duplex.  
 10x5x12 Snow Sinkers Duplex.

### Boiler Feed Pumps

6x4x6 Deane Holyoke Duplex.  
 6x3 3/4 x 6 Dope Maxwell Single.  
 5 1/2 x 4 x 6 Deane Holyoke Single.  
 5 1/2 x 3 1/2 x 5 Fairbanks-Morse Duplex.  
 5 1/2 x 3 1/2 x 5 Deane Duplex.  
 5 1/2 x 3 1/2 x 5 Worthington Duplex.  
 5x3 1/2 x 7 No. 2 Knowles Single.  
 5x3x7 Norwalk Single.  
 5x3x6 Marsh Single.  
 4 1/2 x 3 x 4 Dayton Duplex.  
 5x2 1/2 x 6 Cameron Single.  
 3x2x5 Deane Single.  
 6x4x7 Knowles Duplex.  
 6x16 Deane Artesian Well.  
 4x4 Goulds Triplex.  
 3x4 Goulds Triplex.  
 No. 5 Niagara, Two Man Force.

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No. 3 Connersville Positive, opening 12 in.  
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 No. 9 Buffalo Exhaust Bot. Hor. Dis.  
 No. 8 Sturtevant Exhaust Bot. Hor. Dis.  
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No. 6 Sturtevant Exhaust Bot. Hor. Dis.  
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 1—18-ft. Fraser & Chalmers Revolving Dryer.

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 1—6-K.W. Great Western Generator.  
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 2—15 Arc Light Ball Generators.  
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 14x16x9 1/2 x 16 Norwalk.  
 14x16x9 1/2 x 16 Norwalk.  
 14x16x22 Rand Straight Line.  
 10x12x6 1/2 x 12 Norwalk.  
 8x9x12 Leyner Straight Line.

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 10 Victor, with steel.  
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 8—8-ft. Fraser & Chalmers Settlers.  
 8—8-ft. Comb. Agitators and Pans, Colorado Iron Works.  
 3—36-in. Cleanup Pans, Fraser & Chalmers.  
 1—60-in. Cleanup Pan, Colorado Iron Works.  
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 1—5-ft. Meech Pan.  
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 11x7 Colorado Iron Works Dodge.  
 11x7 Jackson Dodge.  
 10x7 Fraser & Chalmers Blake.  
 10x4 Blake Blake.

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 10x30 Fraser & Chalmers.  
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 12x20 Jackson Belted.  
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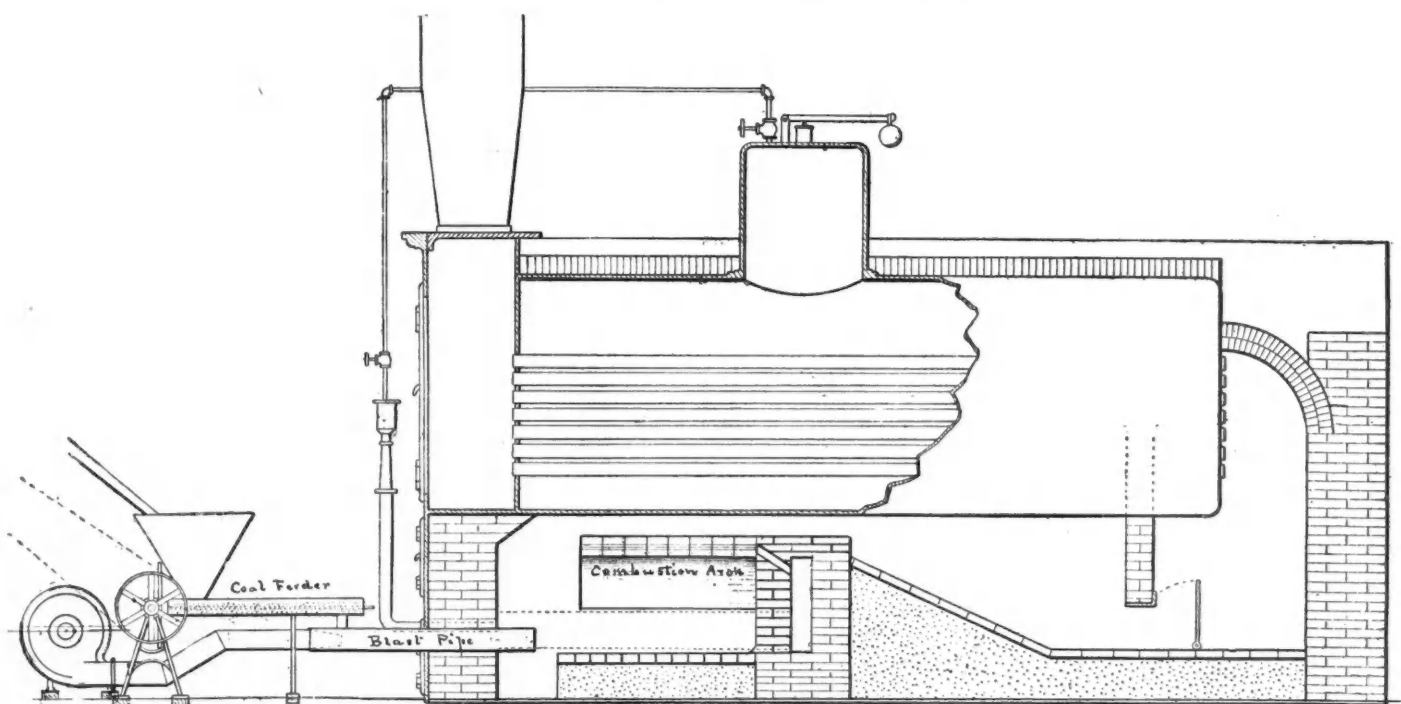
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**2150 WANTED:** By coal company. Young mining engineer with experience in underground surveying in shafts; must be good draftsman with knowledge of construction work; state experience, age, salary expected, etc. Technical graduate preferred. Address "Illinois," Engineering and Mining Journal.

**2152 WANTED**—Mining Engineer, experienced in bituminous coal measures, address, with reference, Ellicott Machine Co., Baltimore, Maryland.

**2155 WANTED AT ONCE,** amalgamator for ten-stamp gold mill in Ontario. Must have thorough experience and be well recommended as to ability and integrity. Apply, with letters, to STAMPMILL, care Engineering and Mining Journal.

**2156 WANTED:** Foreman and Assistant Superintendent for Aluminum Sulphate and Aluminum Works. An energetic, practical man with executive qualities can obtain a good paying position with advancement, on a contract, by taking stock in Company during term of engagement (from \$1,500 to \$3,000) same to be taken up at expiration of agreement. Address: The Schwahn Reduction Company, 307 Wainright Bldg., St. Louis, Mo.

**2157 METALLURGIST,** thoroughly experienced in wet extraction and electrolysis of copper and able to design, build and manage works for this purpose, wanted for a position in Europe. Address, stating references and salary wanted, Dr. H. Schweitzer, 40 Stone St., New York City.

**2158 WANTED**—A bright, active man of good address, graduate of a reputable American college, experienced in the science and art of amalgamating gold ores, to introduce a new amalgamating process. Salary \$200 a month. Address, stating age, education and experience, Dr. Peter T. Austen, 80 Broad St., New York.

**2159 WANTED**—A Manager to take charge of a Placer Mine in Sonora, Mexico. Must thoroughly understand Placer Mining and the placing, operating and repairing of machinery for hoisting gravel, and have had experience in surface and underground workings. Address, stating experience, where employed, and how long, wages wanted, and references, M. V. Hutchinson, 853 Washington St., Boston, Mass.

**SITUATIONS WANTED**

Advertisements under this heading 50 cents for 50 words or less. Additional words, two cents a word. Cash or stamps must accompany order.

A CHEMIST of 14 years' experience in all kinds of analytical (organic and inorganic) and metallurgical work, assaying electrochemistry, etc., at present in charge of a large commercial laboratory, desires a change. Thoroughly competent college graduate. Would like position with commercial laboratory, smelter or responsible mining company. References A1. Address Laboratory, care Engineering and Mining Journal. No. 19,709, Jan. 10.

A N EXPERT in the development, equipment, working and management of mines, especially iron, is open to engagement. Technical education, long practical experience; highest references. Address Iron Mines, Engineering and Mining Journal. No. 19,690, Dec. 27.

A MINING ENGINEER, who has had over 20 years' practical experience since graduating from College in Mining (in most extensive developed mines, as well as in prospecting) Superintendence, and as Consulting Engineer, desires a position as Superintendent or Manager of Mines. Address, Conover, Engineering and Mining Journal, or to Station D, San Francisco Post Office, California. No. 19,714, Dec. 27.

BOOK-KEEPER and ACCOUNTANT, American, twenty-nine years of age, desires position with first-class mining company in the United States or Mexico, if locality is healthy. Having had twelve years' experience in wholesale commission and export business in San Francisco, is thoroughly conversant with modern business in including purchase and transportation of merchandise. Can furnish unqualified references as to character and ability. Address Accountant, Engineering and Mining Journal, San Francisco, Cal. No. 19,679, Dec. 27.

BOOK-KEEPER, fully experienced in mine and metal accounting and all clerical details of the metal trade, having had six years' experience in the metal line, is open for engagement. American, age 24. Highest references as to ability and character. Address Metal, Engineering and Mining Journal. No. 19,708, Dec. 27.

CIVIL ENGINEER, with seven years' experience on railroad work, would like employment with reliable mining company in West with view to investing in mining enterprise after becoming familiar with the work. Graduate of technical university, 29 years old, unmarried, thorough instrument man and draftsman. Lately Chief Engineer of small railroad. Address W. M. J., Engineering and Mining Journal. No. 19,713, Jan. 3.

COPPER MINING ENGINEER, recently back from abroad, open for re-engagement in United States or Mexico. Copper preferred. Experience: six years consulting mining engineer Lake Superior region, eight years manager mines and smelting works, Copper, silver-lead, zinc, iron. First-class references. Address Pyritic, Engineering and Mining Journal. No. 19,696, Jan. 3.

EXPERIENCED MINING BOOKKEEPER and Accountant; thorough knowledge of Spanish, highest recommendations, desires a position in Mexico, Central or South America. Address F. Cadell, Room 104, 15 Whitehall Street, New York City. No. 19,715, Jan. 3.

HYDRAULIC MINING—Capable energetic placer mining superintendent desires appointment. Experienced in construction of ditches, and designing and laying out of necessary hydraulic plant. Has been connected with extensive concerns, being accustomed to handle profitably large quantities of gravel. Good Spanish scholar. Ready for immediate engagement. Excellent references. Address Placers, Engineering and Mining Journal. No. 19,689, Dec. 27.

METALLURGICAL ENGINEER, Specialist in Cyaniding and gold milling, thorough Chemist and Assayer, technically educated; eight years' experience in responsible positions in America and abroad; at present metallurgist in charge of large and successful western Cyanide Works, desires change of position. Would consider opening in reliable ore testing works in city, where his extensive practical knowledge would be utilized. Address Filter Press, Engineering and Mining Journal. No. 19,687, Jan. 17.

METALLURGIST and MINING ENGINEER with extensive experience in lead and copper smelting and refining; and also in mine examination, is open to engagement after January 1st, 1903. Address December, Engineering and Mining Journal. No. 19,694, Jan. 3.

METALLURGIST and chemist, 31 years of age, at present with smelting company, will be open for engagement December 1st. Specialty: copper smelting, leaching silver and copper ores in Mexico, Arizona and California. Speaks Spanish. Can furnish first-class references. Address V. S., Engineering and Mining Journal. No. 19,676, Dec. 27.

MINING ENGINEER and metallurgist, 20 years' experience as manager and superintendent of mines and mills in the United States, Mexico and Central America, wishes a position as manager or consulting engineer; speaks Spanish; the best of references furnished. Address C., Engineering and Mining Journal. No. 19,699, Jan. 31.

MINING ENGINEER with several years' practical experience in management of large properties will be open for engagement January 1st, 1903. References of highest order as to ability can be furnished. Address A. I. M. E., Engineering and Mining Journal. No. 19,674, Jan. 17.

MINING ENGINEER and superintendent of mines wishes change of position; a man of energy, experience and integrity in the management and examination of properties and construction of milling and mining plants; technically educated, willing and of strict temperate habits. Best of references. Address XX, Engineering and Mining Journal. No. 19,716, Feb. 28.

MINING ENGINEER—15 years' underground practical experience as manager and superintendent of mines and mills, wishes a position as manager or assistant manager. Thorough accountant. Can speak Spanish. Address B. J. J., care Engineering and Mining Journal. No. 19,711, Jan. 10.

MINING ENGINEER, with experience in managing large mining properties, desires position as Superintendent or Manager of a company willing to pay for good, economical management; good references. Address W. D., Engineering and Mining Journal. No. 19,704, Jan. 10.

MINING ENGINEER, thoroughly experienced in the management of producing properties, development and exploratory work; competent chemist and engineer; will be open for engagement about January 1st as superintendent, engineer or chemist. U. S. or Mexico. Speaks Spanish. Address A. O. K., Engineering and Mining Journal. No. 19,702, Dec. 27.

POSITION WANTED by accountant of prominent mining and milling company in Mexico employing 1,500 to 2,000 men. Thoroughly experienced in clerical details and accounting involved in heavy construction of reduction works and diversified operations of such company and in showing results periodically. Familiar with Spanish language and Mexican mining and commercial laws. American; age 31; strictly sober. With present employers several years; formerly their cashier. Bond furnished. Address X, Apartado 93, Torreón, Coah, Mexico. No. 19,688, Dec. 27.

PRESENT GENERAL MANAGER of gold and copper properties in Mexico, contemplates a change. Is thoroughly qualified to handle large properties with economy and success, is a close and experienced buyer, an expert on mechanical equipment, successful in handling men, and is energetic, practical, and up to date. Age 34. Spanish spoken fluently. Only a proposition of scope and importance is desired. Address Yendis, Engineering and Mining Journal. No. 19,693, Jan. 10.

TECHNICALLY EDUCATED MINING MAN with thorough practical training in underground work, milling, assaying, surveying, and one who has successfully supervised dividend paying properties, desires engagement with good company. Able to take entire charge of mining enterprise. Foreign engagement acceptable. Fair knowledge of Spanish. Best references. Address B. H., Engineering and Mining Journal. No. 19,712, January 10.

SUPERINTENDENT or MANAGER—Man of 35, with 15 years' practical experience in mining, metallurgy and chemistry, understands handling labor, accounting, purchasing of supplies, etc., desires position. Will examine, report and develop properties. Plan and erect plants. For ten years foreman, metallurgist and superintendent of two of the largest copper companies in the West, and at present manager of a copper property in Mexico. Strong indorsements. Address J. G. B., P. O. Box 585, Los Angeles, Cal. No. 19,698, Jan. 10.

TECHNICAL GRADUATE, with 3 years' experience in mining and civil engineering, desires position with responsible mining company as Assayer, Surveyor or Assistant Engineer. Age 25. Good references. Address G. E. R., Engineering and Mining Journal. No. 19,710, Jan. 10.

WANTED POSITION, middle of March, 1903, by a thoroughly practical smelter of 25 years' experience. Blast or reverberatory furnaces. Converting, desilverizing, Lixivation. Refining of clear volitic residues. Speaks Spanish and can handle Mexican labor. Good references. Wages required \$150, gold, per month. Change of locality desired. Address I. H. R., Mineral Aurora, Teziutlau, Estado de Puebla, Mexico. No. 19,677, Jan. 17.

WANTED—Graduate of University of Virginia and Johns Hopkins University (Ph.D.) with four years' experience in teaching and same time in applied chemistry as Chemist to Iron Co. and Superior Board of Health of Puerto Rico (now occupying latter position), desires position in college, university, or laboratory. Speaks Spanish fluently. Address Quimoco, Box 466, San Juan, Puerto Rico. No. 19,707, Jan. 10.

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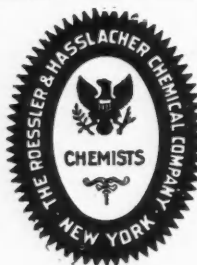
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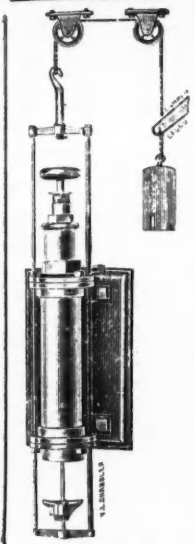
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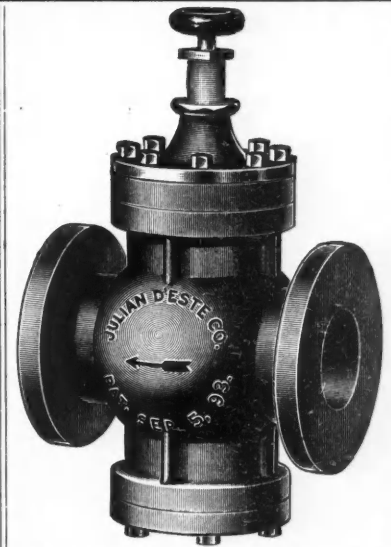
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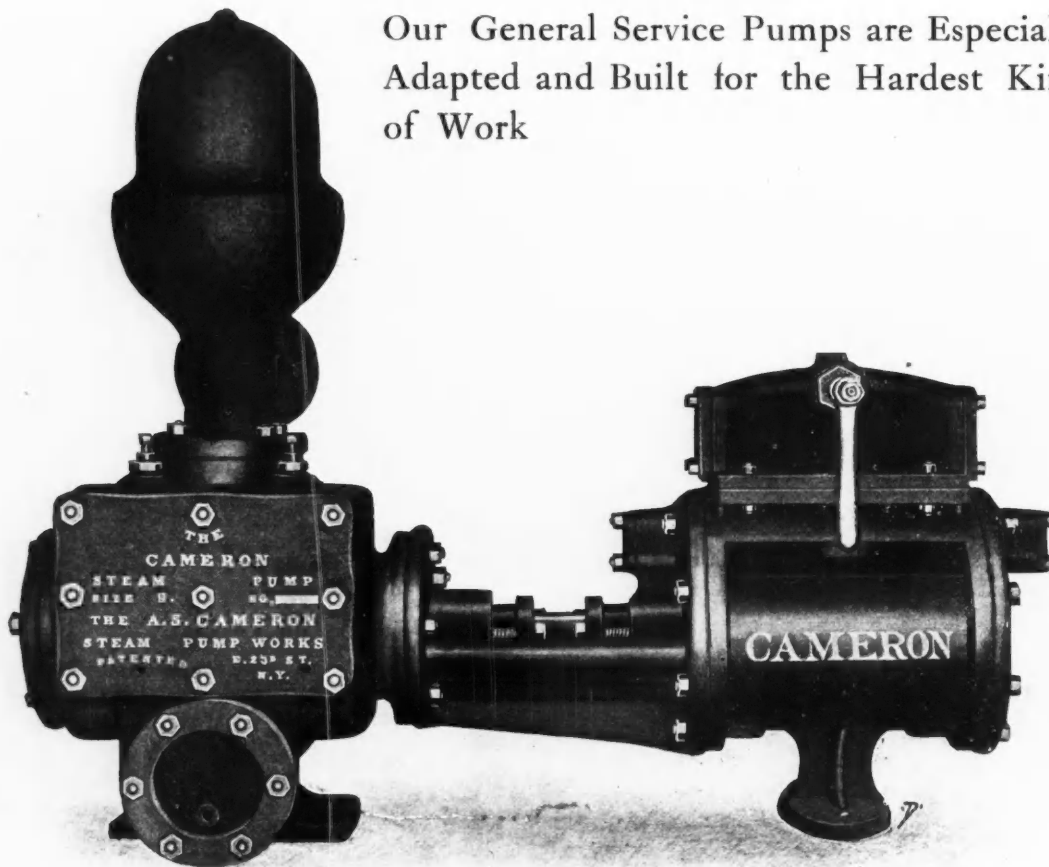


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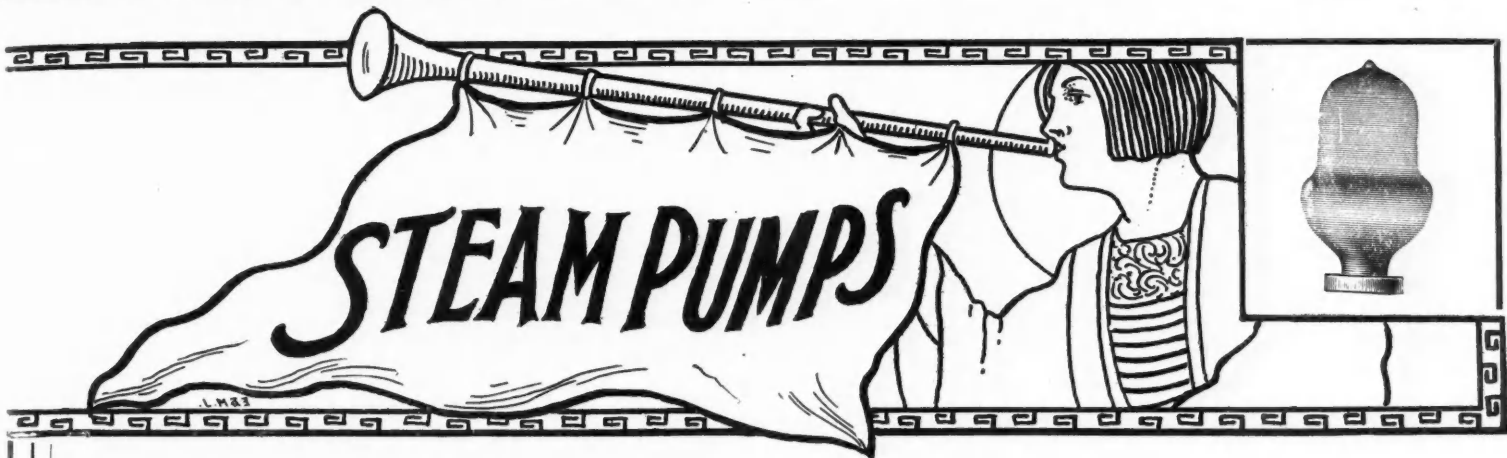
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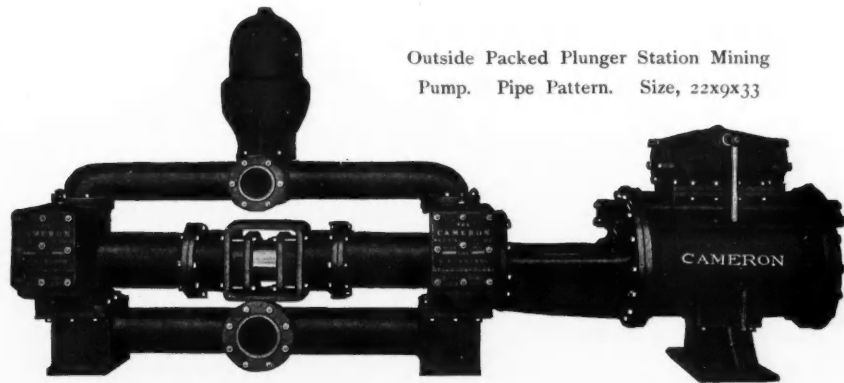
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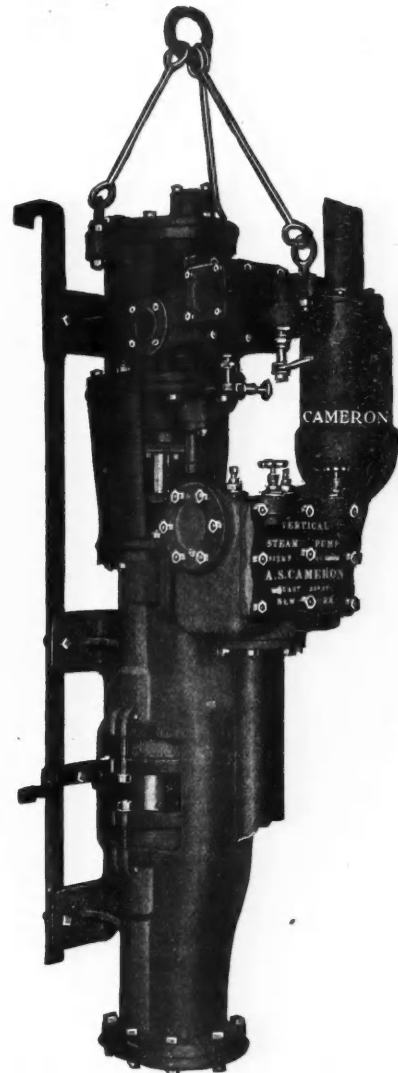
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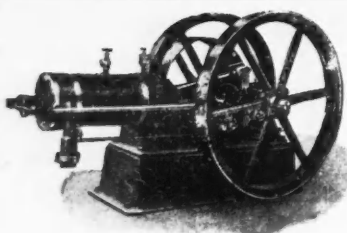
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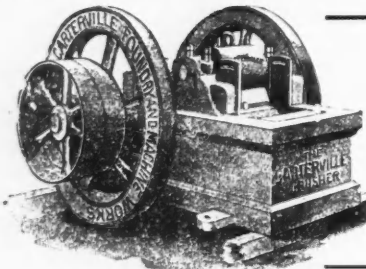
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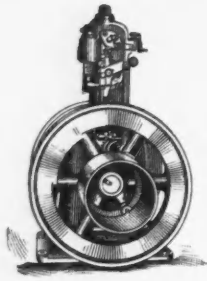


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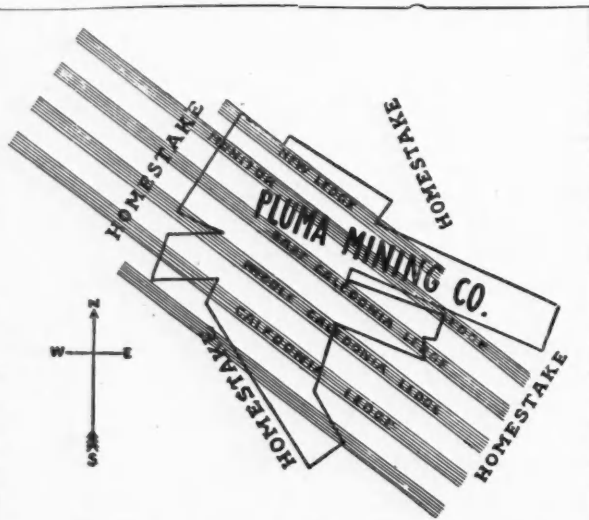
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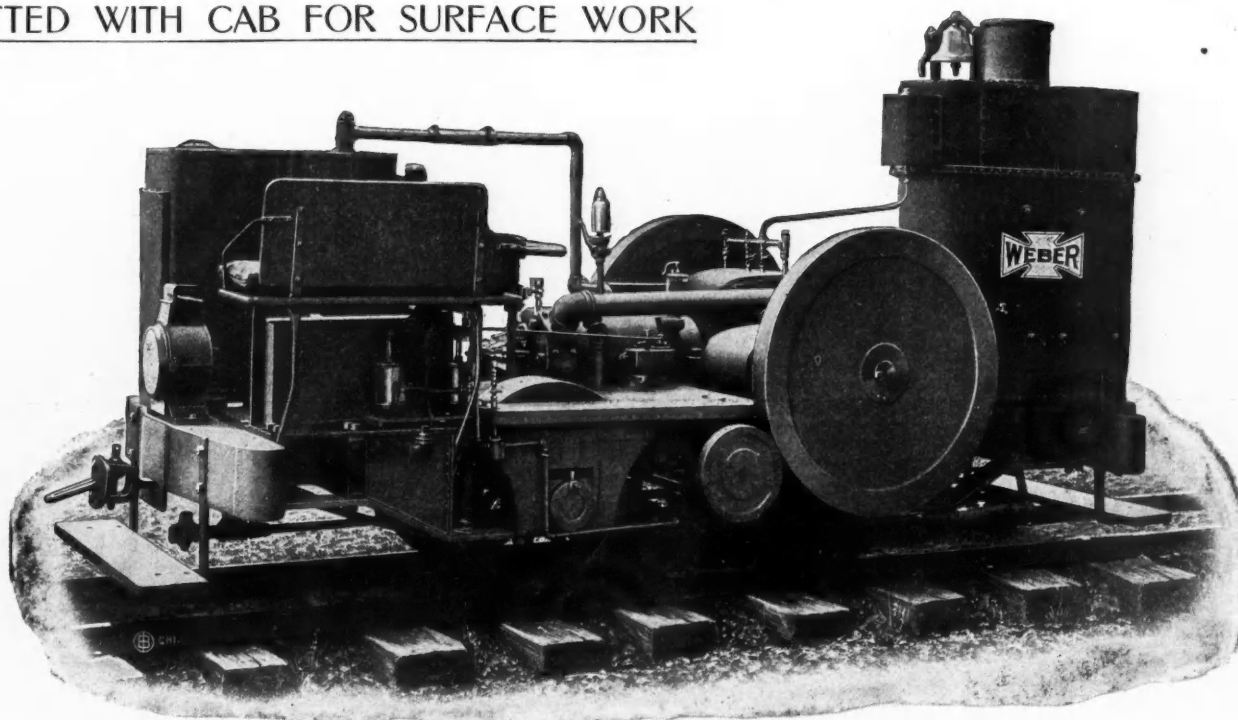
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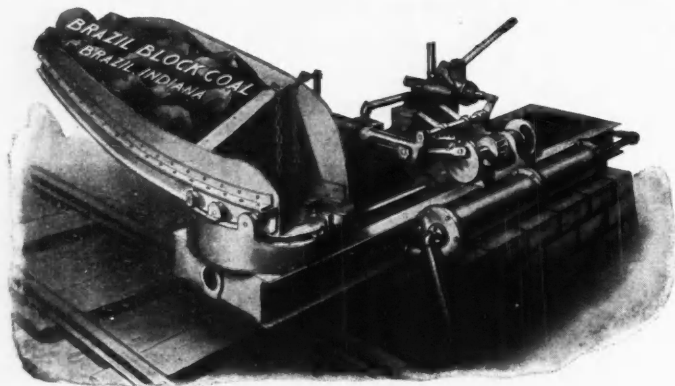
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This pre-eminent work is beyond all doubt or question the very highest authority ever issued on the subject. It is perfectly complete in all details, leaving from a metallurgical basis, nothing to be desired or looked for, and it can be safely classed as the only standard text-book on Copper Smelting now extant which is absolutely indispensable to everyone connected with the buying selling and treatment of copper ores.

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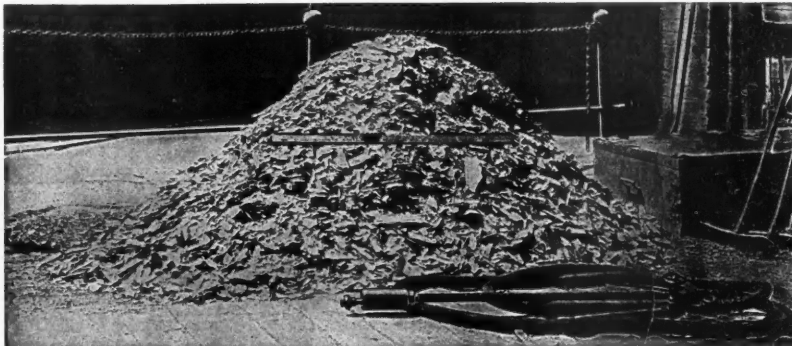
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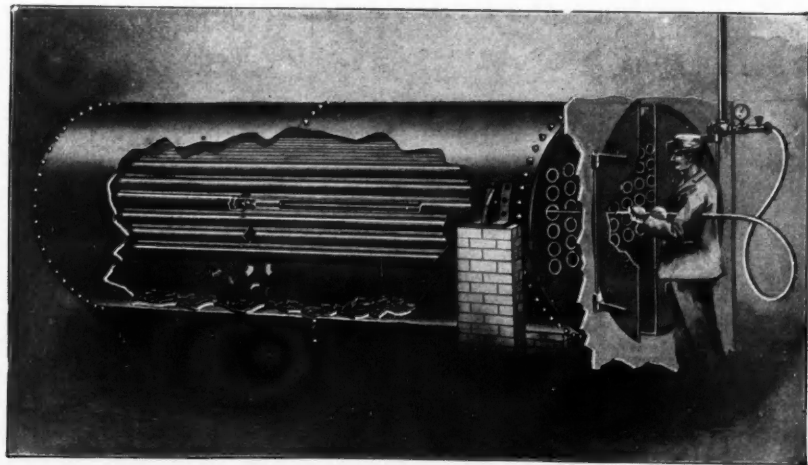
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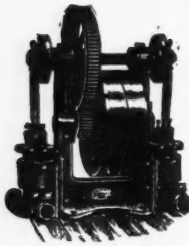
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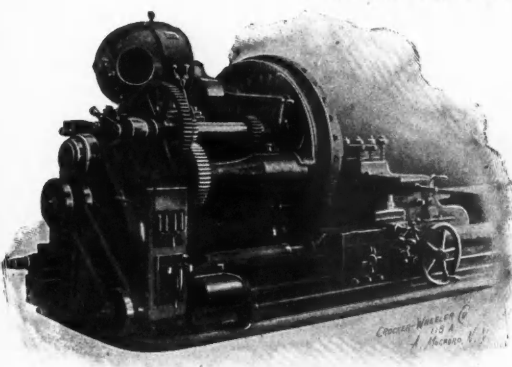
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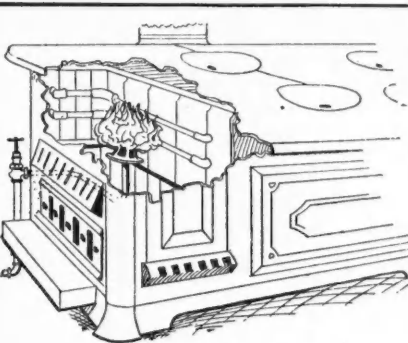
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Holthoff Mach'y Co., Cadzay, Wis.  
Krupp, Fried., Magdeburg-Buckau.  
Pollock, W. B., Co., Youngstown, O.

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Bristol, The, Co., Waterbury, Conn.  
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Crane Co., Chicago, Ill.  
Cresson Co., Philadelphia, Pa.  
Crosby Steam Gauge & Valve Co., Boston, Mass.  
Denver, The, Eng. Works Co., Denver, Colo.  
Link-Belt Machinery Co., Chicago, Ill.  
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Wood & Co., R. D., Philadelphia, Pa.

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Sanders & Rising, Los Angeles, Calif.  
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Klipstein & Co., A., New York, N. Y.

**GRAPHITE.**

Dixon Crucible Co., Jos., Jersey City, N. J.  
Int. Acheson Graphite Co., Niagara Falls, N. Y.  
Wisconsin Graphite Co., Pittsburg, Pa.

**GREASE.**

Besly, C. H., Chicago, Ill.  
Cook's Sons Co., A., New York, N. Y.  
Dixon Crucible Co., Jos., Jersey City, N. J.  
Wisconsin Graphite Co., Pittsburg, Pa.

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Cook's, Adam, Sons Co., New York, N. Y.  
Detroit Lubricator Co., Detroit, Mich.  
Lunkenheimer Co., The, Cincinnati, O.  
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**GRINDING MILL MACHINERY.**

Allis-Chalmers Co., Chicago, Ill.  
Kent Mill Co., New York, N. Y.  
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**HAMMERS (STEAM).**

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Pelton Water Wheel Co., San Franc., Calif.

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Anton, Geo., Monongahela City, Pa.  
Cummings & Co., John S., Tunnelton, W. Va.

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Pass, C., & Son, Ltd., Bristol, England.  
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Picher Lead Co., Chicago, Ill.  
Pennsylvania Smelting Co., Pittsburg, Pa.  
Raymond Lead Co., Chicago, Ill.

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Raymond Lead Co., Chicago, Ill.

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Baldwin Locomotive Works, Philadelphia, Pa.  
General Electric Co., Schenectady, N. Y.  
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Hunt Co., C. W., West New Brighton, N. Y.  
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Westinghouse Elect. & Mfg. Co., Pittsburg, Pa.

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Baldwin Locomotive Works, Philadelphia, Pa.  
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Tallon, C. J., San Franc., Calif.  
Porter, H. K., Co., Pittsburg, Pa.  
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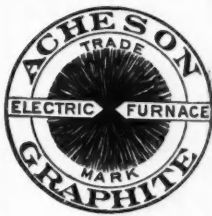
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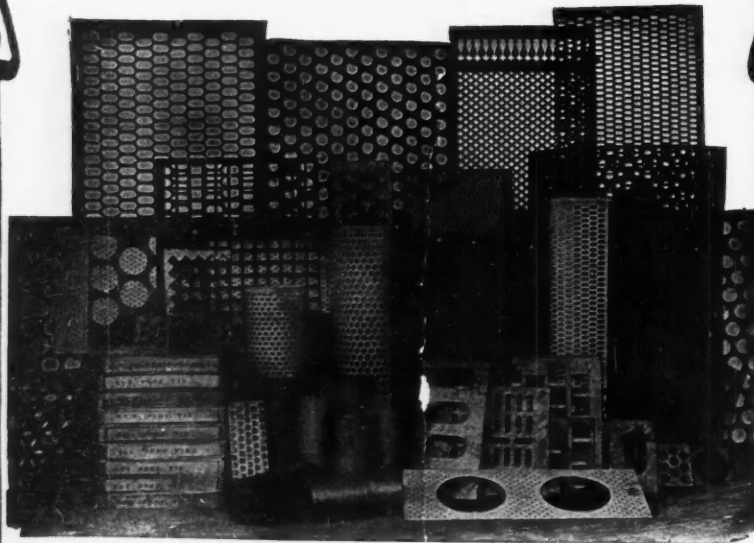
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 Dixon Crucible Co., Jea., Jersey City, N. J.  
 Wisconsin Graphite Co., Pittsburg, Pa.
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 Blackwell, Sons & Co., Geo. G., Liverpool, England.
- MANGANESE STEEL CASTINGS.**  
 Taylor Iron & Steel Co., High Bridge, N. J.
- MECHANICAL DRAFT.**  
 Buffalo Forge Co., Buffalo, N. Y.  
 Sturtevant Co., B. F., Boston, Mass.
- METAL DEALERS.**  
 American Smelting & Refining Co., New York.  
 American The Metal Co., New York, N. Y.  
 Bath, Henry & Son, London, England.  
 Besly & Co., C. H., Chicago, Ill.  
 Blackwell Sons & Co., Geo. G., Liverpool, England.  
 De Lamar Copper Ref'g Wks., Carteret, N. J.  
 Downs, F. L., N. Y.  
 Eureka, The, Co., San Francisco, Cal.  
 Fuerst Bros. & Co., New York, N. Y.  
 Great Western Ext. & Red. Co., Boulder, Colo.  
 Illinois Zinc Co., Peru, Ill.  
 Johnson, Matthey & Co., London, England.  
 Markeen Copper Co., New York, N. Y.  
 Matthiessen & Hegeler Zinc Co., La Salle, Ill.  
 Nichols Chemical Co., New York, N. Y.  
 Orford, The, Copper Co., New York, N. Y.  
 Pass, C. & Son, Bristol, England.  
 Picher Lead Co., Chicago, Ill.  
 Pyne Smelter, San Francisco, Calif.  
 Raymond Lead Co., Chicago, Ill.  
 Seattle Sm. & Refg. Co., Seattle, Wash.  
 Selby Smelting and Lead Co., San Francisco, Cal.  
 United Metals Selling Co., New York, N. Y.  
 Vogelstein, L., New York, N. Y.
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 Sturtevant Mill Co., Boston, Mass.
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 Foote Mineral Co., Philadelphia, Pa.
- MINE TRANSIT (POCKET).**  
 Ainsworth, Wm., Denver, Colo.
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 Rufe Mining, Milling & Sm. Co., Sonora, Mex.  
 California Nevada Mfg. Co., Los Angeles, Cal.  
 Engels Copper Mining Co., San Francisco, Cal.  
 Gray Eagle Cons. Mfg. Co., Nevada Co., Calif.  
 Ludlow Mining Co., Los Angeles, Calif.  
 Montreal & Boston Copper Co., Montreal, Can.  
 Oregon Yellow Jacket Mfg. Co., Los Angeles, Cal.  
 Pacific States Mining and Investment Co., San Francisco, Calif.  
 Pluma Mining Co., Des Moines, Ia.  
 Riverside Copper Co., Phoenix, Ariz.  
 Success Copper Mining Co., Los Angeles, Cal.  
 Wolverine Copper Mining Co., Kearsarge P. O., Mich.
- MOLYBDIC ACID.**  
 Fuerst Bros. & Co., New York, N. Y.
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 Crocker-Wheeler Co., Ampere, N. J.  
 Elwell-Parker Electric Co., Cleveland, O.  
 General Electric Co., Schenectady, N. Y.  
 Guarantee Electric Co., Chicago, Ill.  
 Holtzer-Cabot Elect. Co., Brookline, Mass.  
 Western Elect. Supply Co., St. Louis, Mo.  
 Westinghouse Electric & Mfg. Co., Pittsburg, Pa.
- NICKEL.**  
 Canadian, The, Copper Co., Cleveland, O.  
 Orford, The, Copper Co., New York, N. Y.
- OIL BURNERS.**  
 Amer. Crude Oil Burner Co., San Franc., Cal.  
 Hammel, C. A., Los Angeles, Cal.  
 Tracy Eng. Co., San Francisco, Cal.  
 Union Cons. Ref'g. Co., Los Angeles, Calif.  
 Wilgus Mfg. Co., San Franc., Calif.
- OIL WELL SUPPLIES.**  
 National Supply Co., Pittsburg, Pa.  
 Partridge & Alford Iron Wks., Los Angeles, Calif.
- OILS.**  
 Cook's, Adam, Sons & Co., New York, N. Y.  
 Ironsides Co., The, Columbus, O.  
 Woolner Oil Co., Los Angeles, Calif.
- OILERS.**  
 Besly & Co., C. H., Chicago, Ill.  
 Detroit Lubricating Co., Detroit, Mich.  
 Gem Mfg. Co., Pittsburg, Pa.  
 Ironsides Co., Columbus, O.  
 Lunkenheimer Co., The, Cincinnati, O.  
 Powell & Co., The, Wm., Cincinnati, O.
- OILLESS BEARINGS.**  
 Graphite Lubricating Co., Bound Brook, N. J.
- RE PURCHASERS.**  
 American Metal Co., New York, N. Y.  
 Balbach Smelting & Refining Co., Newark, N. J.  
 Baltimore, The, Copper Works, Baltimore, Md.  
 Copper King, The, Ltd., San Francisco, Cal.  
 De Lamar Copper Ref'g Wks., Carteret, N. J.  
 Donaldson, A. M., & Co., Denver, Colo.  
 Fuerst Bros. & Co., New York, N. Y.  
 Gold and Silver Extraction Co., Denver, Colo.  
 Hagston, T. B., Co., Philadelphia, Pa.  
 Ledoux & Co., New York, N. Y.  
 Matthiessen & Hegeler Zinc Co., La Salle, Ill.  
 Nichols Chemical Co., New York, N. Y.  
 Ogden Assay Co., Denver, Colo.  
 Orford, The, Copper Co., New York, N. Y.  
 Pac. Coast Sm. & Refg. Wks., San Franc., Calif.  
 Pass & Son, C., Ltd., Bristol, England.  
 Penalosa & Co., St. Louis, Mo.  
 Penn. Salt Mfg. Co., Philadelphia, Pa.  
 Pennsylvania Smelting Co., Pittsburg, Pa.
- Penn Smelting & Refining Works, Philadelphia, Pa.**  
**Penn. Sweep Smelting & Refining Co., Philadelphia, Pa.**  
**Pyne Smelter, San Francisco, Calif.**  
**Ricketts & Banks, New York, N. Y.**  
**Selby Smelting and Lead Co., San Francisco, Cal.**  
**Tacoma Smelting Co., Tacoma, Wash.**  
**Vogelstein, L., New York.**
- ORE TESTING WORKS.**  
 Gold and Silver Extraction Co., Denver, Colo.  
 Hunt, F. F., New York, N. Y.  
 Ledoux & Co., New York, N. Y.  
 Penn. Smelting & Ref. Co., Philadelphia, Pa.  
 Pennsylvania Smelting Co., Pittsburg, Pa.  
 Phillips, Alvin, Denver, Colo.  
 Pitkin, Lucius, New York, N. Y.  
 Ricketts & Banks, New York, N. Y.  
 Selby Smelting & Lead Co., San Francisco, Cal.  
 Simonds & Wainwright, New York, N. Y.  
 Webb City Sampling Works, Webb City, Mo.  
 White, Edw. F., Bayonne, N. J.  
 Wood, Henry E., Denver, Colo.
- PACKING AND PIPE COVERINGS.**  
 Brandt, Randolph, New York, N. Y.  
 Chesterton & Co., A. W., Boston, Mass.  
 Jenkins Bros., New York, N. Y.  
 Lechen & Sons Rope Co., A., St. Louis, Mo.  
 Manhattan Rubber Mfg. Co., New York.  
 Quaker City Rubber Co., Philadelphia, Pa.  
 Robertson & Sons, Jas. L., New York, N. Y.  
 Wyckoff, A., & Son, Elmira, N. Y.
- PAINTS.**  
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 Int. Acheson Graphite Co., Niagara Falls, N. Y.
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 Frothingham, N. L., New York, N. Y.  
 Johnston, Thos. J., New York, N. Y.  
 Mason Fenwick Lawrence, Washington, D. C.  
 Siggers & Siggers, Washington, D. C.  
 Straley, Hasbrouck & Schroeder, New York.  
 Townsend Bros., Los Angeles, Cal.
- PERFORATED METALS.**  
 Aitchison, The, Robert, Perforated Co., Chicago, Ill.  
 Allis-Chalmers Co., Chicago, Ill.  
 American Eng. Works, Chicago, Ill.  
 Harrington & King Perf. Co., Chicago, Ill.  
 Hendrick Mfg. Co., Carbondale, Pa.  
 Johnston & Chapman Co., Chicago, Ill.  
 Ludlow-Saylor Wire Co., St. Louis, Mo.  
 Selby-Suessdorf Mfg. Co., St. Louis, Mo.
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 Roessler & Hasslacher Chem. Co., N. Y.
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 Phosphor-Bronze Smelting Co., Philadelphia.
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 Bucyrus, The, Co., South Milwaukee, Wis.  
 Ingersoll-Sergeant Rock Drill Co., New York.  
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 Weber Gas & Gasoline Eng. Co., Kansas City, Mo.
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 Crane Co., The, Chicago, Ill.  
 Vancouver Eng. Wks., Vancouver, B. C.  
 Wood, R. D., & Co., Philadelphia, Pa.
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 Fairbanks, Morse & Co., Chicago, Ill.
- PIPE (RIVETED STEEL).**  
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 Pollock, Wm. B. Co., Youngstown, O.  
 Risdon Iron Works, San Francisco, Cal.  
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 Crane Co., Chicago, Ill.  
 Curtis & Curtis, Bridgeport, Conn.
- PIPE VISES.**  
 Armstrong Mfg. Co., Bridgeport, Conn.  
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 Crane Co., Chicago, Ill.
- PIPE JOINT PASTE.**  
 Wisconsin Graphite Co., Pittsburg, Pa.
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- PLACER MINING MACHINERY.** (See Dressing Machinery).

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Holthoff Mach'y Co., Cudaby, Wis.  
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Link-Belt Machinery Co., Chicago, Ill.  
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Mecklenburg Iron Works, Charlotte, N. C.  
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**SCREENS (MINING).**

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Denver, The, Eng. Works Co., Denver, Colo.  
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Hendrick Mfg. Co., Carbondale, Pa.  
Jeffrey Mfg. Co., Columbus, O.  
Johnston & Chapman Co., Chicago, Ill.  
Link-Belt Machinery Co., Chicago, Ill.  
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Michigan Wire Cloth Co., Detroit, Mich.  
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Thompson, Son & Co., New York.  
Wickes Bros., Saginaw, Mich.

**SEPARATING PROCESSES (ORES).**

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Pneumatic Cyanide Process Co., Denver, Colo.  
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Young & Park, New York.

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Goubert Mfg. Co., N. Y.  
Scranton Steam Pump Co., Scranton, Pa.

**SEIERS.**

Buffalo Forge Co., Buffalo, N. Y.

**SHIELDS.**

Ironsides Co., The, Columbus, O.

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Allis-Chalmers Co., Chicago, Ill.  
American Eng. Works, Chicago.  
Chester Steel Casting Co., Philadelphia.  
Chrome Steel Works, Brooklyn, N. Y.  
Colorado Iron Works Co., Denver, Colo.  
Denver, The, Eng. Works Co., Denver, Colo.  
Koppel, Arthur, New York, N. Y.  
Sandycroft Foundry Co., Ltd., Chester, Eng.  
Tallon, C. J., San Franc., Calif.  
Taylor Iron & Steel Co., High Bridge, N. J.  
Western Forge Co., St. Louis, Mo.

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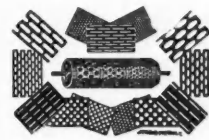
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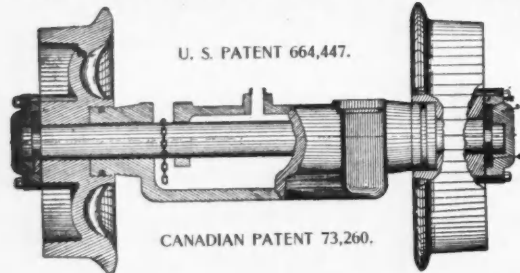
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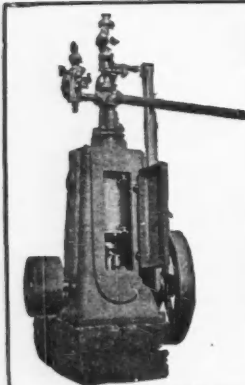
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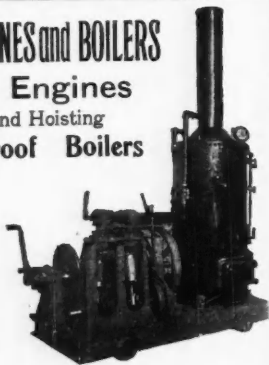


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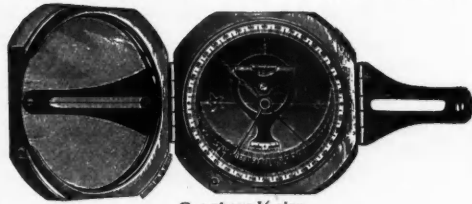
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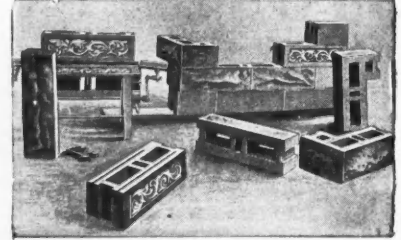
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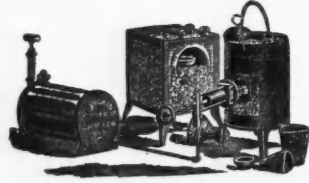
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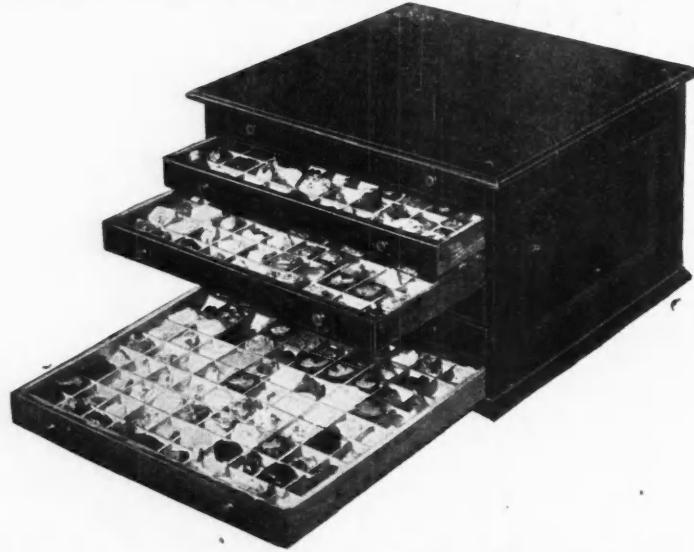
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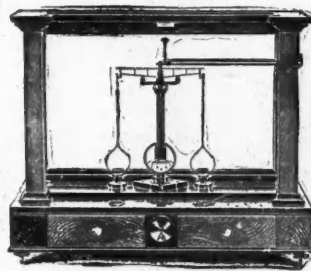


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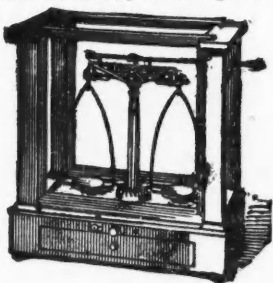
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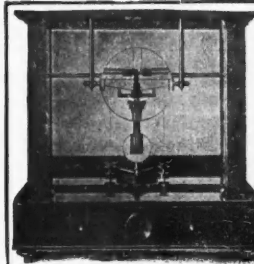
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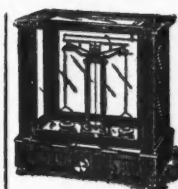
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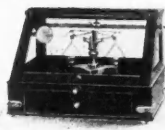


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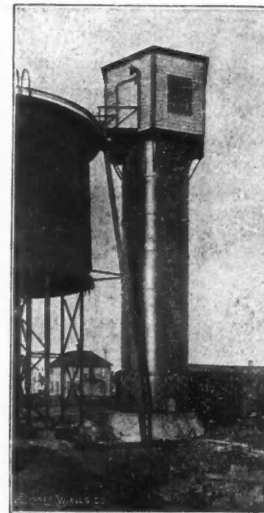
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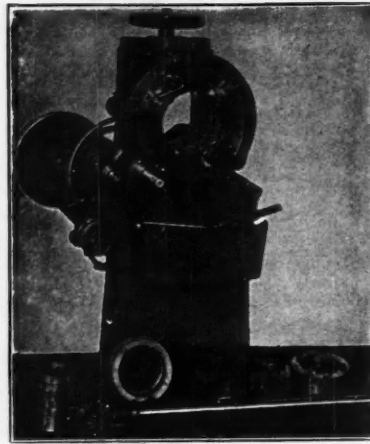
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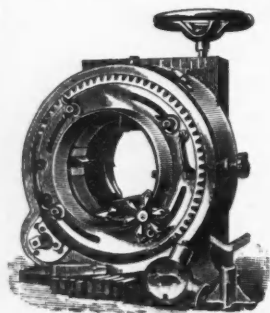
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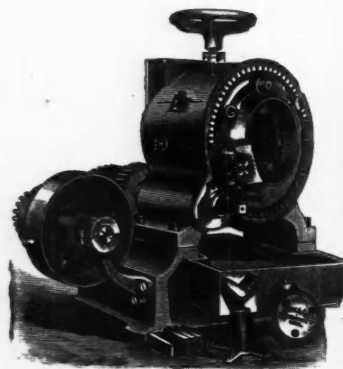
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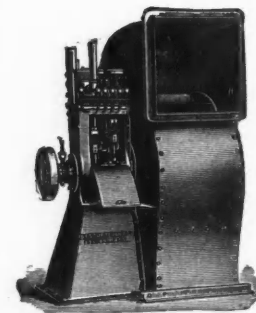
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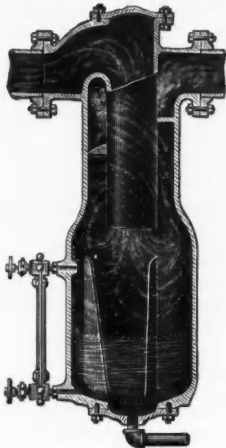
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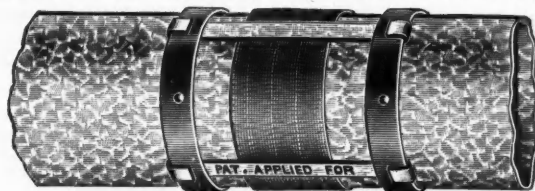
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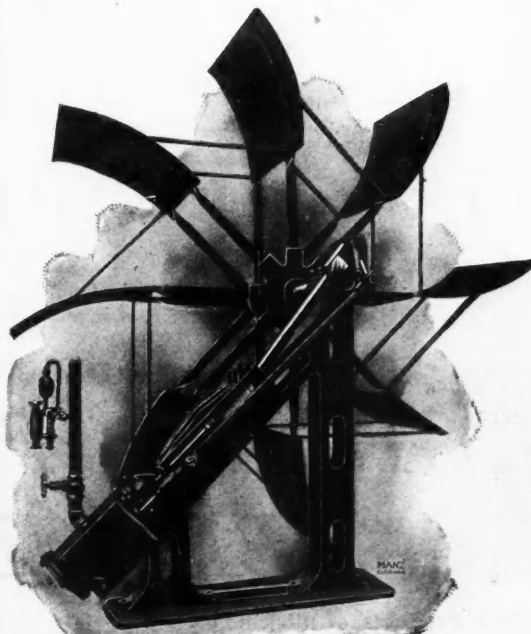
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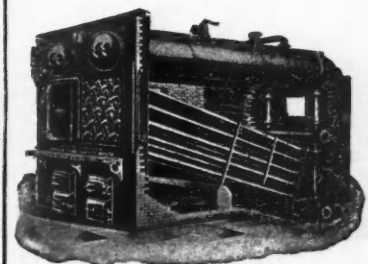
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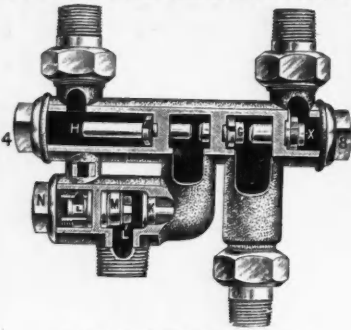
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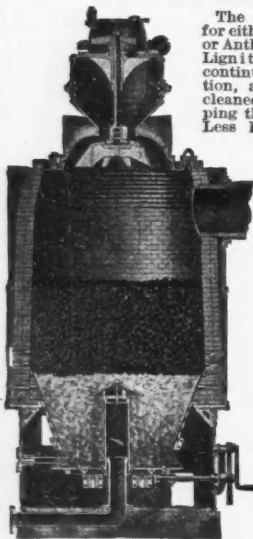
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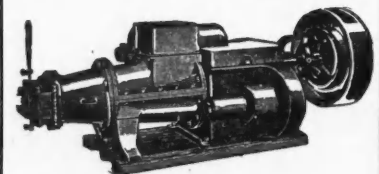
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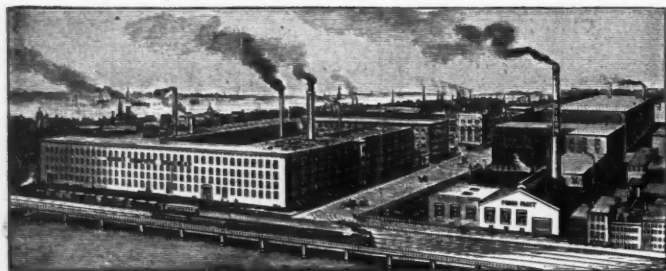
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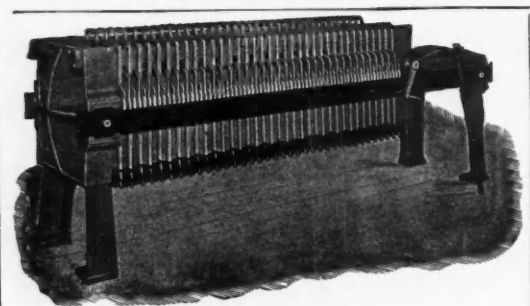
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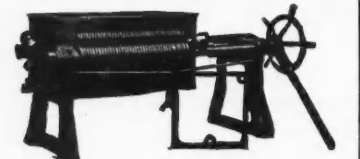
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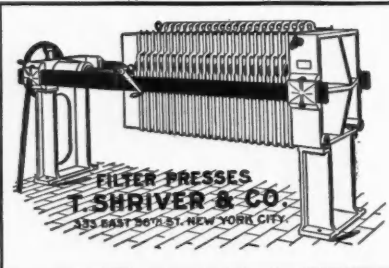


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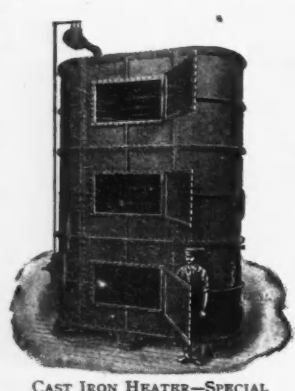
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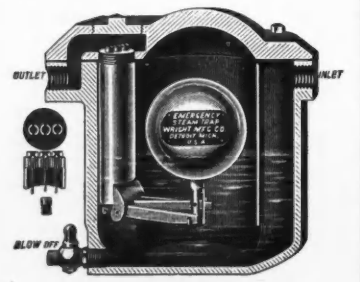
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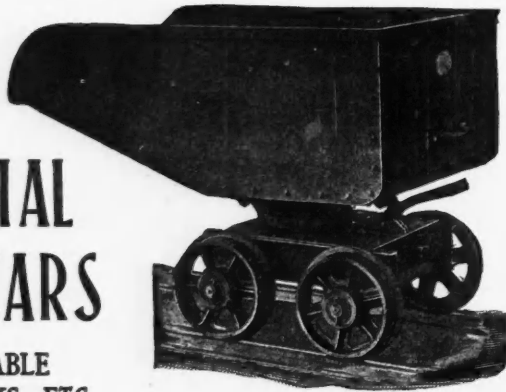
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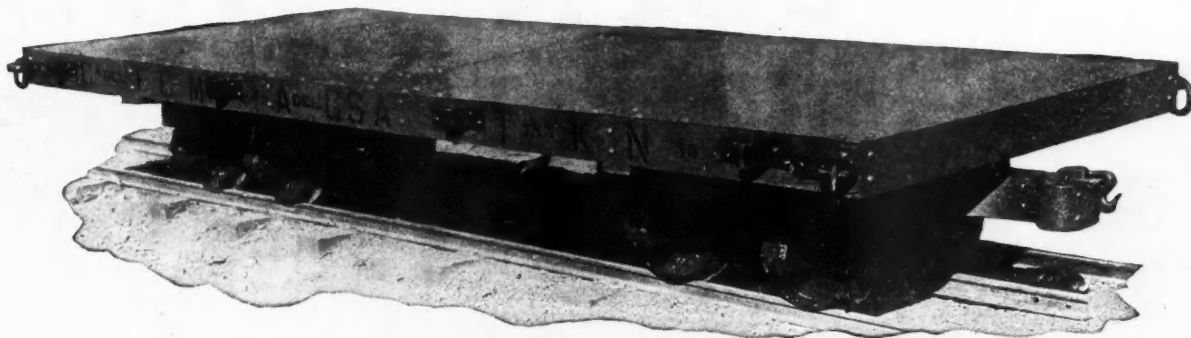


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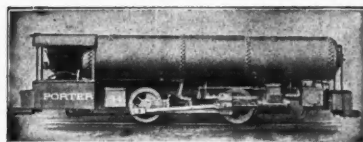
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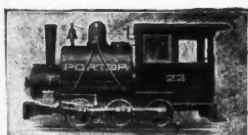
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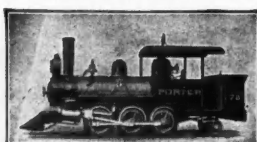
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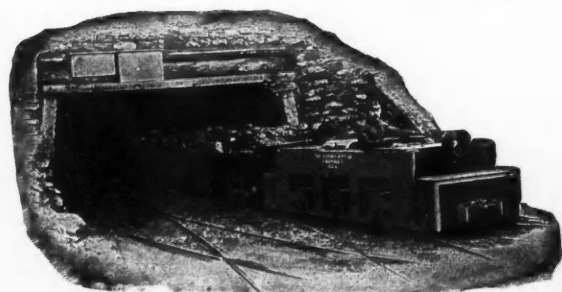


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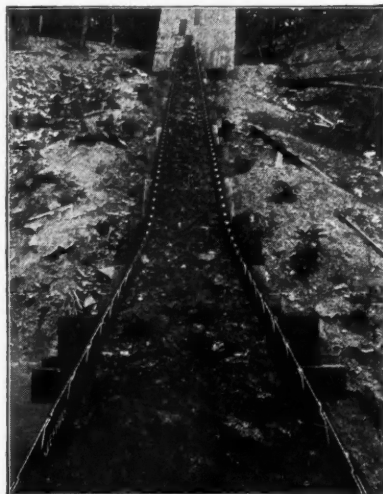
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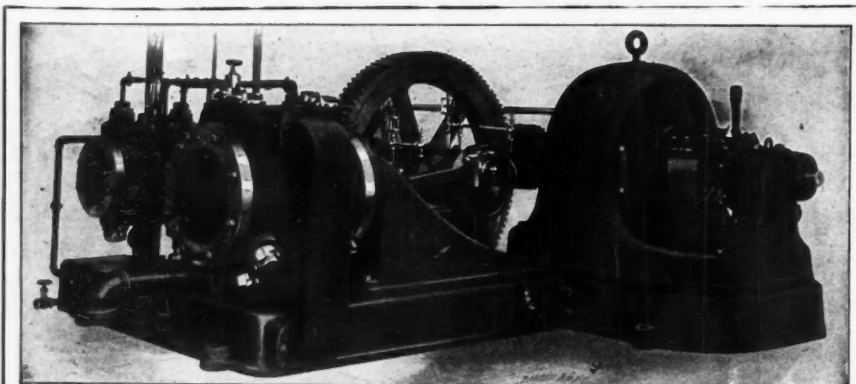
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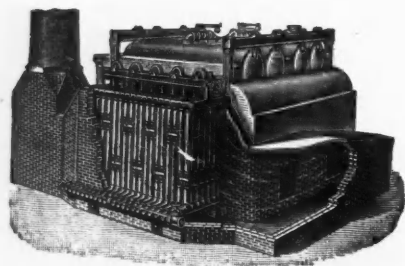
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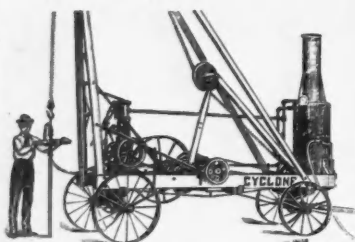
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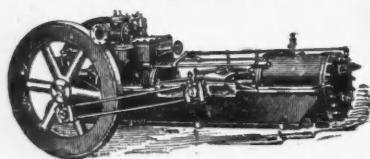
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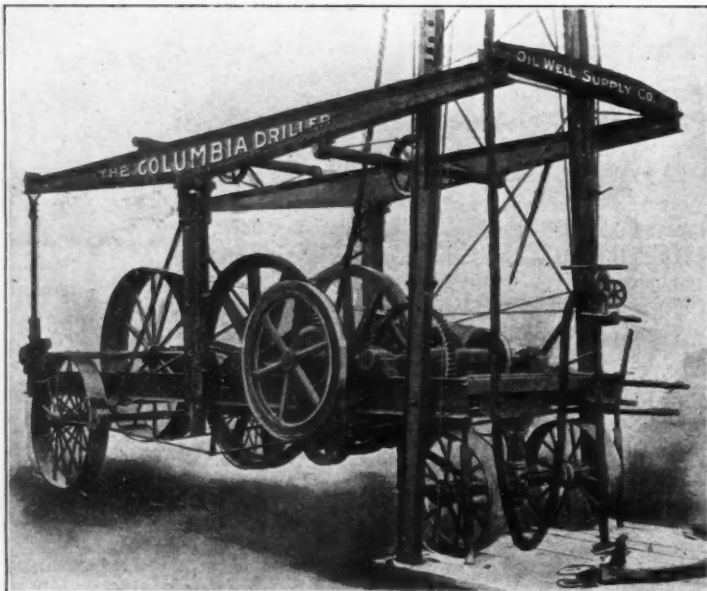
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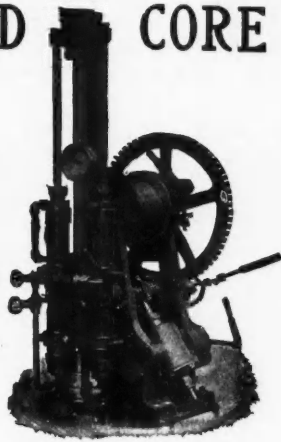
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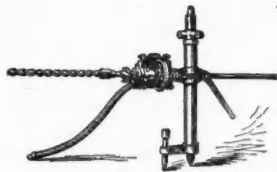
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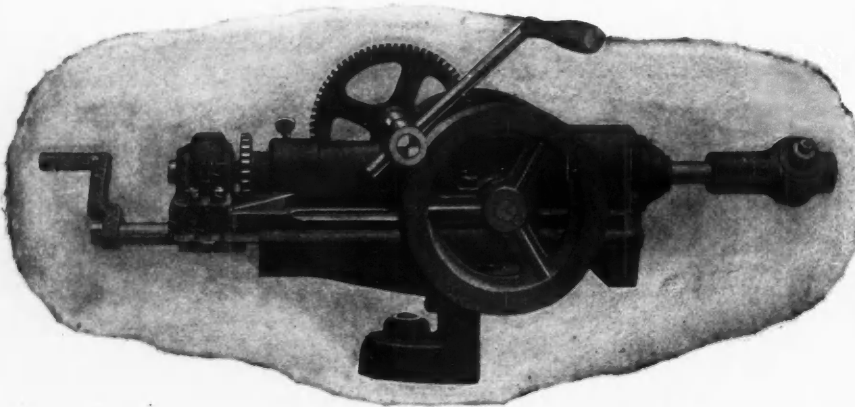
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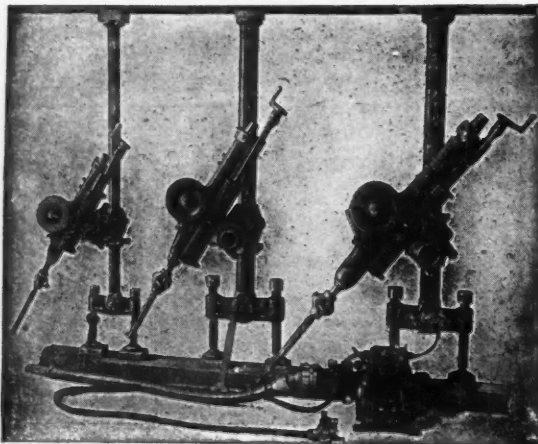
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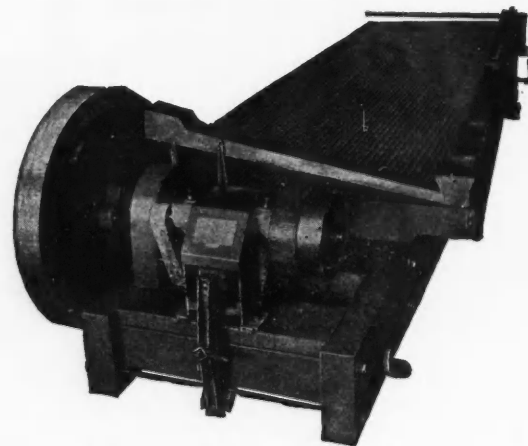
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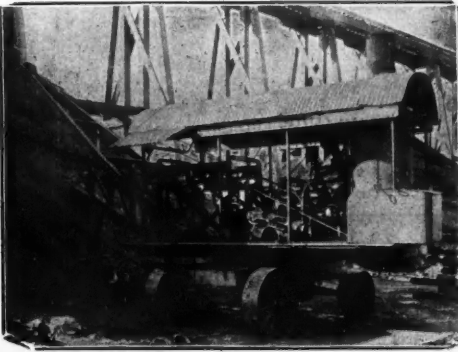
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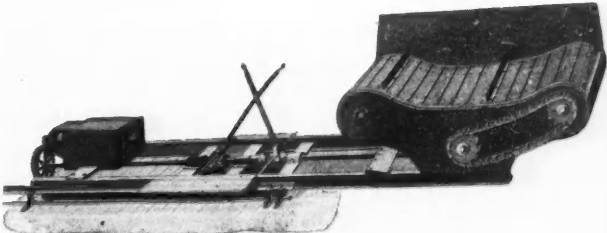


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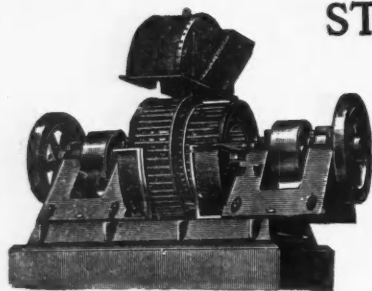
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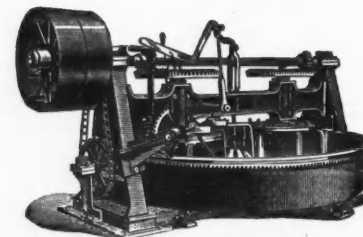
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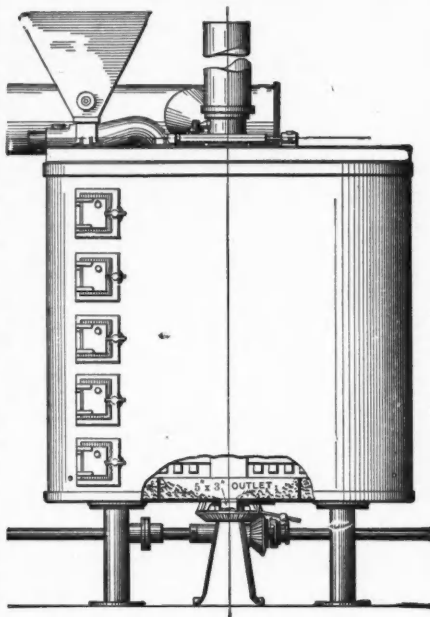
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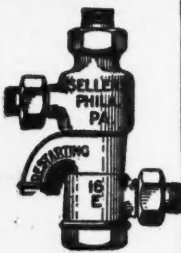
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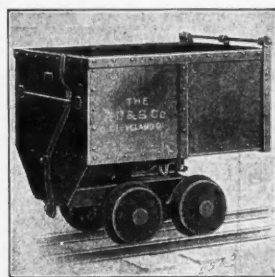
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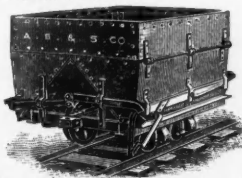
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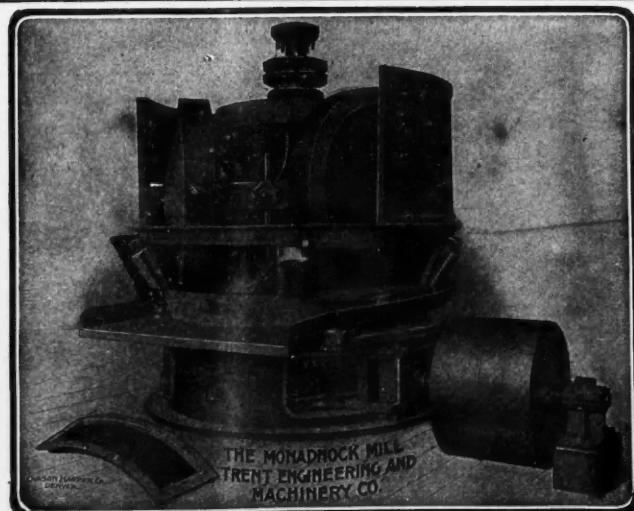
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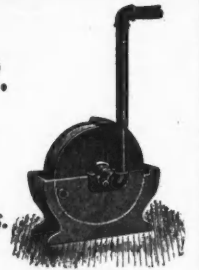
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