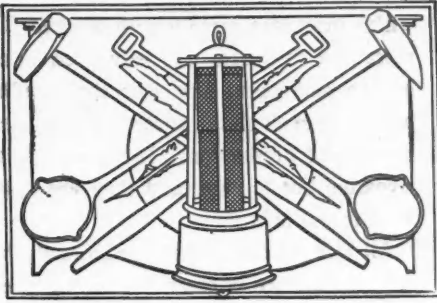


THE ENGINEERING AND MINING JOURNAL

PUBLISHED WEEKLY

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The Advance in Silver

The recent advance in the price of silver, which has carried the quotations up to a point not previously reached since the first quarter of 1908, seems to be well held. The sharp break which followed the increase in the Indian duty on the metal was, as predicted at the time, only temporary, and the price quickly recovered and even advanced. The current quotation of 54c. in New York and 24 $\frac{7}{8}$ d. in London is 2 $\frac{1}{2}$ c. above the average of last year, and the general tendency seems to be upward. As usual the advance comes chiefly from increased demand from the Far East, which is now, as it has been for a long time, the ruling factor in the silver market.

Perhaps the more important cause for this larger demand is found in the improved conditions in India, resulting from two years of good harvests. The people are generally prosperous; their buying power has been increased and according to their immemorial custom the surplus is being invested in silver in various forms. This cause is a familiar one and needs no special comment; it works now as it has in former years. China has also contributed to the larger demand. In January and February the shipments to that country were large, but since then they have fallen off, and the Chinese banks have transferred some of their silver to India in payment of rice bills and in actual sales. The causes of the Chinese demand are more complex. The long continued depression of silver and the consequent low rates of exchange have tended to an increase in the

exports of merchandise and a decrease of imports, leaving a larger balance to be paid for in money—that is, in silver. Moreover there has been a steady increase in manufacturing in that country, so that the home industries now supply many of the articles of daily use formerly imported, and this again tends to improve the export balance, which must be paid in silver. The results of the causes above outlined are shown in the following table.

The principal exports from London to the East for the four months ended April 28 were:

	1909.	1910.	Changes.
India.....	£1,471,800	£2,177,600	I. £ 705,800
China.....	1,038,200	1,113,500	I. 75,300
Straits.....	82,800	.....	D. 82,800
Total.....	£2,592,800	£3,291,100	I. £ 698,300
App. oz.....	26,340,200	32,869,600	I. 6,529,400

The increase here in the approximate quantities was 24.8 per cent.; a little smaller in proportion than that in values. The Straits are no longer takers of silver, since the gold standard was established there.

Outside of the shipments to the Far East there have been some minor causes for increased demand. Germany has bought this year a considerable quantity for coinage, and Russia has also taken large quantities, either for coinage or for use in the East. There is also reported an improvement in the demand for silver for use in the arts, which usually accompanies a period of increased prosperity. This sale fell off heavily in 1908, but now shows a considerable recovery.

The improvement in the silver market has not been accompanied by any increase in our own sales of silver. The exports from and imports into the

United States for the four months ended April 30, were as follows in value:

	1909.	1910.	Changes.
Exports.....	\$19,426,181	\$18,336,081	D. \$1,090,100
Imports.....	14,675,365	15,238,634	I. 563,269
Net exports..	\$ 4,750,816	\$ 3,097,447	D. \$1,653,369
App. oz.....	9,264,600	5,939,950	D. 3,324,650

This shows a decrease of 35.9 per cent. in the approximate quantity of the net exports. The imports are mainly in bullion and other crude forms to be refined here. The United States Mint has not been a buyer of silver this year.

As to the near future, it is to be expected that the demand from the East will continue large for some time to come, as the causes for it are still operative. Moreover, the reserve of coined silver in India is reported to be rapidly decreasing, and it is not unlikely that the Indian Government will soon be in the market as a buyer for coinage purposes, for the first time in three years. This will add to the demand and again improve the price.

Pig Iron Curtailment

The somewhat belated curtailment of pig-iron production is making considerable progress. The steel-works furnaces, which began the movement, have about reached what may be considered a permanent basis. Merchant furnaces are still going out of blast, though some companies are banking their stacks, in the hope of an early revival of business. The latter course is taken usually by those which have no large stocks of iron in their yards. We have said above that the movement was rather belated, and it would probably have been better timed if it had been begun three months ago, before the evident accumulation of stocks helped to force the decline in prices, which has carried them down nearly \$2 per ton since the heavy buying of last October and November.

When that passed and there were no signs of a renewal, most people began to see what a few observers had already realized, that the extraordinary production of the second half of last year had run ahead of demand, and that continued output at that rate could not be absorbed. The country is not yet able to use pig iron at the rate of 30,000,000 or 31,000,000 tons a year. The fall buying movement was not renewed, and stocks began to accumulate to a degree which could not be hidden. Some producers were obliged

to cut prices to clear out their stocks, and others had to follow to hold their business.

The steel-making companies are not directly affected by quotations, but they have to consider the cost of carrying iron, which increases rapidly with stocks. The merchant furnaces, with advanced prices of ore and coke, saw that their selling prices were coming uncomfortably near the cost of production. There was no alternative but to stop, and they are doing it right and left.

All this sounds rather sensational; but that appearance is given to the movement chiefly because of its long postponement. The suddenness of the movement has given it rather the appearance of a panic; but after all the cutting down the blast furnaces will still be turning out iron at a rate equal to the highest yearly output ever recorded and there is every prospect that this can be absorbed. It is simply that they did not realize that the capacity of production had been increased faster than consumption. We are now able to make somewhere between 33,000,000 and 34,000,000 tons a year, and an attempt to utilize the full capacity must certainly call a halt, because that is beyond any consumptive ability, except for a short period.

The Porphyry Copper Mines

We have repeatedly deprecated the circulation of "market letters" about mining enterprises by irresponsible brokerage houses, and we have assailed misrepresentation by anyone, high or low. Our attention has fallen this week upon a circular entitled, "The Low-Grade Porphyry Copper Mines," issued by Hayden, Stone & Co., that contains considerable misinformation, which we hope is ascribable only to carelessness. A mining house of the position of this one certainly should know better than some of the things that it says in this circular.

The most glaring fault is the printing of the prospective cost of copper by the Miami Copper Company at 7½c. per lb. Inasmuch as Mr. Channing has consistently said that the Miami cost will be 9c., it does not seem that prospective investors should be led to anticipate anything lower. It is true that some other engineers who have examined this property have expressed the opinion that Mr.

Channing's estimate of 9c. is conservative, and likely to be beaten, but we do not believe that any competent engineer has indicated a figure anywhere near as low as 7½ cents.

The present cost of copper to the Utah Copper Company is put down at 8c. per lb., and the prospective cost at 7½c. In fact, the cost to this company in 1909, according to its own figures, was 8.787c.; for the first quarter of 1910 the cost was 8.43 cents.

For five porphyry copper mines this circular states figures of tonnage of ore in sight. No discrimination is made as to whether these figures represent proved ore, probable ore, or possible ore. In certain of the cases we know that the figures purporting to represent ore in sight include what the companies themselves rate only as probable ore. If the ore development of these companies were reckoned upon the same basis, we are sure that the figures would be decidedly different from those stated.

Finally, to make a short job of riddling this misleading circular, the net value of a mine is not properly reckoned by multiplying the tonnage of ore in sight by the present net value of one ton. Every tyro in mining finance ought to know that a ton of ore that is not going to be extracted for 20 years is not worth as much as a ton mined and milled today.

The porphyry copper mines are good investments upon the proper mining basis, but investors should understand thoroughly what that basis is, and should not believe everything they are told, even by reputable houses.

The action of the Department of Justice in attempting to dissolve the alleged cotton pool throws a new light upon the Sherman law for some persons who have heretofore been most rabid against the trusts. Everybody, in their estimation, has been bad except those kind gentlemen who have elevated the prices for cotton and wheat. It always matters whose ox is gored.

In addition to the higher cost of mining under the new wage scales, the Western coal operators will have to carry a general advance in railroad rates, which will take effect June 1. This advance, however, being general will not affect competitive trade; though it must increase the price to consumers.

CORRESPONDENCE and DISCUSSION

Views, Suggestions
and Experiences of Readers

The Vortex Copper Converter

Referring to my article on the "Vortex Copper Converter" in the JOURNAL May 7, 1910, I wish to state that since the cost of furnishing air for bessemerizing is but 20 to 25 per cent. of the total expense of converting copper, and amounts to 0.1c. to 0.15c. per pound of copper, whatever increased efficiency in the air supply may be attainable, the ultimate saving would be but small. Other economies would directly result from the more efficient use of the air, such as more rapid oxidation of the charge and reduced time of blowing. The stirring effect of the air is increased also, an important function of the air aside from being the carrier of oxygen to burn the sulphur and oxidize the iron.

BASIC NONCORROSIVE LINING

The tuyere arrangement is of special value where the converter is lined with a noncorrosive lining. I have given this subject considerable thought and study, and as far back as 1906 submitted a report to the Compañía Metallurgica de Torreon, S. A., Torreon, Mexico, on the advantages of the vortex converter lined with basic material, and the feeding of silicious ores through the converter nose. I may say that the lining I intend to use is basic; it is, however, not magnesite, which aside from conducting and radiating heat readily, has other chemical and physical properties which make its use expensive and problematical for copper converter linings. One trouble experienced with basic-lined (magnesite) barrel converters, was the formation of noses at the end of the tuyeres. In punching these, portions of the lining were knocked into the converter, necessitating a cessation of operations to repair the tuyere lining.

With the arrangement of the tuyeres in a ring, the tuyere block can be built in one piece, and in the form of a truncated cone. This is forced into place by hydraulic pressure, and when damaged, is removed by the same force. This has been the practice in steel converting for many years, and has the advantage that a tuyere block can be replaced quickly.

REDUCTION IN CONVERTING COSTS

There is no doubt in my mind that the basic-lined copper converter will replace the one generally in use now. It has been reported that a margin of \$2.50 has been attained in the basic-lined (magnesite) converters at Garfield, Utah, over the cost

in the common barrel converter, and that three more basic-lined converters will be installed. This would be a reduction of 25 per cent. in cost of converting, with \$10 (0.5c. per lb. Cu) the cost of converting one ton of copper. In a plant of the size of the Copper Queen reduction works at Douglas, producing 5000 tons of copper monthly, this would mean a monthly saving of \$12,500.

When the silicious ores are fed through the nose of the converter, a thorough mixing of the converter contents is even more desirable than when the lining itself furnishes the silica for slagging the iron. It is for the reasons above set forth, that I anticipate a large field of usefulness for the vortex converter with noncorrosive, basic lining.

HERBERT HAAS.

Globe, Ariz., May 10, 1910.

Spurious Potassium Cyanide

The correspondence which appeared in the JOURNAL (F. A. Ross, Oct. 23, 1909; J. E. Clennell, Jan. 15, 1910; E. M. Hamilton, Feb. 12, 1910) on the subject of spurious potassium cyanide, left matters in a most unsatisfactory condition. Mr. Ross' samples having been submitted to analysis for the express purpose of determining the relative amounts of sodium and potassium they contained, it was surely most misleading and improper to return the sodium present "in terms of potassium."

DISSOCIATION DOES NOT AFFECT CHEMICAL ACTION

Mr. Clennell advances a theorem which calls for some discussion. He says, in short, "The soluble metallic cyanides are completely dissociated in dilute solution, therefore it would seem that the primary reaction on the gold or silver must depend solely on the presence of the cyanogen. The nature of the alkali metal exerts absolutely no influence on the extraction."

All soluble salts are probably more or less dissociated on going into solution in water, but although this increases the osmotic pressure and the electrical conductivity of the solution, it does not alter their chemical affinities or affect their behavior toward other reacting substances. If we suppose that the subdividing effect of water, in large preponderance of mass, is enough to divide the KCN molecule, holding the K apart from the CN, we must also suppose that it is enough to

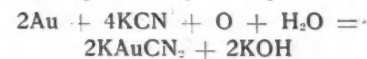
divide the AuCN molecule and keep the Au apart from the CN. Therefore, the dissociating effect of water is a force which acts on both sides of the equation and may be disregarded.

In explaining a chemical reaction it is not necessary to go into ionic theories. In describing the solution of iron by copper-chloride solution, it is not necessary to assume that the copper chloride is dissociated and that the chloride atom is therefore free to act on the iron; it is enough to say that the more electropositive and chemically active element displaces the less active. The affinity between K and CN continues to exist just the same when the molecule is dissociated by solution, for we do not get free potassium and cyanogen, but ionic K and CN, coexisting although separated; nor can the K and CN be separated by their different diffusion rates. Thus, the affinity of K for CN has to be overcome by some stronger affinity before either of them can enter into another chemical combination.

ACTION OF OXYGEN IN CYANIDE SOLUTIONS

What is this stronger affinity in the case of the solution of gold? It is evidently not the affinity of cyanogen for gold, for this is such a small quantity that free cyanogen has not the slightest action on free gold, and it is impossible to think of a highly inert substance like gold as displacing the exceedingly active potassium from any of its combinations. We find the stronger affinity which we are seeking when we examine what takes place on the solution of gold in cyanide.

It is now held to be quite conclusively proved that cyanide solution has no action on gold unless free oxygen is present, and that the reaction which takes place is expressed by the equation



from which it is evident that what takes place is that an atom of oxygen removes two atoms of potassium from its combination with cyanogen, forming K₂O (which then forms KOH with the water) while the nascent cyanogen, in the absence of anything else with which it can combine, takes up gold to replace the potassium which has been removed.

If this reaction were determined by the affinity of cyanogen for gold, there is nothing to prevent it from going on in the absence of oxygen; the gold is there, the cyanogen is there, and the potassium, if it were displaced by gold from its com-

ination with cyanogen, has plenty of water to combine with. But no such action takes place, whereby it is evident that the motive force of the reaction is the attraction of the alkali metal for oxygen.

WHY POTASSIUM SHOULD BE PREFERABLE TO SODIUM

There are three forces tending to promote the combination of gold with cyanide: (1) The affinity of potassium for oxygen, one of the strongest chemical forces; (2) the affinity of gold for cyanogen, not a very strong force; and (3) the affinity of potassic cyanide for aurous cyanide, also not particularly strong. On the other side of the account there is nothing but the affinity between potassium and cyanogen, and although this is weak as compared with the oxygen affinity of potassium, as the oxygen is in the free or molecular state and has to liberate cyanogen in the nascent or atomic state, the reaction proceeds only slowly and with difficulty, whereas, if atomic or nascent oxygen is brought into contact with cyanide, the latter is broken up instantly.

If it is the case as is here represented, that the determining factor in this reaction is the attraction of the alkali metal for oxygen, it follows that the greater this attraction the more the reaction will be promoted. Potassium has a much stronger affinity for oxygen than has sodium, as everybody knows, and it is therefore reasonable to suppose that potassic cyanide will better promote the solution of the gold than will sodium cyanide. It is an old saying that "Whatever soda will do, potash will do better."

THEORY OF SELECTIVE AFFINITY

In the early days of the cyanide process, when the chemistry of the subject was not well understood, the inventors, to account to a somewhat incredulous world for the remarkable results obtained, gave out that they had discovered a "selective affinity" between the precious metals and cyanogen so wonderful in its operation that cyanogen would "select" the few pennyweight of gold or silver in an ore in preference to any or all of the rest of it, and this theory of an extraordinary affinity between cyanogen and gold was an article of faith with the chemists of the original cyanide-process company, and was spread abroad by them and became a tradition. The idea that "cyanogen" is the active principle is a survival of that tradition, but it is now quite evident that "cyanogen" on its liberation takes up gold and silver only when and because these are the only substances present in the free or uncombined state with which it can possibly enter into combination.

The South African cyanide chemists seem to be satisfied with sodium cyanide, but I believe that a different feeling pre-

vails in America. Mr. Ross admits a preference for potassium, and Mr. Hamilton refers to "the fact that many workers are discarding the NaCN in favor of potassium cyanide." About seven years ago I used a lot of sodium cyanide testing about "120 per cent. KCN" but found it unsatisfactory on account of the solutions coming off turbid from the leaching vats, especially toward the end of the washing. Knowing the bad effect of caustic soda in causing turbid filtration, I attributed this to the sodium salt and went back to "KCN" when the turbidity ceased.

REPORTING STRENGTH OF SOLUTIONS

Mr. Clennell's suggestion that the strength of solutions should be reported in per cent. of CN is open to the objection that it would be inconvenient in practice. When the solution man titrates his solution in terms of pounds of cyanide per ton he knows at once how many pounds per ton he must add to bring it up to the required strength, but if it were titrated in terms of cyanogen he would always have to make quite a calculation to find out how much cyanide was called for.

If one is using sodium cyanide, why not call it sodium cyanide and make up the solutions in terms of sodium cyanide, and make up the silver-nitrate solution with 17.3 grams per liter, when 1 cc. = 1 lb. NaCN per ton on a 20 cc. test, or 0.1 per cent. NaCN on a 10 cc. test? By this method any KCN would be returned "in terms of NaCN," but no one who believes that a molecular weight of NaCN is just as good as a molecular weight of KCN could consider that an objection.

It would also have the advantage of showing up any shortage in the cyanogen content of the cyanide, for if it did not test up to somewhere near 100 per cent. NaCN the question would be asked, "what else is there in it?" whereas at present the manufacturer can send out a material containing 75 per cent. sodium cyanide and 25 per cent. common salt and other worthless material, and still point with pride to the fact that his product "tests 100 per cent." At present, apparently, when a sufficient quantity of neutral byproduct is not obtained to bring the "nominal KCN" down to below 100 per cent, the requisite diluent is added in the form of common salt, quite harmless no doubt but not worth 20c. per pound.

EVERY MAN SHOULD MAKE HIS OWN TESTS

In any case, there can be no difference of opinion on the point that if a person wants potassium and orders potassium and pays for potassium he is entitled to get potassium and not sodium, just as if a person wants butter, and orders and pays for butter he ought to get butter and not oleo, and it is beside the question

for the dealer to assert that oleo looks just as well and is quite as nutritious.

The only way in which the operator can look after his own interests is to make sodium-potassium determinations on the stuff he gets. Fortunately this is not such a formidable undertaking as Mr. Ross and Mr. Hamilton seem to think, as it can be done in an hour by anyone who can make a weighing and a titration, and with sufficient accuracy to meet the wants of the cyanide operator, who would be just as well satisfied with the proportion of sodium and potassium to 1 per cent. as to the second place of decimals.

RALSTON BELL.

Edinburgh, March 10, 1910.

[Particulars of the method for rapid sodium-potassium determination will be published in the JOURNAL at an early date.—EDITOR]

A Mythical Stock of Copper

The vagaries of the daily newspapers sometimes pass all understanding, but when a New York daily in its serious financial department fathers views like the following, who can wonder respecting the erroneous beliefs of Tom, Dick and Harry?

"A report came from London late yesterday that copper producers in all parts of the world are much worried over the big surplus of metal that has been accumulated by the Tanganyika Concessions in the Congo. This is one of the mysterious enterprises of the late King Leopold. Lady Warwick got the concession from the king and turned it over to the late Cecil Rhodes, taking a stock interest in the Concessions Company, which is building a railroad to be open by September. The report of yesterday was that by the time this railroad is ready to handle copper metal, the Tanganyika mines will have 200,000,000 lb. ready for delivery. This copper has not been counted in the surplus stock of the world. Its threatened appearance on the market is likely to create some excitement."

In fact, there has never been anything mysterious about Tanganyika Concessions, the promoters of the company having been very explicit in their statements. The company will not have 200,000,000 lb., or anything like it, for delivery in September next. It is recognized that the region in which this company is interested possesses large copper resources, but it will probably be several years before their copper begins to figure prominently in the market.

The Congo is being opened up as fast as capital can be obtained, and several development companies are now advertising for experienced prospectors, offering \$150 and all expenses, together with bonuses for discoveries of importance.

The Passing of Bodie, California

The future of the Standard Consolidated at Bodie, Cal., is summed up by Superintendent Landers in the annual report of the company for the year ended Feb. 28, 1910, as follows: "We now find ourselves with little likely territory left to explore. Such as is left, containing many veins of very small size and only moderate value, cannot be counted on to furnish sufficient ore to keep the plant in full operation after the remaining ore in the Clay vein and its branches has been extracted, which may not be later than the coming summer." The total tonnage in reserve is given at 5600 tons worth \$78,300.

Some of the territory has been thrown open to leasers, and the only other hope of the company seems to be to open the mine to greater depth. Upon this subject Mr. Landers does not become enthusiastic. He says: "The question of pumping out the lower levels or of either sinking one of the shafts or driving a long tunnel is being seriously considered. While it is possible that there is but little ore of pay grade on the lower levels, it *might* be well for the company to take the mining chance and endeavor to open up new orebodies at greater depth."

During the year the 20-stamp mill operated only 168.4 days and crushed 11,732 wet tons of ore. The slimes plant handled, from May 1 to Sept. 30, over 100 tons of slime from the ponds per day in addition to about 43 tons per day from the mill. The pond slimes averaged about \$5.40 per ton, and those from the mill \$8.07. An extraction of about 94 per cent. was made in the slimes plant at a cost of \$2.73 per ton treated.

The Iron and Steel Institute

SPECIAL CORRESPONDENCE

The 41st. annual meeting of the Iron and Steel Institute was held in London during the week ended May 6, under the presidency of the Duke of Devonshire, who has a large interest in the industry and who now occupies the chair that was held by his grandfather, the first president of the Institute, in 1869. Although not claiming any expert knowledge of the metallurgy of iron and steel, the Duke contributed an interesting presidential address, containing some useful statistics as regards production. In it attention was specially called to the enormous increases in late years of the American and German production of both pig iron and steel, as well as to the violent fluctuations in the American outputs. As regards the condition of the working classes in Great Britain at the present time compared with 1869, when the Iron and Steel

Institute was founded, the Duke said that he thought they were now 100 per cent. better off.

The following papers were presented at the meeting: "The Girod Furnace and the Electric Smelting Works of the Paul Girod System," by Dr. W. Borchers; "The Economy and Design of Modern Reversing Rolling-Mill Steam Engines," by E. G. Sehmer and Dr. Rudolf Drawe; "Developments in the Production of Electric Power: its Application and Bearing upon the Iron and Steel Industries," by D. Selby-Bigge.

James J. Hill on Extravagance

James J. Hill writes in *World's Work* for May in part as follows:

We are living in an age of world-wide financial delirium. Most nations have thrown away moderation in the spending of money. The immense increase of wealth has greatly augmented the supply of capital. Its mobility strengthens the impression that it is inexhaustible. The wealth of France increases about a billion a year. This increment, collected by great banking concerns, may be drawn on by enterprise anywhere. While France is the best saver, it is not the richest nation.

The addition of uncounted billions to aggregate wealth has stimulated the spirit of financial adventure and the love of squandering. Its availability has lulled to sleep national prudence. The increase of apparent resources by easy resort to borrowing, the mortgaging of a patrimony not our own, the diversion of wealth to unproductive uses, have gone further than most realize.

Something is due to enormous currency inflation. The tariff is another contributing cause. Combinations in restraint of trade are partly responsible. Still more is due to decline of agricultural products compared to population. The large unexplained balance must be credited to lavish expenditure, which has grown to be a national trait, consuming our resources, encouraging indolence and luxury, and compelling constantly ascending wages. This is the meaning of the statement by me that it is not so much high cost of living as cost of high living that afflicts the country.

Perhaps the greatest factor in the price problem is the wage rate. As the labor supply diminishes, wages rise still more. High wages and prices work in a circle. But these wages do not come out of the air. In the end labor suffers when the business no longer pays profits and payrolls cease. High prices and wages and taxes may work for impoverishment of a nation by the same process of waste that impoverishes the soil. Material resources are conserved by steps to stop destruction. So the wealth of the country, its capital, its credit, must be saved

from predatory poor as well as predatory rich, but above all from the predatory politician.

Trouble for California Wildcats

The U. S. postal authorities have joined hands with the California State Mining Bureau and State Mineralogist Lewis E. Aubury in the investigations as to fake companies in the California oil-fields. Arrests and prosecutions will be made under the Federal postal law, and under the California statute in cases where circumstances warrant such action instead of using the postal laws. There is a State statute which makes it a felony to misrepresent anything in connection with a mining company with the intention of deceiving and defrauding the public.

It is reported that already several companies are under suspicion, and that special agents of the postal authorities and the State Mining Bureau are in the field inquiring into the operation of these and other companies. Mr. Aubury has stated that evidence is about complete against one concern near Coalinga, and that the suspected companies now number probably a dozen.

Successful Year at Laurium, Greece

In the manufacture of pig lead at the Laurium mines, Greece, results were much better in 1909 than the previous year, i.e., the yield was greater, percentage of silver higher, and cost per ton less, says the *Mining Journal*. Mining was carried on more economically and improvement made in processes for washing ore and manufacture of briquets. Cheaper smelting is ascribed to better yields, reduced railway tariffs and more careful maintenance of the plant. Receipts in 1909 were 244,000 drachmas more than in 1908, the losses of the latter year being thus transformed into profits of 70,000. Hitherto, such low prices, combined with unfavorable rates of exchange, were unknown; but this demonstrates that the company can meet the most disadvantageous conditions. The washing plant was idle during two months in 1909, and only in half work for two others, owing to the state of the market. Lead mining was also reduced. On the other hand, to take advantage of the rise in zinc, 1816 tons of calamine were mined.

A large force of men are engaged in development work on the extensive iron-ore deposits controlled by the U. S. Steel Corporation, near Kashabowie, about 60 miles west of Fort William, Ont. Preliminary steps are being taken to organize a subsidiary Canadian company to operate the mines.

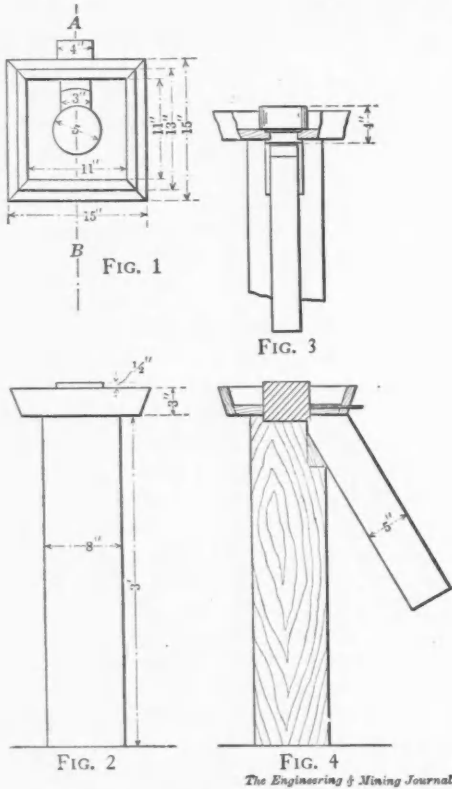
DETAILS of PRACTICAL MINING

Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

A Convenient Slag Anvil

BY R. P. WHEELOCK*

The accompanying cuts show the details of a convenient and easily constructed, assay-office slag anvil for use in cleaning the lead buttons obtained in the fire assay. It is merely a beveled, square, wooden tray, about 2 in. in depth and lined with tin (pieces from a



DETAILED CONSTRUCTION OF SLAG ANVIL

five-gallon oil can), set upon an 8x8-in. wooden post. In the center of the tray is a block of steel (a section of shafting answers the purpose) which is sunk into the post about 1/2 in. to insure stability.

Back of the steel block, a sheet-iron slide is fitted in the bottom of the tray for the purpose of providing a discharge for the discarded slag which drops into the tin trough, shown in Figs. 3 and 4, when the slide is opened. The trough conducts the slag through the side of the building or into any receptacle provided.

Fig. 1 is a top view showing the tray steel block and partly opened slide; Fig. 2, a front elevation; Fig. 3, a rear elevation with the side of the tray broken in

*Quartette Mining Company, Searchlight, Nevada.

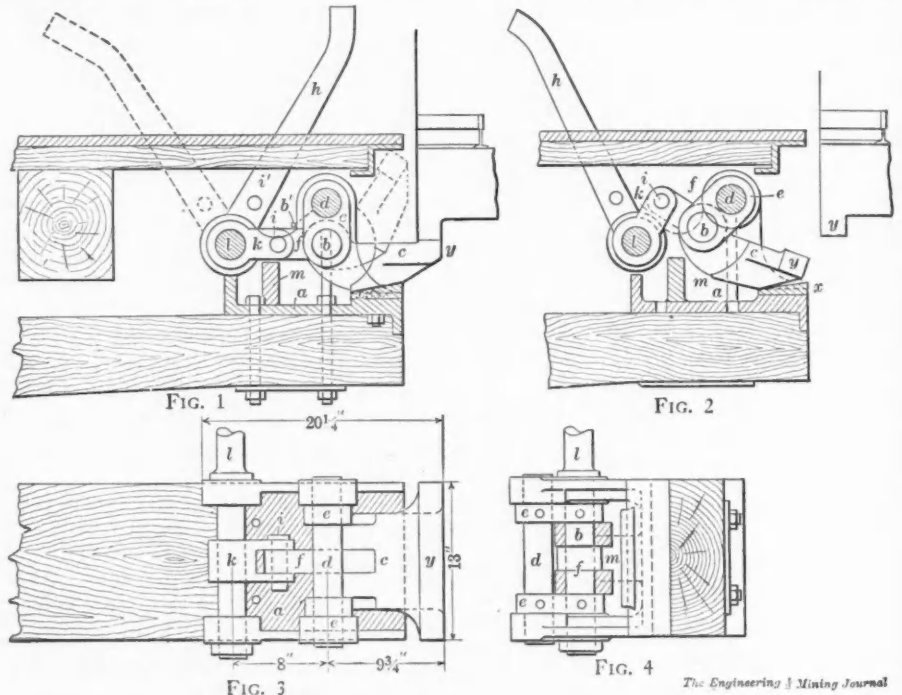
order to show the slide mounted in the bottom of the tray and the trough; and Fig. 4, a vertical section on the line AB of Fig. 1. The dimensions may be varied to suit conditions but those given are well adapted to general use.

Improved Landing Chair

An admirable type of landing chair, patterned after one in use for some years at various German mines, is installed at the Doe Run mines, Flat River, Mo. The prime feature of the chair is that it obviates the inconvenience and delay at-

the chair piece C, and through the link F, the other end of which is loosely attached to the lever K, by the bolt I. The under side of C slides freely on the pillow block X. The axles L, of the two mechanisms on the opposite sides of the shaft collar are connected by keyed levers and link rods, so that they work in unison. The principal dimensions are as follows: L, 27/16 in. in diameter; D, 27/16 in.; B, 2 7/8 in.; I, 1 1/2 in.; center to center, L-I, 3 1/2 in.; I-B, 4 1/2 in.; B-D, 4 1/4 in.; length of D, 9 inches.

The essential feature of the design is that when the weight of the cage is resting



LANDING CHAIR USED AT FLAT RIVER, MISSOURI

tending the lifting of the cage from its supports by the hoisting engine, a procedure which seems to be necessary in connection with the usual types of chairs. In addition to the bother and loss of time, the usual practice also involves waste of steam, excessive and concentrated wear on the hoisting rope, and other disadvantages.

The details of construction are shown in the accompanying figures. The upward projecting sides of the sole plate A, are bored to receive the two axles, L and D. To the former are rigidly attached the hand lever H, and the short lever K. On the shorter axle D, are fastened the two short links EE, through the ends of which passes the pin B. The pin B also passes loosely through the inner end of

ing on the outward end of the block C, the latter is held firmly in position by this weight; it cannot tip because the links EE lie in a vertical line from B to D, and it cannot slide backward because the link F, and the lever K, also lie in a straight line from B to L. In order to prevent a downward motion of the joint I, due to the weight of the hand lever H, a block M, is placed below the lever, K, to stop it at the horizontal position.

When the hand lever is thrown backward, through an angle of 60 deg., the piece C, is obviously withdrawn, and takes the position shown in Fig. 2. After the cage has passed down the shaft, the lever is returned to its first position, putting the piece C, in place, ready for the next landing. Owing to the hinged con-

struction at *B*, the catching of the cage by *C* is automatic, as the piece simply lifts when the cage comes into contact with it, and falls into place when the cage rises above it. The total friction of the apparatus, most of which occurs at the rubbing surface *Y*, is so small that with a load of 5 tons resting on the chair, a force of less than 45 lb. at the handle will suffice to operate the mechanism. One of these chairs is placed on each side of the shaft, and by means a connecting rod both are operated by the same lever. As used at Flat River, the beam upon which the chair is mounted, is cushioned by a spiral spring placed beneath.

Stoping with the Slicing System

The slicing system of stoping is being carried on at a number of the Utah mines where the ground is too heavy to be held by square sets. At the Daly West, Park City, and the United States mines, Bingham cañon, this method is being successfully employed.

The practice is simply to raise to the upper limits of the ore and mine over the whole orebody for a thickness of one timber set, using such timbering as is necessary to hold the back. The floor is then covered with cheap planking, lagging or any available lumber which will serve as a floor. Auger holes are then bored in the timbers holding the roof, loaded and the timbers shot down. The back then caves upon the flooring which has been laid. Another "slice" is then worked out in the same manner from the raise, one set below the portion previously extracted.

To insure greater safety for the men the ore of the successive slices is best mined retreating, i. e., a crosscut is driven from the raise to the other wall of the orebody, drifts run to the stope limits and the working face advanced toward the raise. A safe retreat through the crosscut, which is in solid ground and should be well timbered, is thus always available for the miners.

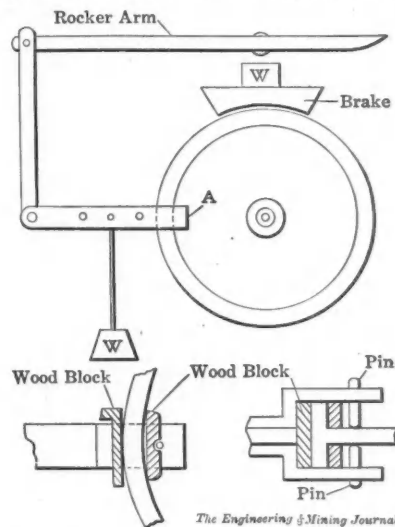
By this method of stoping all the timbers used to hold the roof as well as the different floors are, of course, lost. However, as the stopes need not be held open for any length of time, cheap lumber may be used for this purpose. Lumber in Bingham cañon costs about \$18 per M. for local Uintah pine, and up to \$22 per M. for Oregon pine. In one of the large mines at Bingham, where ore is mined at about \$1.90 per ton, using square sets in overhand stopes, the timber cost approximates 17@34c. per ton of ore stoped. Under the slicing system the timber cost is probably not more than 5c. per ton higher, and by it ground is worked which could hardly be held by ordinary square setting.

Feeder Mechanism

BY CHARLES A. CHASE*

In the JOURNAL, Feb. 5, 1910, are sketches of a feeder mechanism said to be used at Bodie, Cal. I have some interest in this matter because this type of feeder mechanism was devised and patented in 1899 by Charles D. Hooper, foreman of the Liberty Bell mill at Telluride, Colo. A bad feeder mechanism caused extraordinary losses of time and he found in this design complete relief. It has continued in use to the present time with the utmost satisfaction, and I doubt if its equal is available at present.

Mr. Hooper sold the rights to use this design to the Edward P. Allis Company which, I believe, made little use of it, perhaps not appreciating its full value. The original construction was slightly differ-



AUTOMATIC FEEDER AT LIBERTY BELL MILL

ent from that shown on page 305. The additions consisted of two shoes of wood or iron which fitted against the inner surface of the ring and a flat piece of wood which fitted outside the ring. A brake, consisting of a weight or a shoe, rested on the top of the wheel. I am not sure whether this has been found a necessity or not. Instead of the spring we have commonly used a weight on the arm. I mention this simply as an interesting fact in connection with the device.

Sampling Roaster Feed

At the Kalgurli gold mine, Western Australia, the sulpho-telluride ores are fed to the roaster by a short screw conveyer. Through a half-inch hole in the bottom of the casing surrounding the screw a stream of ore is delivered on the point of a cone, placed close up to the casing. A chute attached to the bottom of the cone diverts a portion for

*Mining engineer, Equitable building, Denver, Colo.

assay, the remainder being collected and returned to the fine-ore bin. F. G. Brinsden says that various methods of sampling have been tried, and comparisons of gold contents and grading analyses show that this is a reliable method of arriving at the head value of the ore. There is rarely any exceptional discrepancy between the actual and theoretical gold returns.

Ventilating with Compressed Air

The practice of turning compressed air into a ventilating pipe to induce an air current is quite general in the Cœur d'Alene mines. This is undoubtedly the simplest method of ventilating drifts when compressed air is at hand and power to operate a fan blower is not available. On the 1200-ft. level of the Hecla mine at Burke, air is drawn in this manner 500 ft. from the face of a drift to the shaft. Twelve-inch pipe is used and a piece of 3/4-in. pipe turned up at the end serves as the air nozzle. The air current is in this instance sucked 500 ft. through the fan pipe, the air jet being introduced into the fan pipe about 15 ft. above the bend at the shaft.

A different scheme is used on the 1600-ft. level of the Mace mine. Here the air jet is applied within a few feet of the suction end of the fan pipe. In this manner a current of air is forced 400 ft. to the shaft through 8-in. fan pipe. The nozzle is, however, different in this case, being made of 1/2-in. pipe bent in circular shape so as to just fit around the interior of the fan pipe. The coil is drilled with a number of 1/8-in. holes on the side opposite the suction end of the fan pipe. It is claimed that this acts as a more efficient nozzle and requires much less air than does turning in the air in a single jet. These nozzles may be used at a number of places in the fan pipe if one will not draw a current of air sufficient for proper ventilation.

Machine Drilling in Alaska

The following data on machine drilling are furnished by Superintendent R. A. Kinzie, of the Ready Bullion mine, Douglas Island, Alaska, in his annual report to the Alaska United Gold Mining Company: Stoping, 33.06 ft. drilled and 46.36 tons broken per machine-drill shift; development, 40.42 ft. and 12.07 tons; sinking, 45.08 ft. and 15.24 tons. The cost of explosives in stoping averaged about \$1.95 per drill per shift; in sinking, \$2.70; and in drifting, from \$1.90 to \$2.88. The average cost of supplies, power, repairs, etc., was \$5.65 per drill per shift. On the 700-Foot Claim mine of the same company the average number of feet drilled per machine per shift in stoping was 24.99, breaking 36.94 tons of rock; and in development, 31.88 ft.

breaking 7.89 tons. The cost for explosives per drill per shift varied from \$1.82 to \$2.28 in stoping, and from \$1.85 to \$3 in development. On this mine, the cost of supplies, power, repairs, etc., was \$4.68 per drill per shift.

Combined Office and Laboratory Building

BY EVANS W. BUSKETT *

In connection with a plant recently designed by me, it was found feasible to place the office, drafting room and laboratory in one building as shown in the accompanying plan, thereby economizing on first cost and space, and making, for some purposes, a more convenient arrangement than with separate buildings.

The building is a frame structure 35x40 ft. It is built of yellow pine on concrete foundations. The floors are laid on 2x12-in. joists which are 16 in. between centers. There is first a rough pine floor 1 in. thick, which is laid diagonally. This is covered with 1x3-in. flooring. The ceilings are 11 ft. high and all rooms are lighted by an ample number of windows. The rooms are plastered with Acme cement plaster. The two front rooms and hall are painted an olive green, which is restful to the eyes. The other rooms are the cement color.

ARRANGEMENT OF BUILDING

There is a large basement under the north half of the building, equipped with bucking board, crushers, etc. The basement also contains a toilet room in which are a closet, lavatory and shower bath, with hot and cold water. There is also ample space for the hot-water heating plant, the hot-water boiler for the shower bath, and coal bins. The basement is floored with 6 in. of concrete.

The main-floor entrance is from a porch 8x12 ft. into a hallway 8x19 ft. Directly in front is a gate, while to the left is a ticket window opening into the office. The office is 15 ft. square. To the right is the drafting room, which is also 15 ft. square, and is equipped with a drafting table, filing case and a printing frame mounted on a track, which projects from the south window. At the end of the hallway a stairway leads to the basement. At the right is the chemical laboratory. To the left is the testing room, while between the testing room and chemical laboratory is the weighing room, which is entered from both sides through swinging doors.

LABORATORY EQUIPMENT

The chemical laboratory is equipped with a hood, filtering table, titrating table and sink. The hood is placed against the south wall and is built almost entirely

*Rolla, Mo.

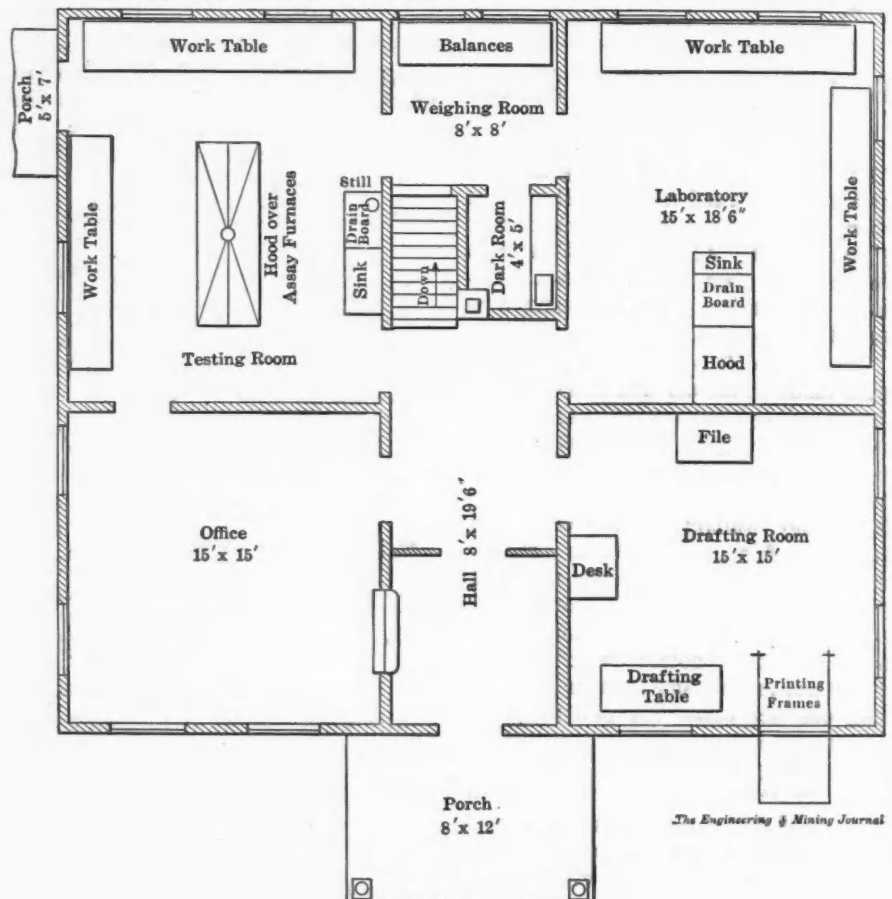
of glass. Where it was necessary to use wood, all nailing was done from the outside, and when it was necessary to nail from the inside, the nails were countersunk and puttied. There is no finish on the inside of the hood, while the outside is made to match the building, which is finished with a liquid granite in the natural wood color. The bench floor under the hood is covered with firebrick. It is equipped with an electric hotplate on one side and a gasolene stove on the other. This stove is connected with a Hoskins pressure tank in the basement.

The burner of the still and the gaso-

THE WEIGHING ROOM

The weighing room is 8 ft. square. It is lighted by two north windows, which give ample light and at the same time no direct sunlight reaches the balances. The top of the balance table is a piece of poplar 2x7½ ft. and 2 in. thick. It is fastened to two transverse blocks, which are bolted on top of concrete pillars resting on the foundation. Back of the weighing room is a small closet used as a photographic dark room.

The third room in the chemical laboratory is called, for the want of a better name, the testing room. It contains two work tables, a sink and drainboard and



PLAN OF BUILDING FOR COMBINED OFFICE AND LABORATORY

lene assay and test furnaces are also connected with this pressure tank. The hood has no sliding windows, both sides being open.

At the end of the table not occupied by the hood are the drain board and sink. The sink has cold-water connection only and is equipped with a large Richards air pump for filtering. Along the east side of the room is a work table which is used for filtering. On this table is a funnel rack which holds 24 funnels, while on the wall between the windows is a set of shelves giving ample space for reagent bottles. On the north side of the room is the titrating table. Above the window, on a shelf, are the bottles containing standard solutions, from which the solutions are siphoned into the burettes.

a furnace table. The furnace table is 4x8 ft., covered with firebrick, and is 3 ft. high. On this table are a gasolene muffle furnace and a pot furnace. Above the table and furnaces is a sheet-iron hood connected with a sheet-iron flue, with a revolving top, so that there is always a good draft. On the wall by the sink is a Sargent still which is heated by a gasolene burner. A door from this room enters a 5x7-ft. porch, where supplies are unloaded.

At the Alaska-Mexican mine in 1909, the machine drills working on stoping averaged 39.95 tons per drill per shift, drilling 27.16 ft. of hole; on development, they averaged 12.41 tons, drilling 34.72 ft.; and on cutting out, 15.13 tons, with 30.69 feet.

Round Mountain Mining Company

The report of the Round Mountain Mining Company, of Nevada, for the year ended March 31, 1910, states that development work has been confined largely to the 600, 700, 800 and 900 levels. The most important development on Los Gazabo vein has been in the lower levels. A new oreshoot about 200 ft. long was encountered on the 700- and 800-ft. levels. Favorable developments resulted from work on the 600 level, where a total of 653 ft. of crosscuts and drifts extended into the footwall, exposing a body of ore 150 ft. in length by 100 ft. in width. On the 800-ft. level crosscuts have been extended into the footwall 958 ft. This work has opened two ore zones, one of which has been followed 140 ft. and has produced a fair tonnage of average grade ore, while the other zone has not yet been prospected to determine its size and value. During the year a total of 8098 ft. of drifts, crosscuts, raises, winzes and shafts were completed.

On the Mariposa, Saddleback and Valley View claims, development work was done by lessees. The Morrin lease workings which are on a vertical vein on the Mariposa claim have \$12,000 worth of ore blocked out ready for stoping. This is a promising vein and has been worked to a vertical depth of only 80 feet.

ORE RESERVES

The ore now blocked out in the various claims amounts to 45,360 tons, which is an increase of 5458 tons over the ore reserves of last year. The value of this ore based upon the average recovery for the year, \$11.63 per ton, would be \$527,537. Much of the ore now exposed is of a lower grade than that milled during the last year, which makes the average value between \$9 and \$10 per ton. In order that the company may mill this grade of ore at as great a profit as that obtained from the higher-grade ores, it has been decided to increase the capacity of milling plant from 100 tons to 150 tons per day. By mining and milling larger quantities of ore it is hoped to decrease the tonnage costs.

TONNAGE MILLED

During the year the amount of ore mined and milled was 33,860 tons of a gross value of \$393,865 and a net value of \$192,805. The total net profit for the year was \$194,049. The cost per ton of ore was \$5.919 as compared with \$6.07 the year before. The mining costs are distributed as follows: Mine development per ton, \$1.738; ore extraction, \$2.318; mill operation, \$1.51; general expenses, \$0.353; total cost of \$5.919 per ton.

Four quarterly dividends of 4c. per share amounting to \$131,181, were paid. The company has 222 acres of patented ground, and 121 acres unpatented. Dur-

ing the year additions were made to the mine and mill equipment at a cost of \$34,188. The company now has in its treasury \$52,109. As to the future of the mine, the report states that only a small part of the territory has as yet been prospected. The discoveries made during the last five months in the footwall section, back of the main or Los Gazabo vein have opened large bodies of profitable ore, which have been only partially explored.

Copper Range Consolidated

The Copper Range Consolidated Company, Houghton, Mich., produced and sold 41,105,311 lb. of copper in 1909 from its three mines. Baltic produced 17,817,836 lb. at a cost of 7.98c. per lb.; Trimountain, 5,282,404 lb. at 13.89c. per lb.; and Champion, 9,002,535 lb. at 8.45c. per lb. (one-half of the Champion output belongs to St. Mary's Mineral Land Company). The Consolidated Company paid \$1,536,930 dividends during the year.

The Baltic Mining Company produced 21.88 lb. of copper per ton from 814,260 tons of rock stamped. President W. A. Paine reports that "Baltic is as strong as ever and can be depended upon to keep up its good work." In regard to the Champion, he says: "The Champion is looking better than it has for two years, and is opening splendid new copper ground in the lowest levels." The Champion yield was 23.88 lb. copper per ton of rock stamped.

Trimountain yielded only 16.33 lb. copper per ton and operated at a deficit of \$47,841. The Copper Range railroad paid its first dividend during the year, amounting to \$600,000. The business of the road is steadily increasing, and the road is in excellent shape.

Steel Production in France

The production of steel in France in the year 1909, according to the report issued by the Comité des Forges, showed an increase of 206,954 tons, or 7.6 per cent., over that of 1908. The total make of ingots for two years past is given as follows, in metric tons:

	1908		1909	
	Tons.	Per Cent.	Tons.	Per Cent.
Acid converter	77,581	2.8	76,981	2.5
Basic converter	1,632,296	59.9	1,853,327	61.1
Open-hearth	1,002,789	36.8	1,080,912	35.6
Crucible	12,662	0.4	16,895	0.6
Electric furnace	2,289	0.1	6,456	0.2
Total	2,727,617	100.0	3,034,571	100.0

All classes of steel showed an increase last year except acid converter. The raw material used in making this steel in 1909 included 2,485,425 tons pig iron, of which 142,903 tons were classed as bessemer pig, 2,111,095 as basic pig and 231,427 as other iron; 127,196 tons ferromanganese and other alloys; 810,778 tons scrap and 17,887 tons ore.

The production of half-finished steel

reported was: Blooms, 1,057,952; billets, 538,441; total, 1,596,393 tons, an increase of 280,394 tons over 1908. What proportion of these were sold by the various works in the half-finished form is not stated. The output of finished steel was, in metric tons:

	1908.	1909.	Changes.
Bars	390,037	534,299	I. 144,262
Rails	322,241	354,631	I. 32,390
Plates and sheets	344,772	364,630	I. 19,858
Wire-rods & wire	156,446	169,558	I. 13,112
Shapes, etc.	551,565	505,339	D. 46,226
Tires	49,373	33,721	D. 15,652
Forgings	40,343	48,249	I. 7,906
Castings	29,245	32,595	I. 3,350
Total	1,884,022	2,043,022	I. 159,000

About 36 per cent. of the finished steel was made in the department of Meurthe et Mosells; 26.5 in the Nord; and 10.5 per cent. in the Center district.

Alaska-Mexican Gold Mining Company

The Alaska-Mexican Gold Mining Company, Douglas Island, Alaska, in 1909 crushed ore of the highest grade so far treated, the average being estimated at \$4.04 per ton during the year as compared with \$3.22 in 1906, the year of highest grade heretofore. The mine produced and sent to the mill 220,976 tons of ore, of which 188,151 tons were milled in the Mexican mill and 32,425 were treated by the Alaska United company. The Mexican mill also crushed 38,100 tons of the United company's ore, making a total of 226,651 tons treated by this mill in 351 days, 17 hours. This tonnage yielded \$2.077 per ton in free gold and base bullion and \$1.66 per ton in concentrates, a total of \$3.74 per ton.

In its report the company figures its operations on the basis of the ton of ore milled in its own mill (226,651) as follows: Total mining costs, \$1.225 (\$1.25 per ton of ore hoisted); milling, 0.2431; total operating, \$1.6788; total operating profit from Mexican mill, \$468,424 or \$2.0367 per ton. After adjusting accounts with the Alaska United the profit for the year was \$499,488, out of which \$360,000 in dividends was paid (40 per cent. on issued stock) and \$73,458 was carried forward to the balance sheet.

The Alaska-Mexican is working to a depth of 1320 ft., the shaft being 1470 ft. deep, and did 3848 ft. of development during the year. The ore reserves are given at 596,404 tons of an average assay of \$3.58 per ton, all this ore being between the 660- and 1210-ft. levels. Only three accidents are reported, one of which was fatal.

One of the most unusual discoveries in a Cœur d'Alene mine was asbestos in connection with the high-grade galena exposed in a drift in the Parrot. A layer of asbestos of fine quality and fiber, and an inch thick, was found next to the shipping ore on the footwall.

Zinc Sulphide Pigment

In recent years, numerous attempts have been made to devise a white pigment to replace white lead, which is subject to discoloration in sulphurous atmospheres, and has also been interdicted by many European governments for sanitary reasons arising out of its poisonous nature. Among other pigments, zinc sulphide has long been recognized as a suitable substitute, but the processes for making it an anhydrous, pure white form have been expensive and exceedingly objectionable on account of the necessity for employing hydrogen sulphide gas, which is even more poisonous than lead. As early as 1878 it was pointed out that the covering power of zinc sulphide was even superior to that of white lead, and at the same time nonpoisonous and unsusceptible to sulphurous emanations.

MAKING ZINC SULPHIDE WITHOUT HYDROGEN SULPHIDE

After long investigation, MM. Piperaut and Vila have succeeded, according to a report submitted to the Société d'Encouragement pour l'Industrie Nationale and published in its *Bulletin* of November, 1909, in perfecting a process for the manufacture of zinc sulphide without the use of hydrogen sulphide. Metallic oxides, derived by roasting suitable ores, are dissolved in a solution of caustic alkali. The solution is then boiled vigorously while powdered sulphur is added. This gradually produces an alkaline sulphide, in a nascent state, which reacts with the metals. Only enough sulphur is added the first time to precipitate the metals having dark-colored sulphides, lead, iron, etc.; after filtration, the amount of zinc contained in the filtrate is determined by titration, and just enough more sulphur is added to complete the precipitation of the zinc. The reaction is not immediate, but progressive, and is complete only after a prolonged boiling. The precipitate consists of dense, microscopic grains, which can be washed rapidly, dried easily and finally dehydrated at a red heat in closed muffle furnaces. The dehydrated sulphide is a fine, unctuous, white powder, having a specific gravity of 4 to 4.2, and mixing freely with oil.

TESTS APPLIED TO ZINC SULPHIDE

The first objection raised to the use of zinc sulphide as a pigment was that when exposed to the atmosphere, especially if damp, it might combine with oxygen, forming a sulphate which, being soluble, would destroy the paint. Samples of both hydrous and dehydrated zinc sulphide were placed in flasks containing both fresh and salt water, were shaken every morning and exposed to the sunlight for six months; it was then found that the amount of decomposition of the

anhydrous sulphide was almost negligible, while the hydrous sulphide had lost only 1.3 per cent. of its weight.

Other tests on the covering power, the mixing qualities, the ease of application, the durability under severe conditions when placed on wood, glass, mortar, etc., were carried out, both in the laboratory and on a commercial scale, and in comparison with white lead and zinc oxides; the tests are reported in full in the report above referred to, the conclusions being that zinc sulphide made by this process is in every respect equal, if not indeed superior, to either white lead or zinc oxide.

Franklin Mining Company

The Franklin Mining Company, Houghton, Mich., did a large amount of development in the Pewabic lode in 1909, aggregating over 7000 ft. of sinking and drifting. It is stated that the lode steadily improved from the 20th to the 28th level, where it runs into section 6. This section was purchased during the year, and, together with the present Franklin ownership of practically the entire capitalization of the Rhode Island Copper Company, gives Franklin 2800 acres in one plot.

The old Franklin mine was sold to the Quincy company about the first of 1909, and all development work ceased on the conglomerate about that time, and production from the conglomerate ceased entirely in November, 1909. The report states that the Pewabic lode is opened to the extent of over 15,000,000 cu.ft., blocking out 1,250,000 tons of stoping ground which appears to be above the average of the lode as mined at present in the district.

Some interesting cost data were embodied in the report and are summarized in the accompanying table. These costs

FRANKLIN PRODUCTION IN 1909.

Rock hoisted.....	176,417 tons
Rock stamped.....	170,546 tons
Mineral produced.....	3,306,820 lb.
Refined copper produced.....	1,615,556 lb.
Mineral in ton of rock stamped.....	19.38 lb.
Refined copper in ton of rock stamped.....	9.47 lb.

COSTS PER TON OF ROCK STAMPED.

Mining.....	\$1.0616
Compressor and drills.....	0.0789
Hoisting.....	0.1367
Rock house.....	0.0662
Surface.....	0.0653
Transportation.....	0.1009
Stamping.....	0.3099
General.....	0.0969
Office.....	0.0249

Total operating and development...	\$1.9413
Construction.....	0.1160
Total.....	\$2.0573

include \$109,950 spent in development on the Pewabic lode. The rock stamped included 47,190 tons from the Pewabic lode and 123,356 tons from the conglomerate, and in addition the mill handled 181,826 tons of custom ore from the Ahmeek. Contract prices were as follows: Sinking, 1107 ft., \$8.332 per ft.;

winze, 267 ft., \$8.613; drifting, 5606 ft., \$5.468; crosscutting, 172½ ft., \$6.004; stoping, 8022 fathoms, \$5.759 per fathom.

Pig Iron in Great Britain

The production of pig iron in the United Kingdom for two years past is reported by the British Iron Trade Association as below, in long tons:

	1908.	1909.	Changes.
First half.....	4,635,851	4,715,679	I. 79,828
Second half.....	4,653,989	4,948,608	I. 294,619
Year.....	9,289,840	9,664,287	I. 374,447

In 1908 the production of the two halves of the year was very nearly equal, while in 1909 the second half showed a gain of 232,929 tons over the first, while the first half had had a smaller advance, 61,690 tons, over the second half of 1908. The greater part of the increase in 1909 was in basic and bessemer pig, foundry and forge iron being about stationary; the exact figures not having been received. The production of pig iron in Great Britain has been as follows, in long tons, for 15 years past:

1895.....	7,895,965	1903.....	8,811,204
1896.....	8,563,209	1904.....	8,562,658
1897.....	8,789,455	1905.....	9,592,737
1898.....	8,631,151	1906.....	10,149,388
1899.....	9,305,319	1907.....	9,923,856
1900.....	8,908,570	1908.....	9,289,840
1901.....	7,761,830	1909.....	9,664,287
1902.....	8,586,693		

In this period of 15 years, the lowest point was reached in 1901 and the highest in 1906; the difference between those two years being 2,387,558 tons. The make of pig iron last year, though greater than that of 1908, fell below both 1907 and 1906; the decrease, as compared with the maximum year, being 485,101 tons. The production during the past 10 years has shown some considerable fluctuations, but no great advance.

The number of blast furnaces in Great Britain at the close of 1909 was 508. The average number in blast during the year was 320; the average make per furnace was 30,224 tons for the year. By districts the highest average output per furnace was 60,111 tons in South Wales; the lowest, 16,162 tons, in Scotland.

Pittsburg-Silver Peak

The Pittsburg-Silver Peak Gold Mining Company, at Blair, Nev., reports that an average of 95 stamps of the total number of 100 were in continuous operation during 1909. Bullion from 150,359 tons of ore was extracted, giving an average gross return of \$6.09 per ton. The net earnings from operating were \$337,004.

The president, William Flinn, says: "We have added 20 stamps to the mill, so that since April 1, 1910, 120 stamps have been dropping. The mine development has progressed so that additional stamps could easily be furnished with ore, but we deem it unwise to increase

the capacity of the mill until after we have demonstrated the most economical process of extracting the bullion; to that end we are erecting a small experimental plant."

During the year the company purchased the property of the Silver Peak-Valcalda, about 175 acres.

Geological Survey Appropriations

SPECIAL CORRESPONDENCE

The appropriations for the Geological Survey made in the new sundry civil bill and expected to receive the approval of Congress are as follows:

Office of the Director, \$34,860; ten scientific assistants, \$29,900; general expenses for pay of skilled laborers and various temporary employees, \$20,000; topographic surveys in various portions of the United States, \$350,000, to be immediately available; geologic surveys in the various portions of the United States, \$225,000, to be immediately available; chemical and physical researches relating to the geology of the United States, \$20,000; preparation of the illustrations of the Geological Survey, \$18,280; preparation of the report of the mineral resources of the United States, \$75,000; gaging the streams and determining the water supply of the United States, and for the investigation of underground currents and artesian wells, and the preparation of reports upon the best methods of utilizing the water resources, \$100,000; the purchase of necessary books for the library, \$2000; engraving and printing geologic maps, \$100,000.

For the continuation of the analyzing and testing of the coals, lignites, and other mineral-fuel substances, \$100,000; continuation of the topographic surveys of the public lands that have been or may hereafter be designated as national forests, \$75,000, to be immediately available; subdivisional surveys of public lands in Alaska and the preparation of the necessary maps and field notes thereof, \$40,000, to be immediately available; salaries of two Territorial mine inspectors, \$4000; for *per diem*, in lieu of subsistence at a rate not exceeding \$3 per day each while absent from their homes on duty, and for actual necessary traveling expenses of mine inspectors, including necessary sleeping-car fares, \$3350; continuing the investigations as to the causes of mine explosions with a view to increasing safety in mining, to be immediately available, \$150,000; total, \$1,347,390.

These are substantially parallel with the appropriations of last year except a small addition for surveys of coal lands in Alaska and for the transfer of the appropriation for testing structural materials to the Bureau of Standards.

The Bureau of Mines

SPECIAL CORRESPONDENCE

The bill providing for a bureau of mines, which passed both houses of Congress early in May was officially sent to the President for his approval on Saturday, May 14, and with it a memorandum from Secretary of Interior Ballinger, as well as one from Director George Otis Smith, of the Geological Survey, with reference to the content of the bureau bill. President Taft signed the bill on Monday, May 16. Even before the bill was signed, efforts were begun in behalf of candidates for the appointment of chief of the bureau. Advocates of J. A. Holmes, now head of the Technologic Branch of the Geological Survey, visited the President on May 14, there being in the delegation members of Congress and some representative coal operators. Other candidates whose names are being pressed are David Ross, now State superintendent of mines, of Illinois, and Benjamin B. Lawrence, a distinguished mining engineer of New York. The new bureau does not come into official existence until July 1, so that it is expected there will be a fair amount of deliberation in the selection of a chief.

The Mondell Coal Land Bill

SPECIAL CORRESPONDENCE

The House of Representatives passed on May 12 the so called Mondell bill, providing for agricultural entries on coal lands. Several important changes were made. This is by many regarded as the most important bill on any question affecting mining on public lands that has passed the House for a long time. The bill is expected to meet no serious opposition in the Senate; at any rate, none has thus far materialized. As passed by the House, the measure makes provision in detail in sections 1 and 2 for agricultural entries on public lands classified as coal lands. In section 3, the bill continues with a statement that patents issued by virtue of its terms shall contain "a reservation to the United States of all the coal in the lands so patented, together with the right to prospect for, mine and remove the same. The coal deposits in such lands shall be subject to disposal by the United States in accordance with the provisions of the coal-land laws in force at the time of such disposal.

"Any person qualified to acquire coal deposits or the right to mine and remove the coal under the laws of the United States shall have the right, at all times, to enter upon the lands selected, entered or patented, as provided by this act, for the purpose of prospecting for coal there-

on upon the approval by the Secretary of the Interior of a bond or undertaking to be filed with him as security for the payment of all damages to the crops and improvements on such lands by reason of such prospecting.

"Any person who has acquired from the United States the coal deposits in any such land, or the right to mine or remove the same, may reënter and occupy so much of the surface thereof as may be required for all purposes reasonably incident to the mining and removal of the coal therefrom, and mine and remove the coal, upon payment of the damages caused thereby to the owner thereof, or upon giving a good and sufficient bond, or undertaking in an action instituted in any competent court to ascertain and fix said damages."

Iron Industry in Northern Bulgaria

BY ROBERT GRIMSHAW*

The iron industry, which was introduced into Bulgaria 12 years ago, has developed rapidly in the last four or five years. This is especially so in Rustchuk, where there are two machine shops which are occupied more particularly with the manufacture of modern mill machinery. In 1908 they were compelled to enlarge their works considerably by reason of the numerous orders received. One of these two shops, which was started 12 years ago, has 400 workmen. Last year the firm was converted into a stock company with a working capital of \$200,000. The other plant was started in 1907, is managed by a German engineer, and has 150 workmen. Worthy of mention, also, are the two shops in Plevna and Wratza, which besides agricultural implements and other products of iron also make safes, and are helped along by a government subsidy. The three foundries of the district about Rustchuk also receive a subsidy.

The manufacturing industries are weak, and it will be a long time before they can supply the native demand. For all that, by reason of the heavy tariff which went into operation in January of 1906, they are making good progress.

The Maikop Oilfield, Russia

British investors are taking a great interest in the Maikop oilfield in southern Russia. This field embraces an area of about 25 miles long by about 20 miles at the point of greatest breadth. It came into prominence toward the end of 1909 when the Black Sea Oil Fields, Ltd., brought in a gusher at a depth of less than 300 ft. Since that time operations have been actively carried on, but few wells have been completed.

*Dresden, A., Germany.

Northwest Smelting and Refining Company

The Northwest Smelting and Refining Company has succeeded to the control of the smelting plant at Sumpter, Ore. F. W. Scofield, the general manager of the new company, has had extensive experience in Montana, Colorado, Missouri and Utah. He has furnished the following data about the plant and the district:

THE SMELTING PLANT

The plant was erected in 1902-03 by the Oregon Smelting and Refining Company, and was operated by that company, until it closed in December, 1907. At the time of closing, there was a large floating indebtedness, and a mortgage covering this, was given. The company having defaulted, the mortgage was foreclosed, and the property sold under execution December, 1909, to the present company.

The equipment includes: A modern, automatic sampling mill, capacity of 250 tons per day; a Chisholm, Boyd & White briquetting machine, capacity 100 tons of briquets per day; one 4x140-in. water-jacketed copper furnace, 10 ft. from top of tuyeres to level of feed floor and charged from barrows. It has a normal capacity of 200 tons of charge per 24 hours.

The power plant consists of a 16x36-in. Corliss engine which supplies power

to the entire plant, the blower and sample mill being belt driven, and a two-unit generator plant supplies power for electrically driven pumps, and for lighting.

The company owns several mining claims, a limestone quarry and timber land.

CHARACTER OF THE ORES

The ores of the district, immediately tributary to the smeltery, are silicious gold ores; and when the plant was formerly in operation, great difficulty was experienced in obtaining a supply of iron sufficient to meet the requirements of this silica, as well as copper enough to properly serve as the collecting agent, but the completion of the Northwestern railway from its connection at Huntington with the Oregon Railroad and Navigation Company, down the Snake river to Homestead, 55 miles, gives an outlet for the iron and copper ore from the Snake River and Seven Devils districts and insures a sufficient supply of iron and copper ore, to take care of the silicious ores of the district, up to the full capacity of the furnace.

RAILROAD EXTENSIONS

The Sumpter Valley railway, a narrow-gauge line belonging to the Oregon Lumber Company, will complete an extension

to Prairie City early in the summer; and during the coming season construct a branch line down the middle fork of the John Day river toward Susanville, both of which extensions will give transportation facilities to a large number of properties, which cannot now ship ore, on account of the high cost of wagon freighting. This entire district will supply base ores, carrying in many instances a considerable excess of iron, and will further insure the supply of iron necessary to handle the highly silicious gold ores. These ores also carry a small amount of copper.

The average ores of the district which will be served by the Sumpter smeltery are too low in value to stand shipment to either Tacoma or Salt Lake. When the smeltery closed in 1907 many mines were shut down which might have continued in operation had they had an available market for the ores. The resumption of smelting will permit these properties to re-open. Some of them have already done so, and others are making preparations to re-open. There are many mines, which can be made most valuable properties, if their management is placed in competent and honest hands, the money provided for their operation will be properly used instead of being squandered.

Report of Esperanza, Ltd.

The report of the directors of the Esperanza, Ltd., which holds practically all the stock of the Esperanza Mining Company, of Mexico, records a profit of £112,385 in 1909 and gives detailed data as to the operation of the property during the year.

CONCENTRATING ORES

The mine produced 30,065 dry metric tons (33,150 short tons) of sulphide ore with an average content of 48.57 grams (1.56 oz.) gold and 343.06 grams (11 oz.) of silver per ton, a value of 76.32 pesos, of which 35.39 per cent. of the gold and 15.59 per cent. of the silver by weight were recovered in concentrates, an extraction of 31.23 per cent. by value. There were produced 363 dry tons (400 short tons) of concentrates containing 1423 grams (45.7 oz.) of gold and 4431 grams (142.5 oz.) of silver, or 1973 pesos per ton; and 29,702 tons of tailings containing 31.77 grams (1.02 oz.) of gold and 293 grams (9.4 oz.) of silver (52.20 pesos) per ton.

The tailings were cyanided for a recovery of 84.68 per cent. of the gold

and 66.72 per cent. of the silver contents by weight, a combined extraction of 81.31 per cent. by value. The tailings from this cyanide treatment carried 4.67 grams (0.15 oz.) of gold and 97.55 grams (3.13 oz.) of silver. The total extraction thus effected from the concentrating ores was 90.1 per cent. of the gold and 71.91 per cent. of the silver by weight, or 86.17 per cent. of the total value of the ore.

TAILINGS AND OXIDIZED ORES

From the sand dump there were cyanided 28,173 dry metric tons (31,000 short tons) carrying 5.06 grams (0.16 oz.) gold and 58.39 grams (1.87 oz.) of silver per ton. The tailing from this treatment contained 1.53 grams (0.049 oz.) of gold and 28.08 grams (0.9 oz.) of silver (2.98 pesos) per ton, an extraction of 69.77 per cent. of the gold and 51.91 per cent. of the silver. The total extraction was 5.71 pesos per ton, or 65.71 per cent. of the total value of the sands.

The mine produced 122,078 dry metric tons (134,750 short tons) of oxidized ores, which were cyanided direct. These ores averaged 13.24 grams (0.425 oz.) of

gold and 72.22 grams (2.32 oz.) of silver per ton, and yielded tailings carrying 1.639 grams (0.0525 oz.) of gold and 27.2 grams (0.875 oz.) of silver (3.08 pesos). A total recovery of 84.57 per cent. was made, this comprising 87.67 per cent. of the gold and 62.34 per cent. of the silver. The net return from mint and smeltery on this ore was 16.77 pesos per ton. A low extraction was made in June on account of starting the new mill, and in August on account of an accident to the sludge tank.

COSTS AND PROFITS

A grand total of 177,702 short tons (wet) of mine ore was treated, and 34,768 tons of old tailings, a total of 212,470 tons. The gross return was \$2,094,446 and the total operating costs \$1,315,201. The costs are given as follows: Development, \$0.97; ore breaking, \$2; mine to mill bins, \$0.71; total mining, \$3.68 per short ton (wet) of ore mined. The milling cost was \$2.19; shipping and selling, \$0.22; general, \$0.55; renewals reserve, \$0.14 per ton (wet) of ore and tailings treated. The net profits of the

mine amounted to \$787,219, out of which \$278,585 was spent in new construction.

ORE RESERVES

The ore reserves are estimated to yield a net return of \$2,005,215, in addition to which the consulting engineer, Pope

Yeatman, counts on considerable additional tonnage in both sulphide and oxide ores either indicated or partly developed. The tailings dump is estimated to yield a large profit from retreatment.

The new regrinding and treatment plant, composed of 10 tube mills and

the necessary Pachuca tanks and Merrill filter presses, was completed last June. Zinc-dust precipitation has been substituted for the zinc-shavings method with a resulting economy. The remodeled plant is now one of the most up-to-date and efficient in the Republic.

Quarterly Report of Utah Copper Company

In its report covering the first quarter of 1910, the Utah Copper Company gives the results from the properties of the company proper for January, and from both Utah and Boston Consolidated ground in February and March. Transportation difficulties did not permit of working at full capacity until March, in which month all plants were fully supplied, approximately 12,500 tons of ore per day.

COPPER OUTPUT

The total output of copper was 18,511,819 lb. in the quarter, distributed as follows: January, 4,745,066 lb.; February, 5,913,465; March, 7,853,288 lb. The operating profit was \$858,782, and the total net profit was \$871,957, based on 13.33c. per lb. for copper. Income from Nevada Consolidated stock owned is not included in these figures.

OLD UTAH MILLING METHOD APPROVED

In the future the Utah company's mill at Garfield will be known as the Magna, and that of Boston Consolidated will be called the Arthur. The cost of copper from the Magna plant was about 8c. per lb., but the higher costs at the Arthur plant made the total average cost 8.43c. per lb. for the quarter. About 17 per cent. of the ore treated was mined by underground methods from the Boston properties, but this method of mining will be discontinued as rapidly as overburden can be removed to permit the use of steam shovels. These stripping operations have already been commenced.

Plans are being prepared for increasing the capacity of the Arthur plant. The report states that a corps of independent engineers confirmed the earlier determinations of the company's own engineers that the machinery and method in use

at the Magna are superior, both as to extraction and costs, to the system at the Arthur. Work has been commenced upon the remodeling of the Arthur plant to make it conform as nearly as possible to the Magna.

ORE RESERVES

The combined, fully and partially developed ore reserves of the consolidated companies are stated to amount to 170,000,000 tons, "all of which is of a grade equal to that upon which we are now operating, and a large percentage of it is of a much better grade." Without considering the undeveloped areas of the property, this tonnage insures a life of 40 years at present capacity, or about 30 years at the capacity which will follow the improvements now under way and which will be completed within a year.

The Mining Industry in Corea*

The mining industry has developed considerably since the law of July 28, 1907, was adopted. Until that date only six gold and copper mines had been granted to foreigners; one belonged to a Japanese syndicate, the others being owned by American, French, English and Italian companies.

ABOUT FIFTY COMPANIES ARE OPERATING

At the end of 1908 there were 361 properties granted by the Korean government, including 109 placers; among these mines, six were granted to an American-Japanese company, eight to English companies, and five to a German company. All others belonged to Koreans or to Japanese. However, they did not work all these mines, their aim being speculation rather than effective mining. In fact, 24 mines and 27 placers only, out of the 361 concessions granted, are worked on a regular scale, and give satisfactory results. These are worked for gold, copper, coal, graphite and iron.

*Abstract of a report by M. Paillard of the French Consulate at Séoul.

PRODUCTION

The principal mining district is between the town of Hpyeng-Yang and the northern boundary of Corea. It includes the whole province of Hpyeng-An and a part of Hoang-Hai-To, and almost every metal may be found. The gold mines produced in 1908, 4040kg. of gold. The Hoang-Hai iron mines exported 100,000 tons of ore to Japan. This ore yields 50 to 55 per cent. iron and costs about 6 yen (\$3) per metric ton. The coal mines yield about 55,000 metric tons yearly, 30,000 tons of which are shipped to Japan for briquetting for the fleet. Although of a good quality, its very friable character prevents its shipment to great distance.

GRAPHITE INDUSTRY

About one-half of the graphite mines are in the hands of English capital. Korean graphite is not so good as that of India. The latter has a market value in London of 300 yen per ton, while the former is quoted only 50 yen. Deducting 12 to 18 yen for freight, etc., the net

value is 32 to 38 yen, which leaves the company about 25 per cent profit. The Korean output of graphite is 10,000 tons yearly, while the world's consumption is over 130,000 tons. The production could be largely increased without any fear of exhaustion, as the graphite mines cover an area of about 4000 hectares.

COPPER

Copper mines are also being developed in Corea. The Siou-An mine reports that from Oct. 1, 1907 to March 7, 1909, its output was 101,000 metric tons, worth 2,829,943 yen, which left a net profit of 1,862,724 yen (\$931,000). Mr. Paillard concludes that the mining industry in Corea has a good future, but that nothing should be undertaken in that country without obtaining the advice of a specialist, as too many properties of little value are offered for sale by speculators who have obtained concessions. He points out that according to the law of Aug. 13, 1908 the machinery and explosives for gold, silver and copper mines enter free of custom duties, and that gold, silver and copper ores do not pay any export tax.

Development Work of Indiana Mining Company

Six Drill Holes Started; Two Finished; Deepest Hole 1843 ft. Metallic Copper and Chrysocolla Encountered. Indiana Lode Cut at 1441 Feet

REPORT OF SUPERINTENDENT

The report of R. M. Edwards, superintendent of the Indiana Mining Company, Houghton, Mich., states that the work done so far consists entirely of diamond drilling with the object of thoroughly exploring the property. Six drill holes have been started, two of which have been completed and four are still sinking to a greater depth. The accompanying tables give the formation and approximate thickness through which the drill has passed. Detailed study of the cores was made by Alfred H. Meuche, formerly connected with the Michigan Geological Survey. The accompanying map shows the situation

DRILL HOLE NO. 1

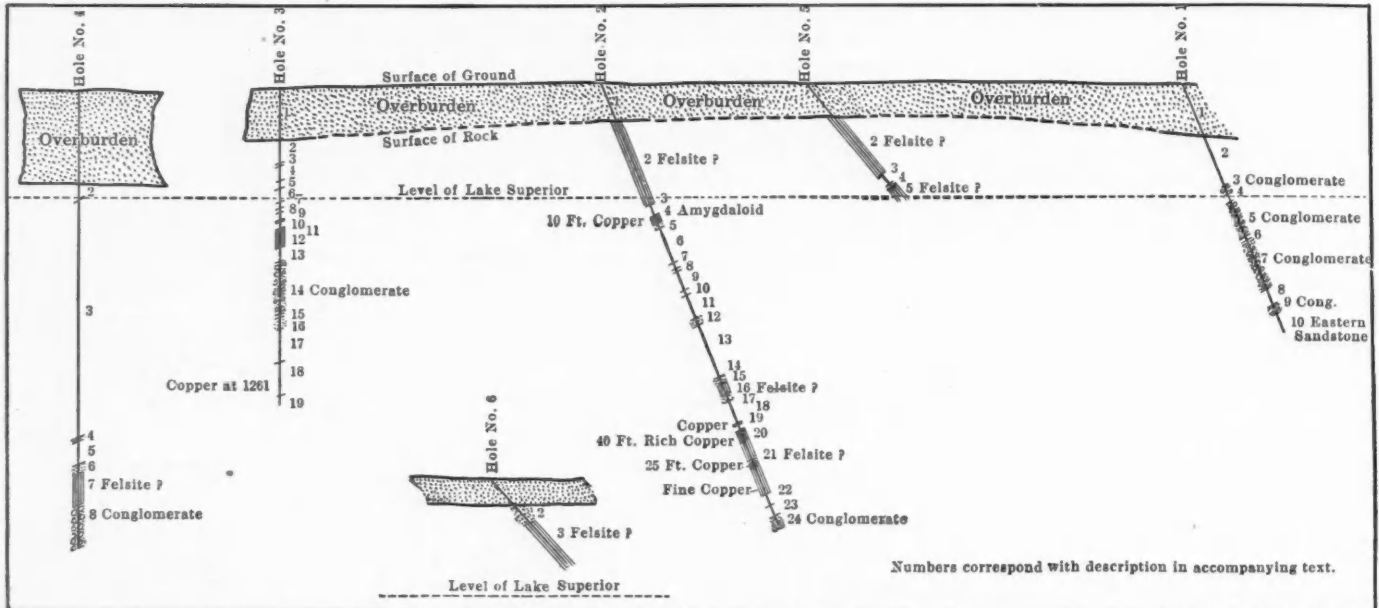
This hole is 520 ft. west and 270 ft. south of the north $\frac{1}{4}$ post of Section 27. The elevation is 447 ft. above the level of Lake Superior. The angle of dip at the surface is 65 deg. and at 975 ft. it is 72 deg. The direction of the hole is south 60 deg. east (magnetic). As neither dip nor strike have been determined the actual thickness of the bed cannot be computed. Referring to the tabulated record of Hole No. 1, formation No. 2, classified as ophite, consists largely of amygdaloid and trap. This bed is badly broken. No. 3 consists of a

No. 8 the upper portion is amygdaloid, while the lower is a porphyritic trap.

DRILL HOLE NO. 2

Drill Hole No. 2 is 13 ft. west and 41 ft. south of the northeast corner of Section 28. The elevation is 425 ft. above Lake Superior. The angle of dip at the surface is 67 deg., and at 1612 ft. is 70 deg. The direction of the hole is south 63 deg. and 28 min. east.

Referring to record of Hole No. 2, Mr. Meuche says that the felsite bed next below the overburden might have been a conglomerate and explains the absence



SECTION SHOWING DRILL HOLES ON INDIANA PROPERTY

of the various drill holes, and Fig. 2 shows cross-sections. No positive correlation has yet been made to determine the depth or strike of the beds.

The important facts so far brought out are: (1) The position of the eastern sandstone determined by Hole No. 1; (2) the existence of a mineralized amygdaloid lode, 30 ft. in thickness at a depth of 550 ft., in Hole No. 2; (3) the existence of copper-bearing rock, 40 ft. in thickness, at a depth of 1440 ft. in Hole No. 2. This bed showed a total thickness of 265 ft. It contains copper for 25 ft. near the center and also copper on the footwall. Holes No. 5 and No. 6, should cut the same lode as that cut by No. 2, but they have encountered some hard rock, making progress slow, and have not obtained sufficient depth to reach the probable position of the lode.

RECORD OF DRILL HOLE NO. 1.

	Formation.	Depth, Ft.	Thick-ness, Ft.
1	Overburden	0-222	222
2	Ophite	222-430	208
3	Conglomerate	430-457	27
4	Melaphyre (trap)	457-479	22
5	Conglomerate	479-642	162
6	Porphyrite (trap)	642-657	9
7	Conglomerate	651-862	211
8	Feldspathic Melaphyre	862-931	69
9	Conglomerate	931-966	35
10	Eastern sandstone	966-1060	bottom

conglomerate and is considered the same as the one exposed in the rock cut on the railroad track in section 22. No. 4 is more or less porphyritic, consisting of trap and amygdaloid which seems to have been highly altered. No. 6 consists mostly of trap, the grain of which is coarse. In

of pebbles by assuming the pebbles were large and the cementing material to be poor so as to be ground up in drilling. This bed has undergone considerable alteration. At first, only a little core was obtained and a large amount of caving ground was encountered. From 240 to 290 ft. it looks much like a sandstone. A large amount of epidote is present. From 290 to 407 ft. is a brecciated area and the small pieces, except for angularity may be mistaken for pebbles. From 407 to 505 ft. the formation is bleached to a pure white. A thin section shows a cryptocrystalline ground mass altered by what appears as calcite.

Formation No. 3 consists largely of trap from which only a 6-in. core was obtained. A heavy clay seam was encountered at 530 to 533 ft. No. 4 is an amygdaloid and carries a fair percentage

of copper from 570 to 558 ft. where it had much calcite, epidote and quartz.

RECORD OF DRILL HOLE NO. 2.

	Formation.	Depth, Ft.	Thick-ness, Ft.
1	Overburden	0-154	154
2	Felsite ?	154-510	356
3	Trap	510-550	40
4	Amygdaloid	550-580	30
5	Melaphyre sandstone	580-597	17
6	Ophite	597-741	144
7	Ophite	741-772	31
8	Ophite	772-781	9
9	Ophite	781-860	79
10	Amygdaloidal con- glomerate	860-878	18
11	Ophite	878-959	81
12	Melaphyre sandstone	959-1016	57
13	Ophite	1016-1231	215
14	Amygdaloid	1231-1233	2
15	Sandstone	1233-1249	16
16	Felsite	1249-1306	57
17	Sandstone	1306-1325	19
18	Ophite	1325-1419	94
19	Felsite	1419-1428	9
20	Feldspathic ophite	1428-1441	13
21	Felsite	1441-1716	265
22	Melaphyre (trap)	1716-1766	50
23	Melaphyre	1766-1806	40
24	Conglomerate	1806-1843+	37+

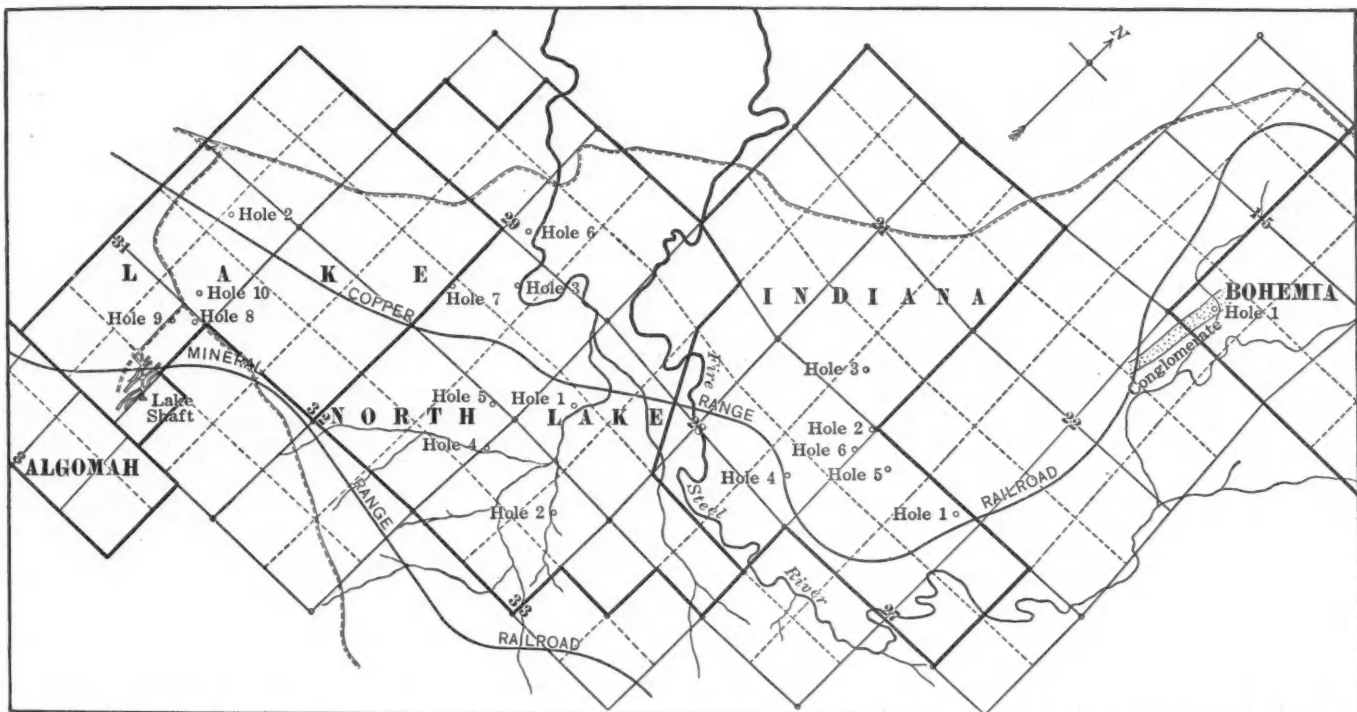
looks much like the sandstone in the top of Hole No. 6. Mr. Corning suggests that it might be a mud floor.

No. 16 is a felsite and carries a small amount of metallic copper and some chrysocolla from 1270 to 1293 ft. No. 17 is a dark gray sandstone similar to the bed from 1233 to 1249 ft. The bandings are 15 deg. from right angle to the hole. This is noteworthy as it would give credence to the flat dip. If the felsite is inclusive it may be a part of the overlying bed. No. 19 is classed as felsite and in this copper was found between 1424 and 1428 ft. No. 21 is also felsite and contains the Indiana lode, carrying copper from 1441 to 1492 ft. and from 1584 to 1611 ft. The last two or three ft. of this formation also shows copper. The top and bottom of this bed are much brecciated. No. 22 consists of an amygdaloidal trap, badly brecciated and shat-tered. A heavy dolomite seam occurs

sandstone. No. 17 consists of an amygdaloid at the top which merges into a sort of conglomerate at the base. Below this is trap. No. 18 consists of

RECORD OF DRILL HOLE NO. 3.

	Formation.	Depth, Ft.	Thick-ness, Ft.
1	Overburden	0-197	197
2	Melaphyre (ophitic)	197-288	91
3	Melaphyre sandstone	288-300	12
4	Melaphyre (Am. Tr.)	300-366	66
5	Melaphyre (Am. Tr.)	366-393	27
6	Melaphyre (Am. Tr.)	393-435	42
7	Melaphyre (Am. Tr.)	435-458	23
8	Melaphyre (Am. Tr.)	458-472	14
9	Melaphyre (Am. Tr.)	472-508	36
10	Felsite	508-513	5
11	Melaphyre (trap)	513-536	23
12	Felsite	536-615	79
13	Melaphyre (trap)	615-670	55
14	Conglomerate	670-878	208
15	Amygdaloid	878-885	7
16	Sandstone	885-934	49
17	Ophite (Am. Tr.)	934-1061	127
18	Ophite (Am. Tr.)	1061-1194	133
19	Ophite (Am. Tr.)	1194-1205+	11+
	Copper at 1161 ft.		



INDIANA, NORTH LAKE AND ADJOINING PROPERTIES —LAKE SUPERIOR COPPER DISTRICT

This quartz looks like a breccia. The rest of the bed is an epidotic amygdaloid. With reference to Formation No. 6, beds 4 and 5 probably represent the amygdaloidal part. Formation Nos. 7, 8 and 9, are ophyte, the upper portion of each being amygdaloid and the lower portion a trap. No. 10 is more or less brecciated, and is a part of the underlying trap. No. 12 is a sandstone, and the banding indicates a dip of approximately 35 deg., but this seems to be far lower than one would expect. Formation No. 13 consists of about 23 ft. of amygdaloid at the top and the remainder of trap. The amygdaloid contains more or less sandstone and the last 40 ft. of the trap are badly broken and crushed. No. 15 is a fine-grained dark sediment somewhat epidotized. This

between 1718 and 1721 ft. No. 23 is a sandstone at the top while the remainder is of a soft clayey nature and badly brecciated. No. 24 is a typical pebble conglomerate.

DRILL HOLE NO. 3

This hole is in Section 21, 832 ft. north and 1068 west of the southeast corner. The elevation is 423 ft. above Lake Superior. Formation No. 2 is classed as melaphyre and is brecciated and somewhat ophitic. No. 3 is a sandstone, the banding of which would indicate a flat dip corroborating observations in Hole No. 2. The other formations from No. 4 to 13 are alternately trap and amygdaloid. No. 14 is a typical pebble conglomerate. No. 16 is a reddish-brown

amygdaloid and trap with a percentage of copper occurring at 1161 feet.

DRILL HOLE NO. 4

Drill Hole No. 4 is vertical and is 697 ft. north and 611 ft. west of the east ¼ post of Section 28. The elevation here is 398 ft. above Lake Superior. Formation No. 2 consists almost entirely of trap which is badly brecciated. No. 3 is a trap which is coarse grained and feldspathic. Free quartz is visible. The dark mineral is either augite or hornblende. On the whole the rock resembles the Mt. Bohemia gabbro and for that reason it is here designated gabbro. A sandstone seam appears from 500 to 503 ft. No. 6 is a sandstone in which banding would give a dip of about 30 deg.,

corroborating the evidence in holes Nos. 2 and 3. No. 7 consists of felsite, the top of which is white and contains some copper. No. 8 is a typical pebble conglomerate. The bottom of the hole is still in this formation at a depth of 1786 feet.

RECORD OF DRILL HOLE NO. 4.

	Formation.	Depth, Ft.	Thick-ness, Ft.
1	Overburden	0-358	358
2	Melaphyre (trap)	358-405	47
3	Gabbro (trap)	405-1346	941
4	Amygdaloid sandstone	1346-1358	12
5	Ophite (trap)	1358-1454	96
6	Melaphyre sandstone	1454-1484	30
7	Felsite	1484-1615	131
8	Conglomerate	1615-1786+	171+

DRILL HOLE NO. 5

Drill Hole No. 5 is in Section 28 and is 800 ft. south 63 deg. 28 min. east of Hole No. 2. The angle of dip is 50 deg. The direction is south 63 deg. 28 min. east. This hole should tap Hole No. 2 but as yet no correlation can be made between the two. The elevation here is the same as at Hole No. 2. Formation No. 2 is classed as felsite while No. 3 is designated ophite, the top of which is amygdaloid and the bottom is a coarse-grained trap which looks as though part of the trap has been cut out by underlying felsite. No. 4 is a breccia which is probably the friction zone between the trap and felsite.

RECORD OF DRILL HOLE NO. 5.

	Formation.	Depth, Ft.	Thick-ness, Ft.
1	Overburden	0-160	160
2	Felsite	160-456	296
3	Ophite (Am. Tr.)	456-511	55
4	Breccia	511-515	4
5	Felsite	515-581	66
6	Ophite	581-	?

DRILL HOLE NO. 6

Drill Hole No. 6 is 500 ft. south of Hole No. 2. The angle of dip is 55 deg. The direction is south 63 deg., 28 min. east. The elevation is the same as at Hole No. 2. Formation No. 2 is a dark gray basic sandstone. The core shows banding which indicates a dip of 25 deg. This is the bed which Mr. Corning suggests might be a mud floor. Compare Hole No. 2 at 1233 to 1249 ft. No. 3 is classed as felsite. It is considerably altered and looks somewhat like a sandstone. It contains a small amount of copper at 242 feet.

Mineral Wool Production

The production of mineral wool in the United States in 1909 was greater than in any previous year, according to statistics collected for THE MINERAL INDUSTRY, amounting to 11,626 tons, valued at \$101,621, an average price of \$8.74 per ton. In 1908 the production was 9197 tons valued at \$77,228, an average price

of \$8.40 per ton. There were six companies engaged in the manufacture of mineral wool in 1909 and approximately two-thirds of the output was rock wool made from sandstone and other silicious rock, and one-third was slag wool.

Bessemer Steel Production in 1909

The production of bessemer steel in the United States, as collected and reported by the American Iron and Steel Association, showed in 1909 an increase of 52.5 per cent. over that of 1908. Large as this gain was, it was less than that in pig iron, which was 61.8 per cent. for the same period; and this indicates that the make of open-hearth steel, not yet reported, will show a larger proportional increase. The total make of bessemer steel for the year was, in long tons, including ingots and direct castings:

	Ingots.	Cast-ings.	Total.
Pennsylvania	2,838,530	7,072	2,845,602
Ohio	3,460,017	6,060	3,466,077
Illinois	1,628,200	4,244	1,632,444
Other States	1,370,222	16,438	1,386,660
Total, 1909	9,296,969	33,814	9,330,783
Total, 1908	6,096,106	20,559	6,116,665

The increase in ingots was 3,200,773; in castings, 13,255; total, 3,214,058 tons, or 52.5 per cent., as above. Ohio was the largest producer last year, Pennsylvania taking second rank for the first time. The steel was produced by 60 works in 1909, in 22 States. Louisiana, Texas and Iowa joined the list of steel-producing States in 1909. Of the active works, 22 made ingots but not castings, 34 made castings but not ingots, and 4 made both ingots and castings.

PROCESSES USED

All the bessemer steel in 1909 was made by the acid process; no basic converters have been in use in the United States since 1897. There were no Clapp-Griffiths works in operation in 1909, and only two Robert-bessemer plants were active, the same number as in 1908. Twenty-five standard bessemer plants were at work in 1909, as compared with 21 in 1908, and 18 Tropenas plants were running in 1909, against 16 in 1908. In addition one plant made steel by the Bookwalter process in 1909 and 1908, and 14 plants made steel by other minor bessemer processes in 1909, as compared with 12 in 1908. All the Tropenas and other modified bessemer plants make a specialty of direct castings and they furnished 32,993 tons of the castings reported last year; only 821 tons being made by the standard bessemer converters. Of the total production, 9,297,781 tons were made by the standard bessemer process; 15,006 tons by the Tropenas process; and 17,996 tons by other modifications of the bessemer process. In the total production for 1909, about 41,959 tons of alloyed-steel ingots and castings are

included, of which 40,483 tons were titanium steel, 1467 tons were manganese steel and the remainder was nickel and vanadium steel. Of the total alloyed steel made, 1646 tons were direct castings.

COMPARATIVE PRODUCTION

The following table gives the total make of bessemer steel in the United States for 15 years past, in long tons:

1895	4,000,128	1903	8,592,829
1896	3,919,006	1904	7,830,140
1897	5,475,315	1905	10,941,375
1898	6,600,017	1906	12,275,830
1899	7,586,354	1907	11,667,549
1900	6,684,770	1908	6,116,755
1901	8,713,302	1909	9,330,783
1902	9,138,363		

The production in 1909 was less than in any year since 1904, with the sole exception of 1908. It was less than that of 1906, the year of greatest output, by 2,945,043 tons, or 24 per cent.

NEW WORKS

On Dec. 31, 1909, there were 9 plants with 12 standard, Tropenas, or other modified converters being built, as follows, by States: Pennsylvania, 3 plants with 4 converters, of which 2 were standard bessemer converters, 1 a Tropenas, and 1 a modified Tropenas; Delaware, 1 plant, with 2 Paxson-Deemer converters; Louisiana, 1 plant with 1 Tropenas converter; Michigan, 1 plant with 1 Tropenas converter; Wisconsin, 1 plant with 1 side-blown converter; Minnesota, 1 plant with 1 side-blown converter; and California, 1 plant with 2 surface-blown converters. With the exception of the two standard bessemer converters, which are to be used for desiliconizing and decarburizing molten metal for open-hearth steel furnaces, all the above converters will make a specialty of steel castings.

The Brennan Monorail for Alaska

According to a despatch to the New York Sun, Louis Brennan's gyroscope monorail system is to undergo a practical test. A contract, signed on April 29, grants the exclusive rights for the use of the device in Alaska to an American syndicate headed by John Ballaine, of Seattle. New York bankers are backing the syndicate, which undertakes to build 100 miles of line within a year.

Mr. Brennan will complete two cars, orders for which were given by Mr. Ballaine, who has seen the gyroscope car undergoing practical tests, in which it carried over 100 passengers at the rate of 26 miles an hour. Mr. Ballaine is very enthusiastic over the system. He said to the correspondent of the Sun:

"I estimate the cost of the 1000 miles of line we are going to build from the Matanuska coalfields toward Fairbanks will not exceed \$3000 a mile, compared with at least \$20,000 for even the lightest double-rail track. The ability of the gyroscope car to take curves will obviate most of the engineering difficulties."

Recent Reverberatory Smelting Practice—II

Preheated Air Advantageous. High Metal Losses in Flue Dust. Efficient Labor Required. Cananea Costs \$2.53; Garfield \$2.65 per Ton

BY REDICK R. MOORE*

The quantity and quality of fuel used in reverberatory furnaces deserve close attention. After making allowance for the power recovered from the escaping gases, the percentages of fuel charged to the smelting operation for several plants is about as follows: Anaconda, 20 to 25 per cent.; Garfield, 23 to 30; Steptoe Valley, 18 to 25; Cananea, (oil) 8.85 per cent.

The coal used at Anaconda is said to contain 11 per cent. ash and 33 per cent. volatile matter. If it contains 2 per cent. moisture there would be 54 per cent. fixed carbon and the heat value would be approximately 7000 cal. Similarly the coal used at Garfield would have a heat value of 6550 cal. The ultimate analyses of these coals are necessary to calculate the theoretical temperatures that would be produced in the products of their complete combustion by air without any excess or loss of heat at standard conditions. The ultimate analyses of the coals used for reverberatory smelting might help to throw some light upon the results obtained. Calculations based upon the ultimate analysis of a Wyoming lignite, having about the same heat value (6578 cal.) as the coal used at Garfield indicated that the theoretical temperature of the complete combustion would be 1862 deg. C. Similarly, taking for the ultimate analysis of the oil residuum used at Cananea, the analyses of a residuum oil giving about the same heat value of 10,100 cal. (carbon 85 per cent.; hydrogen 14 and oxygen 1) the temperature of the products of combustion using 0.44 parts of steam at 178 deg. C. for spraying would be 1800 deg. C. Using air for spraying it would be 1880 deg. C. This would indicate that with steam spray there would be absorbed, in the steam between 178 deg. C. and a smelting temperature of 1500 deg. C., 428 cal. for the 0.44 kg. of steam. By the use of compressed air, at an additional cost of about 25 per cent. of the steam spraying, these calories should all be available for smelting additional ore and be reflected in an increase of 14 to 21 per cent. in tonnage.

PREHEATING AIR

Using a preheat of 200 deg. C. and using all preheated air for spraying and combustion the temperature should be, theoretically, 1975 deg. C. in the products of combustion, and there would be 687

cal. additional to increase the smelting capacity, since the waste gases from the boilers at 397 deg. C. should heat the air supply that amount. This should be a profitable field for experiment.

From Dr. Ricketts' statement of the reverberatory operations burning oil at Cananea¹ it is calculated that for every kilogram of material charged 0.1500 kg. of oil is used and the product is 0.2485 kg. of matte, 0.6302 kg. of slag and 0.1212 kg. of material volatilized. The volatilized matter consisted of 0.0444 kg. of CO₂ from the calcium and magnesium carbonates; 0.0572 kg. of SO₂ from the sulphates and sulphides, and 0.0786 kg. of oxygen from the higher oxides of iron which are reduced to FeO to form slag. From these data, by making reasonable assumptions, the amount of useful work done by the combustion of the oil is calculated as between 20 and 30 per cent. of the heat value of the oil. It can be seen that any heat introduced by preheated air should be entirely available, and if so the moderate preheat of 200 deg. C. would result in an increase of smelting capacity of 23 to 34 per cent. The lack of complete data makes it impossible to calculate the amount of heat actually used for smelting so the figures given were derived by maximum and minimum assumptions.

Richards' gives the heat utilized for smelting operations as 13.5 per cent. of the total heat value of the coal, of which 12.9 per cent. goes into the slag and 0.6 per cent. into the matte. His figures are also based on several assumptions.

FLAME IN REVERBERATORY FURNACES

The flame of a reverberatory is generally stated in most works on metallurgy as neutral. In the recently built furnaces this is not the case when working normally and making good tonnages. The flame for the back half of the furnace is dense and full of incandescent carbon or hydrocarbons, and is necessarily highly reducing. In the front third it begins to clear up from the admission of oxygen from leaks in doors and roof and at the "verb" it should be quite clear and have possibly a slight excess of oxygen, although in special cases combustion may not be complete until the gases have passed into the flue. I have seen deposits of soot on the bridgewalls of furnaces and probably the reduction of the

Fe₂O₃ and Fe₃O₄ is partly accomplished by reduction by carbon deposited on the charge.

LONG VS. SHORT FURNACES

The longer furnaces give trouble with most fuels from insufficient heat at the front which allows the slag to chill. This requires heavy firing to get the slag hot enough to skim. At Garfield, skimming bays were put in the sides about 30 ft. from the front, which were utilized for skimming when the slag was chilled on the bay in the front of the furnace. This same trouble seems to have been encountered at Cananea, with oil fuel. I can see no advantage in a furnace longer than 83 ft., and there are unquestionably several disadvantages. The only advantage claimed for the longer furnace is better settling. I am of the opinion that it is doubtful whether it is even as good. A slag that has passed the skimming stage foams badly from the formation of sulphurous acid. Foamy slags always carry over more matte than a slag that is not quite ready to skim.

It was generally noticed that a furnace which was badly eroded and needed fettling gave better tonnages than when the fettling was in good condition. When a furnace is newly fettled, the thickness of the fettling reduces the width so that a 19-ft. furnace will be only 15 or 16 ft. wide at the slag line. As the side walls are sooner or later partially eroded, greater area is obtained. This suggests the widening of the furnace in the smelting area. Slightly heavier I-beams and rods would hold the roof of a 25-ft. furnace. The fettling could be done by the Cananea plan, or by an arrangement which worked successfully on one furnace at Garfield. This consisted of a 4-in. pipe with a "T" on one end. One branch of the "T" connected with a hopper to feed the silica and in the other a steam jet was inserted to give velocity. This arrangement would throw quartz sand 25 to 30 ft. as fast as a man could shovel it into the hopper.

FLUE DUST

Reverberatories as now operated make flue dust and arrangements should be made for the collection and cheap handling of it. If this is not done, the time is bound to arrive when all the flue dust will go out of the stack, or the draft will be affected and the furnaces will have to be closed down to clean it out.

The physical character of the ores or

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¹Met. Calculations, Vol. III.

²ENG. AND MIN. JOURN., Feb. 5, 1910.

concentrates calcined may greatly affect furnace tonnages. In concentrating some of the Bingham monzonites it was necessary to leave about 40 per cent. of the monzonite with the concentrates in order to avoid heavy copper losses in the mill tailings. It was noticed in the smeltery that when using a large percentage of these concentrates the tonnage dropped, apparently from blanketing the furnace with highly silicious material. Upon following this up it was found that a sample of calcines taken from the top of the charge car showed up to 10 per cent. more silica and 7 per cent. less iron than a sample from the bed or mixture would indicate, or correct samples from the roasters showed. This was found to be due to the segregation of the silicious matter from the heavier portion of the red-hot calcines, while in a mobile condition. This action was probably stronger or more intense in the furnace itself. It is probable that some similar physical reason caused the undoubted greater difficulty of smelting McDougal flue dust, as compared to blast-furnace flue dust. At the same time the coke fines, always present in all blast-furnace flue dusts, may exert a favorable influence both from the reduction of Fe_2O_3 to FeO and from reducing the actual weight to be smelted. Undoubtedly the density and volume of the charge² as well as its specific heat and conductivity affect the smelting capacity.

TONNAGE SMELTED

The tonnage smelted varies with conditions such as I have tried to point out. At the same plant, for example, the tonnages are invariably lower when burning coal in hot and moist weather, due largely to poorer draft. The capacity of four plants is given in the accompanying table.

	Fur-naces.	Months.	Tons.	Tons per Furnace Day.
Anaconda . . .	8	1	56,038	270
Cananea . . .	1	5	40,715	245
Garfield . . .	5	1	35,490	244
Steptoe . . .	...	...	.....	300-400

At Steptoe Valley the converter slag was all poured hot into the reverberatory, and it is claimed that the slags were cleaned of copper contents by the matte fall from calcine charges, but the reverberatory slags showed an average of fully 0.1 per cent. more copper than slags from other plants where that practice is not followed. This converter slag reduced the amount of fluxing necessary but even with its fluxing value utilized, it was still necessary to add enough limestone to produce 8 to 10 per cent. CaO in the slags. The converter slag, as well as converter cleanings, matte chips, etc., was considered part of the furnace tonnage.

²Sticht in "Principles of Copper Smelting," by E. D. Peters, p. 319.

STACK LOSSES

Stack losses were estimated at Garfield by the use of a Pitot tube to obtain the velocities in the flues. A measured volume of the gas is aspirated through a cotton filter, taking care to have the velocity of aspiration greater than the velocity of the gases in the flue. The amount of copper filtered out and stopped in the tube is dissolved with the filter and determined. Knowing the flue area, a simple calculation gave the copper loss per minute or per day. One series of determinations showed the copper loss from the reverberatory flue to be 900 lb. per day.

The effective and cheap working of the reverberatory depends more upon effective and intelligent labor than does blast-furnace smelting. Firemen, graters, skimmers or chargers can, from lack of knowledge and care, or by shiftlessness, put the plant to great loss and expense. It therefore devolves especially upon the construction and operating engineers and metallurgists to see that working conditions are the best. Noxious gases from the furnaces themselves should be eliminated. Converter gases should be kept out of the reverberatory buildings and ample hot water for bathing and good clean change rooms supplied.

SMELTING COSTS AND CAPITAL ACCOUNT

Dr. Ricketts has given the direct cost of smelting both with poor coal and fuel oil at Cananea, but it should be especially noted that the plant is not a custom smeltery and the costs are not by any means the actual total cost of smelting. For example, the roasting cost is an essential part of reverberatory smelting and to get the matte into marketable copper and bullion requires converting and refining the blister copper. In addition we have to add sampling, insurance, taxes, salaries, and general expenses, and to be complete, amortization and interest upon the value of the metals locked up in the process and upon the working capital required for its operation. In custom smelting the interest on the working capital is generally carried in the capital account and does not appear in smelting costs; and the interest on the cost of the ore in course of treatment is taken up in the margins for smelting.

As outlined above, the working capital would comprise the stocks of coal, coke, fuels and supplies, and the salaries and wages expended in treatment. The value of ores would be their gross value less amounts deducted for treatment and losses, all of which should ordinarily be returned in 60 or 90 days, together with the profits of the operation, when ores are purchased outright. When treated by the toll system, the miner carries the capital corresponding to the value of the ore, or rather as much of it as corresponds to his actual cost in mining and deliv-

ering it to the smelter and refiner. Most refining contracts and some ore contracts are based upon the delivery of the metals or their value to the shipper, 60 days from receipt. This puts the interest on the value of the ore against the miner's account just as it does in the other case, the only difference being that he knows it.

AMORTIZATION

Amortization for deterioration should be carried as a fund for replacing the plant when worn out or obsolete and such a fund should be held at compound interest. This is properly taken care of in the difference between the actual cost of smelting and the actual metal returns. Quite the contrary is the case with a mining company owning its own mines, mills and reduction or smelting works. In the case of the custom-smelting industry, the life of the business may be presumed to be indefinite, while in the other, the life of the mine is more or less definite, and the life of the business is dependent on the life of one mine or one group of mines. Interest and amortization on the investments, and the working capital of the plant should be provided, although in the final analysis all these charges fall upon the profits of the mines.

UNIFORM SYSTEM OF COST RECORDS

There should be a uniform system of calculating smelting costs as the many different methods in vogue, each plant having its own system, render comparisons of costs of little value. In general, such a system should be based on the dry ore and flux smelted and each department should take care of or pay for the cost of smelting its byproducts, such as flue dust, cleanings, fuel slag, etc. The reverberatories should have credit for smelting blast-furnace flue dust, but not McDougal flue dust, and the blast furnace should have credit for smelting McDougal flue dust but not for its own flue dust, as it has already been credited with smelting it once, and the credit to one department of course becomes a charge to the department from which the material came.

A division of the charges to any department is useful also in locating the points at which improvements can be made. The division, if uniform at different plants, would also result in easy comparisons.

The following divisions and points of separation would be logical for reverberatories:

Sampling—To include weighing, moistures, unloading, sampling and delivery of ore and fluxes to the furnace bins, including its power, repairs and light.

Fuel—Cost of fuel delivered at works and losses and deterioration of same.

Power—Cost of motive power, including fuel for steam, oil, waste, labor, repairs to power machinery and lights, slag handling and charge hauling.

Labor—Including all loading, weighing, charging, feeding, firing, barring, furnacing, tapping, slag handling, cleanup, etc.

Tools and Supplies—Such tools and supplies as are in regular use, and shop work on same.

Repairs—Supplies and labor for repairs, including shop work.

Salaries—The proper proportion of all salaries directly connected with smelting operations.

General Expenses—Office expense, administration, legal expense, insurance and taxes.

Laboratory—Assaying and analyses, cost of supplies, light, heat, etc.

Roasting—Expense of handling ores to roasters, including power, repairs, labor, fuel and delivery of ore to calcine hoppers, lights, etc.

Converting—Handling matte to converters, power, labor, repairs, relining, casting and loading blister copper and handling converter slag, lights, etc.

COSTS AT CANANEA AND GARFIELD COMPARED

Calculating the Garfield and Cananea costs upon the same basis, we have the following comparisons between coal-fired reverberatories (with coal at about \$4 per ton) and an oil-fired furnace on nearly the same tonnages.

	Cananea.	Garfield.
Fuel.....	\$0.91	\$0.91
Power.....	0.02	0.02
Labor.....	0.23	0.37
Supplies and repairs.....	0.36	0.13
Salaries.....	0.08	0.04
Laboratory.....	0.08	0.02
General expenses.....	0.19	0.19
Sampling.....	0.22	0.22
Roasting.....	0.17	0.22
Converting.....	0.68	0.50
Fuel and fettling.....	0.08	0.03
Total.....	\$2.53	\$2.65

Amortization, interest, refining, freight and selling costs will bring the totals well above \$3 per ton. The converting costs were calculated for Cananea on the basis of sending 6.8 per cent. of the tonnage to the converters where converting cost \$10 per ton of blister copper. The roasting costs are based on the January percentages of calcines smelted and the 11 months' cost of 51c. per ton of dry concentrates roasted.

The costs per ton at the Highland Boy plant were: In 1906, \$2.58; 1907, \$3.21; and 1908, \$3.98. These are calculated from the published statement by adding to the "smelting costs" the percentage of the "miscellaneous" that smelting bore to the entire costs, amounting to 9.6c., 11.4c. and 34.6c. for the respective years. The Highland Boy 1908 costs were, while shipping the ores to the Garfield plant and appear to include freight to the smeltery. The excessive miscellaneous cost in this year may have been due to smoke settlements.

CONDITIONS SUITABLE FOR REVERBERATORY OPERATIONS

The advantages of the large reverberatories and their peculiar fitness for handling fine or crushed ores, flue dust and concentrates are now well understood. A comparison of their cost of operation and metal losses with blast-furnace costs and metal losses can readily be made and the determining factor of the advisability of construction of either system of smelting will probably be the cost and availability of the fuels used in the two methods. Where coke is costly and fuels suitable for reverberatory smelting are cheap, it will be advantageous to do reverberatory smelting even at the expense of crushing coarse ore to the necessary fineness. Where coke prices are reasonably low and fuel suitable for the reverberatory is costly, it may be best to install blast furnaces even at the expense of agglomerating the fines and flue dust by mechanical means or by pot-roasting or sintering. Where the fuel costs are nearly equal it will, of course, be better to install both classes of furnaces. Each problem must be worked out for its own locality and conditions.

Goldfield Consolidated

The preliminary report of the Goldfield Consolidated Mines Company for April shows that the production during the month exceeded that of March in spite of the decreased tonnage treated on account of the mill fire. The total average value of the ore was \$75.11 per ton, the profit was \$56.06 per ton (73.94 per cent.); and the total profit for the month was \$839,040.

APRIL PRODUCTION.

	Dry Tons.	Mine Assay, Oz.	Per Ton.	Total.
Combination.....	3,080	1.75	\$40.72	\$125,400
Mohawk.....	4,700	1.82	42.37	199,000
Red Top.....	3,200	2.34	54.36	174,000
Clermont:				
Mill ore.....	3,530	3.88	90.32	.....
Smelting ore.....	408	38.00	760.00	636,400
Total.....	14,918	.....	\$75.11	\$1,134,800

The excess of value assigned to the ore over the mine assays is explained by Manager Finlay as due to the fact that about 8000 oz. of gold were cleaned up at the mill following the fire of April 8. This gold belonged really to ore of former months, but principally to March.

MILLING

The mill treated 15,818 tons of ore containing 38,409 oz. gold, from which 36,708 oz. were recovered, making an extraction of 95.57 per cent. The tonnage is approximate, the weighing apparatus having been destroyed in the fire. About 14,500 tons came direct from the

mines and 1300 tons from ore contained in partially destroyed bins at the mill.

The actual value of the ore sent to the mill from the mine during the month was about \$590,000, or \$40.72 per ton. On this the tailings loss would be about \$30,000, leaving an extraction of \$560,000. To this should be added \$314,000 in ore sent to the smelters, so that the

APRIL EXPENSES.

	Amount.	Per Ton.
Bullion tax and marketing bullion.....	\$24,000	
Administration, etc.....	17,000	
Total general.....	\$41,000	\$2.59
Mining.....	67,000	4.49
Transportation.....	2,600	0.17
Milling and cyaniding.....	\$45,000	
Marketing concentrate residues.....	14,000	
Total milling.....	\$59,000	\$3.73
Construction—fire loss.....	65,000	4.11
Cost of marketing high-grade ore.....	26,000	1.74
	\$260,600	\$16.83
Loss in tailings.....	35,160	2.22
Total costs and losses.....	\$295,760	\$19.05

NOTE.—These high costs are due to fire loss, reduced tonnage and shipment of high-grade ore,

total gross value actually produced was \$904,000, contained in 14,918 tons, making \$60.60 per ton. In this statement for April the mines are credited with \$14.50 per ton on account of ore produced in former months. The amount per ton thus credited is large because the tonnage was so much below the normal.

DEVELOPMENT

The total advance was 2582 ft., being more than one foot for every six tons stoped. In addition, a large amount of work was done in clearing up and retimbering old drifts. The discovery of ore continues satisfactorily. Sill floor areas on main levels were increased by 1720 sq. ft.

Tonnage from new openings on main levels was as follows: Combination 180-ft. level, 226 tons @ 0.86 oz.; Mohawk, 350-ft. level, 105 tons @ 1.52 oz.; 600-ft. level, 804 tons @ 0.7 oz.; Red Top, 165-ft. level, 82 tons @ 0.43 oz.; 330-ft. level, 213 tons @ 0.78 oz.; Clermont, 600-ft. level, 40 tons @ 1.5 oz.; 650-ft. level, 183 tons @ 6.10 oz.; 750-ft. level, 277 tons @ 0.59 oz.; 900-ft. level, 164 tons @ 1.69 oz.; 1000-ft. level, 78 tons, @ 0.5 oz.; total, 2172 tons @ 1.25 ounces. These developments put in sight about twice as much ore as was mined.

At the end of the month one of the important oreshoots of the Red Top was found in the 600-ft. level of the Clermont. The ore appears to be 12 ft. wide on the level and averages \$30 per ton. Another important discovery is an orebody on the 900-ft. level of the Clermont. It has averaged to date \$35 per ton, but contains some much higher-grade ore. It also points to further important discoveries on the 1000-ft. level.

New Mill of the Tonopah Extension Mining Co.

The Latest Milling Plant Erected in the Tonopah District; All-slime Process Employed; Trent Agitators Are Used for Aërating the Slime

MILL OPERATED BY 15 MEN

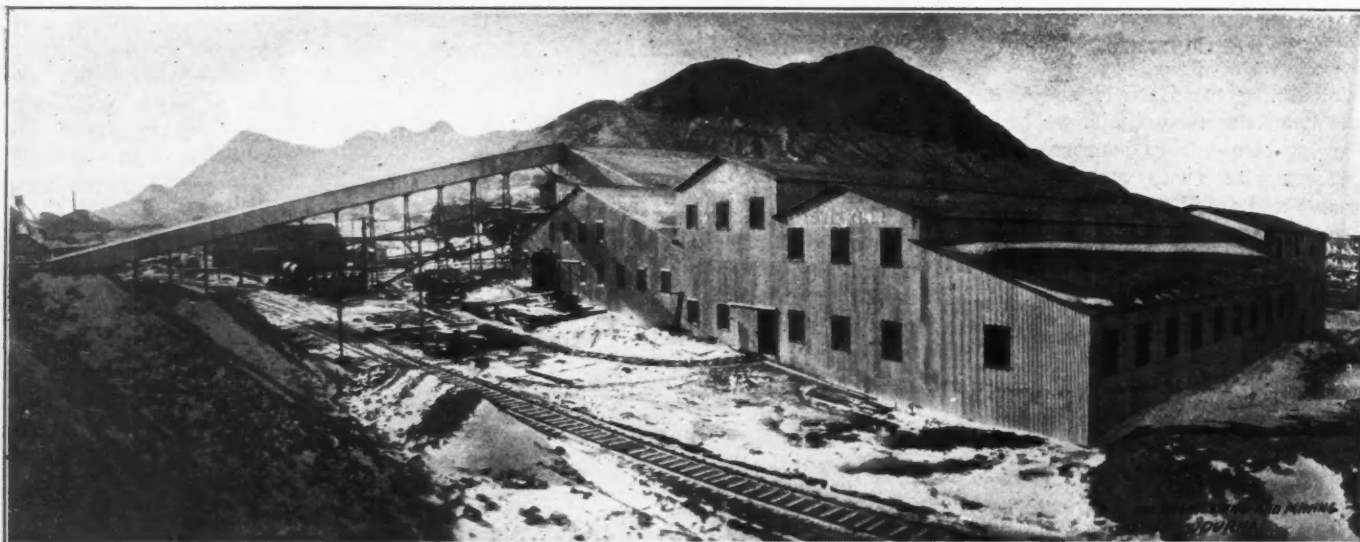
The Tonopah Extension Mining Company is the latest of the operating companies in Tonopah, Nev., to erect a mill and cyanide plant. This new mill was started up shortly before Feb. 1, 1910. It employs an all-slime process and is different in some particulars from other mills in the vicinity. The rock is first crushed to about 1½-in. size, and is then carried to the battery bins by a belt conveyor. The crushing department is entirely separate from the mill, the conveyor being 235 ft. in length and rising 40 ft. in that distance.

The stamps, of which there are 30, are driven in sets of 10 by separate mo-

pumps. The tube mills are set on a concrete floor, which slopes to a central pit, thus allowing the collection of all leakage. This leakage and the coarse product of the classifying cones is returned to the Dorr classifiers for retreatment. The slimes are pumped to six 8-ft. Callow cones, the overflow from which goes to the mill-solution tank and the thickened pulp to 12 Deister slime concentrators.

The slime tailings are run to a central pump and pumped to the slime-collecting tank, of which there are four, 24 ft. in diameter and 16 ft. high, having false conical bottoms with a slope of 25

solution and pulp drawn from the top must pass through these nozzles. The pressure of the solution and slimes discharging through these restricted nozzles causes the arms to revolve at a speed sufficient to thoroughly stir and agitate. Air is admitted to the suction through a small valve, and is introduced in fine particles into the pump and forced into the solution. This results in a complete admixture of air, solution and slime. The solution becomes charged with microscopic particles of air and the top of the tank presents a seething, effervescent surface. A patent, gritproof step bearing excludes all sand and foreign mate-



GENERAL VIEW OF TONOPAH EXTENSION MILL AND CYANIDE PLANT

tors situated under the ore bins. The mortars are set on blocks of concrete, reinforced with 6-in. flat steel hoisting cables. Two Deister concentrators remove the coarse concentrates from the pulp from each battery of 10 stamps. The tailings from these tables flow to two Dorr classifiers, with sheet-steel tanks, 4 ft. 6 in. wide by 16 ft. long, with a bottom slope of 2 in. per ft. Two 5x18-ft. trunnion-type tube mills take the coarse pulp from the Dorr classifiers. These tube mills are lined with El Oro lining cast in 21x16-in. blocks and bolted to the shell. The ribs of the lining are about 1½ in. thick and project 3 in., leaving spaces of about 3 in. between the ribs.

The discharge from the tube mills goes through hydraulic-classifying cones, which remove the coarse particles and deliver the slimes to three Frenier sand

deg. toward the center. The clear solution from these tanks can be discharged either to the mill tank or the gold tank, depending on its richness. A pump sends the thickened pulp from the slime-collecting tank to one of the three agitating tanks, where the solution is built up to its proper strength.

THE TRENT AGITATOR

These agitator tanks are called the L. C. Trent Shoshone agitator and aëerator. The device is operated by drawing off the liquid and thin slime from the top of the tank containing the agitators, and forcing the liquor by means of a centrifugal pump through a central pipe to near the bottom of the tank. The central pipe has four arms or pipes radiating from it. These arms are fitted with short jet pipes, or nozzles, inclined downward toward the bottom of the tank; all the

material from the bearings of the pipe. An advantage of this form of agitator is that the arms revolve within a few minutes after starting the agitator, even after the slimes have been allowed to settle for several hours. A great difficulty in the operation of agitators in general is the difficulty in starting after the pulp has settled. Each agitator is driven by a separate motor.

The pulp from the agitator is pumped to a large storage tank, where it is kept agitated and the solutions drawn from the bottom to Blaisdell filters. The filter tank is constructed of steel and has five hopper bottoms. There are 100 5x10-ft. leaves made of canvas-covered, grooved, wooden strips. No cocoa matting is used. Each set of 20 leaves discharges through a separate hopper. The solution from the filters goes to the gold tank and thence to a long wooden box, 4 ft. square, which

is filled with excelsior and removes any fine slimes from the solution. The overflow from this box goes direct to eight hopper-bottom zinc boxes, each having six compartments. The precipitates from the zinc boxes are sluiced to two tanks which are provided with false bottoms of cloth over slats and act as filters. The filtered liquor is then returned to the zinc boxes. The precipitate is dried in a steam drier and melted in an oil-fired furnace.

INDIVIDUAL DRIVING UNITS

The mill is run on three shifts of eight hours each. One man is employed on each shift on the batteries and also attends the electric-driven air compressor which supplies air to the mine; one man looks after the tube mills, Callow cones and Deister slimmers; one solution man takes care of the agitators and solution tanks; the filters are attended by one man on each shift. On the day shift a roustabout, and a man to attend to the zinc boxes and cleanup are employed. These, with the mill superintendent, make a total force of 15 men. The capacity of the mill is 120 tons per 24 hours. The ore treated is a complex silver-gold ore, carrying approximately 90 oz. silver to 1 oz. of gold. The mill was designed by John G. Kirchen, general manager of the Tonopah Extension company, assisted by Fred M. Field, engineer.

Each unit of machinery, as far as possible, is driven by an individual Westinghouse motor. The distribution of these power units is as follows: Rock breaker, 30 h.p., 900 r.p.m.; conveyer, 7½ h.p., 1120 r.p.m.; distributor to battery bins, 5 h.p., 1120 r.p.m.; each battery of 10 stamps, 30 h.p., 690 r.p.m.; six Deister concentrators, 5 h.p., 1120 r.p.m.; two Dorr classifiers, 5 h.p., 1120 r.p.m.; two tube mills, 100 h.p., 690 r.p.m.; 12 Deister slime concentrators, 10 h.p., 1120 r.p.m.; sand and slime pumps, one 15 h.p. and one 10 h.p., 1120 r.p.m.; each Trent agitator, 10 h.p., 1120 r.p.m.; filter vacuum pump and excess-slime pump, 30 h.p., 680 r.p.m.; mill-solution pump, one 10 h.p. and one 7½ h.p., 1120 revolutions per minute.

Power Installation at Douglas Island, Alaska

It has been decided to substitute electric power for steam wherever its application is deemed more economical at the Douglas Island, Alaska, mines. The installation decided upon at present consists of two units, one at Treadwell and the other at the mouth of Sheep creek on the north side of Gastineau channel, opposite the Ready Bullion mine and about one mile distant from it.

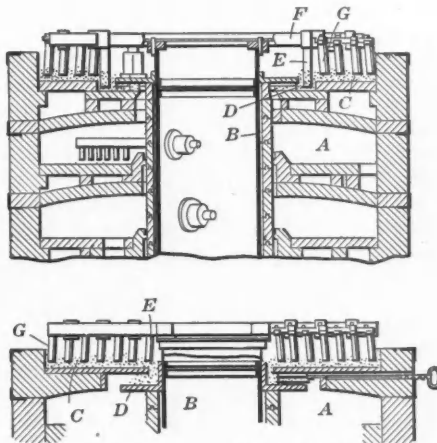
The Treadwell plant will use steam, and its purpose is to furnish power during the winter period when there is a scarcity of water. The plant consists

of two Westinghouse-Parsons steam turbines direct connected to two 1000-k.v.a. Westinghouse generator units. At the Sheep Creek plant water will be used for power, and there is sufficient to supply the needs of the Douglas Island mines for about two-thirds of the year. This plant will have a slightly larger capacity than that at Treadwell.

Method of Charging Furnaces

Utley Wedge, of Ardmore, Penn., describes in Brit. Pat. 12,766, Nov. 25, 1909, a device for feeding ore or concentrates to roasting and other furnaces.

Two constructions embodying Mr. Wedge's invention are shown in the accompanying illustration, the upper one having a heating chamber provided immediately under the storage bed C. Above the upper working chamber A is an ore-storage bed C and a delivery bed D, the inner edge of which is arranged to



DEVICE FOR CHARGING FURNACES

deliver the ore falling over it to the chamber below. The storage and delivery beds communicate with each other through a passage E, which is filled with the ore to be charged, thus forming an air-tight closure, and prevents the escape of gas from the furnace. Mounted on the shaft B is a beam F with bearings at the ends for a rock shaft, to which a bar is fastened having the stirring blades G. By means of the rock shaft the blades are free to rise and fall as they travel over the ore. From the passage E the ore may flow by gravity to the delivery bed or may be fed by suitably inclined blades.

An extensive opal deposit is reported in Oaxaca, Mexico, on the road from Tehuantepec to San Carlos, in the district of San Carlos, Yauatepec. The deposit has not been commercially utilized, but it is said to be valuable both on account of the good grade of some of the opals and because of the extent of the formation.

Las Animas District of New Mexico

BY BRIGHAM LEATHERBEE *

A revival of the mining interests of Las Animas district, Sierra county, N. M., is now taking place. This district, which is characterized by a number of fissure veins converging at Animas peak, contains much mineral wealth. Lead, copper and vanadium have been discovered and prospecting work points to a renaissance in the mining operations of the district.

RENEWED ACTIVITY

The Statehood Mines Company is beginning active operations. The Snake mine has been unwatered and is being retimbered where necessary and a new raise will connect the 500-ft. level with the 425 level. New openings along the vein south of the main shaft are showing bodies of good ore. Work will shortly begin on the unwatering of the Opportunity mine. Preparations are being made to put the 30-stamp mill in operation within 60 days.

The Sigma Construction and Development Company, controlling the Wicks vein, is confining itself to development work, and is sinking a new shaft on the south slope, 750 ft. from the old one. The new shaft is a standard two-compartment shaft and is being sunk on the foot-wall at an incline of about 30 deg. It is now down 365 ft. and will be continued to a depth of 500 ft., which will place it on the 650 level of the old shaft. The two shafts have been connected by a drift and crosscut on the 300-ft. level, while a level has been made at 250 ft. in the new shaft. At 355 ft. a vein of gold-copper ore, 18 in. in width, was encountered.

The Ameranza Gold Mining Company has leased the Bonanza vein and is operating the old stamp mill on 400 tons of ore which were extracted during the winter. No new ore is being mined.

Hiltscher Brothers, who are operating on the southwest slope of Animas peak, have sunk a development shaft 150 ft., drifted 250 ft. on the 80-ft. level, and are now in a deposit of native copper in amygdaloid similar to that of the Michigan copper region. A new engine and air compressor have been ordered and the erection of a mill contemplated.

VANADIUM DEPOSITS

The vanadium properties of the Vanadium Queen Mining Company are not yet in active operation, but prospecting work is being done and deposits of high-grade ore are being uncovered. The property contains many caves which, so far as explored, are filled with vanadium ore.

*Hillsboro, N. M.

Recent Developments in the Metallurgy of Iron

A Résumé of the Improvements and Experiments Made; Notes and References Covering Furnace Practice and Construction in Late Years

B Y B. N E U M A N N

Taking a glance backward over the history of cast-iron production, we may observe first of all that, of course, the extraordinary development of this industry could never have been accomplished had we been forced to use wood-charcoal for fuel, as in the early practice. In only a few localities, where forests abound, is it possible at the present day to procure wood in the quantities required for the modern furnace.

CHARCOAL COMPARED WITH COKE

Some interesting facts relating to the development of crude-iron production with the aid of coke in Germany have been noted by Lurmann.¹ This method naturally had its origin in one of the three great coalfields, not, however, as is commonly supposed, in Silesia, but in the Saar district. The first batch of crude cast iron smelted with coke was run in 1765 at Sulzbach, 24 years previous to the first introduction of coke smelting in Silesia. The first trial run in that province took place in 1789 at Malapane, but coke smelting did not become regular practice until its introduction at Gleiwitz in 1796. In the Ruhr district coke has been used regularly only since 1850, although experiments had been carried out in this direction as early as 1790 at Sterkrade.

The output of the furnaces was at first very small. The furnace at Gleiwitz produced only 2.66 tons per day. At Königshütte the daily output was 4.6 tons. At the present day a furnace in the Minette district produces 200 to 240 tons per day. The furnace of the Gewerkschaft Deutscher Kaiser, in Bruchhausen, has an average daily output of 500 tons. Its record for one day is 580 tons. American furnaces exceed this.² At Duquesne four furnaces produced (in March, 1906) an average of 660 tons daily, the maximum for one day being 845 tons. A furnace of the Illinois Steel Company reached the figure of 972 tons, a truly remarkable performance.

Charcoal furnaces lag far behind coke furnaces. Sweetser reports that a charcoal furnace, 69 ft. high, of the Algoma Steel Company at Sault Ste. Marie, has made a record run of 176 tons in a day. Canada has also the smallest charcoal furnaces, at Drummondville, with a daily output of only 3.44 tons.

Sweetser had occasion to run two mod-

ern furnaces of the same size, side by side, the one with coke, the other with charcoal.³ As the result of his experience he concludes that a good coke furnace can be directly used for charcoal also. With charcoal only one-third the amount of lime and 65 per cent. of the ordinary blast are needed, as compared with the conditions of working with coke. The consumption per ton of crude iron was 930 kg. charcoal and 985 kg. coke. The customary average in the district is 997 kg. coke and 803.6 kg. charcoal.

The charcoal furnace, therefore, does not seem to have been at its best during the run reported by Sweetser. The sulphur content in the coke iron was 0.029 per cent. as against 0.011 per cent. in the charcoal iron.

FURNACE CONSTRUCTION

The various types of furnace construction, both old and new, have been discussed by Ehrenwerth.⁴ He thinks that for some places some of the older systems still possess certain advantages. The same author also gives a formula for calculating the furnace profile.⁵ This subject has also been dealt with by Howe in the JOURNAL.⁶ Howe discusses the good points and failings of the several structures, and shows that it does not pay to increase the height of the furnace beyond 75 to 100 feet.

At the Newport works in Cleveland an elliptical blast furnace which produces 210 tons daily has been installed. Its dimensions are 75x10x18 ft. Such an oval furnace was tried at Muhlheim in Germany in the '60s, at the time when Rochette furnaces of that form were coming into use. But this experiment did not meet with success.⁷

BLAST FURNACE DIAGRAMS

The reactions within the blast furnace can hardly be studied by direct observation, and accordingly there is still considerable divergence of opinions regarding the same. The conditions of equilibrium of the several substances taking part in the reactions within the blast furnace, have been investigated from the standpoint of theory by Boudouard, Baur and Glassner. From their results a "blast-furnace diagram" can be constructed which shows the state of affairs prevailing at different temperatures. Be-

low 500 deg. the carbon monoxide has a reducing action only upon the ferric oxide. Above 650 deg. the direct reducing action of solid carbon upon the Fe_2O_3 also sets in. The reduction of ferrous oxide begins at a temperature above 650 deg. Up to 1000 deg. it is affected by the carbon monoxide. Above this point solid carbon itself is the reducing agent. More recently Brisker⁸ has demonstrated the correctness of the curves given by Baur and Glassner, on the basis of a number of blast-furnace balance sheets, so that we may now be fairly confident that this diagram does represent correctly the state of affairs in the blast furnace.

FUEL CONSUMPTION

Brisker has also published a number of calculations on the fuel consumption in blast-furnace practice.⁹ Interesting figures on the distribution of the heat consumption are given by the Nürnberger Maschinen Aktiengesellschaft.¹⁰ A blast furnace with a daily output of 250 tons consumes an equal quantity of coke. Of the corresponding amount of heat, the following fractions are used up for different phases of the process: For evaporation, 5 per cent.; for radiation, 5; for reduction, 24. In the molten slag 14 per cent. is carried off and lost, and in the iron 4 per cent. Thus the smelting process consumes 52 per cent. of the heat, the remaining 48 per cent. passing off in the furnace gases. For heating the blast 14 per cent. of this heat is recovered from the gases, and 9 per cent. more is used in the blowing engines. There is, therefore, finally left over in the furnace gases an excess of 25 per cent. of the total heat, which, if utilized, would be capable of furnishing 7500 horsepower.

EXPLOSIONS

Violent explosions often accompany the falling of the charge within the furnace. The cause of these explosions is still an open question. The explanation first offered was that they were due to the sudden bursting of gases into flame, as in the case of explosions in the gas and blast conduits. But this view is not tenable, although it has been revived quite recently by Teichgräber.¹¹ Neither can Osann's explanation¹² be accepted,

NOTE—Excerpts from an article in *Zeit. f. angew. Chem.*, Sept. 3, 1909, translated by A. J. Lotka, Washington, D. C.

¹*Stahl u. Eisen*, 1909, p. 89.

²*Iron Trade Rev.*, 1908, pp. 33 and 106.

³*Trans. A. I. M. E.*, 1908, p. 303.

⁴*Oest. Zeit. f. B. u. H.*, 1908, p. 301.

⁵*Loc. cit.*, 1908, p. 229.

⁶*Eng. and Min. Journ.*, Sept. 12, 1908.

⁷*Stahl u. Eisen*, 1908, p. 1791.

⁸*Stahl u. Eisen*, 1908, p. 391.

⁹*Stahl u. Eisen*, 1908, p. 1305.

¹⁰*Stahl u. Eisen*, 1908, p. 41.

¹¹*Stahl u. Eisen*, 1908, p. 1782.

¹²*Stahl u. Eisen*, 1908, p. 1783.

which ascribes the effect to purely physical conditions, namely, to great compression of the gases. Van Vloten¹² accounts for the observed effects by the supposition that there is a sudden evolution of large quantities of gas (carbon monoxide) as the red-hot dust of iron ore becomes intimately mingled with red-hot coke dust, and that this sudden increase in volume causes the disruptive effects. The conditions are particularly favorable for this occurrence when an overhanging portion of the charge collapses, so that all the different constituents come down together. Van Vloten was able to reproduce this effect on an experimental scale.

It has been proposed by Osann to use a thinner, but water-cooled furnace bed, to avoid bursting through of the molten metal. This suggestion has not found favor with technical men.¹¹ Latterly turbine blast has been coming more and more into vogue in furnace practice.¹³ Bolling has shown¹⁴ that the sulphur content of the coke is not quite such a serious matter as commonly supposed; coke containing as much as 2 per cent. sulphur causing no inconvenience whatever if a sufficiently basic slag is made.

RECOVERY OF GASES

In America the recovery of the blast-furnace gases has long been neglected, but the matter is now being taken up in truly American style. The new works of the Indiana Steel Company, at Gary, Ind., are being equipped with a plant for utilizing the waste gases from sixteen 500-ton furnaces. When all the furnaces are working there will be 200,000 h.p. available. For the utilization of blast-furnace gases in gas engines a thorough purification from suspended dust is necessary. In Germany this is carried out mostly by means of Theisen's mechanical washer. Flaccus¹⁷ gives an account of some new American gas washers of Nisbet and Bachmann.

It has been repeatedly proposed to regenerate the whole of the blast-furnace gases, i.e., to convert the carbon dioxide into carbon monoxide by treatment with coke. Schmiedhammer¹⁸ points out that the quantity of coal required for the reduction and to supply the requisite heat would be comparatively small, and draws attention to the great advantages which would thus be gained, a rich, uniform gas being obtained. Bourcoud¹⁹ proposes to use carburated gas to reduce iron ore, the iron sponge being subsequently melted in the electric furnace.

¹²*Stahl u. Eisen*, 1909, p. 1015.

¹³*Stahl u. Eisen*, 1908, pp. 200 and 369.

¹⁴*Stahl u. Eisen*, 1908, p. 73.

¹⁵*Metallurgie*, 1908, p. 493.

¹⁶*Berg. u. Hüttenmännische Rundschau*, 1908, p. 269.

¹⁷*Stahl u. Eisen*, 1908, p. 126.

¹⁸*Oest. Zeit. f. B. u. H.*, 1908, p. 41.

GAYLEY DRY AIR BLAST

The Gayley dry-blast process, introduced some time ago at the Isabella works, has now been installed also at the Warwick works, in Pottstown, and at the south works of the Illinois Steel Company. The Cleveland Cliffs Iron Company, in Marquette, and the Northwestern Iron Company, in Maryville, are also planning to equip their furnaces with dry blast. Outside of America only one Gayley plant has hitherto been installed, namely, one at Cardiff, England. Cook has given a detailed account of the Warwick works,²⁰ and Simmersbach has described the dry-blast plant of the Illinois Steel Company,²¹ and has also published some of the results obtained at Pottstown and Cardiff. At this last-mentioned works the advantage gained by the use of dry blast is 26.4 per cent. increase in the production, and 13.4 per cent. saving of fuel, when working for high production; or 14.1 per cent. increase in production and 18.4 per cent. fuel economy, when working for low fuel consumption. The running expenses and cost of maintenance is quoted at 10c. per ton of iron.

SLAG DIAGRAMS

Some interesting publications on slags appeared in 1908. Riecke prepared a large number of lime-alumina-silica compositions and has determined their melting points.²² When the results are represented graphically they show a number of maxima and minima, indicating the existence of double silicates of in part unknown character. Matthesius has put these results of Riecke's and those of Boudouard into extremely handy and lucid form by plotting the composition of the slags in a system of triangular coordinates, the corresponding melting points being represented by the height of a perpendicular erected upon each point of the triangular base-field. In this way a surface is generated, which shows a variety of properties hitherto unobserved.

Matthesius further plotted a number of other slags upon the same diagram, allowing for bases other than lime. The results show first of all a distinct difference between slags from gray and those from white crude iron, and again a marked divergence between slag from coke furnaces, charcoal furnaces, and from manganese steel and spiegeleisen. The diagram throws light on a number of observations of blast-furnace practice. Matthesius further shows how to apply the diagram for calculating the proper composition of the charge. This method possesses the advantage of greater clearness and certainty over the old method.

²⁰*Eng. and Min. Journ.*, Oct. 24, 1908.

²¹*Stahl u. Eisen*, 1909, p. 283.

²²*Sprechsaal*, 1907, Nos. 44-46; *Stahl u. Eisen*, 1908, p. 16.

Theussner²³ has made experiments with a view to obtaining an insight into the constitution of slags by examining the action of various solvents upon the same.

Among the uses for blast-furnace slag the chief are its application for slag stone and for slag cement. At first the slag, to which sand was sometimes added, was cast in iron molds in a bed of sand, and was there allowed to cool slowly. This method was practised by Payne as early as 1728. But only slags rich in silica and poor in lime could satisfactorily be dealt with in that way. A great progress was made when Lurmann discovered the hydraulic properties of granulated basic slag. Lurmann's method of making slag stone, and some other allied processes, have been described by Schwarz.²⁴

OPEN-HEARTH PROCESS

From America we have some suggestions for improvements in the open-hearth process; Blair, Jr.,²⁵ builds the furnace flue, which suffers most, of magnesia, and cools it. In this way the frequent interruptions in working are avoided. He further proposes to increase the productive capacity of the combined bessemer and open-hearth process; the construction of the furnace is modified, a feature being the introduction of a divided hearth.

An exhaustive discussion of the heat developed and consumed in the open-hearth furnace has been given by Meyer.²⁶ Starting from the generator the heat relations in the regenerators are first considered, then the gas losses on reversing, the arrangement of the burners, and the velocity of the entering gas and air. From these considerations a scientific foundation for the construction and designing of open-hearth furnaces is derived. The heat contained in the flue gases at 600 deg. C. cannot be further utilized. Hydrogen takes part in the combustion in the same measure as carbon monoxide, having due regard to the proportions in which these two are present in the gases. Nevertheless, for the sake of the steel and of the furnace vault, the hydrogen content of the generator gases should be kept as low as possible. The gas losses on reversing are slight. In order to secure a satisfactory flame the gas and air streams should be led to the hearth side by side through long flues and at a high velocity. Harrison and Wheeler²⁷ bring out the importance of a proper chemical control in running the open-hearth process.

DUPLEX PROCESS

An article by Howe²⁸ is devoted to the

²³*Stahl u. Eisen*, 1908, p. 1121.

²⁴*Stahl u. Eisen*, 1908, p. 382.

²⁵*Stahl u. Eisen*, 1908, pp. 170, 277.

²⁶*Stahl u. Eisen*, 1908, pp. 717, 756, 802.

²⁷*Metallurgie*, 1908, p. 633.

²⁸*Electrochem. and Met. Ind.*, 1908, p. 7.

study of the combined bessemer and open-hearth process, the so-called duplex process. This process furnishes the possibility of starting from a crude iron of a composition varying between wider limits than would be permissible with either the acid or basic process. The acid process requires a crude iron low in sulphur and with constant proportion of silicon; in the basic process the silicon and sulphur contents must both be small. If the furnace is run for a product low in sulphur, then the silicon content is increased. With the duplex process, however, an iron which would not be adapted for the ordinary bessemer process can well be worked up, for the acid converter eliminates the silicon and a part of the carbon and the open-hearth furnace subsequently receives a material thoroughly adapted for it.

For grades of iron low in silicon the partial elimination of the latter may be carried out in the mixer, where at the same time a portion of the manganese and sulphur can be removed. In fact a fairly complete purification in this way can be insured in the mixer according to Pratt²⁰ if care is taken to produce a basic-slag cover rich in oxygen, and if lime and oxide are repeatedly fed to the same. Pratt proposes to carry out, by the aid of the mixer, an entirely new process in which the scope of the hearth furnace is extended.

PRATT'S PROPOSAL TO USE THREE FINING FURNACES

In the ordinary fining process Pratt distinguishes three phases: (1) The melting stage, in which the iron is melted; (2) the period of exothermic reaction, or the period of low temperature during which the foreign substances, except carbon, undergo combustion; (3) the period of endothermic reaction, or the period of high temperature during which the carbon and other constituents are oxidized. Now in the ordinary open-hearth process, these periods are not sharply divided. Pratt proposes to separate them and carry them out in distinct furnaces. For this purpose are required: (1) A gas-heated mixer, as "finer," in which silicon, manganese, sulphur and phosphorus are to be eliminated as far as possible at low temperature without appreciably diminishing the carbon content; (2) a "scraper" which must be kept at a high temperature in order to keep the scrap iron liquid; (3) a series of "finishers" which are fed with molten scrap. After adding hot lime and oxides purified crude iron is poured upon the charge. The carbon and the other constituents present in small quantities burn off quickly and the process proceeds rapidly. There is little loss and a good yield is obtained; low-grade raw material may be used.

²⁰Metallurgie, 1908, p. 673.

Much time and fuel are economized through the fact that the temperatures remain constant in all the furnaces.

THOMAS BASIC PROCESS

An experimental investigation of the Thomas basic-bessemer process has been undertaken by Wust and Laval.²⁰ The changes undergone by the several constituents on blowing the charge are shown by means of a number of diagrams, and the changes in the metal are illustrated by a number of metallographic plates. A large number of temperature measurements, analyses of converter gases, etc., furnish an insight into many interesting features in the process. On the basis of their investigations, they prepared a balance sheet of the materials entering into the process and a plan of the heat supplied and consumed in the Thomas process. For 9730 kg. of steel the heat received is shown in an accompanying table.

HEAT PER 9730 KG. STEEL IN THOMAS PROCESS.

Heat Received.	Heat Units.	Per Cent.
Introduced with the crude iron	2,902,960	43
By oxidation of impurities	3,917,080	57
Total heat received	6,820,040	100
Heat Expended.		
Carried away in the gases, decomposition of steam and heating the lime	1,641,007	24
Heat lost in the slag	1,361,410	20
Heat in the molten steel	3,269,280	48
Lost by radiation	548,343	8
Total heat expended	6,820,040	100

The crude iron is fed at an average temperature of 1252 deg. C.; the temperature of the slag is about 25 deg. higher. The steel coming from the converter, after adding the carburizing and deoxidizing agents, has a temperature of 1552 deg. C. The temperature of the flame in the Thomas process rises from 1000 to 1500 deg. in 15 min., and subsequently falls somewhat. There is further calculated what economy might be secured if the blast were used either dry, rich in oxygen, or heated. The use of dry blast would not lead to any particular advantage from the point of view of heat consumption, but the quality of the steel would be improved and the steel rendered denser owing to the fact that there would be no opportunity for the absorption of hydrogen. This supposition has been confirmed by experiments in America where a dry-blast plant originally installed for use with blast furnaces was temporarily, by the way of experiment, connected to a bessemer-converter system. If a blast richer in oxygen were used the bath would ultimately attain such a high temperature that the loss of iron by combustion would be very high indeed. Preheating the blast has a similar effect. The conclusion was reached that the basic-bes-

²⁰Metallurgie, 1908, pp. 431, 471.

semer process will become restricted in its scope as soon as more rational refining processes are introduced.

In Dudelingen, Flohr insures the desired lowering of the dephosphorizing temperature in the Thomas process, not by cooling with lime and scrap, but by adding toward the end of the period a mixture of iron scale and slaked lime in the form of briquets. By this means the time required for finishing the charge is shortened.

A new deoxidizing agent for steel which has of late been recommended is calcium silicide. It would have the advantage over aluminum of eliminating at the same time traces of sulphur. Of the success of the experiments made in this direction nothing has become public.

MAGNET STEEL

A small field, as yet little explored, is that of the production of permanent steel magnets, which consist mainly of tungsten steel. Hannack says with regard to this subject:²¹ "The essential thing is that the steel should be fine-grained; this is attained by adding tungsten. The tungsten content is, however, bound within certain definite limits; moreover, the tungsten alone does not determine the quality of the magnet. This depends on the simultaneous effect of a number of constituents in the alloy. The composition of an excellent magnet steel is as follows: C, 0.597 per cent.; S, 0.038; W, 5.369; Si, 0.255; Mn, 0.176; Cu, 0.004; P, 0.018; Cr, *nil*."

Hannack also succeeded in preparing a magnet steel free from tungsten, but containing chromium and vanadium. This, however, is only of scientific interest. The quality of magnet steel depends not only on the proper chemical composition but also in a large measure on the mode of hardening. The relation between the chemical compositions and the magnetic efficiency of the product is as yet but imperfectly understood.

Howe has endeavored to determine the influence of the rate of cooling and size of blocks on the liquation in steel blocks. One would think that the latter would be favored by slow cooling and large dimensions, but this is not the case. The cause of this, according to Howe,²² must be attributed to the addition of aluminum, which prevents the expulsion of the foreign constituents by gases.

The chief alloys in which chromium is a constituent are ferrochromium, ternary chromium steel, quaternary chromium steels, such as chromium-nickel steel, chromium-tungsten steel, chromium-manganese steel and chromium-molybdenum steel.

²¹Stahl u. Eisen, 1908, p. 1237.

²²Stahl u. Eisen, 1908, p. 1256.

The Cabrillas Lead Mines of Coahuila, Mexico

Lenses of Lead Carbonate Ore, Carrying Silver and Zinc; Gangue High in Iron and Low in Silica; Gypsum Bed below Orebody

B Y S . J . L E W I S *

The Cabrillas group of lead mines is in southeastern Coahuila, close to Cabrillas on the main line of the National Railway. Saltillo is one hour's ride to the west and Monterey two hours to the east. The mines are about 2000 m. from the station. The three mines have produced over three million pesos in six years.

EARLY HISTORY

The sketch map and section shows the formation in its essential features, as

All three properties were discovered by the same prospector, Atanasio Sanchez, now president of the Cabrillas and Paloma companies. Under his management, Higueras was developed into a promising prospect, sold, and the money put into Cabrillas. The purchasers of Higueras subsequently shipped much high-grade ore and made large profits. The total production of the mine, in four years, probably exceeds a million pesos. In Cabrillas, development was slow, as no bonanza ores were found, and the

ward into the valley. The mineralization is in a belt of black, shaly, badly crushed limestone, about 50 m. in thickness, having a strike the same as that of the main range and dipping to the north about 60 deg. These shales outcrop in the form of small isolated buttes and are easily followed. They contain more silica at this side of the hill than at the Higueras side, grading into a finely granular, silicious limestone in the bottom of the Cabrillas arroyo. Below it is a large deposit of gypsum about 50 m.



CABRILLAS MINE, SHOWING TRAMWAY AND OUTCROP AS SMALL PEAKS IN THE FOREGROUND



OUTCROP ALONG FAULT, SHOWING UPTURNED STRATA. THE PALOMA MINE IS TO THE LEFT OF THE CENTER

well as the positions of the three orebodies constituting the group. The most westerly, as well as the oldest, is Higueras, which was denounced in 1889; across the gulch, east of it, is the youngest, the Paloma, upon which work began about three years ago, though it was discovered in 1890; and finally, further east and a little south, on the other side of the same hill, is the Cabrillas, which has given general interest to the region. The country is rough. From the railway line in the valley to the patio of Cabrillas, the elevation is not less than 500 meters.

*Monterey, Mexico.

property was kept alive only by shipping the low-grade ore first encountered, as an iron flux to a local smeltery. In 1904 the mine was leased to the Torreón smeltery, which has operated it since. In this period the smeltery has made settlements for ore amounting to 2,000,000 pesos. Paloma only recently began shipping. Its output so far is about a quarter of a million pesos.

GEOLOGICAL FEATURES

The limestone ridge in which these orebodies occur has a general east and west axis, with spurs radiating north-

thick, dipping 30 deg. toward the north. In the Higueras arroyo, erosion has cut down to the gypsum; in the Cabrillas arroyo, the latter is from 200 to 300 m. below the surface.

Fig. 1 shows the relative position of the various developed orebodies and formations. The gypsum seems to be the lower limit of the ore.

The mountain spur in which these orebodies occur has been dislocated from the main mass by a fault, traversing the formation. The disturbance and movement incidental to this break were the primary factors determining the existence of ore

at this point. The fracture is shown in the photograph of the Paloma side of the mountain, taken from Higueras. The end of the undisturbed anticline is seen, rapidly grading into the broken strata. In the center is seen a series of more or less parallel zones of fracture. The pyramid of limestone to the left of the center, with a prospect hole at its base, is a piece of capping like that of the anticline and seems to have settled down into its present place subsequently to the upheaval. On the Paloma side, the orebody begins below the foot of this

ite, and carries some zinc as a replacement of the iron. The high-grade zinc is being explored downward by a winze following the ore. It will be of interest to see how far down this can be carried before encountering the gypsum. Still lower down on the Paloma side of the hill another adit has been begun and is now in 300 m.; the first 100 m. in limestone, the remaining 200 m. in the gypsum. It will practically crosscut the mountain, dewater the Cabrillas workings and reduce the cost of mining in both properties as well as from any other

gypsum is encountered; the remaining 27 m. are barren. No development work has been done toward the finding of other orebodies. A winze in ore is being carried down below the level of the shaft bottom, but further north, and still above the gypsum.

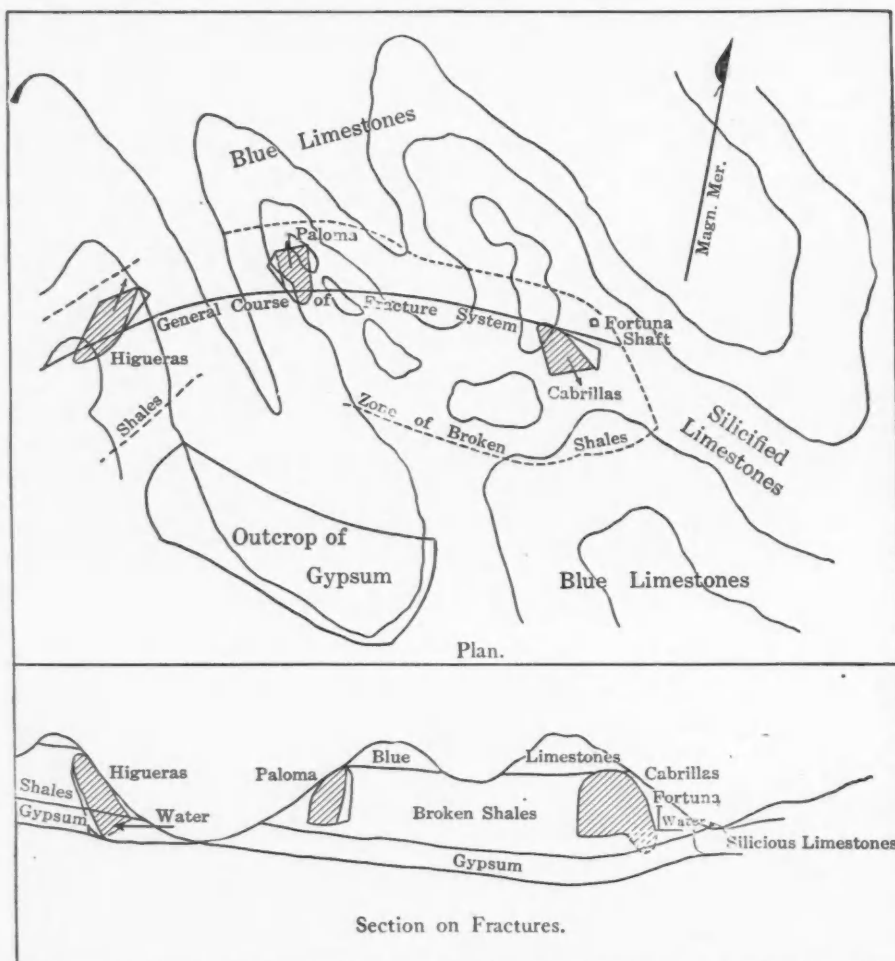
ORIGIN OF ORE

The extensive fractures, followed by intense shattering of the softer limestones, left open a considerable channel for the percolation of mineral-bearing solutions. Favorable conditions for the precipitation from these acid waters were furnished by the belt of shattered calcareous shaly rock now overlying the gypsum. It seems altogether possible that much, if not all, the ore may have come down directly as carbonate without passing through an intermediate sulphide stage. A simple interchange of the acid ions of the percolating solutions for the basic ions of the limestone would have resulted in the deposit of most of the metallic contents as carbonates and oxides, leaving the acid radical free to combine with the lime as calcium sulphate. The reaction is one with which all water chemists are familiar and is sufficient to bring down as carbonate much smaller traces of iron salts than would probably be carried by the solutions. The one important factor necessary is alkalinity, which, evidently, would not be lacking in a limestone fracture.

Conditions underground indicate that the bulk of the ore was deposited in open caves, beginning with a thin sheet on the walls and gradually forming toward the center. The walls are smooth, slickensided and clean. No fragments of country rock as breccia are found in the ore, and such few large boulders as are encountered as horses are isolated and evidently fell from above. On the footwall at various points, calamine crystals occur in thin sheets, deposited on the limestone, and evidently undisturbed since. The concentric relation of the iron and lead is marked, as is their separation from each other. The same is true of the zinc body found in Paloma. Both point clearly to deposition in open channels. The remains of one of these openings can be seen in the upper level of Paloma; it is one meter wide, and about 15 m. in length and height, separating the hanging-wall from the iron envelop of the lead core. The soft iron ore adheres to the wall without sign of replacement processes.

CHARACTER OF ORE

The Cabrillas ores are carbonates of lead and iron, carrying unimportant percentages of zinc. The Paloma mine contains high-grade carbonates of zinc, with occasional perfect calamine crystals. In the orebodies proper, the occurrence of galena is rare, and then only as a small core in a lump of carbonate. In the low-



GEOLOGICAL SKETCH SHOWING FAULT SYSTEM AND RELATIVE POSITION OF THE OREBODIES

pyramid. It has a general dip a little west of north and goes down the hill at a gradually increasing angle, becoming almost vertical in the lowest workings.

DEVELOPMENT WORK

As developed, it is about 150 m. from top to bottom, 35 m. thick, and a little over 100 m. long on the strike of the lens. This has been developed by adits, all in ore, and communicating winzes. A tunnel 60 m. below these, and farther south, passes through the gypsum, getting above it, and turning north, enters the iron envelop of the footwall. It cuts a previously unknown orebody about 25 m. south of the main lens. The smaller lens is about 2 m. thick, principally sider-

lenses that may be cut. It is too far south to go directly under the Paloma, but the latter will be reached easily by crosscutting.

On the Cabrillas side of the spur, the orebody begins at the small workings shown in the upper left-hand corner of the first illustration. It comes down the hill nearly vertically, keeping fairly close to the fault, and forms a solid chimney of iron ore with a lead core. The discoverers developed it over its whole extent, chiefly by a tunnel on the level of the tramway, and an interior vertical shaft down through the center. The lens has a width of 300 m., a length of about 200, and an average thickness of 30 m. The shaft is entirely in ore for 120 m., when

er part of the Cabrillas property, and in the Fortuna workings, where water is plentiful, there is some pyrite. The type of orebody here presented may be described in a general way as a core of lead carbonate entirely surrounded by iron ore, which contains about 4 per cent. lead and traces of zinc. It is low in silica and has been shipped in quantity both as a fluxing ore and as a mixture with the high-grade lead carbonates. The payable ore varies from 15 to 35 per cent. Pb, with about five grams of silver for each per cent. lead. A large amount of ore carrying 40 to 50 per cent. Pb and 200 to 250 grams of silver was shipped from Higuerras during its bonanza days. At present at Cabrillas and Paloma, the various grades are mixed to carry about 20 per cent. Pb, 100 gm. Ag, 15 per cent. iron, about 10 per cent. insoluble, and a little lime. The zinc averages about 5 or 6 per cent. The tenor of the ore in the two mines is practically the same.

The shipments from Cabrillas for several years have been about 2000 metric tons per month. At present, Cabrillas and Paloma are each shipping about 1500 tons of lead ore monthly, in addition to which the zinc at Paloma is being sorted to average about 40 per cent. and shipped to the United States. Higuerras has been idle ever since it was necessary to pump water out of the shaft. The shaft is 150 m. deep, with the last 20 m. under water.

MINING

The greater part of the Paloma ore is so soft that it is mined with pick and shovel. In Cabrillas, it is harder, but the expenditure for powder is not great. Extraction of ore at Paloma has been followed by dangerous caving. Heavy timbering has been necessary; 10x10-in. square sets are carried forward as fast as the extraction, and filled with waste when the limit of the block is reached. Work will then be begun on the section above. This is the plan in use at Cabrillas, where the ore is much firmer and drier; round 6-in. poles with footing and header blocks, set about 6 ft. apart, are sufficient to hold up the ground while the ore is being taken out. The waste from other parts of the mine, or more usually from outside the workings, is filled in nearly to the top of the poles, and when the next section above is begun, the poles are drawn out vertically and used over again. At Paloma it is necessary to leave all the timbering in the stope; it will not hold up the ground without being completely lagged, and in addition double sets frequently have to be put in. It is now proposed to cave the ores into the mouths of small, heavily timbered tunnels, carried into the body from various points. The sides are lagged with 6-in. poles, dovetailed into similar poles whose free ends are bedded firmly into the loose

waste or ore forming crib work. This construction is expected to resist ordinary pressures and to allow the ore to be taken out safely.

HANDLING THE ORE

At Paloma, all ore is dropped through small chutes to the main working level, whence an 8-h.p. gasolene hoist, inside the mine, lifts it to the top. The buckets are small, and dump into cars running out to the bin at the head of the incline. Two and one-half-ton steel cars are operated on the incline to the *arroyo*, where the ore is loaded into wagons and hauled to the station. Similarly at Cabrillas, the ore is sent to the lowest working level and picked up by a steam hoist, also inside the mine. The buckets are large, dump directly into cars which run out to the surface along the tramway about 500 m., and deliver into a large storage bin at the head of the cableway. An aerial ropeway carries the ore to the lower station, where the wagons take it for transport to the railway. The possible economy by having originally installed the cable complete to the railroad is evident.

The plan of extraction pursued in both these properties is evidently based on the idea common to native companies of taking out the orebody already found from the bottom up, without spending anything outside of this for development. There are few places where proper development expense would be more certainly and adequately rewarded.

POSSIBILITIES OF THE MINES

So far as the future of these mines is concerned, the most important factors that present themselves are two:

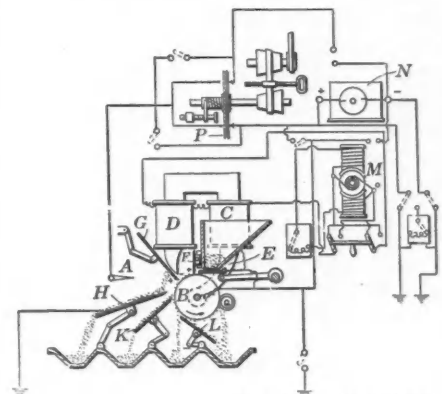
1. The thick sheet of gypsum underlying the oredeposit has been pierced at important points in all three mines, besides being available for study at the surface; at no point is there any indication of its having been even slightly disturbed. From all the evidence at hand the conclusion is inevitable that the orebodies are cut off at the gypsum horizon. Whether they turn and go northward to any extent, along the contact, has never been determined. It does not seem likely.
2. This leaves as the only probability the finding of new orebodies approximately parallel to the lenses now being exploited. In a formation so extensively fractured as this, it is altogether probable that other lenses await discovery. It is known that mineralization took place in at least one minor fracture of this class.

In addition, the amount of water being pumped out of Cabrillas every day makes it clear that the adjoining Fortuna ground, from which this water comes, contains a fracture of no mean size and importance. A shaft in this claim, a few meters north of the Cabrillas line, has

reached water level, with rapid increase in the flow as drifting was carried toward Cabrillas. In order to go on working in the latter, the pumps have to operate 6 hours daily, lifting 125,000 liters of water, or about 90 gal. per minute.

Apparatus for Electrostatic Magnetic Separation

An apparatus for the electrostatic magnetic separation of particles is diagrammatically shown in the accompanying figure. With it particles are delivered from the mass in a thin, segregated, sheet form, and are subjected to the action of a magnetic field into or through which is passed an electrostatic charge. It further provides for electrically releasing certain of the particles from others dur-



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ELECTROSTATIC SEPARATOR

ing the separation. The following description is taken from U. S. Pat. 948,599, Feb. 8, 1910, granted to H. M. Sutton, W. L. and E. G. Steele, of Dallas, Texas.

Referring to the figure, A is a pointed electrode, adapted when supplied with an electrostatic charge of delivering a continuous current. An adjacent cylindrical electrode B rotates in bearings, that are pole pieces for a pair of electromagnets C. Approximately in the center of the bar connecting these magnets is a third magnet D. Above the electrode B is a hopper containing the material to be separated. Beneath the hopper is a shaker pan E oscillated by a connecting rod and eccentric. F is an adjustably mounted shield of hard rubber, and G is a similar one pivotally mounted, for adjustment in reference to the magnet D and electrode B. The shields H, K and L are also of hard rubber (H is covered by a metallic conducting plate connected to the ground) and deliver the particles into the compartments as shown. M is the dynamo for generating electricity for the magnets, and N the electrostatic generator for the pointed electrode. An interrupter or pole changer P is placed in the circuit of the static generator and electrode.

The Use of Electricity in British Coal Mines

During the last twelve months or more the use of electricity in mines has attracted a great deal of attention in the United Kingdom. In the present circumstances, it may be said there is a feeling of apprehension in many quarters, and the suspicion that this power has played an important part in some recent disasters is gaining ground. It is not so much that electricity in itself as a power has been blamed, although among some of the miners' organizations there has been a mild agitation in favor of Parliament being called upon to enforce the removal of electricity from dry and dusty mines. The outcome of such a procedure would simply be the strengthening of legislation in such a manner as to insure that the electrical apparatus installed in the mines would be of a greatly improved quality, which would insure greater safety.

Indications point to the existing need for closer inspection into this question, and there are suggestions that at some mines the plant is not the most desirable, while other collieries are employing modern electrical plants but are not getting the full benefit because there is not a competent electrical man connected with the running of the plant. The price is allowed to enter into the problem and too often the wages offered are much below those deserved and justified. The recommendations implied in a paper before the Institution of Mining Engineers, read by Robert Nelson, electrical mines inspector, are pretty clear, and in view of the importance of the question an extract may suitably be made. Mr. Nelson said:

INFERIOR EQUIPMENT IS FALSE ECONOMY

"A coal mine is the last place in the world where ill-designed electrical apparatus should be used. The risk of employing inferior material is too great to be run. The best advice should, therefore, be obtained on the design of an installation and on the purchase of apparatus. Later the most careful and competent supervision is required during progress of the work, but given due attention to these important matters successful operation in the future is much simplified. A daily test of the operation of all automatically opened circuits is advisable; but a complete test as regards the proper working and insulation of all parts should be made at least every three months, and the results recorded for future reference. It is also advisable that the danger of touching current-carrying apparatus, such as cables and motors, should be pointed out from time to time to all the workmen employed in the mine, or in some way kept constantly before them.

"The majority of accidents it is fair to say have partial or complete ignorance as their primary cause. The unskilled should treat all electrical apparatus as 'live' for in that direction only lies complete security for them. Finally, although the special rules which the home office has issued impose certain precautionary measures, the personal element enters so largely into the case as to become a vital element if successful operation is to be achieved. By 'successful operation' is meant economical and safe operation. It is only by the selection of careful and competent officials that these conditions can be fulfilled and preventable accidents altogether avoided. In this connection it may be said again that the risk of employing inferior material is too great to be run. An opportunity for unremitting vigilance occurs in the avoidance of accidents and dangerous occurrences in coal mines, and any attempt to utilize inferior skill or inexperience is more than likely to result in failure and disappointment.

At an inquest in Yorkshire early in the year 1909, arising out of the death of two miners, the possible fatal effects of deficient appliances were strongly emphasized. W. H. Pickering, mines inspector, said that electrical engineers were not always good mechanics, and if colliery owners and managers took the grave responsibility of installing electricity in the workings of fiery mines, they should not altogether rely upon the opinions of electrical experts, who might have vague ideas concerning mining dangers and of the rough conditions apparatus must endure. The accident into which the inquiry was made, Mr. Pickering said, appeared to draw attention to "the necessity for the motors, starters, terminals and connections to which electricity, special rule No. 37 applied, being inclosed boxes which were gas tight under all conditions, constructed so that the covers could not be removed unless the current was switched off, securely locked, and so designed that any packing intended to make a gas-tight joint between the cover and the box was certain to be in position if reasonable care were taken. No person other than a competent person authorized in writing by the manager, should remove or interfere with the covers of such boxes, which should be tested from time to time."

Following the West Stanley colliery explosion and inquest in February, 1909, John Wilson, M. P., in a circular to the Durham Miners' Association dealing with this disaster in which 168 miners were killed, directed special attention to the evidence of Doctor Thornton, professor of electrical engineering at the Armstrong

College at Newcastle on Tyne, in which he made it clear that the electrical plant was as good as any in the district, and that certain defects described were general. Mr. Wilson made an appeal for the defects to be remedied, pointing out that while there may be expense, the life of the miners is in the other balance, and his view is that in these circumstances, the duty of the community is to the living. "Speaking for myself alone," Mr. Wilson added, "I am convinced that the explosion was caused by electricity within the points fixed by the three mining experts."

The veteran Parliamentary representative of the miners, the Right Hon. Thomas Burt, a leader who has been honored by King Edward VII, also recently called attention to the dangers arising from the use of electrical appliances in mines, offering some suggestions for the mitigation of such dangers by stricter supervision, and better inspection by the appointment of properly trained men. In so doing, he threw cold water upon the suggestion that electricity should be removed from the mines.

THE QUESTION OF GIVING CERTIFICATES

Arising out of his comments, Mr. Burt has had some correspondence with "a consulting and inspecting engineer and colliery expert, who is in active practice in the northern counties." This expert says he feels "strongly on the question of having certificates given to the mechanical engineers of collieries, who are in charge of the electrical plant, and who are more or less responsible to the colliery manager and to the owners." He further says that "although many colliery engineers have a good knowledge of electricity, there are many mines indeed where the electrician has only a very inadequate knowledge of electricity, and is certainly not competent to design or superintend the installation of an electrical plant of any consequence. In some cases consulting engineers have been employed, but again, the man appointed has usually been an electrical expert pure and simple, and he has had to gain his mining experience at the expense of the owners, and sometimes at the expense of the workmen." Mr. Burt's corresponding expert and engineer suggests that the miners' association should appoint their own electrical expert "to attend inquests, and make a report on every fatal accident, and to make suggestions for their prevention; and such a record would not only be valuable to the miners themselves, but would be of material assistance to the owners when installing electrical plants, and would thus do very much to remove the present feeling against the use of electricity in mines, which can do much to improve the

conditions of the men underground, if properly installed and used."

FAULTY CONSTRUCTION

Dissatisfaction with the prevailing conditions is general, and one of the strongest impeachments is contained in a Blue Book emanating from the home office. The electrical inspector of mines, Robert Nelson, refers to common faults or defects of construction embracing:

1. Exposed high- and medium-pressure conductors at surface; and exposed high- and medium-pressure conductors and switch gear underground.

2. Frames, bedplates, covers, etc., of high- and medium-pressure apparatus not "earthed" or efficiently earthed.

3. Switch gear and cables, the former mounted on wood and surrounded by as much wood as possible and the latter a confused mass, placed frequently in the main intake airway. The whole arrangement inviting two occurrences; (a) shock by accidental contact with an exposed live part; (b) fire.

4. Defective points in cables.

5. The omission of insulating brushes where frames of machines and switch boxes are pierced by cables.

Mr. Nelson also summarizes defects of organization as follows:

1. The absence of a trained electrical engineer.

2. The handling when not absolutely unavoidable of live cable or apparatus for adjustment or repair.

3. The absence of a definite and distinct rule that unskilled men may handle electrical cables and apparatus only when the pressure is "off" and only then if the work be under the direct supervision of an electrical engineer.

REASONS FOR INFERIOR WORK

Assuming that interest in this question is not confined to Great Britain, it may be permissible to make the following extracts from Mr. Nelson's report:

"The very general lack of technical knowledge which exists has serious results. Tenders are obtained for electrical plants from several contracting firms, and the lowest bidder is usually accepted. The purchaser having no special knowledge of electrical matters is quite unable to judge whether the work is good or bad, his only guide being the outward appearance of the fittings. The result is frequently disastrous."

"Electrical plants for mines should first be bid for according to strict specifications; and secondly should be constantly supervised during progress. There are firms of contractors who are willing and anxious to do good work, and such firms prefer to follow strict specifications and welcome close supervision. The loose and short-sighted methods which, however, so frequently obtain with colliery owners, result in firms of this class being unable to compete against more

ignorant or less scrupulous rivals, with a consequent lowering of the general standard of electrical engineering as applied to mining."

DAY OF AWAKENING AT HAND

It is evident that in Great Britain the day of awakening is at hand. The Government is moving in the matter, and there has been appointed a departmental committee to inquire into the working of existing rules for the use of electricity in mines, and to consider what amendments are required. There is reason to believe that the best evidence available will be placed before the committee. The Council of the Institution of Electrical Engineers are considering the evidence to be submitted, and observations of members to this end are being invited. Then the institution of Mining Electrical Engineers (referred to below) will also supply evidence, and as the majority of the members of the latter may be said to be experts, the report to be drawn up and presented to the departmental committee will contain the condensed views of a body of experts, and for that reason be likely to influence any regulations that may be recommended by the committee.

Undoubtedly the way is being paved for the ambitious working electrical engineer to find a promising field for his energies in connection with mining work, and it is interesting to note that on Dec. 20, 1909, a large body of electrical engineers assembled in the city of Manchester, England, to take part in the opening general meeting of a new society to be known as the Institution of Mining Electrical Engineers. Although in its infancy, the institution has a membership approaching seven hundred. The first president is William Maurice, general manager of the Hucknall Torkard collieries in the county of Nottinghamshire. The objects of the institution appear to be agreeable to, and have the support of colliery owners and the management of the mines.

THE ADVANCE OF ELECTRICITY

The address of the president is not without interest and some of the points may be surveyed. It appears that 70 years ago there were only some three or four electric-power installations in the mines of Great Britain. In 1889, there were only 42 mines sufficiently advanced to have adopted electric lighting. Of these 42, 20 were in south Wales, 7 in Staffordshire, 4 in Derbyshire, 5 in Lancashire, and 6 in Durham and Northumberland. Today practically every colliery in the country has its own electric generating station, and many of these rival in the extent and perfection of their equipment, the central power stations of large municipalities.

The purposes for which the institute is established, are cited as follows:

1. To consider means for minimizing

the risk attending the application of electricity to the industry of mining, and to promote the adoption of approved methods and devices tending to increase safety.

2. To promote the general advancement of electrical science in its applications to the industry of mining; to facilitate the exchange of information and ideas on this subject among the members of the institute and otherwise; and generally, to extend the experience, increase the efficiency and elevate the status of those engaged in such applications.

"Who is there among you," Mr. Maurice, the president, inquired of his audience, "who cannot recall accidents and narrow escapes from accidents by the dozen, almost everyone of which had its origin in some form of neglect or carelessness? In fact (and it is an indisputable fact, lying at the root of the whole problem of the safe use of electricity in mines) accidents do not happen at all on account of some mysterious and incalculable property of electricity, but simply and solely for want of order, cleanliness and common care. Merely a little elementary technical knowledge, if associated with intelligent application, would work wonders in the prevention of accidents. At many collieries there are dynamo attendants, motor drivers, wiremen, and others associated with electrical plants, who have had no technical training. They have in fact, picked up all they know, in course of the performance of their work." The president hopes that many such men will avail themselves of the opportunities the Institution offers for self education and training. Enlightened men, he says, already pay their doctors in order that they may be kept in health. The true function of the engineer also is to prevent rather than to repair breakdowns. As a rule, he who prevents breakdowns prevents accidents. The question of the complete development of all his faculties is one that ought to attract the attention of every young man.

Blown-out Shot Causes Explosion

Six coal miners were killed at Wilburton, Okla., March 31, as the result of a blown-out shot at the Wilburton mine. The miners were driving a slope and were just preparing to quit work when the accident occurred. The slope caved in and the body of the sixth victim was not immediately recovered. The mine is owned by the Great Western Coal and Coke Company and is located about three-quarters of a mile from Wilburton. The injuries to the mine were slight. This is the second fatal mine accident as a result of a "windy" shot in Oklahoma in less than a week. On March 26, four men were killed as the result of a blown-out shot in the Kali Inla mine, situated 25 miles east of McAlester.

Mine Gases and Safety Lamps

BY W. HARTMAN *

Different inventors have tried to produce an apparatus which will successfully announce the presence of gas in mines and warn in time to prevent disasters. No doubt such a device would be of enormous importance, but unfortunately, none has so far proved its practicability.

Some of these so called indicators are based on that physical quality of gases that makes the lighter gas penetrate a porous substance, such as clay or an animal skin, quicker than a heavy one. In a vessel closed on its open side with an animal skin and brought from the ordinary atmosphere into a room filled with a certain gas mixture, for example, methane (CH_4), an exchange will take place. The CH_4 forces its way through the skin into the vessel pressing the atmospheric air out of it. The lighter gas, in this case CH_4 , of course, can pass the separating skin considerably quicker than the heavier air can escape. This results at first in a higher pressure inside of the vessel which power has been used to ring electric bells as a warning.

Such devices, although cleverly constructed, could not be introduced into practical mining. In a gaseous mine, danger may exist in the remotest corner, and since the workings are continually pushed forward, the location of the device would have to be changed constantly.

The only reliable means to establish the presence of gas is with the ordinary safety lamp. If the atmosphere necessary for combustion contains CH_4 in small quantities only, this mine gas around the lamp flame will burn and produce enlargement and lengthening of the flame. Fortunately this extension of the flame can easily be observed even if only 1 or 2 per cent. of CH_4 is in the air. When gas is present in small quantities, a pale blue cone of light can be noticed; however, this is only possible when the lamp flame is screwed down as low as possible, otherwise the brighter light of the lamp will surpass it. Therefore, when the presence of a small percentage of gas has to be determined, a flame as small as possible should be used. The visibility of the cone of light is different when benzine is used. Benzine, on account of the higher heat its flame produces, indicates gas when only 1 per cent. is present.

When from 1 to 2 per cent. of gas is present, the lengthening of the flame is very little. When 3 per cent. CH_4 is present, the top of the light cone is a little bit lower than the upper edge of the

glass chimney; at 4 per cent. the cone is about the breadth of a finger above the glass chimney, and at 5 per cent. the gas cone reaches the top cover and broadens out. When more than 5 per cent. of gas is present, the original flame of the lamp extinguishes, while the gas in the lamp burns as long as new mine gas keeps entering it; at more than 14 per cent., the flame is extinguished entirely. When oil is burned in the lamp, the process is similar, only the presence of gas cannot be observed with certainty unless above 2 per cent.

With ordinary benzine and oil lamps, the observation and determination of smaller bodies of mine gas are prevented by the illuminating power of their flames. Also, the glass chimney is a drawback on account of its reflecting qualities. Therefore lamps using a burning material which, though producing a great heat, gives but little light, are adapted best for the determination. Furthermore, it is proper if the character of a lamp does not forbid it, to omit the glass chimney entirely.

THE PIELER LAMP

Such a lamp which works excellently is the Pieler lamp, but, of course, this lamp can be used for testing purposes only. Instead of oil, pure alcohol or methyl-alcohol is used. A small brass chimney hides the original flame so that the eye is not blinded by the light. The glass chimney is missing. Before entering gaseous parts of the mine, the flame is so adjusted that the point of the flame cone is on the same level as the upper edge of the brass chimney; with such a lamp, even $\frac{1}{4}$ per cent. of methane (CH_4) in the air can be traced, and at $2\frac{1}{2}$ per cent., the point of the flame reaches already the top of the chimney.

An especially favorable indicator of mine gases is the hydrogen gas flame on account of its giving an extraordinary heat and yet possessing a very small illuminating power. This gas is used in the Clowes and Hempel lamps, both of which are also fitted out with the common benzine or oil burners, but besides, have another burner for hydrogen gas. When testing, the illuminating flame has to be extinguished.

The Clowes lamp is another excellent type. The handle of the lamp is at the same time used as a vessel which contains the compressed hydrogen sufficient for quite a number of tests. There is a main and also a hydrogen burner. If the vessel containing the hydrogen runs empty it has to be refilled.

On the same principle, Hempel has constructed his lamp, with the difference only that the necessary hydrogen itself is produced in the vessel attached on the side of the lamp by sulphuric acid and zinc. This is more convenient as the refilling with these chemicals can be done in the mine.

Reinforced Concrete Mine Props

Armored-concrete forms of construction for mine props are now largely in evidence in coal-mining operations. One special form of mine prop constructed of reinforced concrete, and recently introduced into English mines, is cylindrical in shape and is constructed by taking a hollow cylinder of steel, fitted at each end with a flange. It is lined internally with concrete, leaving a hollow space longitudinally through the center of the cylinder. The lining is then closed at each end and reinforced with a steel lattice.

In order to give a homogeneous internal structure, the whole exterior of the structure of the cylinder, together with the flanges and lattice, is then incased with a layer of cement concrete. It is evident from the description, that the whole construction constitutes a compact and efficient design of reinforced concrete.

This style of prop was designed by F. E. Gulley, and is manufactured in Northumberland, Durham and Scotland. The props are made 5 in. in external diameter, and of assorted lengths to suit the requirements of the position in which they are to be placed. This form of support is adapted for use in mines, because of its great strength and length of life as compared with timber props. As compared with brick work, there is the advantage of greater facility in obtaining and transporting the material. There is the additional advantage of a saving in space.

A prop 5 ft. in length weighs only about 80 lb. Decay is avoided internally and externally, as all parts of the metal are covered with cement concrete.

GREATEST COST IS INCURRED IN SETTING PROPS

One point brought out by the advocates of reinforced-concrete props is that in mines through which foul air travels, the life of a timber prop is generally less than two years, and because of this short life, 75 per cent. of the cost connected with the use of timber is expended in the labor of setting the props.

Estimating that each timber prop costs 10c., and that the labor of renewing each prop is 30c., then comparing this total with a cost of \$1.50 for each reinforced-concrete prop, it can be shown, if allowance is made for renewing timber once every two years, that the saving resulting from the use of concrete props would be equal to 65 per cent. In a similar manner, one engineer figured that the saving effected through the use of concrete props, as compared with brickwork, is about 58 per cent. It would appear from the foregoing that the concrete-steel prop has some valuable feature as pertains to economy, and is deserving of investigation by coal-mine operators.

*With Whitney & Kemmerer, 143 Liberty street, New York.

Mining Coal in Mexico

BY H. BRENDDEL *

Mexico consumes about 4,500,000 tons of coal and about 2,000,000 tons of coke per annum. As the total coal output of the Republic is less than 1,000,000 tons each year, the consumers are dependent on the United States and Europe for the remainder of their fuel supply. Up to the present time there are no import duties on coal and coke brought into Mexico; however, the coal-mining companies in Mexico representing a large capitalization, are urging the government to impose a duty on coal and coke. The railroads have recently advanced the freight rate on these commodities imported through El Paso, Eagle Pass, Laredo, Tampico and Vera Cruz, \$1 per ton, allowing the old rate on domestic coal to remain. As Mexico imported about 3,000,000 tons of coal and 1,500,000 tons of coke last year, this will either mean added revenue to the railroads of approximately \$4,500,000, or else an increase in the price of domestic coal.

The production of coke in Mexico will soon become an important industry, as the Mexican coal is well adapted for making an excellent coke. So far there are only about 400 ovens operating in the Republic; the beehive style of oven is used exclusively.

COST OF MINING

Mine timber in Mexico sells for a high price, as most of it has to be imported from Texas. This timber expense, however, is largely offset by the cheap labor; another additional advantage is that there are no strikes instigated by labor agitators. The government does not look with favor upon unionism, and although the Mexican mining laws are becoming more stringent each year, they show more favor to the operators in cases where injuries and deaths occur through accidents than is shown in the United States. The average cost of mining coal in Mexico, including royalty, timbering, wear and tear and depreciation of plant, surface expenses, etc., until loaded on board cars ready for shipment, averages from 2 to 2.50 pesos (\$1 to \$1.25 gold) per ton. Good, clean, washed coal in Mexico sells f.o.b. cars at the mines from 6 to 6.50 pesos (\$3 to \$3.25 gold) per ton. Coke sells from 15 to 17 pesos (\$7.50 to \$8.50 gold) per ton f.o.b. cars at the mines.

From the foregoing figures it is easy to estimate the possible profit attending coal mining in Mexico. Figuring on a 4-ft. seam of coal, good authorities state that such a bed will produce 4000 tons per acre. Drill holes put down in many parts of the Mexican coalfield have shown that some of the seams run more than 4 ft. in thickness.

*Muzquiz, Coahuila, Mexico.

An Emergency Breathing Apparatus

An emergency breathing apparatus has been invented by Clarence Hall, of the United States Geological Survey. As perfected, the apparatus weighs a little more than 2 lb. and can be carried without laborious effort by each shot-firer. The machine consists of a metallic cylinder, divided into two parts by a diaphragm. The upper part is used as a water reservoir and cooler. The lower part contains an oxygen generator, and layers of chemicals for generating oxygen. A rubber nose and mouth piece is provided, and a rubber cloth breathing bag is connected to the cylinder by a seamless steel tubing. The generator containing fused sodium peroxide, together with 15 layers of crushed sodium peroxide, supplies the wearer with sufficient pure oxygen for half an hour's use; or, in the smaller apparatus, for about 15 min. use. By means of the chemicals, the carbonic acid gas exhaled is absorbed and the oxygen used by the lungs is replaced.

When an emergency arises, a brass needle valve is released, allowing the water to drop into the sodium peroxide, producing oxygen, which rises to the nose and mouth of the miner through a sheet-iron tube. This tube is 6 in. x 1 in., and extends from the base of the rubber nose and mouth piece through the water tank. Two and two-tenths cubic feet of oxygen are generated by the amount of water and chemicals used to charge the apparatus.

It is stated that but three seconds are required to adjust and start the apparatus. The basic principle of emergency breathing apparatus has depended, heretofore, on the utilization of the outside air. In such machines, however, if any appreciable amount of carbon monoxide gas is present, the usefulness of the apparatus of that type is destroyed. For this reason the invention of Mr. Hall is likely to be of much benefit to the mining industry.

Smoke Consumers for Coke Plants

One of the latest practical innovations connected with the coal and coke industries is the tar and ammonia extracting process now in use at the Tower-Hill No. 2 coke plant, near Brownsville, Penn. This mechanical arrangement is operated by the Manufacturers' Purifying and Reclaiming Company, of Philadelphia. Stacks are erected over the ovens, three in number, two ovens to each stack, and the smoke is drawn through a conducting pipe to the extracting tanks, which are located on the east side of the coke plant and about 75 yd. distant. These stacks rest on rollers and are connected with the main conducting pipes in such a manner that they can be moved from one oven to the

other at regular intervals of from 22 to 24 hours.

The smoke is drawn from the oven through the pipe by a suction apparatus, which operates on the same principle as the centrifugal pump. This apparatus works in a tank which is at all times kept half full of water, so the smoke passes through a smaller tank before it gets to the suction apparatus.

In the first tank, the tar is separated from the gas, lamp-black and other constituents. The gas and dust then pass through the second tank, where the dust forms lamp-black and settles, and the remaining matter passes off, which, however, is but small in quantity after the smoke has gone through the process.

The water in the tank is not constantly running, but stands for several days, and the gaseous matter passing through gradually turns it into ammonia. The ammonia must then be refined thoroughly before it is ready for the market. The tar made by this process is said to be of a superior quality and needs but little refining. There are about 40 to 50 lb. of tar manufactured every 24 hours per oven.

The plant was erected for experimental purposes, and if it meets with the approval of the company officials, the installation will be enlarged. The quality of the coke is in no manner changed by the process, neither does the appliance interfere with the charging, watering or drawing of the ovens.

Explosiveness of Coal Dust

Concerning the explosiveness of coal dust, one English engineer discussing the matter before an institute meeting said: "I have now come to the conclusion that watering a place where a shot is about to be fired does no good at all, because if the atmosphere is charged with a certain amount of fine coal dust, there will be great risk of a blown-out shot kindling the dust and causing an explosion, even though the sides and roof are thoroughly watered. Judging from experiments, if an abundance of stonedust is used instead of water, in the neighborhood of the spot where a shot is about to be fired, I think there would be no risk of an explosion taking place. When water is used for laying coal dust in a dry mine, where the temperature is up to about 70 deg. F., the water in a short time dries up; but if an abundance of stonedust is used, the coaldust that is given off from the full cars going to and fro would be neutralized and the place kept safe."

M. R. Campbell, of the U. S. Geological Survey, estimates the coalfield acreage of New Mexico at 870,400 acres, and the available tonnage 30,805,000,000 tons, mostly in Colfax county.



GOLD REFINING, by Donald Clark. 12s. 6d. Critchley Parker, London.

TESTS OF WASHED GRADES OF ILLINOIS COAL, by C. S. McGovney. Bull. No. 39. University of Illinois.

INDUSTRIES DU CHROME, DU MANGANESE, DU NICKEL ET DU COBALT, By L. Ouvrard. Octave Doin et Fils.

THE FIELD PRACTICE OF RAILWAY LOCATION, by Willard Beahan. \$3. Engineering News Publishing Company.

YEAR BOOK FOR 1908: Illinois State Geological Survey, Bull. No. 14, 1909. H. Foster Bain, Director. University of Illinois.

REPORT OF TOPOGRAPHIC AND GEOLOGICAL SURVEY OF PENNSYLVANIA, 1906-1908. Harrisburg Publishing Company, State Printer.

DIE GRUNDLAGE DER PETROGRAPHIE MIT EINEM ANHANG UEBER ERZLAGERS TAETTENLEHRE, by J. W. H. Adam. 1 mark. Craz and Gerlach.

TIEFBOHRTECHNISCHE STUDIEN UEBER OELGRUBEN-BETRIEB UND SPUELBOHRUNG, by Richard Sorge. Fachliteratur G. m. b. H., Berlin.

A HISTORY OF THE LOGARITHMIC SLIDE RULE AND ALLIED INSTRUMENTS, by Florian Cajori. \$1. Engineering News Publishing Company.

REPORT ON THE MINES AND MINERAL RESOURCES OF NATAL (OTHER THAN COAL), by F. H. Hatch. Published by Order of the Natal Government.

GENERAL INDEX OF THE REPORTS OF THE BUREAU OF MINES, ONTARIO, Volumes I to XVI (1891-1907). Compiled by Frank J. Nicholas. L. K. Cameron, Toronto.

MITTEILUNGEN AUS DEM EISENHUETTEN-MAENNISCHEN INSTITUT DER KOENIGL. TECHN. HOCHSCHULE AACHEN, by F. Wüst. 10 marks. Wilhelm Knapp, Halle a. S., Germany.

MINERAL RESOURCES OF THE UNITED STATES, CALENDAR YEAR, 1908. Part I: Metallic Products. Part II: Non-metallic Products. U. S. Geological Survey. Government Printing Office.

A RECONNAISSANCE OF SOME MINING CAMPS IN ELKO, LANDER, AND EUREKA COUNTIES, NEVADA, by William H. Emmons. U. S. Geological Survey, Bulletin 408. Government Printing Office.

PETROLEUM MINING, by A. Beeby Thompson. \$5. D. Van Nostrand Company.

A guide to the exploration of petroleum lands, and a study of the engineering problems connected with the industry. It also contains statistical data of the important fields, and notes on the origin and distribution of petroleum.

CALIFORNIA OILFIELDS, WITH INDEXED MAPS. \$1. Barlow & Hill, Bakersfield, Cal.

The book contains maps, size 12x14 in., of the Kern River, Coalinga, Devil's Den, McKittrick, Midway and Sunset fields. These maps are indexed, showing the situation of the property owned by each company. The individual maps may be obtained in size 36x60 in., as follows: Blueprints, \$2; white paper, \$2.50; and cloth, \$3. The latter are corrected daily and contain the latest developments.

MODERN COKING PRACTICE, INCLUDING THE ANALYSIS OF MATERIALS AND PRODUCTS, by T. R. Byrom and J. E. Christopher. \$3.50. The Norman W. Henley Publishing Company.

This book, as is stated by the authors, is a handbook for those engaged in coke manufacture and the recovery of by-products. The volume is broad in its scope, treating the subjects of coal washing, classification of fuels, sampling and valuation of coal, coke, etc., as well as the science of coke manufacture. The illustrations showing various modern plants are excellent, and the drawings have been well selected and carefully executed. Not least in merit are the many useful tables, showing specific gravities, melting points, weights of materials, heat units, calorific values, etc.

FROM PROSPECT TO MINE. By Etienne A. Ritter. \$2. The Mining Science Publishing Company.

This little volume, unique in its composition, method and contents, will be valuable not only to youths graduating from mining schools and entering upon the practice of their profession, but to prospectors, working miners, promoters and to intending purchasers of mining properties or shares in mining companies. The story is told in an interesting and conversational manner of how the prospect is discovered, and the methods of making it a mine, all with an absence of confusing technical terms. Thirty-three illustrations add to the ready and full understanding of the simple text, and the book will be alike instructive to the boy of fourteen and the man who has grown gray-haired in the profession.

THE DAVIS HANDBOOK OF THE COBALT SILVER DISTRICT WITH A MANUAL OF INCORPORATED COMPANIES. By H. P. Davis. Published by the Canadian Mining Journal. Price, \$1.50.

Mr. Davis' book is a handy compilation of the official data concerning the numerous companies operating in the Cobalt-Ontario district. It also contains interesting chapters treating of the mining methods, estimations of ore reserves, the geology, and an historical sketch of the district, together with useful maps and numerous interesting illustrations. The book apparently is an impartial and reli-

able compilation. The records in a book of this character are naturally more or less transitory and the author has therefore planned to issue annual revised editions which will furnish a needed and valuable standard reference book for this new and remarkable district.

THE MINING YEAR BOOK, 1910, containing Directories of Directors, Secretaries, Mining Engineers and Metallurgists; also Glossary of Mining Terms. Edited by A. N. Jackman, Introduction by J. W. Broomhead. 15s. "The Financial Times," London.

This comprehensive and carefully compiled directory of mines is commended for its timeliness. The 1910 issue is under date of February and apparently the book is entirely complete up to that date. It includes a careful summary of the essential data of the important British mining interests, which by reason of their world-wide scope make the book international in aspect. A number of American operations are also included, but the book cannot be considered a directory of American mines. It contains also valuable lists of secretaries and mining engineers, and a glossary of mining terms. It is a convenient and valuable annual reference book.

IRON ORES, FUELS AND FLUXES OF THE BIRMINGHAM DISTRICT, ALABAMA. By Ernest F. Burchard and Charles Butts. **CHAPTERS ON THE ORIGIN OF THE ORES**. By Edwin C. Eckel. United States Geological Survey, Bull. 400. Government Printing Office, Washington.

This bulletin is a report of the results of field work extending over three years in the district which has Birmingham as its center. This comprises a belt approximately 75 miles long and 10 miles wide, in which iron ores, coking coal, limestone and dolomite are found in close proximity, as they are found nowhere else in the United States. It is this conjunction which has made the district a large and successful iron producer. Other regions have ores of higher grade, but in Alabama there is no problem as to the transportation of fuel to the ores or ores to the fuel; they are already together. There have been previous reports on the district, notably by the Alabama Geological Survey, and the present bulletin presents little that is new, beyond the general summary and harmonizing of our knowledge of the district. It contains chapters on the general geology; the Clinton ores; the brown ores; the coal, including mining and coke-making methods; the dolomites and limestones. Notes on the probable origin of the ores are added by Edwin C. Eckel, who was in charge of the work when it was first begun. It is illustrated by a number of maps and geological sections, and by some reproductions of photographs.

i PERSONAL i

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

H. S. Washington has returned from Brazil.

John Hays Hammond has been visiting Mexico, accompanied by a party of friends.

John T. Fuller has returned from New York to the diamond mines in Pike county, Arkansas.

Leo Von Rosenberg, of New York, has gone to Georgia to make examinations of gold properties.

Francis A. Thomson has returned to Pullman, Wash., from a professional trip to Republic, Washington.

Charles L. Newcomb, Jr., is now with the Denver Rock Drill and Machinery Company, Denver, Colorado.

S. S. Fowler, of Nelson, B. C., was in New York, May 16 and sailed for Europe May 17. He expects to return in July.

J. B. Tyrrell, of Toronto, Ont., has been elected president of the Canadian Institute, the oldest scientific society in Canada.

A. A. Blow will deliver the annual address at the commencement of the Colorado School of Mines at Golden, on May 27 next.

Oscar Cartledge, of Benton, has been appointed inspector of mines for the ninth district of Illinois, to succeed W. S. Morris, resigned.

E. L. Dufourcq is in San Francisco, whence he will come East by way of Colorado, expecting to arrive in New York early in June.

Elton W. Walker, recently appointed superintendent of the Mass Mining Company in the Lake Superior copper district, has taken charge.

E. J. Sweetland is in Guanajuato, Mexico, to complete arrangements for the Sweetland slime-filter installation at the Tajo de Dolores mine.

Carl F. Dietz, of Dietz & Keedy, Boston, has gone to New Mexico on professional business and before returning to Boston will go to Mexico.

J. H. Plummer has been elected president and C. S. Cameron secretary-treasurer of the consolidated Dominion Steel and Coal Corporation of Canada.

R. E. Rowley has been appointed assistant general manager of the Indiana Steel Company, at Gary. He has been for some time chief civil engineer of the company.

T. M. Dickinson, of Birmingham, Ala., has been appointed assistant State mine inspector of Alabama, to succeed James Hillhouse, recently promoted to be State mine inspector.

E. A. Wiltsee announces that on account of his business interests in California, he has discontinued his New York office, and that his address is at Bakersfield, Cal.

Frederick W. Baker has resigned as chairman of the London Venture Corporation, in order to give his time to his duties as managing director of the Hirsch mining syndicate.

W. Anderson, of Dawson, Anderson & Warden, left Vancouver, B. C., on May 3, for Peru, to report on a hydroelectric power scheme for the Cerro de Pasco Mining Company.

Capt. Timothy Dunn, lately in charge of the Hartley interests at the Norman mine on the Mesabi range, has been placed in charge of the ore docks at Superior, Wisconsin.

Arthur Howe Carpenter, son of the late Dr. Franklin R. Carpenter, Denver, Colo., will continue the professional business of the firm of which he was formerly the junior member.

A. G. Larson, for several years in charge of the Le Roi mine, at Rosslund, B. C., has gone north to examine mining properties on Queen Charlotte islands, and in Portland Canal district.

Gardner F. Williams, of Washington, has gone to California to attend the celebration of the fiftieth anniversary of the founding of the College of California, from which the present university has grown.

F. A. Heinze, president of the United Copper Company, has been acquitted of the charges in connection with the Mercantile National Bank, on which he was recently tried in the United States Court at New York.

On April 25, while engaged in professional work in South Carolina, Morrill B. Spaulding met with a serious accident, breaking both legs. Fortunately, no other complications have arisen and his speedy recovery appears now to be assured.

C. P. Byrne, of Carnegie, has been appointed inspector for the Twelfth bituminous district of Pennsylvania, in place of Roger W. Hampson, who recently resigned and will take charge of the Cortez mine, at Punxsutawney.

W. Fischer Wilkinson, of London, has been appointed principal of the new Cornwall School of Metalliferous Mining, and will assume his duties on Sept. 1 next. He is a graduate of Freiberg and has had extensive experience in different parts of the world. For several years he was engineer for the Consolidated Goldfields of South Africa. For some years past he has been in consulting practice in London. He has been a frequent and most acceptable contributor to the technical press. His wide knowledge and experience and his faculty of clear expression of ideas will make him an admirable head for the new school.

+ OBITUARY +

George Schaible died at Silver City, N. M., May 2, aged 50 years. He was born in Indiana, but had lived in New Mexico over 20 years, and was well known as a prospector and miner. At one time he held a lease on the Cooney mine.

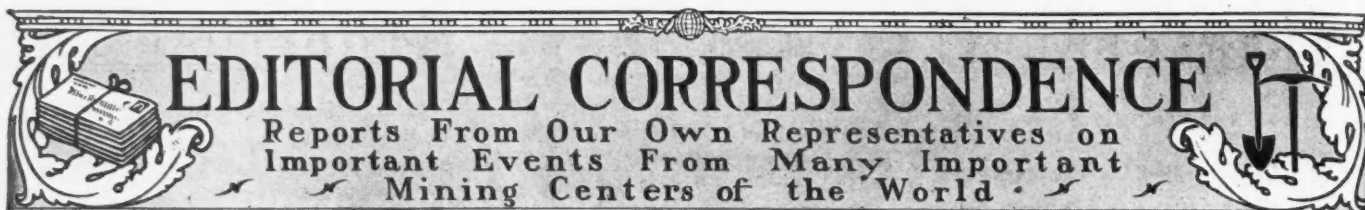
Joseph T. Wolfe died at Los Angeles, Cal., May 5. He was born and brought up at Washington; from 1896 to 1906 he was engineer for the Westinghouse Electric Company, working in the United States, Europe and Australia. For four years past he had been superintendent of the power plant of the Tonopah Mining Company, of Nevada.

Carl McKinney died April 19 at Scranton, Penn., aged 68 years. He was born at Kutztown, Penn., was brought up in Scranton and rose from office boy to general manager of the Lackawanna Iron and Coal Company. When W. W. Scranton retired from that company in 1880, Mr. McKinney went to the new Scranton Steel Company as superintendent, continuing in that position after the consolidation of the two companies under the name of the Lackawanna Iron and Steel Company. In 1897 he became superintendent of the Maryland Steel Company's plant, but after four years returned to the Lackawanna company as general manager, continuing until the Scranton plant was dismantled for removal to Buffalo in 1902, when he retired.

Carl Hesse, a mining engineer, well known on the Pacific coast, died at Reno, Nev., Feb. 9, of heart failure. He was a native of Saxony and a graduate of Chemnitz and Freiberg. After having practised his profession for a number of years in Spain and at Laurium, Greece, where he erected the first Piltz furnaces, he came to the United States with the late Mr. Cohn, the representative of Baron Erlanger in the Old Telegraph Mine, to take charge of the smelting works. After the collapse of that concern, he erected and ran the Gregory works for the Seligmans in Montana; was with Clark's Colusa for a while and then became metallurgist of the Mulatos mine in Sonora. Later he bought and worked the Odin, a placer mine, near Nevada City, Cal., then went to West Australia, where he built a mill near Freemantle for an English company. He returned to California, where he bonded and arranged the sale of several mines.

SOCIETIES and TECHNICAL SCHOOLS

American Society of Mechanical Engineers—The regular semi-annual meeting will be held at Atlantic City, N. J., May 31-June 3. Among the subjects to be discussed are machine-tool construction, gas power and power transmission.



EDITORIAL CORRESPONDENCE

Reports From Our Own Representatives on
Important Events From Many Important
Mining Centers of the World

San Francisco

May 15—The new baghouse to be installed by the Mammoth Copper Company at its smeltery at Kennett, in Shasta county, is to contain 2960 woolen bags 18 in. in diameter and 30 ft. long. The American Bridge Company has the contract for the structural steel, which will weigh about 800 tons. The fumes after passing through a series of pipes will enter the baghouse and finally reach the air free from all substances deleterious to vegetation, through small stacks. The total cost is estimated by Manager Geo. W. Metcalfe at \$300,000. There are 60 men employed on the baghouse-construction work; 400 at the smeltery; 550 at the mine, and about 60 men at Quartz hill, where silicious ore is mined for a flux to the copper ores of the Mammoth. The cost of installing the Cottrell process at the Coram smeltery, Shasta county, is estimated at only \$100,000.

There is a probability of the further development of the Friday-Lowdon copper claims adjacent to the Mammoth and Trinity properties, Shasta county. Chicago capital is said to be interested. About \$100,000 has been expended on these claims. It is likely that any ore will be shipped to local smelteries.

The United States Gold Dredging Company and the Consolidated Gold Dredging Company, of Berkeley, are operating in Shasta county, chiefly with suction dredges. W. D. Egilbert, a director in both companies, controls extensive tracts of dredging land in Shasta, Siskiyou and Trinity counties and these lands will be exploited by the above companies.

Recently 4000 acres were bonded by Eliel & Aubury interests in Shasta county, along the Sacramento river, south of Redding. The tracts include the McCormick-Saelzer ranch of 1300 acres, and the Fitzgerald ranch of 300 acres. Drilling has been done and six Keystone drills will be shortly put to work to determine if the pay gravels exist to warrant the installation of a bucket dredge. That W. P. Hammon was interested in the venture is denied.

The San Francisco Stock and Exchange Board has absorbed the California Stock and Oil Exchange, and changed its name to the San Francisco Stock Exchange. The Nevada and California mining and oil stocks are largely dealt in on this exchange.

A railroad is planned from Eugene, Ore., to Coos Bay, which, if built will open up a market for the Coos Bay coal

in the interior of Oregon. A considerable subscription is said to have been made and surveyors are now at work west of Eugene laying out the route.

A delegation of oil men from San Francisco, Los Angeles and the San Joaquin valley, left for Washington May 6 to make a formal protest against provisions in the Pickett bill now before Congress. A hearing has been arranged before the Senate committee. Specific protest will be directed against that portion of the bill which seeks to ratify the withdrawal order of last September, by which several thousand acres of oil lands already located were placed in the reserve. It was pointed out that the legislation contemplated was retroactive and of a nature forbidden the States under the Federal constitution.

Denver

May 17—On the Australia claim of the El Paso Consolidated, on Beacon hill, Lessees Middagh & Co. are reported to have made a strike of ore from 4 to 14 ft. wide, showing calaverite and sylvanite, and of an average of \$50 per ton in gold without handsorting, the screenings, of course, running a great deal higher. The last shipment returns were at the rate of \$90 per ton for 27 tons. The ore in the Australia is found at a contact between granite and phonolite. The gold is chiefly in the calaverite, but in the ores of the El Paso group galena, stibnite, chalcopyrite and tetrahedrite have been found. On the C. K. & N. vein of the same company, Brass & Clifford, lessees, have opened a shoot of ore 6 ft. wide, which can be sorted to run \$30 per ton. The C. K. & N. is a sheeted zone in granite, and the ore, calaverite, is in narrow veinlets. The workings are in the same formation as the El Paso mine, viz.: granite, cut by a number of small phonolite dikes.

The Cripple Creek output for April was 2400 tons, yielding an average of about 1½ oz. gold per ton.

The St. Louis, at Leadville, continues to produce rich ore, and it is stated that a fine shoot has just been opened in the porphyry, 70 ft. below the quartzite, a streak a little over an inch in width in the main orebody giving 1 lb. of pure gold to 25 lb. of ore. Twenty-five pounds of this gold is on exhibit at the American National Bank.

After lying idle for three years, the smeltery at Golden was blown in April 9. It is now operated by the North Amer-

ican Smelter and Mines Company, H. A. Reidel, president, and George C. Vivian, manager. It is stated that \$35,000 has been expended in remodeling the plant, and the company has enough ore saved and in sight in its Banner group of 400 acres, in the Clear Creek district, to keep the smeltery in operation, although at the same time it is in the market for custom ores, of which large quantities are offering.

The Mary Murphy mine, opened in the early '80s, in the Chalk Creek mining district, Chaffee county, was one of the great producers of the State, but when the workings got below the zone of oxidation into the sulphide ores, the grade became too low for profitable extraction. About a year ago the mine was purchased by London people, and under the management of Charles J. Moore seems destined to enter on a new and profitable life. The ore carries silver-lead and zinc, with pockets or kidneys which yielded gold. Rich gold ore has just been opened in the 1400 level.

Butte

May 15—A special meeting of stockholders of the Alice Gold and Silver Mining Company will be held at Salt Lake, May 27, to consider the sale of all property to the Anaconda Copper Mining Company. In the report to stockholders which accompanies the call of meeting it is stated that the company's mines were operated from 1880 to 1893 and for a short time during 1897 and 1898 but have not been in active operation since. The loss for three years and nine months ended Dec. 31, 1909, is given as \$21,400. In 1906 the Butte Coalition company purchased a majority of the Alice stock and has since been in control.

The Great Northern will begin the construction of a branch from Lewistown, Fergus county, to Mondak, on the Montana side of the Montana-Dakota line and condemnation proceedings for a right of way have been started.

The United States Assay Office at Helena reports the receipt of \$141,432 worth of precious metals during April. Fergus county ranks first with \$46,397 and Choteau county, second with \$41,051. While the receipts from Silver Bow county are only \$114, yet the Butte mines produce nearly \$500,000 per month in gold and silver which is sent to the eastern refineries with the blister copper.

In an official statement from Senator W. A. Clark, relative to the sale of his Butte copper mines, his manager, A. H.

Wethey, says the sale includes what is known as the Original Consolidated Mining Company, which comprises the Original and Stewart shafts, with all the copper interests immediately adjacent to them, in all 15 or 20 small claims. The only other mining property involved is two small fractions between the Alice and Magna Charta claims, which latter already belong to the Butte Coalition Company and gives the latter a solid block of claims in the Alice group. The Amalgamated company acquires the Butte reduction works so far as furnaces are concerned. Senator Clark retains the use of the concentrator for a term of years and all the shops. The concentrating plant will be operated on zinc ores and it is contemplated that the zinc business will greatly develop. Senator Clark will soon commence work on mining properties that have been lying idle. Elsewhere in Montana the senator has also enlarged his business.

Goldfield

May 17—The total gross output of the mines of Nevada for 1909, according to the official data of James F. Haley, State bullion tax agent, was \$24,969,947. This total, it is estimated, will be increased more than \$1,000,000 if the output of the very small companies not reporting were added. The 1908 production was \$14,373,545, according to the same authority.

The figures show that Esmeralda county led, with an output of \$9,587,831. White Pine county was second, with a production of \$7,114,354, and Nye county third, with \$5,740,581. Eureka is fourth, with a production of \$815,088. On the other hand, the copper properties of White Pine county led in the point of tonnage of ore handled, as it shows 1,678,895 tons of ore produced, as against the 509,801 tons produced by Esmeralda county, with its gold, silver and lead properties. Nye county comes third, with 374,827 tons of ore produced during the year. The official figures for the year show that there were produced and officially reported in the State of Nevada during 1909, 2,906,825 tons of various kinds and grades of commercial ores. The expense of producing this ore and turning it into metal and marketing the same is given as \$20,033,947. That there are discrepancies between the figures as to mine expenses as submitted to the bullion tax agent and to the stockholders is shown by the fact that the dividend record of the State for the year 1909 was more than \$5,000,000, while Mr. Haley's report shows that total net profits were but \$4,900,000. Bullion taxes are paid upon the net profit, and the State received bullion taxes upon that amount of profit, the State revenue from this source for the year amounting to \$224,579.

The Nevada Central railroad will be rebuilt into Austin at once, insuring a resumption of activity in that old camp.

Morgantown, W. Va.

May 17—The coal mines in the Kanawha field that were shut down in April, pending the adjustment of the wage-scale, have now started up. Nonunion miners have generally been granted an increase in wages to forestall discontent. The Villa Coal Mining Company has recently been incorporated to operate near Villa.

The rejection of the first lot of tenders on March 25 from the New River-Pocahontas district for the Panama railroad coal contract, on the ground of collusion between bidders, was a surprise. The second bids were opened April 25. The contract calls for a minimum of 14,600 B.t.u. (with a penalty for deficiency but no premium for excess) and involves 500,000 tons.

The new Superior Thacker Coal Company expects to mine at Williamson in the Thacker field and the new Mary Helen Coal Company at Hatfield, while the Great Bend Coal Company will operate near Sprigg.

At Thacker mines, James Collins, superintendent, plans to spend \$100,000, in opening and equipping four new mines to produce a total of 3000 tons daily. The output will be brought by retarder-conveyers to one tippie where there will be five loading tracks and a box-car filler, all built by the Link Belt Company of Philadelphia. There will be six 150-h.p. boilers and two 200-kw. generators, to furnish current for the hauling and coal-cutting equipment.

The Crystal Block Coal Company, which lately took over the Rawl mines, has begun shipping and is planning to build a tippie and make improvements.

New companies at Fairmont are the Fairmont & Southern Coal and the West Fork Coal companies. The mines of the New England Coal and Gas Company have been sold to the Keystone Coal and Coke Company, of Greensburg, Penn., and the output will be increased.

At War, in McDowell county, the Excelsior Pocahontas Coal Company will open mines and make coke, while on Dry Fork creek, near Berwind, a new producer will soon be started by the Berwind-White company of Philadelphia.

The Davis Coal and Coke Company will open new drift mines at Davis, on Beaver creek and on Pendleton run; and at Thomas will soon start at shaft mine.

Birmingham, Ala.

May 16—The Anniston Iron Company, formerly Woodstock Iron Company, is rushing work on the furnace at Anniston, and will soon be in readiness to resume making iron.

The Woodward Iron Company, of Woodward, has let the contract for the construction of 60 Koppers by-product coke ovens.

Joseph H. Hoadley, of New York,

president of the Alabama Consolidated Coal and Iron Company, visited the Birmingham district last week and inspected the properties.

The new rod mills of the Southern Iron and Steel Company, at Gadsden, are now rolling rods. Within another 30 days wire and nails will be coming from the plant.

Three wells are now flowing natural gas in Fayette county, 80 miles west of Birmingham. Steps are being taken for the construction of a pipe line to Birmingham; several of the large manufacturing companies which can use gas are figuring on making contracts for a supply. Columbus, Miss., citizens are also making effort to have a pipe line constructed to that city.

Scranton, Penn.

May 17—It is asserted that 3000 men are idle in the counties of Lackawanna and Luzerne owing to the fact that the mine-examining boards are dilatory in issuing miners' certificates. It is certain that a large number of men cannot secure work at the mines owing to this fact. In former years, the examination for miners' certificates was a farce, and any person could buy such a certificate at almost any saloon, but now unless the applicant is fully competent to pass the examination in all its details, he is turned down. The mine superintendents say that examiners are too scrupulous, and are rejecting capable miners upon technicalities.

Although no serious cave has occurred in Scranton for some time past, slight subsidences of the surface are continually occurring. A few days ago a school in West Scranton was affected by a cave and numerous slight subsidences of the streets in the neighborhood of this building had superficial rents caused by squeezes in the surface veins underneath.

For the first time since the sliding scale went into effect the anthracite miners will not receive an increase in their wages for April on the basis of the average selling price of coal at tidewater. When the average price of coal per ton at tidewater exceeds \$4.55 the miners obtain a proportionate increase in wages. During April, prices did not exceed \$4.45 per ton.

Dawson, Y. T.

April 30—From indications, the Klondike camp has a busy season ahead. The Five Fingers Coal Company has been prospecting all winter, and will begin work this spring on greater developments. The Morrison coal leases will also be fully prospected this season with diamond drills.

The Dome Lode Development Company has resumed work on the largest quartz enterprise so far attempted in the territory. The company plans to build a

mill soon. The Lone Star has the first quartz mill in operation; it has tapped rich ore, which will be worked on an enlarged scale. New quartz properties in Green gulch, upper Hunker, Bonanza, Dublin, and other localities are also being opened.

A large amount of dredging will be done in this territory the present season, foremost among which are the enterprises of the Yukon Gold and the Canadian-Klondike company.

The North Fork Power Company and the Northern Light and Power Company have started work. The former has 150 tons of machinery *en route* for power and placer operation.

Cobalt

May 15—The Bartlett mines, the promotion of which was to a considerable extent responsible for the stampede into the Gowganda district, are to be reopened. McLaughlin and McIntyre, the original stakers, have contributed 350,000 shares to be placed in the treasury and sold at 25c. Besides this a large sum has been raised to carry on the work. The Bartlett controls a large acreage in the best section of Gowganda, and has several good surface showings. The ground, however, has not been prospected. The mine has a splendidly equipped plant much too large for its present needs.

The Gowganda district as a whole is picking up, the shipments made last winter having helped to reestablish confidence. The Reeves-Dobie, has much tonnage blocked out above the 80-ft. level, and the shaft is being sunk. The option on the Morrison, held by a British syndicate, has been extended for six months. The syndicate was to spend \$100,000 in proving up the property, but the early breakup, prevented it getting in machinery.

A fire at the Government townsite, Porcupine, partially destroyed that place. On account of the lowering of the waters in Night Hawk and Frederickhouse lakes, navigation will be restricted to canoes, until steps are taken to cut a channel at the southern end of the latter lake. Additional discoveries have lately been made in the district, that tend to enhance the prices at which claims are held. On the Vipond property, a 5-ft. quartz vein with a 2-ft. pay streak, showing high free gold, has lately been discovered. It has now been traced for 400 ft. and a shaft is being sunk on it. The plant at the Dome is running and two shafts, one of which is in high-grade ore, are being sunk. Three more will be started in the near future. Many other properties are showing up well under development, and there is a strong demand for good claims which are commanding excellent prices. Although there is considerable movement into the district transportation is far from being an easy matter.

The power situation in Cobalt still con-

tinues to be unsettled, on account of the failure of the Hydraulic company to furnish air. There are two companies now furnishing electricity and the service is good. The Mines Power Company is running three of the 5000-ft. air compressors, but the service so far has been intermittent. The company expects that when the four generators are running there will be no further difficulties.

Toronto

May 17—Hon. William Templeman, Canadian Minister of Mines, states that the department has in preparation a bill to be presented at the next session of Parliament providing for the organization of an explosives division of the department and the establishment of a Government explosives testing station. To this division will be assigned all matters relating to the manufacture of and trade in explosives and investigation into accidents due to explosives. All explosives to be used in Canada are to be subject to examination and test at the Government testing station. At present mine managers and other users of explosives have no way of determining which are safe to use or whether imported explosives are up to the standard required in the country where they are manufactured. The investigations to be carried on will determine which explosives are fit and which unfit for certain classes of work, and the conditions under which they may be used. The minister will be authorized to appoint inspectors with large powers of search and inquiry to enforce the law, and heavy penalties are provided for its violation. The sum of \$10,000 has been approximated for the preliminary investigations, and the services of one of the experts employed by the British Government at the explosives testing station at Woolwich will be secured to examine the conditions under which explosives are manufactured and stored in Canada, and make recommendations as to the regulations required.

The opening of navigation witnessed the sending out of a number of exploring parties to the lignite fields along the Metagami river in northern Ontario, and it is reported that in several instances cannel coal has been found beneath the overlying lignite deposits. Many additional claims have been taken up. R. E. G. Burrows has staked ten claims for a New Liskeard syndicate and has obtained samples of cannel coal. R. Horschitz, of Pittsburg, Penn., has located four claims for an American syndicate. R. J. Flattery and party are prospecting in the interests of the United States Steel Corporation and claims to have made discoveries of coal and iron. Foster Shields, of Sudbury, has gone into the district to begin active development for a syndicate which has taken up extensive iron claims. It is reported that petroleum indications are promising.


Twenty-four field parties are being sent out this season by the Canadian Geological Survey, some of the more important investigations undertaken being as follows: D. D. Cairnes will examine the ore deposits of the Atlin district, B. C.; R. G. McConnell, assisted by G. S. Mallock, will study the country at the head of the Portland river, B. C., which has recently attracted much attention; W. W. Leach will continue explorations in the Hazelton district, B. C.; Charles Camsell will complete the geological mapping of the Tulameen district, B. C.; C. E. Le Troy, will pursue investigations in the Slocan and other districts of British Columbia; D. B. Dowling will make further examinations of the coal areas of Alberta, near the Grand Trunk Pacific Railway; J. Dresser will continue his researches in the eastern townships of Quebec; E. R. Faribault will spend part of the season as a member of the commission sent by the Quebec Government to explore the Chibougamu district and will also be in charge of a party to investigate the gold-bearing rocks of Lunenburg county, N. S.; W. H. Collins will make a geological study of the country lying west of Gowganda.

D. D. Mann, vice-president of the Canadian Northern railway, and who is heavily interested in mining, has offered to purchase at a high figure, the rights for the world in a patent smelting process invented by Dr. James S. Island, of Toronto, and now controlled by the Island Smelting and Refining Company. Mr. Mann is erecting a plant of 10-ton capacity here, where a complete commercial test of the value of the Island process will be made, and should this result satisfactorily, the deal will be completed.

Mexico

May 17—The Mexican Iron and Steel Company, the Boston concern now in possession of the Tula iron mines, foundry, timber and lands in the Tapalpa district of Jalisco is placing a bond issue of \$1,500,000 in France. The bond money will be used in the establishment of a modern iron and steel industry. Modern smelting furnaces will be erected at the iron mines, and a steel plant and implement factory built. Tramways to handle the pig iron and finished products will be constructed. Charcoal will be used exclusively in the production of iron at Ferreria de Tula, and the company will give much attention to the manufacture of charcoal byproducts. The Mexican Iron and Steel Company has a capital of \$5,000,000. The purchase price of the Tula properties was \$500,000.

Effective May 1, the Sud Pacific de Mexico road announces the opening of freight and passenger service as far south as Yago in the territory of Tepic, almost to the southern bank of the Santiago river and 880 miles south from Nogales at the Arizona line.



THE MINING NEWS

Reports of New Enterprises, New Machinery,
Installations, Development Work and Property
Transfers The Current History of Mining

Alaska

Paul Denhart and associates, of Nome, have purchased the cinnabar property on the Kuskokwim river and will erect a reduction plant.

A large number of the miners in the Mayo district have stampeded to the Rainbow district, a name applied to Duncan creek, and vicinity. Good strikes are reported.

Alaska-Treadwell—Returns for month ended April 15 show: Tons crushed, 49,756; total production, \$127,333; net operating profit, \$36,698. Average yield per ton milled, \$2.55.

Arkansas

PIKE COUNTY

Arkansas Diamond Company—This company intends to begin active operations as soon as the necessary machinery can be obtained.

Arizona

COCHISE COUNTY

Superior & Pittsburg—The Briggs shaft is bottomed in ore of high grade. The water in the shaft is now controlled.

Shattuck-Arizona—This Bisbee mine is shipping 150 to 200 tons daily to the Copper Queen smeltery and reports earnings in excess of \$150,000 monthly. The stock has been listed on the Boston Stock Exchange.

GILA COUNTY

Miami—At 570 ft. the second haulage level is being established at the main shaft and the driving of a drift from the shaft toward the orebody at that depth has been commenced. This haulage level will be similar to the one already established 420 ft. from the surface and will be equipped with motor cars. Above the 420-ft. level, virtually all the blocking out is completed except on two of the sublevels, where a little drifting is in progress. The main shaft has been bottomed at a depth of 710 ft. and has been permanently timbered throughout. The steel frame of the concentrator building is practically done and a part of the equipment has arrived at the mine. Nearly all the machinery for the power house and hoisting plant is on the ground. The twelfth churn-drill hole is now being begun on the Captain claim. The pipe line, which will conduct water from the pumping station about one mile south of Globe to supply the concentrator, is nearly finished. The management's records show that 722 ft. of drifting was ac-

complished during the week ended May 2.

Inspiration—At the Joe Bush shaft, nearly all development is being done at present on the tunnel level, which has been established 127 ft. above the fourth. In this part of the property, 12 drifts are being advanced. One of these drifts is being driven west toward the Scorpion shaft and at present measures 500 ft. The drift driven south from the Scorpion on the 275-ft. level is 600 ft. long and will eventually connect with the drift mentioned above. The company has commenced sinking a prospect shaft on the Colorado claim, 2500 ft. west of the Joe Bush shaft and 400 ft. east of the Taylor tunnel. The extraction tunnel has been driven 600 ft. from its portal toward the Joe Bush shaft. The advance work in this tunnel last month was 319 ft. Engineers are working on plans for the experimental mill which will be erected near the Joe Bush shaft.

Live Oak—The second churn-drill hole is 40 ft. deep and in granite capping common to the Miami district. Underground, drift No. 208, driven east on the second level, measures 45 ft. and for this distance has been in concentrating ore of fine grade. The vertical shaft has been sunk 109 ft. below the third level.

Warrior—The third churn-drill hole is 225 ft. The El Paso smeltery is receiving from 95 to 100 tons of 9 per cent. copper from the Warrior mine daily.

Old Dominion—The new hoist to be installed at A shaft was shipped from the Nordberg factory May 1. Two steam turbines of the horizontal type are ready for installation. These turbines, actuated by the exhaust from the engines, will run two generators.

YAVAPAI COUNTY

United Verde—This company certified for assessment a bullion yield for 1909 as follows: Copper, \$4,763,778 rated on the valuation of 12.982c. per lb., average New York quotation; gold, \$351,801; silver, \$255,181 rated at 51.502c. per oz.; total for the year, \$5,370,761.

United Verde Extension—Development of the recently opened orebody is being pushed. The ore is of high tenor, but nothing positive as to its extent can yet be determined. The company has electric power and will install a tramway a mile long.

Ohio Mines—This company, of Columbus, Ohio, is operating the Jessie group, near McCabe, in the Big Bug district. A. L. McCarthy is manager.

Independence—This property, near Chapparal, is shipping gold concentrates. W. H. Jones is manager.

Mt. Elliott—This mine, 4 miles from Poland, is shipping concentrates. Additional stamps will be added and electrical connection made to the Arizona Power Company lines. H. W. Stevens is manager.

Federal—This company is building a mill. E. Kidd is engineer.

YUMA COUNTY

Clara Consolidated—The smeltery has been blown in. The plant includes a blast-furnace and converter plant. The company has installed a pipe line for water from the Bill Williams river and a broad-gage railroad from Bouse to Swansea. George Mitchell is president.

California

AMADOR COUNTY

Original Amador—The officials of the company have refused to allow A. L. McSorley to transfer his 19,337 shares of stock and McSorley has entered suit to have his stock declared personal property.

Bellwether—This mine was sold in the Superior Court, April 11, to R. I. Kerr, for \$29,975. As the mine was relocated April 5 by H. D. Emerson, litigation is likely to ensue.

Treasurer—At this mine, situated between Bunker Hill and Fremont, the shaft is down 400 ft. and a new hoist is being installed.

Central Eureka—The shaft is now down 2700 ft., and a connection with the South Eureka shaft will shortly be made.

Lincoln Consolidated Mining Company—This company has been formed to take over the Lincoln, West Lincoln, Stewart, Iowa and Isola mines at Sutter Creek. The Lincoln shaft is 2000 ft. deep.

Ross—This mine is to be opened up with L. R. Poundstone in charge.

Argonaut—A new orebody is reported on the 2800 level, 600 ft. south of the main oreshoot. The shaft is 3400 ft. deep and the lowest level 3300 ft. deep.

Zeile—A new orebody is reported 2000 ft. north of the shaft on the deepest level, which gives indications of containing higher grade ore than the large orebody already developed.

SHASTA COUNTY

Evening Star—This mine has been sold to a German syndicate for \$115,000 and is to be developed with George Bayha as

superintendent. The mine is in the Old Diggings district, adjoining the Reid.

Reid—The ledge on the 1000 level has been encountered and is reported to be 12 ft. wide.

Milkmaid—The new 19-stamp mill has been completed and is crushing 35 tons per 24 hours. A diamond drill is being used for prospecting. Clifford Wiegall is superintendent.

Midas—The cleanup of this mine in Harrison gulch resulted in \$33,000 bullion for March.

SISKIYOU COUNTY

Golden Eagle—Operations have been resumed on this mine on Indian creek, 6 miles from Fort Jones.

Mono—The 10-stamp mill is crushing about 20 tons of ore per day. The mine is on Humbug creek, 9 miles west of Yreka. B. M. Newcomb is the manager. The workings are over 500 ft. deep.

Oro Fino—Frank Star has uncovered a vein of high-grade ore in the tunnel and has drifted 40 ft. on it, near Fort Jones.

Freitas-Lynn—The tunnel, near Quartz valley, has opened a quartz lode 20 in. in width.

Old Turk—Kirk & Son, of Quartz valley, have a lease on the Old Turk vein and have extracted 25 tons for a mill test.

Johnson—These quartz claims at Fort Jones were prospected for several years by George Addison without discovering any ore. On the expiration of the bond in April, Severman & Holgate took charge and in three days opened up a rich lode.

Classic Hill—Certain stockholders claim that the mine of this company at Happy camp, has been in operation for two years unknown to the stockholders, during which time it has twice been sold at sheriff's sale.

Red Ant—Ore is being hauled to Yreka from the Red Ant, for milling. The mine is near the Mono, on Humbug creek. R. M. Brown is superintendent.

Pickard—The mill at this property, Oro Fino, is crushing about 13 tons daily.

Cub Bear—The Siskiyou syndicate owning the Cub Bear or Borden group of quartz claims in the Salmon river district, has let a contract for 100 ft. of tunnel. I. J. Luce is president.

TRINITY COUNTY

Trinity River—This company has run a tunnel to turn the river from its bed. C. E. Goodyear, of Weaverville, is superintendent.

Tinsley & Treloar—Operations on this high gravel bench, at Cox, have been conducted with a No. 3 giant, but on account of the small water supply not much washing could be done. Good results, however, were realized.

Homestake-Ellebrook Consolidated—At this mine, south of Weaverville, about 20,000 sq. ft. of bed rock was uncovered in the winter's run. This is a good showing with a limited water supply and a gravel bank 60 ft. deep. Two No. 3 giants throwing 4-in. streams were used. The water is conveyed from Brown creek in a 7-mile ditch. In the early '60's the gravel here was washed with a canvas hose, one of the first attempts at hydraulic mining in Trinity county. W. B. and C. J. Testy are the owners.

Headlight—The Trinity Gold Mining and Reduction Company, operating the Headlight, has made the second payment of \$40,000. The company is installing a 40-stamp cyanide mill, with a 500-h.p. hydroelectric plant.

Oro Grande—This quartz mine, on Coffee creek, has changed hands and will be operated by H. L. Cleary.

Colorado

CLEAR CREEK AND GILPIN COUNTIES

Gambetta—This Republican Mountain mine is shipping 100 tons of zinc ore monthly to Oklahoma.

Prudential—This tunnel, now in 850 ft., will be extended to cut the Gambetta vein.

Cliff—This mine, on Democrat mountain, is a steady shipper, under charge of Thomas Randall.

Reliance—This company, operating the Sporting Times mine, Alpine mountain, will install machinery using electric power. A. H. Colburn is manager.

PARK COUNTY

The new smeltery at Alma is taking contracts for ore from near-by mines, and will open the Atlantic & Pacific properties. The London mine is producing about 30 tons per day.

ROUTT COUNTY

C. H. Collins & Co., of Leadville, have taken a bond and lease on 90 acres, which includes a copper lode deposit about one mile from Yarmony, on the Moffat road. Some rich oxidized copper ore has been found. The vein will be thoroughly proved by sinking and drifting.

SAN JUAN REGION

In the Sneffels district, near Ouray, the wagon roads are opened, and teams are busy hauling concentrates down to the railroad from the Camp Bird, Atlas and Revenue mines.

Sunnyside—This mine continues profitably productive.

Little Maud—A portion of this gold and silver mine has been leased to William Anderson.

Hoosier City—This property on Anvil mountain, under the management of C. A. Sugart, will erect a mill. A drift is be-

ing extended on the Hoosier City vein to the outcrop of milling ore.

Gold Prince—Operations have been resumed at the mine and mill, near Animas Forks, and shipments of concentrates are awaiting the opening of the Silverton & Northern road.

Silver Ledge—The Red Mountain railroad has been opened from Silverton to the mine, and shipments of zinc concentrates have commenced.

TELLER COUNTY—CRIPPLE CREEK

Mitchell—This mine, owned by the Pinnacle company, on Bull hill, and operated by the Pinnacle Mining and Leasing Company, is reported to have struck a rich orebody, 18 in. wide.

Free Coinage—The Bison claim, leased by Rose & Co., has made a shipment of 60 tons, which is expected to yield 10 oz. gold per ton. The vein is 4 ft. wide.

W. P. H.—Fogleman & Roach, lessees on this mine on Ironclad hill, have received returns of 6 oz. gold to the ton from the last carload of screenings shipped.

Dante—Fifteen carloads per month are being sent out from the Dante mine on Bull hill. M. B. Rapp, leasing on No. 2 shafts, is shipping 2-oz. gold ore.

Modoc—Eight feet of ore has been opened in the Ocean View vein, which parallels the Medoc vein, and three carloads have been shipped, the coarse rock yielding \$30 per ton, and the screenings about 7 oz. gold to the ton. This mine is in the saddle between Bull hill and Battle mountain.

Rigi—This mine, which adjoins the Modoc, and owned by the Baroness Von Richtofen, of Berlin, Germany, is operated by lessees, and after a long period of inactivity, is now shipping again. The lessees have just sent out a carload of ore estimated to yield about 2 oz. gold per ton.

Idaho

COEUR D'ALENE DISTRICT

Stewart—This mine, purchased by F. Augustus Heinze in 1906, has been reopened and shipments have begun at the rate of 200 tons per day. It is a lead-silver property. Fully 10,000 tons of lead and silver are lying on the dump taken out in development. The ore in sight is reported sufficient to guarantee the continuation of shipments for a year. The closing of the mine two years ago was due to an injunction secured by the Coeur d'Alene Development Company which owns property adjoining the Stewart ground. The Stewart did not have a favorable site for a mill and under agreement with the Development company, built a mill on the latter company's land. After the mill was up the Development company alleged the Stewart had promised to buy the two mining claims

on which the mill stood. The Stewart would not buy the land and the injunction was obtained. After trying for two years to settle the matter the Stewart has decided to ship any way and has obtained a lease on the Mammoth mill of the Federal, at Wallace.

LEMHI COUNTY

Yellow Jacket—The Proprietary Mines Company of America has obtained control of this gold mine, which has for years been tangled up in the John E. Searles estate. It will be reopened under the management of the Proprietary company. It has a 60-stamp amalgamating mill to which a cyanide department will be added. The mine was operated by Searles between 1895 and 1898. The vein is said to average 50 ft. wide.

Illinois

The Governor of Illinois has appointed the following commissioners to establish fire-fighting and rescue stations in the State, under the law recently enacted: Operators, J. W. Miller, of Gillespie, and John L. Schmidgall, of Murphysboro; miners, Charles Krallman, of Glen Carbon, and Charles Bennett, of La Salle; Hector McAllister, State mine inspector, Streator; H. H. Stoeck, State University, Urbana; Dr. J. A. Holmes, United States Geological Survey.

Indiana

DAVISS COUNTY

Mandabach—This coal company, Washington, is advertising for several hundred miners. The company has just closed a contract with a firm of Chicago coal brokers to take the entire output of the mines for one year.

GREENE COUNTY

The Vincennes Railroad Company has resumed work in the mines on the road. Nearly 2000 miners were added to those put to work immediately after the suspension was at an end. The indications are that all the mines of the Jasonville field will be in full operation soon.

Massachusetts

The Senate has passed the bill granting permission to the New England Gas and Coke Company to improve Island End river channel to provide a way for ships from the Mystic river to the proposed iron works of the company on the Everett shore.

Michigan

COPPER

Isle Royale—From "A" shaft on the Baltic lode a drift is being driven at the 750-ft. level toward a point from which a good drill core was taken, a change being noted in the character of the rock and copper ground may be encountered at any time. From a point in this drift

a crosscut has been started west to explore the ground on the hanging-wall side of the lode.

Houghton Copper—No. 2 drill hole has penetrated a 17-ft. copper-bearing lode, which is believed to be the west vein lying just above the Baltic lode.

Victoria—This mine continues opening a good grade of ground in both drifts extending from the twenty-second level. A large mass was encountered recently in the west drift. At the eighteenth level an improvement has been noted in the character of the rock in the east drift.

New Baltic—No. 4 drill hole going down in the northwest quarter of section 16 has encountered a copper-bearing amygdaloid formation at 350 ft. The core shows the formation to be 20 ft. wide, with 10 ft. of it carrying copper in commercial quantities. This lode is probably the same as exposed in No. 5 hole or the Oneco some time ago. In the No. 3 hole at 1200 ft. the New Baltic lode was reached, the core was badly broken but showed copper throughout. This is the second core taken from this formation which has also been exposed on surface.

Lake—The shaft is being sunk in the foot-wall of the lode exposed in the shaft at the sixth level. When the new 50-drill compressors are ready, greater progress can be made and a much larger tonnage shipped. The company is operating 11 drilling machines.

Quincy—No. 9, or Pontiac shaft is sinking below the 900-ft. level with copper appearing from time to time throughout. An order has been placed for a 300-kw. low-pressure turbine generating set to operate from the exhaust steam of the hoisting plants. This unit will furnish the electrical power which the company is now buying.

IRON

Davidson Ore Mining Company—This company has been organized to operate in the Iron River district, Menominee range. Spencer Kellogg, of Buffalo, and M. S. McDonough, of Iron River, are among the incorporators.

Cleveland-Cliffs—This Ishpeming company is opening the Northwestern property in the Swanzy district, Marquette range.

Minnesota

Chandler—The reopening of this mine at Ely by the Hanna interests is under way. New orebodies have been found and machinery is being installed.

Kennedy—This iron property, owned by Rogers-Brown company, will be the first shipper from the new Cuyuna range this season.

Section 30—This Vermilion iron mine, known also as the Shagawa or St. Claire, will probably send out 100,000 tons this season.

Montana

BUTTE DISTRICT

Alex Scott—The shaft is down about 1524 ft., having been sunk 106 ft. during April. When 1600 ft. has been reached a station will be cut and an electric pump installed and a crosscut run. On the 1400-ft. level an orebody 20 ft. in width has been exposed.

Butte Central—Three boilers are now being set up on foundations and a compressor will be installed. Work of unwatering the shaft will begin May 20. The shaft, down 500 ft., will be sunk to the 1000-ft. level before further exploration work is done. The mine has been idle for two years.

Amalgamated—A crosscut has been run from the 2800-ft. level of the High Ore mine to a point underneath the Anaconda shaft, now 2400 ft. deep, and a raise will be run from the crosscut to connect with the shaft.

Raven—The company has retired \$35,000 of its bond issue, leaving outstanding \$30,000 which the management states will be paid during the present year.

Butte & Superior—The company has recently acquired full control of one-half of the Basin concentrator, and will hereafter concentrate its ore according to its own method and without the supervision of the La France company officials. The concentrates have heretofore averaged about 49 per cent. in zinc; it is expected that they can be made to run much higher. The management proposes to treat 500 tons daily within the next month. At the Black Rock mine mining is being done on the 1000-, 1200- and 1400-ft. levels. On the 1600-ft. level the orebodies are being developed and a crosscut run to the new Colonel Sellers claim. Much of the structural steel for the new concentrator has arrived and construction is under way.

JEFFERSON COUNTY

Blizzard—At 175 ft. a vein carrying gold, silver and lead has been cut. Joynt & Thompson are operating the property, near Wicks.

LEWIS & CLARK COUNTY

Copper - Silver Montana—A 65-h.p. boiler, a hoist good for 600 ft. and a pump are being installed at this property, 5 miles north of Helena. The shaft is down 315 ft. and sinking will be begun. E. R. Purnell is manager.

MADISON COUNTY

Valley View—Two tunnels are being run, one now in 71 ft. and the other 80 ft. The ore runs high in gold.

MISSOULA COUNTY

Bullion—The construction of a 4-mile wagon road from the mine to the railroad will be completed soon when shipments of copper ore will be begun.

Nevada

ESMERALDA COUNTY

Booth—The Lind lease has encountered the northeasterly extension of the Red Top vein of the Consolidated workings at 360 feet.

Atlanta—Development is being prosecuted with full forces on both the Precious Metals and Maloney leases.

Consolidated—The Laguna shaft, now 400 ft. deep, is being unwatered preparatory to sinking. A new surface plant will be installed and the shaft used for hoisting both Red Top and Clermont ores.

LYON COUNTY

Mason Valley—Work was begun on the new Mason Valley smeltery at Wabuska, May 8. The Copper Belt railroad, the new line from Wabuska to Mason City and the mines, will build a spur to the smeltery site.

Ramsey-Ottawa—This company has properties in the Ramsey district adjoining the Ramsey Queen mine. Francis H. Griffin is president. The stock has been listed on the New York Curb.

NYE COUNTY

Tonopah shipments are as follows: Tonopah, 3500 tons; Tonopah-Belmont, 1350; Montana-Tonopah, 968; MacNamara, 260; West End, 170; Tonopah Extension, 800; total, 7038 tons.

Tonopah Extension—The first full month operation of the mill shows 2981 tons treated; extraction 89.12 per cent. and net profit \$15,042.

Tonopah—Development is being confined principally to the levels above the 700. Prospecting at 2200 ft. with diamond drills has as yet given no definite results.

Thanksgiving—A 4-ft. vein in the west drift on the 425-ft. level shows remarkably high assays.

Eclipse Development—The cyanide plant is now running in connection with the stamps and amalgamating plates.

Johnnie—It is proposed to extend the electric line from Rhyolite to supply cheaper power to the mill.

Pocahontas—A cement water tank of 8000 gal. capacity has just been completed.

WHITE PINE COUNTY

Boston Ely—The inclined winze from the drift in the Emma shaft has left the ore and is now in the footwall, the vein having flattened. The winze will be carried downward 50 ft. and a drift run to the contact.

Giroux—The company will now start six churn drills at first on the original Giroux estate and later on recently acquired claims. The big shaft, 12 ft. by 19 ft. 4 in., has been sunk 1200 ft. in 10 months, a record in shaft work.

Cumberland-Ely—On March 31, 1,269,222 shares had been exchanged for Nevada Consolidated, or about 98 per cent. The mines are still idle and the operating income from working up the by-products has stopped. The only revenues is from the company's interests in the Steptoe smeltery and the railroad.

New Mexico

Chino—The May 1 report gives the ore reserves 17,948,566 tons, assaying 2.6 per cent. copper. The total increase for the last month amounted to 395,056 tons. The reserves may be divided as follows: Developed ore, 7,875,579 tons, assaying 2.41 per cent. copper; partially developed, 10,072,987 tons, assaying 2.75 per cent. copper. The company has developed a water supply from the Apache Tajo spring, from which it is estimated that sufficient water for a 10,000-ton mill can be obtained. The deepest hole drilled, namely, 1040 ft., with the bottom still in high-grade ore, had to be abandoned as the drill had reached its workable depth. The company is installing drills capable of operating to 3000 ft. or more.

Tennessee

The Grasselli Chemical Company, of Cleveland, O., has purchased the property of the New Market Zinc Company and has leased the property of the Roseberry Zinc Company, at Mascot, and intends to develop the mines on a large scale.

Utah

JUAB COUNTY

Tintic ore shipments in carloads for the week ended May 6 are as follows: Iron King, 20; Iron Blossom, 19; Sioux Consolidated, 17; Dragon Iron, 15; Colorado, 8; Gemini, 7; Eagle & Blue Bell, 4; Grand Central, 4; Scranton, 4; Eureka Hill, 4; Ophongo, 3; Chief Consolidated, 3; Uncle Sam, 2; Beck Tunnel, 2; Lower Mammoth, 2; May Day, concentrates, 1; Gold Chain, 1; East Tintic Development, 1; Swansea, 1; Yankee, 1; Bullion Beck, 1; May Day, 2; total, 122 cars.

Eagle & Blue Bell—Orders have been received from Eastern headquarters to purchase new hoisting equipment, and to sink the old Eagle & Blue Bell shaft, now down 220 feet, to 1000 ft. A drift is being extended under the shaft on this level, and raising and sinking will be carried on at the same time. A Hendrie & Bolthoff hoist has been ordered, which will be capable of sinking to the 2000-ft. level. Timbers for the shaft have been ordered, and sinking will be started as soon as possible. The mine is now producing 16 cars per month, which net the company about \$20 per ton.

Lower Mammoth—The drift south of the shaft on the 2000-ft. level recently broke into heavy sulphide ore. Develop-

ment on this new strike is being continued, and shipments will be made from it. Ore is also being mined for shipment from between the 1700- and 1800-ft. levels.

Tintic Central—The shaft has just passed the 700-ft. level, and will be sunk to 900 or 1000 ft. Three shifts are being worked.

Centennial-Eureka—Hoisting ore was resumed May 5. After the installation of the electric pump on the 2200-ft. level, the ore output has been gradually increased up to the normal production of 300 tons per day.

Iron Blossom—Shipments have been heavier than usual. No action was taken regarding the June dividend at the meeting in Provo, May 10.

Colorado—The No. 1 or South shaft is being sunk from the 300- to the 500-ft. level.

Tintic Standard—The shaft has been sunk 65 ft. below the 700 level. Streaks of lead ore and bunches of silicious ore, carrying gold and silver, have been encountered. Mineralization is said to be increasing with depth.

Yankee—Preparations are being made for the installation of the new hoisting plant.

SALT LAKE COUNTY

Cardiff—This property near the head of Big Cottonwood cañon has mined about 70 tons of ore from development. Ore 2 to 3 ft. thick, carrying copper, lead and silver, was recently developed on the tunnel level. A raise has been driven on this ore, and is now up a distance of about 65 ft.; it is following the vein to the limestone-quartzite contact.

Columbus Consolidated—Shipments were resumed May 5. The ore bins are filled with crude ore and concentrates awaiting shipment. Two shifts are employed in the mill, and about 75 tons of ore are being treated daily. Approximately \$60,000 out of the \$70,000 due on the recently levied assessment of 25c. per share has been collected.

SUMMIT COUNTY

Park City ore shipments for the week ended May 6 are as follows: Daly-Judge, 1,376,000 lb.; Daly-Judge (zinc), 798,580; Daly-West, 1,260,000; Silver King Coalition, 762,800; total, 4,197,380 pounds.

Silver King Coalition—The main working shaft is to be repaired, which will take 30 days. The working force will not be reduced during this time, but will be sent into the mine by way of the Alliance tunnel. Some ore and waste will be hoisted on night shift.

East Carbonate—A small mineralized stringer cut on the tunnel level has been drifted on a distance of about 30 ft., and is reported to have opened into 2 ft. of ore carrying lead and silver.

Canada

BRITISH COLUMBIA

Pacific Coast Collieries—This company will erect a plant at Merritt, capacity 500 tons per day.

Granby—The eight furnaces are in operation, treating about 4000 tons daily.

British Columbia Copper—The settlement of the strike which has tied up operations since April 19 has been effected. As soon as a new force of 500 men can be collected, operations will be resumed.

Mother Lode—A plant will be installed on this property this spring. John McMartin has control.

ONTARIO

The shipments from Cobalt for the week ended May 6 are as follows: La Rose, 339,803 lb.; Nipissing, 190,280; Kerr Lake, 256,468; Crown Reserve, 138,225; Temiskaming, 125,330; Peterson Lake, 100,000; Trethewey, 64,500; Coniagas, 59,300; Buffalo, 52,010; Beaver, 60,350; total, 1,386,266 pounds.

Beaver—In the fight for control of this property the present management was sustained.

Buffalo—The monthly report shows that the mill treated 3523 tons, averaging 37.2 oz., and recovered 103,865 oz. of silver.

Peterson Lake—The annual report shows a cash balance of \$47,237, with an additional 160,000 shares placed in the treasury. During the year 111 tons of ore were shipped netting the company \$11,313 from the 25 per cent. royalty.

Nipissing—Surface prospecting has resulted in the discovery of two good veins.

La Rose Consolidated—The management reports: "Fine showing silver No. 11 vein at the Lawson showing 9 in. high-grade ore on the 48-ft. level. The No. 2 vein at the Lawson is also looking good on the 88-ft. level."

Cobalt Provincial—This property consists of 30 acres adjoining the Nipissing and Savage. Development and trenching are being done. John Reddington is superintendent and John T. Milliken and Frank G. Logan are directors.

Mexico

CHIHUAHUA

Cusihuiriachic—It is announced that the Mexico Northwestern Railway is to immediately begin construction on the 24-kilo. line from San Antonio station to this silver camp. Interest in the camp has been augmented of late by the profitable operations at the Promontorio mine of the Cusi Mining Company and by the pending sale of the Reina mine to the Pearson interests.

Rio Tinto—The copper furnace was

blown out May 1 so as to facilitate the addition of a second furnace and converter, and the remodeled plant is expected to be in commission July 1. During the year the copper matte has been accumulated and there is on hand 2,500,000 lb. of copper, which will be converted on the ground.

El Rayo—The company has completed a 1000-ft. crosscut from the upper or San Jose tunnel and encountered the Volga vein on the northern portion of the property. Drifting on this vein from the intersection has progressed 40 ft. and exposed ore for the entire distance, showing a width of 3 ft. and assaying from \$18 to \$20 per ton.

International Gold Mines Company—This company has again taken over its property from the Socorro Mines Development Company and is carrying on developments under the direction of J. Gordon Hardy, consulting engineer, and D. Gordon Smith, superintendent.

Cherokee—This company, in the San Julian section, south of Parral, has resumed under direction of H. D. Higgins and C. S. Allen. The English stockholders subscribed \$100,000 for the work. The mill will be remodeled and enlarged.

GUANAJUATO

Oro Grande Mines Company—This company has purchased control of the property of the Guanajuato Amalgamated Gold Mines Company, owning 160 acres at La Luz, adjoining the Oro Grande groups. The deal includes the 100-stamp cyanide mill and a reservoir of 100,000,000-gal. capacity. It is proposed to proceed at once to increase the capacity of the mill by installing additional machinery and equipping it with improvements in cyanidation (Just process) recently perfected by the Guanajuato Development Company. An aerial tramway of 100 tons hourly capacity will connect this mill with the properties of the Oro Grande company.

JALISCO

Virginia & Mexico—The one-hundredth bar of bullion has been marketed. The bars average 1000 pesos each. The company is also shipping concentrates averaging 350 pesos per ton.

Mina Grande—The reopening of this *antigua* has been started by a company in which French capital is principally concerned. It was purchased from Dwight Furness for 75,000 pesos. W. A. Hoing is in charge.

Altamira—Work will be soon resumed at this group, near Ahualulco. Dennis Ryan, of St. Paul, Minn., is the principal owner. A reduction plant and an aerial tram are projected.

SONORA

Neill Development Company—This corporation has been launched by Spok-

ane, Wash., people to work the Paloma placer mines, Altar. The price paid for the property, consisting of 12,000 pertenencias, was \$750,000, plus one-third of the company's stock. About \$400,000 will be expended. R. K. Neill is in charge.

Cianguita—The litigation in the Arizona courts involving the corporation affairs of this company, brought by Thomas Farish and others, has been decided in favor of the company.

Mines Company of America—Results at the Creston-Colorado, for December, January and February, show a total profit of \$63,112. The company is engaged in extensive development on the new unprospected territory.

ZACATECAS

San Carlos—The 50-stamp mill and cyanide plant of this English concern are again in commission. From 100 to 150 tons daily are being handled.

Mexico-Milagros—This company, operating at Chalchihuites, has been listed on the New York Curb. B. F. Howland, Brooklyn, is president.

Asia

INDIA—MYSORE

Kolar Goldfield—Gold production in April is reported at 46,842 oz., being 193 oz. less than in March and 714 oz. more than in April, 1909. For the four months ended April 30, the total was 181,136 oz. bullion in 1909, and 185,889 oz. in 1910; an increase of 4753 oz. The bullion reported this year was equal to \$3,458,091, or 167,300 oz. fine gold.

Australia

NEW SOUTH WALES

The gold production of New South Wales is reported at 15,381 oz. for April, 1910, and 75,301 oz., or \$1,556,471, for the four months ended with April.

WESTERN AUSTRALIA

Gold production in April is reported at 125,248 oz. For the four months ended April 30, the total was 520,141 oz. in 1909, and 481,109 oz., or \$9,944,523 in 1910; a decrease of 39,032 oz., or \$806,791 this year.

VICTORIA

Gold production in February was 47,676 oz.; for the two months ended Feb. 28 it was 87,268 oz., or \$1,803,830, an increase of 815 oz. over last year.

New Zealand

The gold output in April was 28,253 oz. bullion in 1909, and 38,796 oz. in 1910; an increase of 10,543 oz. The bullion reported this year was equal to \$743,228, or 35,957 oz. fine gold. Silver reports for the month were 147,983 oz. in 1909, and 126,078 oz. in 1910, a decrease of 21,905 oz. for 1910.

THE MARKETS

Current Prices of Metal, Minerals, Coal and
Stocks, Conditions and Commercial Statistics

Coal Trade Review

New York, May 18—Coal trade in the West is still in an uneasy condition. The settlement of the new wage scales proceeds slowly, and in the important State of Illinois no settlement at all has been reached or is even in sight. A new conference is now in session and this may reach some basis of agreement, but it is not certain. In the Pittsburg district, Ohio and Indiana there is still some friction, but the mines are getting to work and business promises to be good. In the Southwest no agreement is in sight, and the operators are discussing the question of reopening their mines on the open-shop basis.

Where mining has been resumed there is much activity, as the stocks of coal which were accumulated before the suspension have been almost exhausted. New supplies are needed, and the working mines are receiving orders which will keep them busy for some time. One month or more of suspension had its favorable side for the operators.

Lake trade, so far, has been rather slow since the first rush of loaded boats started. The Northwest does not seem inclined to take coal freely so far, and the trade has been rather a disappointment.

In the East there is nothing special about the bituminous trade, and no change from the conditions for several weeks past. There is no great rush for coal anywhere, but a fair trade is being done at most points. The anthracite trade is steady and without special incident.

COAL TRAFFIC NOTES

Coal and coke tonnage Chesapeake & Ohio Railway, nine months of fiscal year from July 1 to March 31, short tons:

	Coal.	Coke.	Total.
New River	5,932,093	273,866	6,205,959
Kanawha	4,921,997	46,403	4,968,400
Kentucky	408,291	228	408,519
Connecting lines.....	77,105	36,865	113,970
Total.....	11,339,486	357,362	11,696,848
Total, 1908-9.....	9,096,732	275,677	9,372,409

Deliveries to points west of mines this year 5,963,617 tons coal and 173,274 coke; points east, 1,507,603 tons coal and 153,395 coke; tidewater, 3,796,537 tons coal and 30,693 coke: anthracite to line points, 5700 tons. The total increase this year was 2,324,439 tons, or 24.8 per cent.

Coal tonnage passing Sault Ste. Marie canals for the season to April 30 was: Anthracite, 179,596; bituminous, 360,327; total, 539,923 short tons.

Bituminous coal and coke tonnage of leading railroads in Pennsylvania and West Virginia three months ended March 31, short tons:

	Bituminous.	Coke.	Total.
Pennsylvania.....	11,267,286	3,985,861	15,253,147
Balt. & Ohio.....	6,704,767	1,175,551	7,880,318
Buff., Roch. & Pitts.	1,933,620	185,098	2,118,718
Buff. & Susqueh'na	337,505	71,057	408,562
Penn. lines, N. Y. C.	2,536,167	13,546	2,549,713
Pitts. & L. Erie.....	2,536,371	1,914,191	4,510,562
Pitts., Shawmut&N.	160,336	4,821	165,157
Norfolk & Western.	4,026,662	826,667	4,853,329
Ches. & Ohio.....	4,005,071	129,738	4,134,806
Total.....	33,567,785	8,306,530	41,874,315
Total, 1908.....	25,238,610	5,504,642	30,743,252

Total increase this year, 11,131,063 tons, or 36.2 per cent. The Pittsburg, Shawmut & Northern tonnage in 1910 is for two months only. Anthracite tonnage of Pennsylvania and Baltimore & Ohio is not included.

Coal receipts at Boston, four months ended April 30, reported by the Chamber of Commerce:

	1909.	1910.	Changes.
Anthracite.....	556,101	557,936	I. 1,835
Bituminous.....	1,067,693	1,349,295	I. 281,602
Total domestic....	1,623,794	1,907,231	I. 283,437
Foreign.....	95,985	100,311	I. 4,326
Total.....	1,719,779	2,007,542	I. 287,763

The foreign coal is almost all from Nova Scotia mines.

New York

ANTHRACITE

May 18—There is nothing especially new in the trade. Business is steady, and so far, little affected by the coming of warm weather.

Schedule prices of domestic sizes are \$4.35 for broken, and \$4.60 for egg, stove and chestnut, all f.o.b. New York harbor points. For steam sizes current quotations are: Pea, \$3@3.25; buckwheat, \$2.20@2.50; No. 2 buckwheat or rice, \$1.65@2; barley, \$1.35@1.50; all according to quality, f.o.b. New York harbor. The lower prices are usually for washery coals.

BITUMINOUS

Current business is about the same as last week, and there is still a preference for the lower-priced coals. A few contracts come in, but many are still dragging.

The miners in the Central district in Pennsylvania come in slowly, and hardly any of the mines is working with a full force. It is understood that the New River and Pocahontas operators have decided to shut down two days in each week, as their coal seems to be in oversupply and they do not want to pile up stocks.

Car supply is falling off a little. Trans-

portation is not quite as good as it has been, coal taking a day or two over schedule time to come through to tide.

New York harbor trade is fairly active, but prices are unchanged. West Virginia coal can be had at \$2.40, f.o.b. shipping point; while \$2.50@2.55 is paid for Somerset and \$2.65@2.70 for good Miller vein steam coal.

In the coastwise market there is talk of advancing vessel rates, but that will not be easy at this season, and with boats in good supply. Going rates from Philadelphia are 70@75c. to Boston, Salem and Portland; 75@80c. to Portsmouth; 80@85c. to Lynn, Bath and Bangor; 80@90c. to Newburyport; 65c. to Providence and the Sound.

Birmingham

May 16—With wages advanced 2½c. per ton, the miners in Alabama are working well, and there is a better production of coal. The product is being handled about as quickly as it is being mined. The railroads are the largest consumers here of coal at present. Some good contracts are in hand by Alabama coal producers. Other contracts are said to be pending which will require full operation of the mines for the balance of the year. Coal prices are down considerably, and some complaint is to be heard on that score.

Coke is in good demand, and production is being kept up. Coke prices have not fallen.

Chicago

May 17—The coal market shows activity in Indiana coals and in those from the East, with supplies plentiful for all purposes. Illinois coal, of course, is wholly out of the market and the fine coals on which an increasing number of steam users have come to rely are supplied chiefly from Indiana at prices about the same as those that prevailed shortly before the suspension in Illinois. The country trade, however, which is short of supplies, is buying largely of lump from Eastern mines. Danger of a coal famine seems to have become obviated by the general resumption of mining outside Illinois and as yet prices show no sharp tendency upward. Storage supplies of the largest consumers are near exhaustion.

Indiana lump at \$2.25@2.50, run-of-mine at \$2.15@2.40 and screenings at \$2@2.25 represent the available Western supply. Smokeless sells well at \$3.55 for lump and \$3.15 for run-of-

mine, with none of the old-time surplus on track. Hocking remains at \$3.15 and is steady as regards demand and supply. Anthracite has a fair sale in both city and country.

Cleveland

May 16—Ohio mines continue to operate rather irregularly. Supplies of coal are sufficient, however, and stocks are not cleaned up yet, apparently, as demand is light. Lake trade is still slow.

Prices quoted are, Cleveland delivery: Middle district, \$2 for 1¼-in., \$1.85 for ¾-in., \$1.75 for run-of-mine and \$1.65 for slack; No. 8 district \$2.20 for 1¼-in., \$2 for ¾-in., \$1.90 for run-of-mine and \$1.85 for slack; Youghiogeny, \$2.50 for 1¼-in., \$2.35 for ¾-in., \$2.25 for run-of-mine; Pocahontas, \$2.85 for lump and \$2.45 for run-of-mine. Slack is in a little less demand than it has been.

Indianapolis

May 16—Coal operators and miners are in good spirits over the outlook for heavy coal traffic during the next few months. Manufacturers are sending in orders for immediate shipments of coal and the Northern people who draw their supply from Indiana mines, are sending representatives to contract for coal.

The railroads have increased the rates on coal on an average of 8c. a ton, to go into effect June 1. This fact and the nearly exhausted supply of manufacturing coal accounts for some of the orders for immediate delivery.

A meeting was held in this city during the past week by local and other State representatives for the purpose of securing uniform mining laws in the respective States. Better living and social conditions for miners were advocated. Un-sightly mining camps, it was declared, should be replaced with better houses at moderate rent.

Pittsburg

May 17—The mines are running full, except in certain nonunion districts where there are still strikes. The Westmoreland district is almost entirely down. This idleness, with heavy shipments in the Lake trade, makes a good demand for coal, and prices are fairly well maintained at the higher basis quoted after the suspension, there being only occasional shading by a few interests, and we continue to quote: Mine-run and nut, \$1.25; ¾-in., \$1.35; domestic 1½-in. lump, \$1.50; slack, 85c. per ton.

Connellsville Coke—The furnace-coke market has found a trading basis, some operators making concessions on contracts and meeting furnace views. Following one or two contracts placed at about \$1.85, we can report the following fresh business this week in furnace coke: 12,000 tons monthly, July to June inclusive, \$1.85; 9000 tons monthly, sec-

ond half, \$1.80; 5000 tons monthly, second half, \$1.75. One of these contracts was with an Eastern furnace interest, another with a Valley interest and the third with a Lake front interest. We note also 15,000 tons of furnace coke sold for May and June shipment at \$1.65. There is some contract business under negotiation for second half. The prices are quite unsatisfactory, but it has become evident to some at least of the operators that when pig iron is down practically to cost of production, on purchased ore, that profitable prices for coke cannot be expected. Foundry coke is moving slowly, at unchanged prices. We quote: prompt furnace, \$1.65@1.75; contract furnace, \$1.75@1.85; prompt foundry, \$2.25@2.35; contract foundry, \$2.35@2.50 per ton.

The *Courier* reports the production in the Connellsville and lower Connellsville region in the week ended May 7 at 394,414 tons, an increase of 22,000 tons over the previous week, and shipments at 4063 cars to Pittsburg, 5860 cars to points west of Pittsburg and 1020 cars to points east of Connellsville, a total of 10,943 cars.

St. Louis

May 16—Conditions took a material turn this week as a number of large industries have been forced to come on to the market, owing to the fact that their storage supply was exhausted. This includes a number of railroads; consequently prices have advanced from 30 to 40c. per ton in the last several days. The demand far exceeds the supply at present. Coal is being shipped in here from six or seven different sources now, as it is coming from several districts in Kentucky and both the northern and southern districts of Indiana, with considerable reloaded screenings from Illinois.

Current prices are as follows for the St. Louis market:

	Mine.	E. St. Louis.
Kentucky mine-run.....	.....	\$2.60
Indiana mine-run.....	.....	2.55
Kentucky lump.....	.....	2.80
Indiana lump.....	.....	2.75
Illinois:		
Reloaded screenings.....	.....	2.00
Pocahontas and New River:		St. Louis.
Lump or egg.....	\$1.50	\$4.00
Mine-run.....	1.10	3.65
Pennsylvania Anthracite:		
Nut, stove or egg.....	.....	6.55
Grate.....	.....	6.30
Arkansas Anthracite:		
Egg or grate.....	3.35	5.35
Coke:		
Connellsville foundry.....	.....	5.40
Gas house.....	.....	4.50
Smithing.....	.....	4.15

Prices for Kentucky and Indiana coals are on track, East St. Louis.

The anthracite market is in good shape and tonnage moving is normal. Prices

are being maintained in both the wholesale and retail trade. The retail conditions are much more favorable than last week, and while the circular price is lower than in former years, there seems to be no cutting.

FOREIGN-COAL-TRADE

German Coal Production—Coal production in the German Empire, three months ended March 31, metric tons:

	1909.	1910.	Changes.
Coal.....	36,477,870	36,370,787	D. 107,083
Brown coal.....	16,815,920	16,147,498	D. 668,422
Total mined.....	53,293,790	52,518,285	D. 775,505
Coke made.....	5,243,747	5,636,781	I. 393,034
Briquets made.....	4,518,916	4,469,226	D. 49,690

Of the briquets reported this year, 3,433,910 tons were made from brown coal or lignite.

German Coal Trade—Exports and imports of fuel in Germany, three months ended March 31, metric tons:

	Exports.	Imports.	Excess.
Coal.....	5,222,961	1,990,741	Exp. 3,232,220
Brown coal.....	16,893	1,760,587	Imp. 1,743,694
Coke.....	937,241	150,299	Exp. 786,942
Briquets.....	383,077	51,328	Exp. 331,749
Total.....	6,560,172	3,952,955	Exp. 2,607,217
Total, 1909..	6,415,752	3,980,741	Exp. 2,435,011

Of the coke exported this year, 4585 tons went to the United States.

Welsh Coal Prices—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of Welsh coal as follows, on May 7: Best Welsh steam, \$3.96; seconds, \$3.81; thirds, \$3.66; dry coals, \$3.72; best Monmouthshire, \$3.60; seconds, \$3.48; best steam smalls, \$2.16; seconds, \$1.92. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

IRON-TRADE-REVIEW

New York, May 18—The iron and steel markets are still in a waiting mood, and there is little change to be noted from the proceeding week.

The pig-iron business has been quiet, although it is generally believed that consumers have drawn down their stocks rather low. Users of foundry iron do not seem much disturbed by the movement to reduce production. Some orders have been placed, both in the West and in New England territory, but they seem to be only for immediate needs. It is not that buyers do not expect to require iron, but they seem to believe that the bottom of the market has not yet been reached, and they are waiting for the turn.

In finished material there is a moderate business reported in most lines. Sheets and bars are in the best condition. A good deal of structural business is forward and more is ready for contract, but differences over price are delaying the final placing of orders. Railroad orders

are rather scarce for the time being, but it must be remembered that very heavy contracts for new equipment, placed some time ago, are still unfilled. A good deal of small bridgework is being placed.

Taking the finished-steel trade as a whole, the mills are running chiefly on old contracts, much of the tonnage having been booked last year. Even with the slightly reduced rate of output the total tonnage of business on books is decreasing. Without any general change in the situation, consumption will probably warrant the continuance of the present rate of output, but as contracts run out there will have to be much new buying, and with mills indifferently occupied there will obviously be sharp competition for the business, so that some recessions in prices within the next three months are to be expected, and touching the majority of finished-steel products outside of rails and tinplates, rails by reason of custom and tinplates by reason of heavy demand being well established in price.

Alabama Iron Production—Pig-iron output in Alabama in April, is reported at 172,885 tons; for the four months ended April 30, it was 676,741 tons, an increase of 109,581 tons over last year.

Baltimore

May 17—Imports at Baltimore for the week included 500 tons manganese ore from Antwerp; 2400 tons ferromanganese from Great Britain; 16,100 tons iron ore from Cuba; 400 tons copper ore and 2835 tons cupreous pyrites from Huelva, Spain. The exports included 2061 tons steel rails and 597,450 lb. splice-bars to Argentina.

Birmingham

May 16—The Southern pig-iron market, while a little quiet, yet gives promise of material improvement before long. The curtailment in production is preventing accumulation of iron, and this is having some effect on general conditions. There are a few inquiries being received indicating that there is a need for some iron. There is no hesitation among the cast-iron pipe makers and the foundries and machine shops recently took on a little more business so that the home consumption of pig iron is keeping up well. The shipments to other sections are not so good. One prominent interest in the Birmingham district in speaking of the general conditions said that while the lull at present is a little depressing, within 60 days there will be business on all sides and the make will be cared for easily. The quotations at present in the Southern territory are around \$12, No. 2 foundry.

Chicago

May 17—Conditions in the iron market seem on the turning point. A larger tonnage has been contracted for in the

last week and inquiries are numerous on last-half requirements. That the bottom of the market has been reached would seem to be the general conclusion of melters of pig iron. Below the \$12 Birmingham price (\$16.35 Chicago) which has been standard for several weeks no selling interest seems to be willing to go. Northern iron remains at \$17. At these prices a good deal of business is done for deliveries in the next 30 to 90 days, with an occasional large order given for last-half needs.

Iron and steel products continue largely in demand. Sales of practically all forms of iron and steel are good.

Cleveland

May 16—Nothing doing in iron-ore sales. The ore shipments reported in April reached a total of 1,520,305 tons, more than was expected.

Pig Iron—The market is quiet. It is reported that offers of Southern No. 2 foundry have been made at \$11.50 Birmingham, on large quantities. Current quotations, Cleveland delivery, are \$17.90 for bessemer; \$16.50@16.75 for No. 2 foundry; \$16.10@16.35 for No. 2 Southern; \$16@16.25 for forge.

Finished Material—The lull in buying is still the feature of the market. Shading on sheets and plates is reported. Local mills are running only five days a week, for the most part.

Philadelphia

May 18—Sales during the past few days aggregate a slight increase over last week, both in foundry No. 2 and forge, while the movement in basic is at a standstill, no inquiries having been received and negotiations of a week or two ago halted. At the present time, makers say, large consumers are more likely to be early customers for large lots than for small ones. The mill owners are indisposed to buy in a large way until the effect of curtailment in other markets can be sized up. The makers of special brands who are usually well sold ahead will have material on hand before July 1, unless the market improves. Any downward tendency in prices will be resisted by Eastern furnace interests, as they are not afraid to permit an accumulation of stock. Quotations for No. 2X foundry are given at \$17; gray forge at \$16.25; and basic, \$16.75 per ton.

Steel Billets—There has been an absence of orders and consumers are delaying inquiries until the effect of fluctuations in crude material can be discounted. The asking prices remain firm.

Bars—There is a noticeable falling off in bar iron at mills; but local storekeepers report an improving distribution in the local and near-by trade.

Sheets—Sheets have been shaded in a small way on inquiries for large supplies

for summer and autumn delivery. In a general way the sheet-iron industry is strong and the production of mills shows no falling off.

Pipes and Tubes—An unexpected activity has been developed in tubes, probably because of the postponement in the placing of orders which were withheld in view of an expected drop in prices. Wrought-iron pipe is weaker and sales have not improved. Cast pipe is strong and the pipe works are busy.

Plates—Latest orders for plates from large concerns call for only a part of supplies for which inquiries were made from two to three weeks ago.

Structural Material—The probability of any weakness in structural shapes has disappeared as shown in latest quotations given on bridge material.

Scrap—The scrap market remains quiet and supplies are large, covering nearly all lines of scrap usually dealt in. Dealers are quietly holding their stock for their own prices and foundries and other buyers are not in the market at present.

Pittsburg

May 17—The finished-steel trade shows no improvement, but seems to maintain the better rate of business shown early in the month as compared with April, which was a poor month. It remains, however, that in some lines, such, for instance as wire products, plates and shapes, there is not enough absolutely new business to test the market seriously, and mills are running chiefly on specifications on old contracts. In hoops and bands there is fairly good new buying, and in steel bars and sheets a moderate amount.

There has been sharp competition in spikes lately, and standard railroad spikes have sold down to \$1.60 per 100 lb., for prompt shipment, the market having been \$1.75 early in the year. Contracts can be made at \$1.65@1.70.

Wrought-iron pipe is down a point, making the nominal discount 74 off and the inside price 75 and 5, so that iron pipe is four points instead of five points above full-weight steel pipe, the latter remaining at 79 and 5 for full weight and 80 and 5 for "catch weight."

Pig Iron—The market has become weaker all around. Basic iron has been sold at \$15, Valley, and it is believed that a round tonnage, running into thousands of tons, has been done at this figure, although details are not available. Foundry iron can be had at \$15 on an attractive tonnage for early delivery, although no sales of importance have yet been made. For either basic or foundry a contract for extended delivery could hardly be made at less than \$15.50, as cheap iron has been sold chiefly to clear off stocks, and for iron still to be made, using the new ore at the season's advance of 50c., the furnaces insist upon a higher

price. Bessemer iron has not moved, and the old quotation of \$17 has become purely nominal. It would be quite impossible to sell any iron at the price, but the market does not know what price could really be secured. Some reports have been circulated of sales at \$16.50 and \$16.25 but there is good ground for believing that the alleged transactions were not *bona fide*. A more cheerful tone pervades the market as furnaces believe the situation is being shaken out and a real trading basis is coming in sight through prices being pushed down to the cost limit. The market is quotable as follows: Basic and No. 2 foundry, \$15@15.50; malleable, \$15.50@15.75; forge, \$14.50@15, all at Valley furnace.

Ferromanganese—The market has been quiet locally, but it is reported that a large sale, about 5000 tons, has been made in the East. Prices remain at \$40 @ 40.50 for prompt at \$40.50@41 for forward delivery, f.o.b. Baltimore.

Steel—The market has been quiet, and prices show no change from last week, when we quoted bessemer 50c. lower, quotations remaining: Bessemer billets, \$25.50@26; sheet bars, \$26.50@27; open-hearth billets, \$28.50@29; sheet bars, \$29@29.50; rods, \$32, all f.o.b. maker's mill, Pittsburg or Youngstown districts.

Sheets—The Canton Sheet Steel Company has broken ground at Canton, O., for six sheet mills, C. A. Irwin, W. W. Irwin and other Canton people being interested. The Phillips Sheet and Tinplate Company, which recently completed and put in operation 10 tin mills at Wierton, Hancock county, W. Va., is adding 10 sheet mills to the plant. Demand for sheets is rather quiet, but a heavy tonnage is being turned out. A few mills are idle or running light, simply because there has been such a large increase in capacity in the past year and a half. Such mills are shading black sheets \$1@2 a ton and galvanized sheets \$2@3, regular prices being 2.40c. for black, 3.50c. for galvanized, \$1.70 for painted corrugated and \$3 for galvanized corrugated. Specialties are very firm. Blue annealed at the regular price of 1.75c. cannot be done for any early delivery, 1.85c. being done on delivery six weeks ahead, while for spot shipment 1.90c. or 1.95c. could be obtained. Pickle-finished sheets command a premium of \$2 a ton for prompt shipment, being held at 2.50c. base, plus the regular extra.

St. Louis

May 16—The pig-iron market remains in a state of lethargy. A few inquiries are coming in and little business has been closed during the last week. Prices remain unchanged. All firms in this part of the country seem to have all on hand that they will need for the present and do not seem inclined to buy ahead at all.

The price of \$13 f.o.b. Birmingham, or \$16.75 per ton St. Louis, remains unchanged.

Lake Iron Ore

The records kept by the Cleveland *Iron Trade Review* show the shipments of Lake ore through Lake Erie ports to furnaces for the year ended May 1, 1910, as follows:

Stocks on docks, Dec. 1, 1909	8,965,789
Stocks, May 1, 1910	5,444,080
Winter shipments	3,521,709
Season shipments, May 1-Dec. 1, 1909	30,077,304
Total shipments to furnaces	33,599,013

The total shipments to furnaces through Lake Erie ports for the years ended May 1 have been, for 12 years past:

1898-9	12,122,982	1904-5	20,057,070
1899-1900	15,832,881	1905-6	28,984,358
1900-1	14,465,260	1906-7	30,099,769
1901-2	17,216,055	1907-8	31,692,446
1902-3	21,905,251	1908-9	20,524,923
1903-4	18,739,995	1909-10	33,599,013

The stocks on docks May 1 have not varied greatly for three years past. Those reported for May 1, 1910, show an increase over 1909 of 73,812; but a decrease from 1908 of 36,220 tons.

FOREIGN IRON TRADE

Iron Production in Great Britain—The total production of pig iron in Great Britain in 1909 was 9,664,287 long tons; an increase of 374,447 tons, or 4 per cent., over the previous year.

German Iron Ore—The production of iron ore in Germany, including Luxemburg, for the full year was 24,278,157 metric tons in 1908, and 25,505,409 in 1909; an increase of 1,227,258 tons.

Belgian Iron Trade—Foreign iron and steel trade of Belgium, year 1909, metric tons:

	Exports.	Imports.	Excess.
Pig iron	19,362	477,811	Imp. 457,94
Other iron and steel	1,177,093	360,255	Exp. 817,438
Total	1,197,055	837,566	Exp. 359,489
Total, 1908	1,054,479	662,390	Exp. 392,086
Iron ore	434,748	4,389,892	Imp. 3,955,344
Iron ore, 1908	446,233	3,342,404	Imp. 2,996,171

Belgium imports—chiefly from Germany—much pig iron, which is worked up into finished material in Belgian mills.

METAL MARKETS

New York, May 18—The metal markets generally do not show any material changes, and continue rather quiet.

The cable reports the gold output of the Transvaal in April at 619,000 oz., or \$12,794,730. This makes for the four months ended April 30, a total of 2,403,109 oz., or \$49,672,263; an increase of \$158,684 over last year.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
April 1910	\$36,283,625	\$ 2,100,918	Exp. \$34,182,707
" 1909	6,337,994	3,345,861	" 2,992,133
Year 1910	47,199,706	11,669,276	" 35,530,430
" 1909	44,316,626	15,504,136	" 28,812,490
Silver:			
April 1910	4,696,534	3,840,495	Exp. 856,039
" 1909	4,952,251	4,222,147	" 730,104
Year 1910	18,336,081	15,238,634	" 3,097,447
" 1909	19,426,181	14,675,365	" 4,750,816

Exports from the port of New York, week ended May 14: Gold, \$30,380; silver, \$670,692, chiefly to London Imports: Gold, \$42,235; silver, \$54,152, from the West Indies, Mexico and South America

Foreign trade of the United States four months ended April 30, as valued by Bureau of Statistics, Department of Commerce and Labor:

Merchandise:	1909.	1910.
Exports	\$ 547,230,803	\$ 545,766,431
Imports	477,271,628	560,736,040
Excess	E. \$ 69,959,175	I. \$14,969,609
Deduct excess of exports, silver		3,097,447
Deduct excess of exports, gold		35,530,430
Net export balance		\$ 23,659,266

Gold and silver movement in detail is given in the table at the head of this column.

Gold—There was no special demand in London, and prices on the open market remained unchanged at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. No exports from New York are reported.

Platinum—The market remains quiet but steady, and prices are unchanged. Dealers ask \$29@29.50 per oz. for refined platinum and \$34.50@35 per oz. for hard metal.

Silver—During the whole of the week ended May 18, the silver market has remained steady around 24³/₈d. on Indian bazaar buying; closing slightly easier at 24 13/16d. in London. The general tone of the market continues good.

SILVER AND STERLING EXCHANGE

May.	12	13	14	16	17	18
New York	54	53 ³ / ₈	54	54	54	53 ³ / ₈
London	24 ³ / ₈	24 ¹ / ₈	24 ³ / ₈	24 ³ / ₈	24 ³ / ₈	24 ¹ / ₈
Sterling Ex.	4.8660	4.8675	4.8700	4.8695	4.8700	4.8720

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

Exports of silver from London to the East from Jan. 1 to May 5, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India	£1,519,300	£2,282,600	I. £ 763,300
China	1,088,200	1,113,500	I. 75,300
Straits	82,800		D. 82,800
Total	£2,640,300	£3,396,100	I. £ 755,800

India Council bills in London brought an average of 16.03d. per rupee.

Copper, Tin, Lead and Zinc

May.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	St. Louis, Cts. per lb.
12	12 3/4 @ 13	12 3/4 @ 12 3/4	56 1/2	33 3/4	4.25 @ 4.27 1/2	4.10 @ 4.12 1/2	5.00 @ 5.05
13	12 3/4 @ 13	12 3/4 @ 12 3/4	56 1/2	33 3/4	4.25 @ 4.27 1/2	4.10 @ 4.12 1/2	5.02 1/2 @ 5.07 1/2
14	12 3/4 @ 13	12 3/4 @ 12 3/4	....	33 3/4	4.25 @ 4.27 1/2	4.10 @ 4.12 1/2	5.05 @ 5.10
16	12 3/4 @ 13	12 3/4 @ 12 3/4	....	33 3/4	4.27 1/2 @ 4.32 1/2	4.12 1/2 @ 4.15	5.07 1/2 @ 5.12 1/2
17	12 3/4 @ 13	12 3/4 @ 12 3/4	56	33 3/4	4.27 1/2 @ 4.32 1/2	4.12 1/2 @ 4.15	5.12 1/2 @ 5.17 1/2
18	12 3/4 @ 13	12 3/4 @ 12 3/4	56 1/4	33 3/4	4.27 1/2 @ 4.32 1/2	4.12 1/2 @ 4.15	5.12 1/2 @ 5.17 1/2

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

In the table published last week, the price of standard copper in London on May 5, was given at £59 9/16. This was a misprint, the correct figure being £55 9/16—£55 11s. 3d.—for that date.

Copper—An effort was made during the last week by some of the leading sellers to advance prices, but buyers could not be tempted to come in and some sellers then switched from their position and offered copper at a small concession. During the latter part of the week, electrolytic has been freely offered upon the basis of 12.60@12.62 1/2, net, cash, New York, while the Calumet & Hecla has been offering its Lake copper at 13c. Some moderate sales of Lake have been made at about that figure, but the sales of electrolytic have been of small proportions. European buyers, true to their previous tactics, withdrew upon the recent advance in the market, while American buyers have all along been conspicuous by their absence, although their supplies are now believed to be low. At the close the market shows a weakening tendency, with Lake at 12 3/8 @ 13c., and electrolytic in cakes, wirebars and ingots at 12 1/2 @ 12 3/4c. Casting copper is quoted nominally for the week at 12 1/4 @ 12 1/2 cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14c. base, carload lots at mill.

The London market for standard copper has crumbled away from day to day, and the close is practically at the lowest, being cabled at £56 5s. for spot, and £57 2s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £59; best selected,

£59 15s. @ £60 5s.; strong sheets, £68 @ 69 per ton.

Visible stocks of copper in England and France—including copper afloat from Australia and Chile—are reported at 243,308,800 lb. on May 15; a decrease of 3,561,600 lb. as compared with the May 1 report.

Exports of copper from New York and Philadelphia for the week were 3228 long tons. Our special correspondent gives the exports from Baltimore at 2967 tons.

Tin—The London market retained its firm undertone throughout the week. Transactions, however, decreased considerably and the absence of American demand was manifest. The close is cabled as strong at £151 5s. for spot, and £152 12s. 6d. for three months.

While the buying in the domestic market has subsided, the smaller shipments during the present month to the United States tend to keep prices firm, and a premium is again asked for spot shipments of tin.

Messrs. Robertson & Bense report receipts of tin ore and concentrates from Bolivia at Hamburg, Germany, in April at 752 metric tons.

Lead—At the beginning of the week, prices eased off somewhat more, but toward the close prices hardened slightly under the impetus of a better demand and the market is quoted at 4.27 1/2 @ 4.32 1/2c. New York, and 4.12 1/2 @ 4.15c. St. Louis.

The London market is somewhat higher, the close being cabled at £12 12s. 6d. for Spanish and £12 15s. for English.

Spelter—The advance has made further progress. The smelters are disinclined to sell since ore is not coming out freely on the basis of the lower prices recently established. The output in the Joplin district as a result has shown a falling off. Under relatively small transactions, prices have advanced from day to day, the close being steady at 5.12 1/2 @ 5.17 1/2c. St. Louis, and 5.27 1/2 @ 5.32 1/2c. New York.

Spelter quotations in New York, May 12, were 5.15 @ 5.20c.; May 13, 5.17 1/2 @ 5.22 1/2c.; May 14, 5.20 @ 5.25c.; May 16, 5.22 1/2 @ 5.27 1/2c.; May 17 and 18, 5.27 1/2 @ 5.32 1/2 cents.

The London market is unchanged at £22 for good ordinaries, and £22 5s. for specials.

Base price of zinc sheets is \$7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Other Metals

Aluminum—Business is good, with a steady demand and plenty of inquiries. Current quotations are 23 3/4 @ 24c. per lb. for No. 1 ingots in large lots, New York. The market abroad continues strong, with an upward tendency.

Imports of aluminum into the United States during the 12 months ended Dec. 31, 1909, were 5,109,843 lb., valued at \$745,963; an average of 14.6c. per pound.

Antimony—The market remains extremely dull, and in the absence of business prices are nominally unchanged. Quotations are 8 3/8 @ 8 1/2c. for Cookson's; 7 7/8 @ 8c. for U. S.; 7 3/8 @ 7 1/2c. for outside brands.

Quicksilver—Spot stock in New York is exhausted, and no sales can be made until supplies on the way from California arrive. Prices, however, are unchanged at \$48 per flask of 75 lb.; jobbers ask 67 @ 69c. per lb. for small lots. San Francisco, \$47.50 @ 48 for domestic orders, and \$2 less for export. The London price is £9 per flask; with £8 17s. 6d. quoted by jobbers.

Nickel—Large lots, contract business, 40 @ 45c. per lb. Retail spot, from 50c. for 500-lb. lots, up to 55c. for 200-lb. lots. The price for electrolytic is 5c. higher.

Magnesium—The price of pure metal is \$1.50 per lb. for 100-lb. lots, f.o.b. New York.

Cadmium—Current quotations are 65 @ 70c. per lb. in 100-lb. lots at Cleveland, Ohio.

German Metal Trade

Imports and exports of metals other than iron, in the German Empire, for the three months ended March 31, were, in metric tons:

	Imports.	Exports.	Excess.
Copper.....	48,444	17,718	Imp. 30,726
Copper, 1909....	39,122	15,298	Imp. 23,824
Tin.....	3,552	2,484	Imp. 1,068
Tin, 1909.....	3,301	1,610	Imp. 1,691
Lead.....	13,320	9,027	Imp. 4,293
Lead, 1909.....	16,930	7,677	Imp. 9,253
Zinc.....	8,763	24,913	Exp. 16,150
Zinc, 1909.....	7,310	23,549	Exp. 16,239
Nickel.....	1,251	293	Imp. 958
Nickel, 1909....	380	504	Exp. 124
Aluminum.....	2,132	452	Imp. 1,682
Aluminum, '09.	1,388	410	Imp. 978
Miscellaneous....	374	2,967	Exp. 2,593
Miscellan's, '09	331	2,399	Exp. 2,068

The figures include alloys and manufactures of the different metals. The imports and exports of ores for the year were, in metric tons:

Ores:	Imports.	Exports.	Excess.
Gold ore.....	6	.....	Imp. 6
Gold ore, 1909	23	.....	Imp. 23
Silver ore.....	296	.....	Imp. 296
Silver ore, '09	372	.....	Imp. 372
Copper ore....	4,540	5,602	Exp. 1,062
Copp'rore, '09	3,757	1,819	Imp. 1,938
Tin ore.....	3,892	63	Imp. 3,829
Tin ore, 1909.	2,779	4	Imp. 2,775
Lead ore.....	23,751	263	Imp. 23,488
Lead ore, '09	25,424	430	Imp. 24,994
Zinc ore.....	45,266	12,263	Imp. 33,003
Zinc ore, 1909	36,855	6,702	Imp. 30,153
Nickel ore	62	.....	Imp. 62
Nickel ore, '09	2,027	.....	Imp. 2,027
Chrome ore....	7,135	69	Imp. 7,066
Ch'me ore '09	6,474	21	Imp. 6,453
Pyrites.....	125,255	3,225	Imp. 122,030
Pyrites, 1909.	108,123	2,396	Imp. 105,727
Miscellaneous....	1,260	192	Imp. 1,068
Mis., 1909....	1,038	103	Imp. 935

Miscellaneous ores include tungsten, molybdenum and other ores of the minor metals.

Zinc and Lead Ore Markets

Platteville, Wis., May 14—The highest price paid this week for zinc ore was \$39 per ton. The base price, 60 per cent. zinc, was \$38@39. The base price of lead ore was \$48@49 per ton.

SHIPMENTS, WEEK ENDED MAY 14.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point.....	1,104,900	55,000	.....
Platteville.....	830,760	139,730	1,037,400
Highland.....	780,400	75,000	.....
Cuba City.....	346,051	.....	.....
Galena.....	330,440	.....	.....
Rewey.....	87,000	.....	.....
Shullsburg.....	.....	160,000	.....
Total.....	3,479,551	429,730	1,037,400
Year to date.....	30,989,426	2,250,169	6,115,490

In addition to the above there was shipped during last two weeks to the separating plants, 6,242,203 lb. zinc concentrates.

Joplin, Mo., May 14—The highest price paid for zinc sulphide ore was \$43, the base being \$38@41 per ton of 60 per cent. zinc. The high price for zinc silicate ore was \$28, the base being \$20@23 per ton of 40 per cent. zinc. The average price, all grades of zinc, was \$37.64 per ton. The highest offering for lead ore was \$48 for ores of 80 per cent. lead or better, with deductions on ore grading lower. Some lead was shipped this week on last week's price of \$49, and the average, all grades, was \$48 per ton.

SHIPMENTS, WEEK ENDED MAY 14.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	4,119,760	1,187,200	\$108,828
Joplin.....	1,530,460	185,450	35,825
Alba-Neck.....	914,330	4,280	19,297
Duenweg.....	383,770	77,310	8,852
Spurgeon.....	383,720	86,270	7,346
Auroa.....	274,150	52,310	6,600
Granby.....	409,200	22,680	6,215
Miami.....	435,370	66,000	5,937
Galena.....	246,390	64,580	5,772
Carthage.....	252,980	10,140	5,544
Carl Junction.....	193,830	.....	4,070
Oronogo.....	97,250	87,410	3,636
Sarcoile.....	163,230	.....	3,182
Badger.....	119,200	.....	2,438
Cave Springs.....	108,750	5,860	2,254
Quapaw.....	57,620	.....	1,037
Totals.....	9,690,010	1,849,490	\$226,833

20 weeks.....218,942,560 33,110,860 \$5,319,902
Zinc value, the week, \$182,399; 20 weeks, \$4,445,000
Lead value, the week, 44,434; 20 weeks, 874,902

MONTHLY AVERAGE PRICES

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January.....	\$41.25	\$47.31	\$38.46	\$45.16	\$52.17	\$56.99
February.....	36.94	40.69	34.37	39.47	50.50	53.64
March.....	37.40	43.60	34.71	39.71	50.82	51.26
April.....	38.63	41.00	37.01	39.33	55.63	49.72
May.....	40.06	.....	37.42	.....	56.59	.....
June.....	44.15	.....	40.35	.....	57.52	.....
July.....	43.06	.....	41.11	.....	53.74	.....
August.....	48.25	.....	44.54	.....	57.60	.....
September.....	47.70	.....	44.87	.....	56.11	.....
October.....	49.50	.....	45.75	.....	55.02	.....
November.....	51.31	.....	48.29	.....	53.94	.....
December.....	49.45	.....	47.57	.....	55.26	.....
Year.....	\$43.98	.....	\$41.20	.....	\$54.60	.....

NOTE.—Under zinc ore the first two columns give base prices for 60 per cent. zinc ore; the second two the average for all ores sold. Lead ore prices are the average for all ores sold.

The sharp advance in zinc-ore prices prevented a number of mining companies from joining the movement to close down their mills, inaugurated two weeks ago. None of the mills closed down, however, have been restarted.

CHEMICALS

New York, May 18—The general market remains quiet, with only a moderate business coming in.

Copper Sulphate—Business has been steady and prices are unchanged at \$4 per 100 lb. for carload lots and \$4.25 for smaller orders.

Arsenic—Prices are a shade off, at \$2.40@2.45 per 100 lb. for white arsenic. Sales continue to be light.

Nitrate of Soda—Sales are moderate, as usual at this season. This article is quoted at 2.15c. per lb. for spot lots, while 2.05c. per lb. is named for futures.

Potash Salts—The German Reichstag on May 11 passed a bill providing that all companies mining potash salts must limit their production to the allotments made to each mine by the official Kali-Syndikat. The penalty is a tax of 16 marks—\$3.81—per 100 kg. on all production in excess of the allotment. The bill was passed notwithstanding a protest from the mines controlled by American interests. The anticipation of some action of this kind was doubtless the cause of the extraordinary exports to the United States in the first quarter of the year, as shown in the statement published last week.

Petroleum

Production of petroleum from Midcontinent and Gulf Coast fields in April, reported by *Oil Investors' Journal*, in barrels of 42 gal. each:

	Production.	Shipments.
Oklahoma.....	4,576,164	4,002,165
Southeast Texas.....	597,606	1,111,619
Louisiana.....	319,313	287,366

Stocks of Oklahoma oil on May 1 were 55,766,422 bbl. Texas shipments again largely exceeded production for the month. New wells reported in Oklahoma in April, 348 oil and 14 gas; Southeast Texas, 79 oil and 3 gas; Louisiana, 13 oil wells.

MINING STOCKS

New York, May 18—The general stock market has been on the whole rather stronger than last week, but rather dull; the volume of business has been less, and there has been little interest shown in trading. The market may be characterized as dull, but not especially weak.

On the Curb trading in copper stocks was inclined to be slow. Prices were variable, some issues advancing and

others declining. The market, indeed, was without special interest. Cobalt issues were more active, and prices were pretty well held. Other mining issues were dull.

In the Ohio suits against Hocking Valley the court has appointed receivers for the company. This will prevent for the present the transfer of the road to the Chesapeake & Ohio control.

Boston, May 17—Copper shares generally have been inclined to dullness, but there have been no marked declines in price. The exception to the general

COPPER PRODUCTION REPORTS.

Copper contents of blister copper, in pounds.

Company.	February.	March.	April.
Arizona, Ltd.....	2,658,000	2,886,000	2,340,000
Balaklala.....	989,102	1,263,733	1,109,311
Boleo (Mexico).....	2,331,832	2,148,383	2,777,800
Copper Queen.....	8,927,203	10,809,488	9,920,000
Calumet & Ariz.....	2,024,000	2,820,000	.....
Cananea (Mexico).....	3,586,000	3,700,000	4,262,000
Detroit.....	1,486,400	1,698,975	1,980,000
Imperial.....	750,000	825,000	800,000
Nevada Con. (Est.).....	5,115,723	5,339,466	5,500,000
Old Dominion.....	2,035,000	2,674,000	2,325,000
Shannon.....	1,526,000	1,468,000	1,288,000
Superior & Pitts.....	1,864,000	2,370,000	.....
Utah Copper Co.....	5,913,465	7,853,288	.....
Butte District.....	13,758,620	24,000,000	25,000,000
Lake Superior.....	18,250,000	19,250,000	16,250,000
Total production.....	71,099,622	89,366,867	.....
Imports, bars, etc.....	14,093,381	20,178,202	.....
Imp. in ore & matte.....	6,063,764	6,181,476	.....
Total.....	91,256,767	115,726,545	.....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacoziari. Boleo copper does not come to American refiners. Utah Copper report from February includes the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product 'n.	Deliveries, Domestic.	Deliveries for Export.
V, 1909.....	118,356,146	61,163,325	70,542,753
VI.....	116,567,493	60,591,116	70,966,457
VII.....	118,277,603	75,520,083	75,018,974
VIII.....	120,597,234	59,614,207	48,382,704
IX.....	118,023,139	52,105,955	50,077,777
X.....	124,657,709	66,359,617	56,261,238
XI.....	121,618,369	66,857,873	55,266,595
XII.....	117,828,655	69,519,501	59,546,570
Year.....	1,405,403,056	705,051,591	680,942,620
I, 1910.....	116,547,287	78,158,387	81,691,672
II.....	112,712,493	66,618,322	37,369,518
III.....	120,067,467	62,844,818	40,585,767
IV.....	117,477,639	67,985,951	31,332,403

VISIBLE STOCKS.

	United States.	Europe.	Total.
V, 1909.....	183,198,073	114,050,320	297,248,393
VI.....	169,848,141	127,352,960	297,201,101
VII.....	154,858,061	150,928,960	305,787,021
VIII.....	122,596,607	171,492,160	294,088,767
IX.....	135,196,930	197,993,600	333,190,530
X.....	151,472,772	210,224,000	361,696,772
XI.....	153,509,626	222,566,400	376,076,026
XII.....	153,003,527	236,857,600	389,861,127
I, 1910.....	141,766,111	244,204,800	386,970,911
II.....	98,463,339	248,236,800	346,700,139
III.....	107,187,992	254,150,400	361,338,392
IV.....	123,824,874	249,625,600	373,450,474
V.....	141,984,159	246,870,400	388,854,559

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

rule was Isle Royale, which was strong and active on reports of an important strike on the 500-ft. level. A gain of \$2.25 was recorded today, with little disposition to sell. North Butte also had a small advance. Indiana was in some request. Calumet & Arizona was off again today, closing weak.

The Quincy dividend for the quarter is \$1.25, which is 25c. less than that declared three months ago, but 25c. more than a year ago.

Trading on the Curb was not very active. While there was no special pressure to sell, prices today were a little lower for most stocks. Chino was prominent, and there was fair trading in Davis-Daly, but both showed fractional losses. All of the declines were small, however, and a few stocks held their own.

Assessments

Company.	Delinq.	Sale.	Amt.
Andes, Nev.	May 31	June 21	\$0.10
Blue Bell, Idaho	Mar. 14	June 1	0.002
Brownstone, Utah	Apr. 15	June 10	0.001
Bullion, Nev.	May 8	June 6	0.05
Columbus Con., Utah		May 11	0.25
Con. Imperial, Nev.	Apr. 19	May 12	0.01
Con. Virginia, Nev.	May 9	June 3	0.20
Exchequer, Nev.	Apr. 27	May 18	0.05
First Nat. Copper, Cal.	May 10		1.25
Hector, Idaho	Mar. 28	May 26	0.001
Helvetia, Ariz.			0.50
Mangus Dev., Mich.	May 7		2.50
Mexican, Nev.	May 17	June 9	0.15
Mineral Farm, Idaho	Mar. 12	May 16	0.003
New Arcadian, Mich.	Mar. 10		1.00
Ophir, Nev.	Apr. 22	May 16	0.25
Overman, Nev.	Apr. 6	Apr. 27	0.10
Savage, Nev.	May 2	May 27	0.10
Sierra Nevada, Nev.	Apr. 7	Apr. 27	0.10
South Columbus, Utah	Mar. 30	Apr. 30	0.02
Ton. North Star	Apr. 21		0.03
Utah, Nev.	Apr. 22	May 3	0.05
Utah Con. of Tintic, Utah	May 15		0.01

Monthly Average Prices of Metals SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905		24.343	
June	52.538		24.166	
July	51.043		23.519	
August	51.125		23.588	
September	51.440		23.743	
October	50.923		23.502	
November	50.703		23.351	
December	52.226		24.030	
Total	51.502		23.706	

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	NEW YORK.				London.	
	Electrolytic		Lake.		1909.	1910.
	1909.	1910.	1909.	1910.		
January	13.893	13.620	14.280	13.870	61.198	60.923
February	12.949	13.392	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.561	12.733	12.931	13.091	57.363	57.238
May	12.893		13.238		59.338	
June	13.214		13.548		59.627	
July	12.880		13.363		58.556	
August	13.007		13.296		59.393	
September	12.870		13.210		59.021	
October	12.700		13.030		57.551	
November	13.125		13.354		58.917	
December	13.298		13.647		59.906	
Year	12.982		13.335		58.732	

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	
February	28.290	32.920	August	29.966	
March	28.727	32.463	September	30.293	
April	29.445	32.976	October	30.475	
May	29.225		November	30.859	
June	29.322		December	32.913	
			Av. Year	29.725	

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287		4.214		13.225	
June	4.350		4.291		13.031	
July	4.321		4.188		12.563	
August	4.363		4.227		12.475	
September	4.342		4.215		12.781	
October	4.341		4.215		13.175	
November	4.370		4.252		13.047	
December	4.560		4.459		13.125	
Year	4.273		4.153		13.049	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124		4.974		21.975	
June	5.402		5.252		22.000	
July	5.402		5.252		21.969	
August	5.729		5.579		22.125	
September	5.796		5.646		22.906	
October	6.199		6.043		23.200	
November	6.381		6.231		23.188	
December	6.249		6.099		23.094	
Year	5.503		5.352		22.201	

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	\$17.18	\$19.90	\$16.40	\$17.98	\$16.26	\$17.94
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.53	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77		15.02		15.08	
June	16.13		15.84		15.63	
July	16.40		15.90		15.96	
August	17.16		16.17		16.20	
September	18.44		16.80		17.03	
October	19.75		17.84		18.02	
November	19.90		18.37		18.09	
December	19.90		18.15		17.90	
Year	\$17.46		\$16.46		\$16.40	

STOCK QUOTATIONS

COLO. SPRINGS May 17			SALT LAKE May 17		
Name of Comp.	Bid.		Name of Comp.	Cig.	
Listed:			Carisa		.47
Acacia	.05		Colorado Mining		.65
Cripple Cr'k Con.	.02		Columbus Con.		1.47
C. K. & N.	.14		Daly Judge		3.95
Doctor Jack Pot.	.08		Grand Central		1.30
Elkton Con.	.70		Iron Blossom		.99
El Paso	.79		Little Bell		1.25
Fannie Rawlins	.04		Little Chief		1.45
Findlay	.07		Lower Mammoth		.47
Gold Dollar	.12		Mason Valley		7.00
Gold Sovereign	.03		Maj. Mines		22.32
Isabella	.16		May Day		.05
Mary McKinney	.48		Nevada Hills		.66
Pharmacist	.02		New York		.13
Portland	1.05		Princes Con		.71
Vindicator	.78		Red Warrior		16.00
Work	.03		Silver King Coal'n		2.30
Unlisted:			Sioux Con.		.30
Golden Cycle	1.50		Uncle Sam		.33
United Gold Mines	.07		Victoria		11.07

SAN FRANCISCO.

May 17.

Name of Comp.	Cig.	Name of Comp.	Cig.
COMSTOCK STOCKS			
Atlanta	.12	MISC. NEVADA	
Belcher	.56	Belmont	3.82
Best & Belcher	.25	Daisy	.06
Caledonia	.48	Jim Butler	.27
Challenge Con.	.26	MacNamara	.31
Chollar	.12	Midway	.29
Confidence	.90	North Star	.11
Con. Cal. & Va.	1.20	West End Con.	.52
Crown Point	.89	Atlanta	.12
Exchequer	.22	Booth	.13
Gould & Curry	.26	C.O.D. Con.	.06
Hale & Norcross	.36	Columbia Mt.	.04
Mexican	1.12	Comb. Frac.	.51
Ophir	1.30	Great Bend	.03
Overman	.96	Jumbo Extension	.23
Potosi	.30	Oro	.06
Savage	.35	Red Hill	.04
Sierra Nevada	.26	Sandstorm	.03
Union	.24	Silver Pick	.08
Yellow Jacket	.82	St. Ives	.10
		Tramps Con.	.05

N. Y. EXCH. May 17

Name of Comp.	Cig.	Name of Comp.	Cig.
Amalgamated	70%	Adventure	6%
Am. Agri. Chem.	146	Allouez	43%
Am. Sm. & Ref. com	79 1/2	Am. Zinc	125 1/2
Am. Sm. & Ref., pf.	87 1/2	Arcadian	6
Anaconda	43%	Arizona Com.	15 1/2
Bethlehem Steel	130	Atlantic	7
Col. & Hock C. & I.	7%	Boston Con.	15
Colo. Fuel & Iron	38	Butte & Balak	12 1/2
Du Pont P'd'r, pf.	87 1/2	Calumet & Ariz.	63
Federal M. & S.	141	Calumet & Hecla	580
Great Nor., ore ctf.	63	Centennial	17 1/2
Nat'l Lead, com.	77%	Con. Mercur.	10
National Lead, pf.	109	Copper Range	67
Nev. Consol.	20%	Daly-West	8 1/2
Pittsburg Coal.	119 1/2	East Butte	8 1/2
Republic I & S, com.	33%	Franklin	13 1/2
Republic I & S, pf.	97 1/2	Granby	42
Sloss Sheff. d, com.	173 1/2	Hancock	20 1/2
Sloss Sheff. pf.	117 1/2	Helvetia	21 1/2
Tennessee Copper	27 1/2	Indiana	21 1/2
Utah Copper	40 1/2	Isle Royale	22
U. S. Steel, com.	82 1/2	Keweenaw	3 1/2
U. S. Steel, pf.	118	Lake	55
Va. Car. Chem.	59 1/2	La Salle	13 1/2
		Mass	6 1/2
		Michigan	5
		Mohawk	51
		Nevada	20 1/2
		North Butte	33 1/2
		North Lake	12 1/2
		Ojibway	7 1/2
		Old Dominion	37 1/2
		Osceola	136
		Parrot	15
		Quincy	77 1/2
		Shannon	11 1/2
		Superior	41 1/2
		Superior & Bost.	11 1/2
		Superior & Pitts.	12 1/2
		Tamarack	52
		Trinity	6
		U. S. Smg. & Ref.	43
		U. S. Sm. & Re., pf.	49 1/2
		Utah Apex	3 1/2
		Utah Con.	24
		Victoria	3
		Winona	8 1/2
		Wolverine	120
		Wyandotte	17 1/2

N. Y. CURB May 17

Name of Comp.	Cig.	Name of Comp.	Cig.
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