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The Spelter Market

The price for spelter after rising to 6.25c., St. Louis, has crumbled away since the first of the year and now is a little less than 5.50c. There is no mystery about the cause for this rapid decline.

The revival of business soon after the middle of 1909, together with the scare, excited by the imposition of the tariff on zinc ore, and evidently some misconception on the part of the principal purchasers led to a rise in the price for this metal that was inordinate. The natural effect was a stimulation of production.

However, the situation was miscalculated by everybody—by the producers of ore as to the supply of their product; by the smelters as to the quantity of metal they were producing; and by the manufacturers as to the demand for consumption. Ore supply turned out to be bountiful. The smelters reckoned the production of spelter at about 230,000 to 240,000 tons for the year. The statistics that became available immediately after the close of the year showed 267,069 tons, compared to 210,511 in 1908. Worse than this, the deliveries for consumption appeared to be 288,629 tons in 1909, compared to 216,635 in 1908.

These figures, which exceeded the highest previously on record, were a complete surprise to the producers. It was impossible to believe that consumption had actually increased to any such extent as indicated by the deliveries, and the explanation that manufacturers had overbought could not be escaped. It accounted, moreover, for the absence of

buying in December, when the smelters began to find stocks accumulating once more on their hands.

When the smelters awoke to this situation they began to press spelter on the market, with the result that is now known. In spite of this, there has lately been a further accumulation of unsold stock and the price is likely to go somewhat lower although it is now close to what may be considered the normal and is once more in tune with copper and lead.

The recent experience in this metal illustrates the folly of tampering with natural conditions by a tariff for plunder, and the danger that may arise in the absence of frequent, prompt and accurate statistics. We believe that the actual consumption of spelter is going on at a satisfactory and increasing rate, but the market for the metal must continue weak and halting until the excess of production has been absorbed.

The Prospects for Copper

The slight decline in the price for copper this week is no cause for alarm. The liquidation of speculative accounts in London has for several weeks depressed the price in that market below our parity and cut off sales for export except at concessions in price. What this means will quickly appear upon reflection that nearly one-half of the North American production must be exported in the long run. At the same time the long drawn-out catastrophe in Wall Street has caused American manufacturers to become more timid and they have naturally ceased contracting for supplies until the

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*Illustrated.

meaning of it all develops more clearly. With both outlets thus cut off the producers of copper stood steadily to their position for several weeks, and in general are still doing so, but it is only natural that some have finally been inspired to make metal move by offering it at concessions. This step will probably be followed by others and we may consequently see a further decline in price in spite of the favorable statistics that are anticipated tomorrow, but we are inclined to think that a rally will soon ensue and that a general improvement will develop during the next three months, by which time it is hoped that the increase in consumption will take care of a resumption of production at the maximum rate of record.

The Situation in the Iron Industry

Judging from the statistics of pig-iron production that we reported last week, the situation in this industry at the end of 1909 must have been similar to that existing in spelter and copper, although in the cases of both pig iron and copper the misconception was less, owing to the possession of monthly statistics of production. The production of pig iron in 1909 was 25,795,471 long tons, which was a trifle more than the highest previously on record. Looking at the statistics by semesters, however, it appears that the output in the second half of 1909 was 1,500,000 tons greater than in the first half of 1907 and more than twice as much as in the first half of 1908.

We do not think that anyone dreams that all of the great production in the second half of 1909 was going immediately into consumption. Like everyone else, the producers were anticipating the good times to come, and they, together with speculators, were piling up stocks. This was evidently overdone, with the natural result of a lull in contracts followed by some pressure to sell, but it does not follow from this that actual consumption has been checked.

In pig iron, copper and spelter we experienced too rapid production in the second half of 1909 and the producers have been obliged to wait for the excess to be absorbed. Many persons besides the speculators in Wall Street were under the illusion that the industrial revival was going faster in 1909 than was really the case. The recent upset has

been rather of ideas than of actual conditions.

The Coal Wage Conference

The failure of the conference over the coal-mining scale at its first meeting does not necessarily mean that no scale will be adopted; nor does it mean that there must be a stoppage of mining in April. The present situation is due to the refusal of the Illinois operators to enter the conference. They decided to make their own separate agreement, but the miners refuse, claiming that Illinois is one of the so-called competitive States and must therefore be included in the general agreement. As Illinois was not represented, the operators from the other States would not consent to the admission of the Illinois miners. The miners' representatives insisted on their presence, and the result was a deadlock and summary adjournment.

No provision was made for a renewal of negotiations, but there is little doubt that they will be resumed before long. Operators generally are anxious for a settlement, and the leaders of the miners seem to be in a conciliatory mood. The first meeting of the wage conference is seldom a successful one, and an agreement is rarely reached until two or more meetings have been held. There is a strong probability that some compromise will be reached before April.

"Prospects"

The term "prospect" applied to a mining venture is sometimes used depreciatingly and contemptuously. This is all wrong, as was pointed out in the very excellent address of Mr. Hammond, published in a recent issue of the JOURNAL. All mines at some stage or other have been "prospects." As well speak disparagingly of boys, since all men, no matter what their present degree of greatness may be, were at one time only boys. It is true that there is apt to be much misconception and also misrepresentation in placing valuations upon prospects. Prospects have a certain value, but it is not of the definite character that a mine has. Mine value is based on measured ore and on probable ore deduced according to accepted and established rules. The tendency of conservative mining operators is to pur-

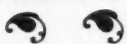
chase or secure control of all prospects on a development basis, making the payments contingent upon the development that may be shown after a certain amount of exploration has been done. This is fair to the owner of the prospect and is safe to the operating company, and is one of the tendencies in mining negotiations that is to be commended.

A Canadian Steel Trust

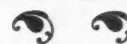
Reports come from Montreal and Toronto that negotiations are in progress for a consolidation of Canadian iron and steel interests, somewhat on the lines of the United States Steel Corporation. The leaders in this proposed merger are the Dominion Steel Company—represented by J. H. Plummer, its president—and Robert Fleming, the representative of London interests which recently took a controlling interest in the Lake Superior Corporation. The merger, it is reported, will include the Dominion Iron and Steel Company, the Dominion Coal Company, the Lake Superior Consolidated Company, the Atikokan Iron Company, of Port Arthur, the Montreal Rolling Mills, the Hamilton Steel and Iron Company, and the National Iron Works Company, which is arranging to build blast furnaces and rolling mills at Toronto. Such a consolidation would include practically all the iron and steel makers in Canada except the Canadian Iron and Foundry Company, the consolidation of the Drummond interests in Nova Scotia, Quebec and Ontario, which was formed last year; and the Nova Scotia Steel Company.

While positive confirmation of these reports is not yet obtainable, they appear to have some basis, and an important merger of the kind indicated is altogether possible. Our Canadian neighbors have lately shown an inclination to form large industrial combinations, as in the asbestos and cement industries. The union of the Dominion Steel and Dominion Coal companies seems to afford a basis for further extension, which is aided by the recent changes in the Lake Superior Corporation and the transfer of its control from the United States to Canadian and English hands. That the Mackenzie-Mann interests should come into such a combination is also probable, as they are capable of large expansion, and the needed capital could be best supplied by a large combination.

CORRESPONDENCE AND DISCUSSION



VIEWS, SUGGESTIONS



AND THE EXPERIENCES OF READERS

Ely Central Copper Company

Since B. H. Scheftels & Co., have seen fit to give me, gratis, a certain amount of objectionable free advertising in their market letters and telegrams sent out in connection with boosting Ely Central stock, I ask that the JOURNAL kindly publish this letter, explaining my connection with that company.

Mr. Herzig, consulting engineer for Ely Central, offered me the managership, which I accepted. At the time arrangements were made, I specifically stated that I did not wish any publicity in "dope sheets" and would only take charge of legitimate mine development. I was assured that this would be the case and that only facts were desired by the stockholders. After five days of active management, I became convinced that daily "dope" was required by certain stockholders for publication purposes and that daily favorable development facts were necessary to their stock manipulation. As I did not wish to be connected with this sort of thing, I have resigned and shall have nothing further to do with the company.

Scheftels & Co.'s market letter dated Jan. 29 stated: "On the morning of his first visit, therefore, Mr. Wilmot had a mine turned over to him." I wish to state that it was not a mine but a prospect, and furthermore that the above statement is absolutely unwarranted and misleading.

In a telegram, signed by me, to the New York office, for their sole information, I stated that the last 20 ft. of drill hole was in porphyry similar to that found in Nevada Consolidated's pit. Contrary to my understanding, this statement was sent out and a layman would naturally interpret it as meaning porphyry ore of commercial value, whereas such is not the case, the porphyry being very silicious and low in copper contents.

In closing I would add that the property is yet a prospect and the stock a gamble and not an investment as some people undoubtedly have been led to believe.

H. C. WILMOT.

Salt Lake City, Utah, Feb. 3, 1910.

The index to Vol. LXXXVIII of the JOURNAL is mailed with this issue. Any subscriber who fails to receive it is requested to notify us promptly.

Spurious Potassium Cyanide

The communication entitled "Spurious Potassium Cyanide" in the JOURNAL of Oct. 23, 1909, touches on a number of points which are of practical importance to cyanide men, and I may, perhaps, in spite of the time elapsed, suggest answers to some of the questions propounded by the writer.

The difficulties underlying most of these queries seem to me to rest in the analyses of the two samples of "potassium cyanide." The figure given for NaCN, 82.24 per cent., is apparently stated in terms of KCN, because if 82 per cent. by weight of true NaCN had been present, a weighed portion of the mixed salt titrated to the standard for KCN should have shown a value of about 125 per cent. in terms of KCN. It would seem that, in making the analysis, the cyanogen contents were first ascertained in terms of KCN, and then, the sodium and potassium being relatively determined, the cyanogen was apportioned between them, giving a total result in terms of KCN.

If this supposition be correct and if the mixture when titrated to the KCN standard showed only 100 per cent. or a little less, then there would be left a considerable margin in a given weight of the substance for impurities which do not appear in the analysis at all, probably chiefly sodium salts other than NaCN, since the total sodium was apparently determined. On this hypothesis such a sample of the double salt as that mentioned, if on titration it gave a value of about 100 per cent. in terms of KCN, ought to have something like the following composition: KCN, 15.83 per cent.; NaCN, (equivalent to 82.24 per cent. KCN), 61.83; impurities, 22.34; total, 100 per cent. It is possible that the difference in behavior between the old and the new lots, marked 1 and 2 respectively, lies in these impurities not shown by the analysis. Now to take the questions *seriatim* as propounded in the article:

(1) In reply to this I might say that I have long understood that "potassium cyanide" in recent years has become merely a trade name for the double salt containing a varying proportion of sodium cyanide: in fact in many advertisements of "potassium cyanide" the words "double salt" are inserted in brackets.¹

(2) If my previous explanation be cor-

rect, then when a weighed portion of a mixed salt such as that analyzed shows a value of only 100 per cent. on being titrated to the KCN standard, there must be impurities present which are not shown in the analysis.

(3) The answer to this would lie in the fact that the 82 per cent. of NaCN in the mixture which Mr. Ross is comparing with 100 per cent. NaCN, is really not 82 per cent. true NaCN, but only 82 per cent. cyanogen value in terms of KCN. Questions 4 and 5 would turn on the same point.

These things being so, the important matter really is, how are we to get the material we wish for, whether it be NaCN, KCN or the "double salt"? I will not discuss the question here as to the relative merits of these cyanides: I have usually found that, per unit of cyanogen in the stock solutions, there is little to choose between them in regard to extraction, but that on some ores the decomposition of NaCN is greater than when using "potassium cyanide," so that pound for pound the same work is accomplished in spite of the higher content of cyanogen in the NaCN. Also I have found that some brands of NaCN contain a considerable quantity of caustic soda which accumulates in the solution and demoralizes the work of the zinc precipitation boxes.

These are matters, however, for the individual operator to work out in connection with the particular kind of ore he has to treat and the conditions under which he is working. When the brand that gives the best results has been ascertained, then the only recourse seems to be to take careful samples of that lot and preserve them in hermetically sealed tubes, to be used as checks against the analyses of future shipments: each shipment would then be required to conform to a certain specification.

Owing to the fact that many workers are discarding the NaCN in favor of "potassium cyanide," there is likely to be a growing tendency on the part of manufacturers to increase the proportion of NaCN in the "double salt" while keeping the cyanogen contents down to the specified 98-99 per cent., the difference in weight being made up by impurities; and unless detailed analyses are regularly made the average cyanide man will be none the wiser except insofar as he may find a difference in his extraction and precipitation.

The custom has been adopted in South

¹Julian and Smart, second edition, p. 107.

Africa of maintaining a special analytical laboratory for a group of companies, which shall test and analyze every material used at the mines. The companies can thus insist on manufacturers maintaining a certain specified grade of goods. Of course, in the case of the Rand, the mines are so closely grouped that such an arrangement is much easier than in this country where the companies are scattered over a wide area, but there must be many instances where some combination for the purpose would be feasible.

I came across an instance not long ago showing the need for something of the kind. The assay office ran out of litharge, and, the mine being situated 7 or 8 days from a railway, a requisition was made on the store for some red lead to tide over the difficulty. This red lead seemed to the assayer suspiciously light when weighing up, and the resulting assays turned out worthless. There were no appliances available for an analysis, but on making a fusion assay of the red lead with excess of reducer it was found to contain only 5 per cent. lead; what the remainder was, of course, was not determined. It is beside the point whether this material answered its purpose in the shops or not; the fact remains that red lead was ordered and this was shipped as red lead and paid for as such. The only protection consumers would appear to have in such cases lies in some scheme like that lately inaugurated in South Africa.

E. M. HAMILTON.

Ventanas, Durango, Mex., Jan. 15, 1910.

Stamp Drop Sequence

The communication from Ralston Bell in the JOURNAL of Jan. 22 on stamp sequence is interesting. Nearly all mill men will agree with him so far as concerns the advantage of 1, 4, 2, 3, 5 over 1, 3, 5, 2, 4, and I personally maintain that there are no circumstances where the former is not the better. It appears to me, however, that Mr. Bell's explanation of the cause of the differences and his deductions from what he calls a secondary drop are at least open to criticism if not to gentle ridicule. For example, after evolving this secondary drop from the Homestake sequence, 1, 3, 5, 2, 4, would it not have been equally logical to discover a "tertiary" drop, omitting two stamps, thus getting the series 1, 2, 3, 4, 5, which is the reverse of his secondary? This would seem to upset his theory—or at least 66 per cent. of it. Similarly a quaternary drop is obtained by omitting three stamps (1, 4, 2, 5, 3) which in turn is nothing but 1, 3, 5, 2, 4, read backward, which lands us where we began. This resembles finding a Bacon cipher in Shakespeare to prove authorship.

It is in place here to call attention to the fact that in large mills no two batteries will operate the same, each seem-

ing to have a separate individuality of its own. Take for example a time when new shoes and dies are put on several batteries on the same day. The drop of each battery will be adjusted to the same weight by means of a set of blocks, but within half an hour after starting the batteryman will be raising or lowering tappets on stems to correct the "feel" of the dropping stamp. Slight variations in lengths of cams and of fingers will account for part of this erratic action, while part is also chargeable to differences in conditions of mortar liners, foundations and screens.

MARK R. LAMB.

Milwaukee, Wis., Jan. 25, 1910.

A Bureau of Mines?

Much can be said for R. P. Jarvis' opposition, in the JOURNAL of Jan. 22, to the proposed mining bureau, if it means simply a device for extending the present reckless waste of public funds gathered from the people through indirect taxation; but is there not much legitimate service which such a bureau can perform for the nation? That a Government bureau can be administered as efficiently as a private enterprise, provided it is in charge of a trained man unhampered by politicians, is being demonstrated daily by such examples as the Geological Survey or the Panama canal.

It appears to me that the mining bureau can properly confine itself to two lines of work. (1) The administration of the remaining public mineral lands; (2) the regulation of the working of mineral lands already in private hands.

President Taft's excellent plan of leasing the remaining public coal, oil and phosphate lands direct to the operators, will itself require a large force to administer it practically. The inspection of assessment work annually required from the holders of all United States metallic-mineral claims, is at present so imperfect as to permit of extensive fraud, and for this work the mining bureau would also be especially fitted.

The regulation of privately owned mines should be pursued with two objects: (1) The preservation of human life; (2) the conservation of mineral resources. A comparison of the vital statistics of our coal mines with those of the deeper and more dangerous mines of western Europe convinces me that what we need more urgently than any fresh knowledge is the proper enforcement of safety regulations already known to be necessary. Disobedience to safety regulations by unscrupulous operators is made possible by complaisant mine inspectors who are aware of the danger in offending liberal campaign contributors to the party in power. A national bureau could have no direct veto for such State abuses and its only remedy at present would be the force of example. However, the with-

holding of national grants for education, etc., from such States as refuse to conform to the regulation system of the mining bureau might be made a powerful lever for improving mine inspection.

The regulation of exploitation with a view of preventing waste of mineral will be simple in those mines leased by the mining bureau direct to the operator. Waste prevention in privately owned mines is an innovation in this country, but public sentiment is soon going to demand it, and such prevention would be no more an invasion of individual rights than are other extensions of the police power. Robinson Crusoe on his island or a miner on the frontier can be a law unto himself, but there comes a time in the growth of population when a miner's individual exploitation of the mineral wealth of society must be as firmly restricted as is individual conduct in other directions.

There is a broad field for the investigating department of the mining bureau without any encroachment on the proper field for private enterprise. Research work on problems affecting the preservation of life and of mineral resources would demand the highest class of talent from the bureau's scientists.

ROBERT B. BRINSMADE.

Morgantown, W. Va., Jan. 29, 1910.

[Professor Brinsmade seems to have a misconception of what a Federal bureau may do constitutionally and may not do.—EDITOR.]

Wanted—A Method of Mining Red Slate

I wish to invite the attention of mining men, through the JOURNAL, to the necessity for improved methods in quarrying red slate. At present a large amount of this valuable material is destroyed or injured by blasting. Owing to the sharp incline of the rock, it is difficult to operate a channeler, and then too the heavy stroke of that machine shatters the slate for a considerable distance on each side of the cut. We have tried patent blasting schemes and a variety of appliances, including plug and feathers, but all have proved either ineffective or too expensive.

A description of conditions is given in the hope that some reader may win fame for himself and an additional profit to the manufacturers by describing a better method for removing red-slate blocks. Red slate lies in beds which are 18 in., 2 ft., 6 in. and 4 ft. respectively in thickness, and tilted at an angle of 45 deg. Between these layers is a serpentine rock, ½ in. thick and about as strong as a hard-finish wall plaster. When the ends and one side of a bed have been freed, the slate can be pried off and removed.

CHARLES I. BAKER.

Middle Granville, N. Y., Feb. 4, 1910.

Coal Mine Explosion in Mexico

It is reported that about 80 lives were lost in an explosion of gas at one of the mines of the Esperanza Mining Company, Las Esperanza, Coah., Mexico. The dead miners are equally divided between Japanese and Mexicans. Very few Americans were caught in the disaster; however, it is stated that at least five foremen were Americans and that they must have met death.

The explosion is thought to have been caused by the ignition of gas from a cigarette smoked by a miner in violation of the company's rules. The accident occurred after the day shift had gone to work. The explosion shook the entire mine, and buildings on the surface were rattled as if an earthquake had occurred.

When the first cageful of searchers descended, they found that the men on the first and second levels of the mine were unhurt beyond being badly frightened. On the third level the bodies were scattered all through the workings; some were crushed by debris and others had been suffocated while trying to escape to the shaft. There being no rescue apparatus available, it was impossible for rescuers to work long in the poisonous atmosphere, and relays were sent on quick dashes into the galleries to bring up as many bodies as possible.

The mine was believed to be one of the best equipped in the country, in regard to its ventilating apparatus, and there will doubtless be an investigation of the cause of the presence of firedamp which is said to have started the explosion.

Mine Explosion in Pennsylvania

Following close upon the recent explosions in various parts of the United States, an explosion of gas occurred in one of the mines of the Jefferson & Clearfield Coal Company, at Ernest, six miles north of Indiana, Penn. The accident happened at 9 o'clock on the morning of Feb. 5; 11 miners were killed and four injured.

Early reports seemed to indicate that the disaster would claim at least 100 lives, but the fact that only a small pocket of gas was ignited, prevented the death roll assuming such large proportions. The men were working in a new heading. Whether or not safety lamps were used has not been determined.

Immediately after the explosion, a rescue party headed by Superintendent William Reed and Foreman John Harrington entered the mine. Several members of this first party were overcome, but were brought to the surface without any resultant fatalities. At a later hour, on the day of the explosion, Clarence Hall and other members of the staff

of the Technological Branch of the United States Geological Survey, Pittsburg, arrived at the mine, and have since then worked in conjunction with the State mine inspectors. The Government experts were provided with all necessary equipment for rescue work.

The Precious Metal Production of Mexico

Concerning the precious metal production of Mexico for the fiscal year 1908-1909, the Minister of Finance in his documents accompanying the budget for 1910-11 gives the gold production for the fiscal year 1908-09 at 33,761 kg., valued at 45,014,954 pesos; the silver production is stated to have been 2,292,260 kg., valued at 77,109,742 pesos. Minister Limantour in reviewing these statistics says:

"In calculating the production of gold, the Department of Finance is in the habit of taking the export of gold as bullion, in ore or in other forms, except Mexican and foreign gold coins, and then adding the domestic gold bullion, bought by the Exchange and Currency Commission and not sent abroad by that commission, as well as a small amount of gold used for the arts in the Republic. So that if there is eliminated from the figures in question, the gold that may accidentally come to the country from abroad, and which might be mistaken for domestic gold, it will be easy to arrive at the quantity of gold produced in the Republic.

MEXICAN GOLD PRODUCTION IN 1908-09.

	Kilograms.	Value. In Pesos.
Exportation of Mexican gold bullion.....	36,544,546	
Exportation of gold in ore and other forms.....	2,633,145	
Total.....	29,383,306	39,177,691
Difference between the gold acquired and exported by the Currency Commission..	4,277,958	5,703,930
Consumed in the arts in Mexico (estimated).....	100,000	133,333
Total production in 1908-09..	33,761,264	45,014,954

"The accompanying table shows a considerable increase over the production of the preceding year, and a still larger increase over that of earlier years. Up to 1891 the annual production of gold never exceeded 2,000,000 pesos, and not until the year 1895-96 did it exceed 10,000,000 pesos

MEXICAN SILVER PRODUCTION.

	Kilograms.	Value.
Silver exports in the form of ore, cyanide products, etc. and in the form of bars.....	2,191,200	\$73,741,313
Silver bought for coinage.....	100,060	3,334,784
Consumed in the arts in Mexico (estimated).....	1,000	33,645
Total production in 1908-09..	2,292,260	\$77,109,742

"The quantity of silver produced in 1908-09 was the largest annual production in the history of the Republic. Only since 1902 has the annual production of

silver exceeded 2,000,000 kg. The production in 1907-08 reached 2,151,014 kg., but the production for 1908-09 showed a further growth of nearly 140,000 kg. The value of the silver produced in 1909-09 was 77,100,000 pesos, as against 85,400,000 pesos in 1907-08, being a decrease of 8,300,000 pesos, notwithstanding the fact that there was a gain in the quantity produced. This result is due to the low price of the metal of late.

"Low as may have been the total value of the silver produced during the fiscal year 1908-09, it was nevertheless larger than the value of the production in any of the years prior to 1902-03, and also larger than the value of the production in 1905-06, proving that the momentary reform in 1904 has not stopped the operation of the silver mines and has not impaired the country's power to purchase foreign goods, or meet foreign liabilities with its output of the white metal.

"Silver mining does not pay so well now as when free coinage prevailed, but the operation of silver mining is carried on as actively, or more actively than ever. During the two years in which the price of silver rose above the new legal parity, the owners of silver mines realized profits far in excess of what they obtained before the reform of the currency."

In the JOURNAL of Jan. 8, 1909, owing to a clerical error, the production of gold by weight for the fiscal year 1907-08 was given as the silver output of the country. The silver output for 1907-08 was officially placed at 2,153,014 kg., and for 31 years, including that date, at 40,255,278 kilograms.

January Oil Dividends

The accompanying table gives the amount of dividends paid by a number of California oil companies during January,

Name of Company.	January, 1910, Dividend.	Total Paid to Date.
Alma.....	\$ 11,400	\$ 159,600
Amalgamated Oil.....	50,000	1,400,000
American Petroleum..	122,785	803,225
Brookshire.....	5,000	442,500
Caribou.....	20,175	660,180
Claremont.....	10,000	305,000
Columbia.....	4,996	254,811
Euclid.....	3,500	117,000
Globe.....	6,000	81,000
Home.....	2,000	470,000
Illinois Crude.....	2,000	84,000
Imperial.....	60,000	1,940,000
Mexican Petroleum....	85,616	3,306,010
Palmer.....	18,020	214,320
Paraffine.....	3,000	9,000
Pinal.....	14,992	857,117
Record.....	7,500	40,000
Rice Ranch.....	3,000	93,000
Royalty.....	400	8,000
S. F. & McKittrick....	15,000	310,000
Sauer Dough.....	4,987	507,328
Sesnon.....	15,000	90,000
Sovereign.....	5,000	90,000
Traders.....	14,000	157,186
Union.....	124,813	6,118,629
United Petroleum....	40,375	2,098,208
Vabash.....	3,000	114,000
Total for January....	\$652,559	.....

1910, together with their total dividends to date, as reported by the California Stock and Oil Exchange, San Francisco.

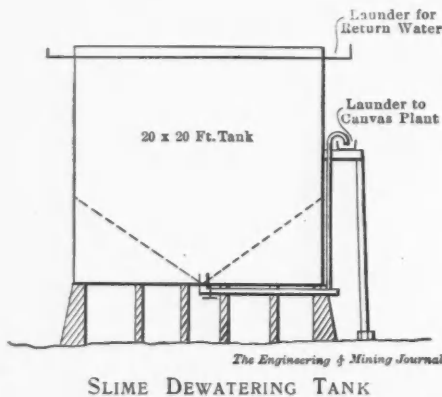
DETAILS OF PRACTICAL MINING

NOTES OF INTEREST TO OPERATORS OF SMALL AS WELL AS LARGE MINES
 THINGS THAT HAVE TO BE DONE IN EVERY DAY MINING

Readers of the JOURNAL are invited to contribute to this department. Articles should be brief, thoroughly practical, and preferably illustrated by drawings or sketches. Our draftsmen will prepare properly any kind of a pencil sketch that is intelligible. Something that is an old story in one district may be quite unknown in another. Articles accepted and published are suitably paid for.

Saving Lead Slimes

In the milling of lead ores a certain amount is always lost as slime. The fine particles of galena will remain suspended in the moving current of water and finally reach the tailings pile. The following scheme for collecting the lead from the slimes has been adopted by the



Federal Lead Company at Flat River, Missouri.

The slimes from the concentrating plant are conveyed to 18 wooden settling and dewatering tanks, 20 ft. in diameter and 20 ft. deep, with a conical bottom. In the bottom of each tank is a 3-in. pipe, shown in Fig. 1, and which passes out beneath the tank and then up about 2/3 the height of the tank. The pipe terminates in a goose neck and in the end of the pipe is a wooden plug, in which is a hole one inch in diameter to reduce the flow of water. The total flow from all the spigots is 720 gal. per minute. Through this pipe the heavy particles pass under a 5- to 10-ft. head and are carried by a launder to the canvas plant. The overflow of 250 gal. per minute from each of these tanks is taken to a concrete tank from which it is pumped back to the mill for re-use.

THE CANVAS PLANT

The canvas plant has eight sets of canvas-covered tables, four on each floor of the building. The tables are 12x14 ft. and there are six in each group. Two rows of tables are placed back to back and slope about 19/16 in. per foot, as shown in the accompanying drawing, Fig. 2. The tables are covered with 18-oz. canvas and it is upon this that the fine lead is collected.

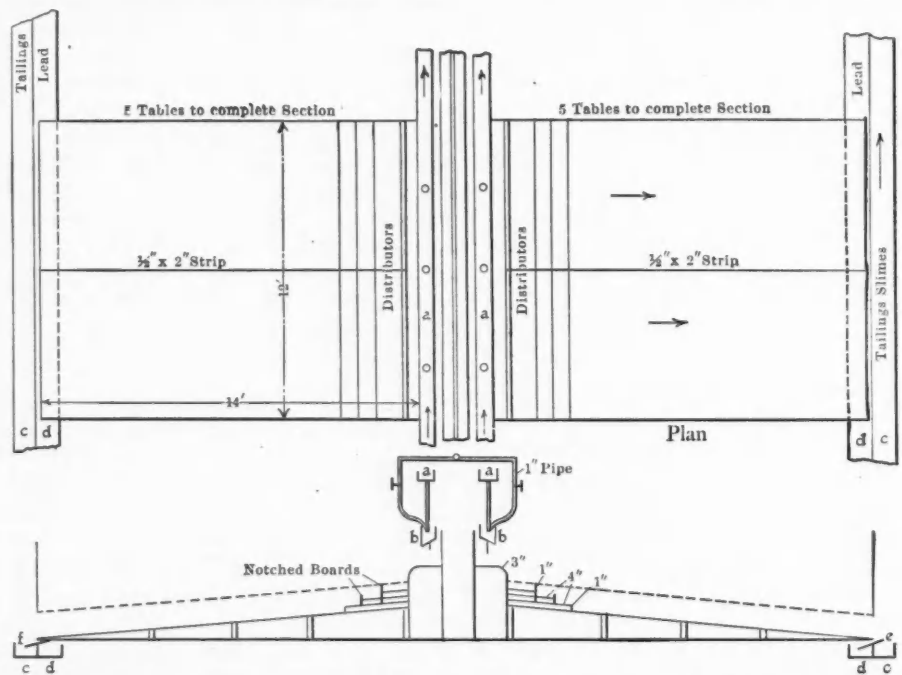
The slimes are run to the tables from a launder and distributed by means of a distributing trough *b*, in the bottom of which are 1/2-in. holes, 3 in. apart. The pulp is further distributed by passing

The galena is then washed off by water from a nozzle and carried into a collecting tank, by the launder *d*, where it is pumped to a settling tank by a sand pump. All the work is done by boys, one boy caring for 6 to 10 tables. A screen test of the feed to the canvas plant shows:

	Wt. per cent.
On 80 mesh.....	1.0
On 150 mesh.....	25.0
On 200 mesh.....	8.0
Through 200 mesh.....	66.0

SETTLING TANKS

The receiving tanks for the concentrates are four in number, 10x16 ft., and



over notched boards. The notches in each board are about one inch deep, 1 1/2 in. apart, and the boards are so placed that the notches alternate. The slimes are allowed to flow over the tables for 30 or 40 minutes. Then clear water is turned on through the distributing trough for a few minutes until the barren sand is washed off, leaving the canvas covered with lead concentrate. While the clear water is flowing over the tables it has a tendency to cut channels in fine sand on the canvas. This is prevented by a boy who works barefooted, and with his foot turns the course of the water, thus preventing the lead concentrates from being washed off.

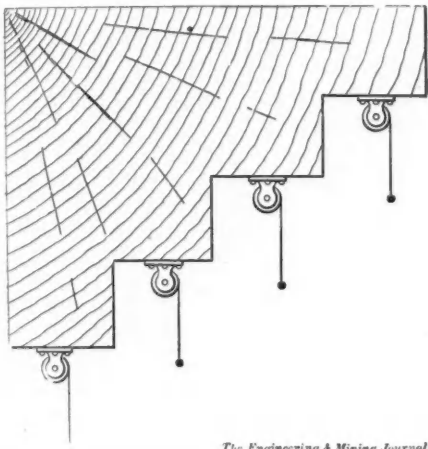
3 ft. deep. The lead slimes are pumped into one of these tanks and allowed to settle until the tank is full of concentrates, when the flow is diverted to a second tank. The water from each of the four tanks flows over the edge and passes by a launder to a second settling tank, 16 ft. square, where the last of the lead is collected, and the water allowed to run off. The plant has been in operation a number of months and the management is well pleased with the results obtained. There is no machinery to get out of repair and the operating cost is low as it requires only one man and four to six boys. This is the only plant of its kind operated in southeast Missouri.

LAUNDER

One special feature of this plant is a double launder in one side of which, *c*, the waste slimes are carried off while *d* carries the lead concentrates. This is accomplished by means of a board *f* about 8 in. wide, and the length of which is equal to the width of the table. This board forms an apron which while in one position carries the slimes to the slime trough; by means of a small iron hook the board is shifted to act as an apron to conduct the lead to the other compartment of the launder, as shown at *e* in the accompanying illustration.

Method of Exhibiting Mine Maps

An inexpensive and handy method of exhibiting mine maps is to have them mounted on window-curtain rollers set on a notched wooden frame, as shown in



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ARRANGEMENT OF CURTAIN ROLLS FOR MAPS

the accompanying illustration. The maps or blueprints are first mounted on cheese cloth, then fastened to the curtain rollers and provided with cords or grips by which they may be handled in raising and lowering. This makes an excellent method of exhibiting mine plans and sections. The maps are always at hand and a comprehensive idea of the workings can be had by referring from one map to the other. It is much more convenient to raise and lower maps so mounted than to handle bothersome blueprints which have to be spread out for observation.

Hoisting Cable Run through a Drill Hole

A 6-in. drill hole from the surface penetrated a body of ore which later was stoped out. Upon sinking the drill hole ore was struck at a lower level and a winze sunk with the drill hole as a center. In order to work the winze to any depth

it would have been necessary to install a hoist underground, which was not practical. A hoist was therefore erected at the surface and the cable operated through the drill hole. Ore was hoisted to the main working level and then trammed to the hoisting shaft.

Method of Rigging Ladders to Reach Stope Backs

In the large underhand stopes in the Tennessee Copper Company's mines, where the miners practically never see the back, which in an open stope is frequently from 70 to 80 ft. above them, it is evidently necessary to keep the roof well trimmed of all heavy, or "balk

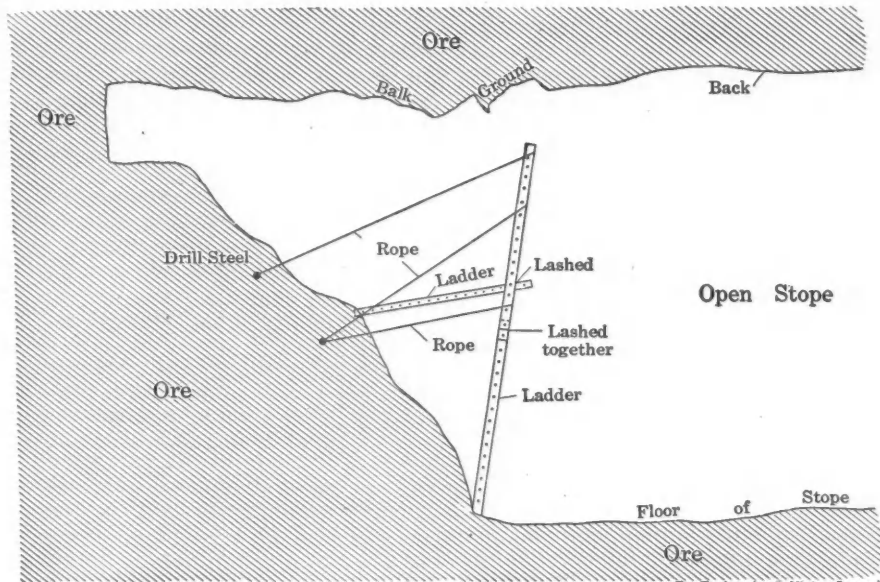
Methods of Stopping in Use on the Kalgoorlie Field*

BY J. CHEFFIRST†

The three methods of stoping described in this article are known as the "rill," the "flatback," and the "shrinkage." For comparative purposes each method will be applied to a block of ore 500 ft. in length, and opened up by levels 200 ft. apart.

THE RILL SYSTEM

It is necessary in the rill system for facilitating mullocking, to make connections between levels by raises and winzes every 100 or 150 ft. along the orebody. After the leading stope is opened the



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LADDER SCAFFOLD FOR STOPES

ground." To insure this, a crew of men is continually kept at work, looking after the condition of the roof. This work is extremely dangerous and ready resource is required to enable the men to gain access to the back. The accompanying drawing shows the method of rigging ladders to reach the roof over the benches of an underhand stope, open to its full height and for a width of from 50 to 150 ft. The ladders are securely lashed together, and, as shown, stayed by ropes secured to the drill steels set into the rock face. A small stoping drill is frequently slung from the ladder and used to put holes in the roof where much balk ground must be slabbed down. Shooting the roof, is, however, a dangerous practice, as shattered rock is apt to be left to fall later, when the face of the stope has advanced and the back is inaccessible.

A great trouble with machine men is their tendency to get cut holes too flat and lifters too steep. Lifters should be as flat as possible.

full length of the drive, the level is timbered. Single stulls are used up to a width of 14 ft. If the span is too great for stulls, set timbers of saddleback stulls are used. Stulls are lagged over with 4-in. poles, and wooden chutes are built at intervals of 50 ft. Ore chutes are cribbed up through the filling and are constructed of 7-in. round timber. The chutes are 4x4 ft. in the clear. Occasionally a double pass or chute may be carried up, one side serving as a man-way.

Stoping is commenced off the winzes, and rills or channels are gradually formed, one on either end of each winze. The rills are generally at an angle of 37 deg. off the horizontal. After the rill is cut through, and the ore, which gravitates down the rill to the ore pass, is cleaned up, machines are transferred to another portion of the stope, ore passes built up, and filling is proceeded with. The filling,

*Abstract of a paper read at Kalgoorlie meeting of Australasian Institute of Mining Engineers.

†Lake View Consols, Limited.

which usually consists of residues, is dumped down the winzes from the level above and gravitates down the rill into position, although at the extreme points of rills a certain amount of handling is required.

FLATBACK SYSTEM

The flatback system is similar to the rill, the difference being that the stope is carried horizontally, and not rilled as in the previous method. As the ore does not gravitate, but lies where it is broken, it is necessary to have ore passes at shorter intervals. Filling is also more expensive on account of the extra handling required. This method is usually put in force where the ground is heavy, and bulkheads, etc., are required to keep up the back or walls, as the flat bed of mullock forms a solid foundation for the bulks.

SHRINKAGE SYSTEM

In the shrinkage or "lay" system one connection between levels at about the center of the block is all that is needed. The level is timbered similarly to the rill system, except that the chutes, which are put in every 20 ft., are constructed of $\frac{3}{8}$ -in. steel. These chutes practically consist of a steel lip protruding into the level, the bottom of the chute being formed by the broken ore itself. Any rocks which are too large to pass through the opening can be blasted without damaging the chute. The stope is rilled at an angle of 23 deg., all waterholes being tored.

Sufficient of the broken ore, approximately 44 per cent., is drawn off to allow comfortable working room between the back of the stope and the top of the broken ore, which acts as filling until the stope is completed. Two ladderways are cribbed up through the ore, one near either end of stope, built of 6-in. half-joggled logs, and measuring 3x3 ft. in the clear. These manways are commenced between two chutes, so that the shrinkage of the ore directly over the chute will not affect them. When blasting, only a few holes are fired in a round, so as to allow the large rocks to be broken sufficiently small to pass through the chutes.

After the stope is opened through to the level above, all ladders and air pipes are removed from passes, and the balance of the ore remaining in the stope is drawn off. The passes then collapse, and the timbers are regained through the chutes, to be utilized in other places. Filling is then a simple matter, as the stope being open, the mullock may be dumped at whatever point required.

COMPARISON OF METHODS

Where conditions permit of the satisfactory working of the shrinkage system I prefer it. In the rill system in opening up the block of ore, three or four winzes

are essential to economical mining, while in the shrinkage system one winze is sufficient. A considerable saving in the cost of development is thus effected. Expensive ore passes, which have to be installed and maintained in the rill system, are entirely dispensed with in the shrinkage system. Loss of time, experienced in shifting machines preparatory to filling, is avoided, because in the shrinkage system the stope is not filled until after it is cut through and the ore drawn off. In the rill system a certain percentage of ore, no matter what care is exercised in cleaning up rills, is lost—embedded in the filling—while in the shrinkage system a certain amount of low-grade material scales off the walls and reduces the grade slightly. This can be reduced to a minimum by strict supervision in the breaking of the stope.

There are certain conditions under which the shrinkage system, if applied, would be unsuccessful, such as in flat veins or in stopes where the walls and backs are bad; but where the lode is at all nearly vertical and the walls fairly good I am satisfied that it is a cheaper

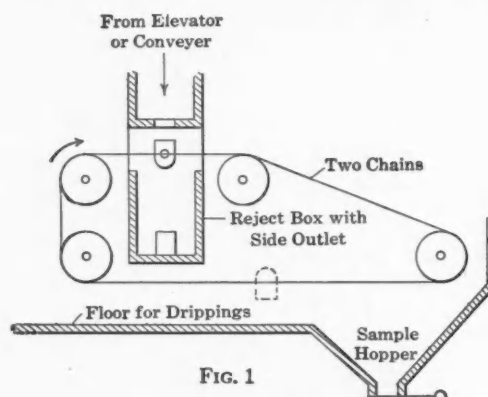


FIG. 1
SIMPLE FORMS OF SAMPLING BELTS

and just as satisfactory a method as the rill system. In isolated patches of ore, which probably would not be worth considering if a lot of dead work were necessary to deliver the mullock in the stope, this system can be used to advantage.

Wooden Gate for Mine Shafts

At the Mount Morgan mine in Queensland, the water which trickles down the shaft is extremely acid, due to the oxidation of the pyrite in the ore. On this account the old gates in the mine were always requiring repairs to the hinges and fastenings. A gate was designed and built entirely of wood, and has given satisfaction. Wooden dowels replace all nails and screws; the bottom of the post of the gate is stepped into a block of wood which has a hole bored into it for the introduction of grease, and the top is held by a similar block. Some gates made in this manner are stepped into the inverted bottom of a glass bottle.

A Simple Sampling Device

By FRANZ CAZIN*

Referring to the article, entitled "The Van Mater Sampler," in the JOURNAL of Dec. 25, 1909, I beg to say that I have used the sampler therein described in a number of mills for obtaining a sample of a passing stream of ore, and that on account of its simplicity and the reliability of the device for obtaining a sufficiently correct sample for mill purposes, together with the little head-room required for its installation, the sampler has given entire satisfaction.

The objections which may be raised against the arrangement as shown in the drawing, which accompanies the above mentioned article, viz., that the bucket may not empty itself completely into the sample hopper and that some particles of the sample may drop into the reject, may be overcome by making the sample hopper sufficiently long and by leading the bucket on its return under the reject hop-

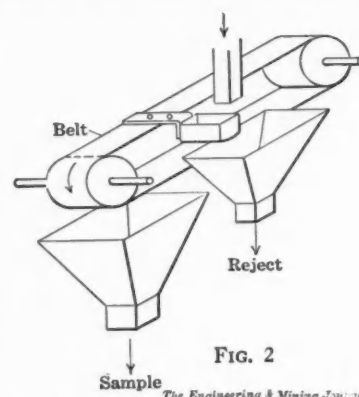


FIG. 2

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per (or automatic scale), instead of over it, and over a floor on which the drippings would fall and from which they can be brushed up and added to the sample at the end of each shift. This arrangement is shown in Fig. 1 of the accompanying sketch.

I used this sampler in 1901 in the Santa Cruz concentrating mill, Santa Earabara, Chihuahua, Mex.; in 1902, in the Penobscot cyanide mill near Deadwood, S. D.; in 1906, in the copper-concentrating mill of the Penn-Wyoming Copper Company at Encampment, Wyo., and in other instances. So I do not think that this device can be patented now.

I may call attention to a still simpler form of this sampler which I used in the concentrating mill of the Pitt Ores Company near Breckenridge, Colo. In this sampler I replaced the two chains by a belt to which the bucket is fastened, as shown in Fig. 2. This sampler can be easily made at any mill.

*Consulting mechanical engineer, Denver, Colo.

Dry Placer Mining in California

BY SAMUEL H. DOLBEAR*

Widespread interest is being manifested by western engineers in the efforts made in the arid portions of the western States to recover gold from placer lands, where water is not available for sluicing and dredging operations. Perhaps the most noteworthy attempt in that direction is that of J. W. Jardine, Jr., and A. W. Patton, at Summit, San Bernardino county, Cal., where the deposits were first noticed in 1896.

The discovery was attended by the usual rush of prospectors, and for a time 150 men "dry-washed" parts of the deposits. Hand dry-washers of the fan or bellows type were employed, to which work a production of \$100,000 is accredited. The grade of gravel from which this amount was extracted is not known. Recent sampling over a large area in Fairy gulch shows an average value of 30c. per yd., while the grade in Phœnix gulch is much better, averaging approximately 70c. per yard. The shallow deposits having become exhausted, most of the prospectors discontinued their efforts. Later on, a reservoir designed to retain rain water was constructed, and sluicing has since been done from time to time as water was available.

Associated with the native gold in this deposit are found magnetic and nonmagnetic black sand. The magnetic sand is found to be valueless, while the nonmagnetic material varies greatly in value. In order to conduct experiments with the mechanical extraction of this gold, Jardine and Patton built a plant of 15 tons daily capacity, which plant has been in operation during the last 11 months. It is not the object of this machine to separate the native gold from the gravel and black sand, but rather to produce a concentrate of sufficient value to permit its shipment to one of the local smelters for treatment.

The gravel is first shoveled into the boot of a chain-bucket elevator, from which it is discharged to a ¾-in. grizzly, the oversize being carried to the boot of the tailings stacker. The material passing through the grizzly is sized over a ¼-in. screen, the oversize in this case passing into the stacker boot while the screenings constitute the material to be tumbled. The screening is fed automatically to a table provided with 10 riffles, over which it is forced by the ordinary "bumper" motion. Tailings are conveyed to the stacker boot and the concentrates are delivered from the side of the table into a sacking machine.

Each riffle is provided with a worm extending the width of the table, and set in a 1½-in. groove in the face of the table

and in front of the riffles. The duty of the worm is to convey the finer particles to the upper end of the table course, at which point they are discharged over the riffles, moving downward to a given point on the second worm, which point is, of course, determined by the specific gravity of the concentrate.

The best concentrate obtained in the demonstration of the experimental plant was worth \$150 per ton, with an approximate extraction of 98 per cent. A plant of 500 yd. daily capacity is in course of construction, and will vary only in a few respects from the experimental machine. Revolving screens are being provided instead of flat screens, and the entire plant is portable.

Pig Iron Production in 1909

The figures collected and published by the American Iron and Steel Association put the production of pig iron in the United States in the second half of 1909 at 14,773,125 long tons. This makes the total production for the year 25,795,471 tons, against 15,936,018 in 1908 and 25,781,361 in 1907; the increase last year over 1908 having been 9,859,453 tons, or 61.8 per cent., while over 1907 it was 14,110 tons. The production for 1909 was the largest ever recorded.

The production of pig iron in the United States for the past 10 years has been as follows, in long tons:

1900	13,789,242	1905	22,992,380
1901	15,878,354	1906	25,307,391
1902	17,821,307	1907	25,781,381
1903	18,009,259	1908	15,936,018
1904	16,497,003	1909	25,795,471

The approximate consumption of pig iron in the country in 1909 appears as follows:

Production	25,795,471
Imports	174,988
Total supplies	25,970,459
Exports	61,999
Apparent consumption	25,908,460

No account is taken of stocks on hand, as they are not reported. It is probable, however, that they were larger at the end of 1909 than in the previous year.

The division of the iron made according to the purposes for which it was intended was as follows, for two years past:

	1908		1909	
	Tons.	PerCt.	Tons.	PerCt.
Foundry & forge	4,307,734	27.0	6,386,833	24.8
Bessemer	7,216,976	45.3	10,557,370	40.9
Basic	4,010,144	25.1	8,250,225	32.0
Charcoal	249,146	1.6	376,003	1.4
Spiegel and ferro	152,018	1.0	225,040	0.9
Total	15,936,018	100.0	25,795,471	100.0

Bessemer iron in 1909 included 212,615 tons of special low-phosphorus pig. The production of spiegeleisen was 142,831 tons; of ferromanganese 82,209 tons. this total including a few hundred tons of ferrophosphorus. Basic pig does not include a small quantity of basic iron

made with charcoal as fuel. A notable point is that while the make of bessemer pig increased 46.3 per cent., that of basic pig more than doubled.

The production according to fuel used was as follows:

	1908.	1909.	Changes.
Coke	15,331,863	24,721,037	I. 9,389,174
Anthracite	355,009	698,431	I. 343,422
Charcoal	249,146	376,003	I. 126,857
Total	15,936,018	25,795,471	I. 9,859,453

Coke includes a small quantity made with raw bituminous coal. Nearly all the anthracite furnaces use some proportion of coke; the quantity made with anthracite coal alone in 1909 was only 16,048 tons. Under charcoal iron is included a small quantity made in the electric furnace.

The production by States for the last three years was as follows:

	1907.	1908.	1909.
Mass. and Conn.	19,119	13,794	18,388
New York	1,650,752	1,019,495	1,733,675
New Jersey	373,189	225,372	294,474
Pennsylvania	11,348,549	6,987,191	10,918,824
Maryland	411,833	183,502	286,856
Virginia	478,771	320,458	391,134
Ga. and Tex.	55,825	24,345	26,072
Alabama	1,686,674	1,397,014	1,763,617
West Virginia	291,066	65,551	228,282
Kentucky	127,946	45,096	86,371
Tennessee	393,106	290,826	333,845
Ohio	5,250,687	2,861,225	5,551,545
Illinois	2,457,768	1,691,044	2,467,153
Ind. and Mich.	436,507	348,096	964,289
Wis. and Minn.	322,083	148,938	348,177
Mo., Colo., Wash. and Cal.	468,486	313,071	382,766
Total	25,781,361	15,936,018	25,795,471

The whole number of furnaces in blast on Dec. 31, 1909, was 338, against 258 on June 30, 1909, and 236 on Dec. 31, 1908. The number of furnaces idle, including furnaces being rebuilt, on Dec. 31, 1909, was 131, against 205 on June 30, 1909, and 223 on Dec. 31, 1908.

On Dec. 31, 1909, there were 14 entirely new furnaces in course of erection, all of which will use mineral fuel, as follows: New York, 1; Pennsylvania, 7; Ohio, 3; Indiana, 2; and Michigan, 1. In addition 1 furnace in Pennsylvania and 1 in Virginia were partly erected but work on their construction had been indefinitely suspended.

On Dec. 31, 1909, there were 11 furnaces being rebuilt, 10 mineral fuel and 1 charcoal, as follows: Pennsylvania, three cokes; New Jersey, Virginia, Tennessee, Alabama, Ohio, Illinois and Wisconsin, each one coke; Georgia, one charcoal furnace.

A drive was advanced on the East Rand Extension a distance of 361 ft. in October, a record for the Rand, says the *South African Min. Journ.* Ingersoll-Sergeant ¾-in. machines were used, working three shifts per day. The average number of holes was 12.7 per round. The average distance of the breast from the shaft was over half a mile, and all the broken ground and supplies had to be transported over this distance.

*Mining engineer, Johannesburg, Cal.

Iron Ranges of Northern and Northwestern Ontario

Examinations Made in 1907 and 1908 Indicate Little Present Economic Value to Deposits, but Further Prospecting Warranted in Many Cases

FEW DEPOSITS DEVELOPED

Recently numerous explorations have been undertaken to determine the value of the known iron ranges of northern and northwestern Ontario. Dr. A. P. Coleman has investigated the iron ranges of Nipigon district, his recent work being directed toward completing the mapping of the ranges.

The Little Long lake range is east of the Poplar Lodge ranges which are situated along the east shore of Lake Nipigon, previously examined, and it is probably an extension of the Poplar Lodge ranges. A number of iron-ore locations have been taken up on or near the western bay. The first suggestion of iron formation is found on the south side of the western end of the lake where low cliffs of Keewatin rocks occur and a few thin seams of banded gray and black material are evidently very low-grade examples of the usual iron formation. They are associated with green schist and irregular masses of coarse arkose. The shore for some distance east and west consists of the same rocks with a little of the iron formation, and, where drift-covered, often exhibits magnetic attraction. Inland in these locations no rock was seen, the country being a succession of swamps or muskegs, and sand plains and ridges.

The most important outcrop is at the east end of a large island where stripping disclosed a width of 24 yd. of iron formation intermixed with schist, some of the bands almost heavy enough to be considered ore. The colors at this stripping are gray and black, and there is magnetite enough to make the ordinary compass useless. Much of the material gives a red powder when pounded, showing the presence of hematite. Another stripping a short distance west shows 40 yd. of lean iron formation without schist and containing some dull-red jasper. The iron mineral here seems to be mainly hematite though the compass is still useless. The greatest width of the banded silica and ore found on the island is 130 yd. and the total length of the outcrops a little over a quarter of a mile.

Along the shore of the southwest bay rock is seen rising in places 20 or 30 ft., chiefly massive greenstone and green schist, but including a lean iron formation. To the west of the lake seven claims have been taken up, but only one of them shows outcrops of any importance, the others being largely covered with drift

NOTE—Abstract of the Eighteenth Annual Report of the Ontario Bureau of Mines for 1909.

and muskeg. A steep rocky hill of green schist contains several bands of iron formation, mostly very lean but with some narrow streaks heavy and black with magnetite. The width of rock exposed is about a quarter of a mile. Sections at short intervals to the west show less rock but of the same kinds; in the southern half of the location strong local attraction at many points proves that there is magnetite below the covering of drift. There appear to be two small parallel iron ranges running east and west in this region, the more important including the north half of the island previously referred to and running east; the other is a short distance south of it. There is a gap of several miles between this range and the most easterly one mapped in the Poplar Lodge and Sturgeon river region, in which only indications of iron have been found. Little can be said as to the value of the deposits examined until some work has been done in the way of exploitation with test pits or diamond drills. The iron formation resembles that of the southern range near Poplar Lodge, but so far as known the outcrops are much less extensive and of lower grade. If orebodies of importance should be found on Little Long lake, only about 20 miles of railway would be required to connect them with the nearest point on the National Transcontinental Railway.

BLACK STURGEON IRON REGION

Doctor Coleman also furnishes a report of his work in the neighborhood of Black Sturgeon lake and river, southwest of Lake Nipigon, where a number of iron locations were taken up some years ago, and some work done in the way of stripping and diamond drilling, principally by Wiley and Marks, of Port Arthur. Some high-grade hematite has been produced in this region, but the observations of Doctor Coleman indicate that so far no discoveries of deposits sufficiently extensive to be of commercial value have been made. The iron locations touch Nonwatin lake at its northeast corner and extend southeastward for some distance and northwestward to Black Sturgeon lake. It was found that no iron formation of Keewatin age existed in the region, the lower ground consisting of drift with a few outcrops of Keweenaw sediments or diabase, and the range of hills of granite, gneiss and certain schists. The iron ore occurs always along or near the southwestern flank of the Laurentian hills, mainly in

small fissures. Along Black Sturgeon river between Nonwatin and Black Sturgeon lakes there are considerable exposures of red shale or marl. Some of the locations on which no rock was found were apparently taken up with the idea that iron-bearing rocks might underlie the drift, the red shale giving a suggestion of this sort. The most interesting seams of ore are found on a location southeast of Black Sturgeon lake where a good deal of stripping and diamond drilling has been done. Here rusty decomposed rock shows seams of pure hematite. The ore occupies narrow fissures between small blocks of breccia and is found in the form of soft red hematite, black micaceous or specular hematite, botryoidal concretionary coatings of hematite, and martite. Small veins or fragments of the ore may be selected which are practically pure, but the total amount to be seen is only small. The ore is of admirable quality if enough were present to make it of economic importance. In other locations in this neighborhood where a comparatively large amount of work has been done in sinking pits, trenching and diamond drilling thin seams of ore occur. The bed rock appears to be brecciated coarse granite, much reddened with hematite, but seldom heavy enough to be called ore. Doctor Coleman attributes the source of the iron solutions which have widely impregnated the Archean granite and schist at the edge of the escarpment between the two levels, to Keweenaw sediments, most of which carry enough hematite to be red. So far as known the leaching process went on chiefly along the cliffs or slope of the escarpment. The brecciation of the granite and schist suggests that faulting took place after the Keweenaw covered the region, giving an opportunity for the leaching of sediments from above and the deposits of seams of hematite in the fissures in the Archean beneath.

Some iron claims about a mile and a half west of the north end of Fraser lake, which lies between Nonwatin lake and the Nipigon river, were also examined. The geological relationships and the peculiar little seams of hematite of that neighborhood were found to be of exactly the same character as those of Nonwatin and Black Sturgeon lakes, except that everything was on a much smaller scale. The amount of ore seen was quite insignificant.

BOG IRON ON ENGLISH RIVER

In the autumn of 1907, bog iron was discovered on Little Bear lakes, south-

east of Selwyn lake, and subsequently on Yellow and Greer lakes along the boundary between the Thunder bay and Rainy river districts. Similar deposits have also been found near Niblock station on the main line of the Canadian Pacific Railway where over 140 claims have been staked. The latter deposits are about 20 miles from those at Little Bear lakes. E. S. Moore, reporting on the distribution and economic importance of these deposits, states that the artificial drainage of the lakes of the bog-iron district would be a difficult matter for several reasons. The iron occurs in both the ferrous and ferric conditions, and as a combination of the two forms. The ferrous form exists in the state of the greenish salt or salts of the protoxide, and the ferric form as the common hydrous oxide, limonite. The combination of the two oxides gives a small amount of magnetite, which cannot be proved to originate in the bog as it may have been carried in by streams. No carbonate of iron was detected.

The limonite occurs in red, brown and yellow colors, and forms either soft or hard bedded masses, concretions, slimy mud, or cement in sand. The soft, bedded yellow limonite occurs in the most easterly of the Little Bear lakes as a layer 4 in. thick in water about 2 ft. deep. It is badly mixed with sand and is of low grade. A partial analysis gave silica, 35.17 per cent.; metallic iron, 27.34; carbon dioxide, absent; loss on ignition, 8.52 per cent. The most frequent occurrence of the iron is in the form of concretions of various shapes of a dark or yellowish brown color. They vary in size from $\frac{1}{2}$ to 3 in. in diameter and from $\frac{1}{4}$ to $\frac{1}{2}$ in. thick, being smaller than those found in Quebec and New Brunswick. An analysis of some of these concretions gave silica (soluble), 8.92 per cent.; silica (insoluble), 4.88; ferric iron (Fe_2O_3), 68.36; ferrous iron (FeO), 2.16; metallic iron, 49.5. The metallic iron is a little lower than that of the average bog ore worked in other regions.

The most important deposit of the region was found around Hematite lake, being practically confined to the northern half of the lake. An almost continuous band of limonite mixed with sand extends around the shore, varying in depth from 1 to 15 in. and in width up to 300 ft. After a careful consideration of the bog-iron deposits of the region the conclusion is reached that there is not sufficient iron in sight to warrant much expenditure in the attempt to work them, though some ore might be collected from the larger deposits by washing the sandy lake-bottom material. The presence of these deposits, however, shows that prospecting in the region is warranted. Should other deposits exist they will probably be found within a short distance of the surface of the sand in the lakes or in peat bogs.

ONAMAN IRON RANGE AREA

A report on the geology of the Onaman iron-range area is furnished by E. S. Moore from a survey completed in 1908. This region comprises about 70 square miles lying northeast of Lake Nipigon and surrounding the head waters of the Red Paint river, by the name of which it was formerly known. It first attracted attention in 1904, during the survey of the line of the National Transcontinental Railway. A number of claims have been located and some trenching, stripping and diamond drilling done, but no considerable development work is likely to be carried on until the railway is in operation. The rock systems of this area include the Keewatin, Laurentian, Huronian, Keweenawan, Pleistocene and recent formations. The Keewatin consists of an older complex series of basic rocks, cut and overflowed by an acid series, which are in turn overlain by a thin series of pyroclastics grading into sediments. These are overlain conformably by a banded iron formation, which in one place seems to be cut and overflowed by the acid rocks. The iron formation occurs in two bands distinguished as the Northern and Southern ranges, extending nearly east and west across the district, and about two miles apart. The Northern range, beginning below Holliday lake, extends across the high of land and along Johnson creek nearly to the border of the district, a distance of about 10 miles. The outcrop is not continuous, there being gaps of considerable extent. Local magnetic influences where outcrops do not occur are sufficiently strong to warrant the band being regarded as continuous and lying along a syncline. The width varies greatly from a few feet at the western end to half a mile. Where the high of land is crossed the outcrop disappears under the drift and reappears two miles to the east, as narrow outcrops on either side of a mass of greenstone which has been faulted into it, again disappearing and coming to the surface three miles further east in a considerable outcrop. The formation at this point can be traced over an area two miles in length by one and one-fourth miles wide and is on the whole pretty lean, much slate and schist being intermixed with the jasper.

The Southern range is more continuous and compact than the Northern. The most westerly outcrop lies along the south side of Castor lake, where a very narrow band of jasper occurs. There is then a break where drift extends for a mile between this small outcrop and the main portion of the range, the formation probably underlying the drift. The main portion of the range is represented by almost continuous exposures for about two miles, with a maximum width of 700 ft. This range, like the Northern one, contains much foreign rock in its widest areas. At the east end it runs under

drift but local deflections of the compass in a large swamp and the occurrence of a small outcrop indicate that the range is continuous for at least $1\frac{1}{2}$ miles under the swamp. Outside of the outcrops embraced in the ranges followed, there are two very small patches of iron formation occurring to the southeast of the main ranges, being little ledges of jasper contained in slate and green schist.

On account of the complexity of the folding throughout the area it was impossible to work out the thickness of the iron formation even approximately. Bands of jasper appear, disappear and reappear again and cannot be correlated with any degree of certainty in different portions of the range. The formation, which is composed largely of red jasper, often well banded, and magnetite, does not at present show commercial ore. Many of the bands are rich enough to make ore, but as a rule a great deal of schist and slate is mixed with them. There does not appear to have been much concentration as neither the outcrops nor the drill holes that have been sunk show any bodies of rich ore. The rocks are, as a rule, so hard and close-grained that little percolation of water seems to have taken place. No drilling has been done on the Southern range where the best outcrops of jasper occur.

A number of analyses of specimens were made. One from a band of magnetite and chert a few inches wide extending between bands of slate showed total metallic iron, 50.32 per cent.; iron in ferrous condition, 17.06; silica, 26.85. A specimen of jasper collected from an outcrop in a swamp gave: Total metallic iron, 55.79 per cent.; iron in ferrous condition, 10.94; silica, 37.10. An analysis from a band of distinctly banded red jasper and magnetite occurring in bands a few feet wide lying between strips of slate showed: Total metallic iron, 38.83 per cent.; iron in ferrous condition, 12.9; silica, 50. A specimen secured by diamond drilling on the Miller claims on the Northern range gave 42.8 per cent. of iron. Though there is a large amount of well banded jasper on this range the iron content on the whole is low, but so much of it is covered by drift that it is impossible to say until it has been more fully prospected what some parts of it may produce. The eastern end of the Southern range is better than the western, which gives no promise of producing ore.

THE WOMAN RIVER AREA

An examination of a portion of the Woman river iron range was made by R. C. Allen, whose report deals largely with the relation of the iron formation of the region with the associated igneous rocks. This range is a belt of iron-bearing rocks extending from the vicinity of the northeast end of Rush lake in the Sudbury mining division in a general

southwesterly direction for about 11 miles, crossing the Woman river from which it takes its name. West of the river the iron formation runs in three belts.

This formation is made up of finely banded cherty iron carbonate rocks, hematitic, magnetitic and pyritic cherts, black and red jaspilites, a unique amphibole-magnetite-chert rock and iron ores. Great variability in character of the iron formation is characteristic of all the belts. In several claims taken up west of the river iron ores occur. These are of low grade, running as high as 43 per cent. iron and as shown by an average of 16 analyses, carrying a phosphorus content of 0.018 per cent. Samples from the most highly ferruginous areas, which coincide with those that are abundantly amphibole-bearing, show an iron content varying up to 43 per cent. with an average phosphorus content of 0.0127 per cent. A small amount of sulphur is present as

typical iron-formation rock is composed of a crystallized chert interbanded with magnetite and hematite and containing small amounts of siderite. The magnetite is present in sufficient quantity to affect (very locally) the compass to an appreciable extent.

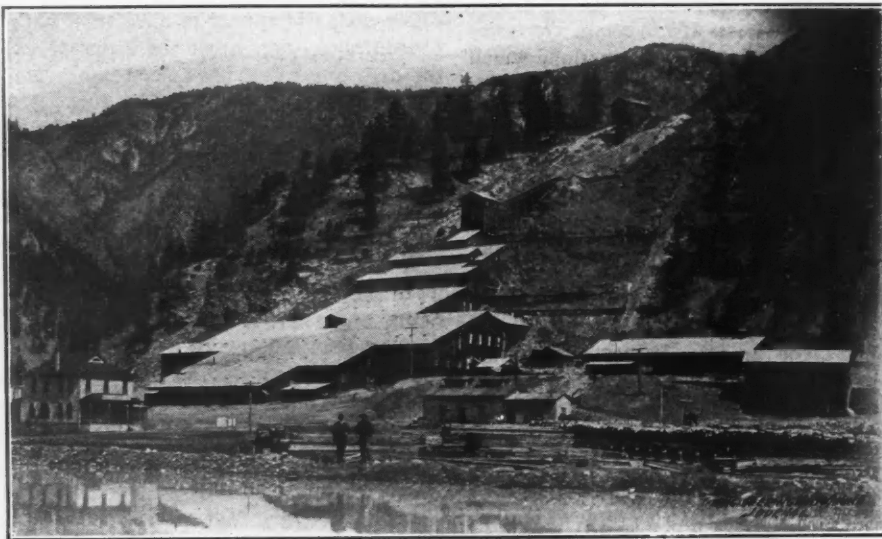
The Nickel Plate Mine

The properties of the Daly Reduction Company and the Yale Mining Company in British Columbia were purchased by the Exploration Syndicate, composed of a group of capitalists who ordinarily associate themselves with the Cole-Ryan copper enterprises. From April 10 to Aug. 1, a corps of mining engineers worked quietly making exhaustive tests by sampling and diamond drilling, which were of a satisfactory nature. The Hedley Gold Mining Company, a close

to a rock made up largely of epidote and garnet with quartz and calcite, depending upon the purity of the original beds. The greatest width of pay ore being mined is about 60 ft. thick.

The Yale Mining Company owned 28 claims, water rights, mill sites, etc., the principal mining claims producing ore being the Nickel Plate and Sunnyside. The Daly Reduction Company (a parent company) treats the ore. The mill is equipped with forty 1050-lb. stamps; amalgamation, concentration and cyaniding being the process used. About 85 per cent. of the assay value of the ore is recovered. The mill and power plants are run by water-power. The capacity of the mill is about 4000 tons per month, and about 175,000 tons of ore of an average grade of \$12.50 per ton has been treated in less than five years.

Preparations are being made for betterments and enlargements. A complete system will be installed for sliming purposes, with filter presses. Development work will be vigorously prosecuted on all the property with a view of increasing the ore reserves and tonnage treated.



MILL OF THE HEDLEY MINING COMPANY

pyrite: An average of 8 determinations gave 1.184 per cent., but these samples were selected for analysis because of their relatively high sulphur content.

IRON RANGE NORTH OF ROUND LAKE

In order to complete the exploration of the iron ranges of the Nipigon region an examination was made of a small range near Round lake by E. S. Moore. Round lake is an expansion of Mud river, lying about 27 miles up the stream and north of Wendigo bay on Lake Nipigon.

About one-third of a mile north of Round lake some narrow bands of lean iron formation occur, the length of the range being about one mile and its width very indefinite. It occurs in a chloritic, or gray gneissic schist and only shows in a few outcrops. Bands of magnetite and silica varying from 8 in. to 8 ft. in width occur, but gradually grade out into the fine-grained, gray gneiss or schist containing much silica and chlorite. The

corporation, was organized and took the property over from the Exploration syndicate at an actual cost of \$720,000. I. L. Merrill is president, T. Walter Beam is directing the operations and Gomer P. Jones, the former superintendent of the mine, has been appointed general superintendent of the mines and plants. The property is near Hedley, B. C., on the north side of the Similkameen river near the mouth of Twenty Mile creek. The Victoria, Vancouver and Eastern railroad, which is now building west to the coast, entered Hedley in August.

The orebodies lie in the sedimentary rocks, a large eruptive mass of monzonitic porphyry having been the cause of intense metamorphism in the sediments that it cuts. These sediments are of great thickness, the prevailing dip being westerly about 20 deg. The beds in which the ore occurs were originally limestones, and near the contact of the igneous rocks these have been altered

Republic Iron and Steel Company

A preliminary report issued by the executive committee, and covering the half-year ended Dec. 31, 1909, says that the general improvement in business anticipated in the last annual report has been fully up to expectations, and the net earnings for the period of this report show substantial improvement, as compared with the last half of the calendar year 1908. The reduction in profit as compared with the same period in 1907 is due entirely to lower prices on sales of manufactured products. As a result of appropriations and expenditures for improvements and labor-saving devices, cost of production has been largely reduced, notwithstanding the fact that labor rates and cost of general supplies are substantially on the basis of 1907. The reduction in costs, however, have been more than offset by the greater reduction in selling prices, so that the profits per ton shown by this report are necessarily less than for the six months ending Dec. 31, in the previous year.

The income account for the half-year is as follows:

	1908.	1909.
Gross profits	\$1,633,534	\$2,499,775
Interest account, surplus	27,507	72,212
Total	\$1,661,041	\$2,571,987
Maintenance and repairs		\$598,376
Depreciation and renewals		312,178
Exhaustion of minerals		127,684
Interest on bonds		199,357
Total charges		\$1,237,595
Surplus for half-year		\$1,334,392

Dividends amounting to \$794,798 were paid on the preferred stock. Unfilled orders on the books, Dec. 31, were for 39,995 tons of pig iron and 457,785 tons

finished products; a decrease of 54,252 tons of pig iron, but an increase of 65,365 tons of finished products, as compared with Dec. 31, 1908. The new tube works have been substantially completed, and it is expected will be placed in operation not later than March, 1910. Substantial progress is being made on the construction of the Haselton steel works; it is not probable, however, that any benefit from the operation of this department will be realized during the present fiscal year.

Rock Filling at Rio Tinto*

BY ERNEST LEVY†

I was managing for a time a mine situated on the largest known ore mass in the world—namely, the San Dionisio lode of the Rio Tinto Copper Company, in the province of Huelva, Spain. In order to give you a better understanding of the filling methods employed, it will be necessary to go somewhat into other connected matters, as, for example, some of the characteristics of the ore mass and the scheme of ore extraction. The ore mass, which reaches a length of about 1 km. and a maximum width of 220 m., has been developed more or less on the levels from the seventh to the 32d, which are separated by distances of 12.5 meters.

The development has in general taken the form of 4x4-m. headings, 10 m. from center to center, running both with the length of the mass and across it at right angles to that direction; consequently, the ore left in place between each two levels may be thought of as a mass or slice of mineral with a thickness of 8.5 m. and an area equal to that of the lode at that horizon, supported on pillars which are 4 m. high, 6 m. square and 10 m. from center to center.

I am not sure if, on account of the huge size of the various masses belonging to the company, it was not originally considered that the small percentage of the mass thus extracted would be sufficient to supply all demands from these mines. However, whether this be so or not, I am of the opinion that the methods to be later employed in extracting the remainder of the ore had not been drawn up.

METHOD OF STOPING

The method later decided upon was to commence more thorough extraction by means of stopes running parallel with the width of the ore, approximately 100 m. apart and 15 m. wide. These stopes are divided into sections of from 30 to 40 m., according to the width of the mass at the place, in order that

the rock filling should not have to be carried an exorbitant distance from the stope-filling shafts. It is a characteristic of this mass that where the width is great the ore is soft and heavy, and where small, the mineral is extremely hard and stands well.

Great care has to be exercised when removing the pillars in preparation for stoping, and also when excavating ground in the stopes themselves, that not too much weight has to be borne by the ground above the roof. The weight also becomes more effective when the natural fissures in the ore have become devoid of cementing material; these then form a plane of weakness. Water is a notable factor in effecting weakness along these planes by washing out soluble copper salts deposited in them at some former period. It is therefore advisable to catch up and remove from harm's way all water which may be found running into the mine, so that it can do no damage. A complete system of surface drainage is resorted to in the neighborhood of the outcrop for the purpose of minimizing trouble from this source.

WASTE ROCK SUBSTITUTED FOR TIMBER

Timber, being scarce and expensive, is used as little as possible. As above mentioned, the spaces formed by removal of the ore are filled with rock in order to support the mass. The rock is procured from the following places: From the overburden, hanging and footwall rocks removed of necessity in preparation for and during open casting, and from any rock afforded by underground workings. This latter source is only a small one, since, as can be well understood with such a huge and continuous mass, but little dead work is called for.

The filling rock is delivered into the mine partly through the main tunnel, which strikes the mass on the 10th level, and partly through main rock shafts, through which it is taken to such levels as desirable. The rock is taken down in mine cars, in which it is distributed from the main shafts to interior rock shafts, which are large enough to form pockets to be drawn from when required. The train loads are dumped directly into interior rock shafts.

THE SUBMARINE

The interior rock shafts have overflow ways at such levels as are decided necessary, and the rock flows out on to a masonry platform locally known as a "submarine," about 2 m. higher than the floor of the level. The height of the submarine facilitates the shoveling of the rock direct into mine cars, and thence it is distributed where needed. Each stope section has an individual rock shaft and through this is dumped all the rock used to fill that stope section.

Before stoping, all former excavations made, that is, the 4-m. headings, must be tightly packed, and there must be built in the filling, main passageways formed of side walls and an arched roof about 4 ft. wide by 6 ft. high, in such positions as to enable the ore that is mined and rock that is to be used to be distributed as required, and also as a means of ingress to pillars yet unrecovered. Places for manways and stope rock shafts are left in the walls of these arches where suitable, with a view to aiding future work. Arranging the plan for these arches, etc., is a matter which requires careful consideration, in order that the scheme may be as effective as possible.

REMOVAL OF ORE

At those places where it is decided to stope, it becomes necessary, first, to fill gradually (if this has not already been done) the spaces formed by the development galleries, in such a manner that the pillars and those sections of the neighboring pillars lying within the confines of the vertical bounding planes of the stope can be removed.

The ore is removed in horizontal sections of about 2 m. thick, as follows: A drift 2 m. wide is run across the center of the section under consideration, and parallel to the length of the lode, which is parallel to the width of the stope. This connects the manways and rock shafts. The remainder of the ore from this layer of the section is removed in contiguous drifts approximately 2 m. wide; they start from the end of the preliminary drift, and run north and south, or parallel to the length of the stope, and extend to the ends of the section under consideration. Before each of these secondary parallel drifts is run, the roof of the previous one is supported by solid rock filling. In placing the filling, a sufficiently strong retaining wall is first built at a convenient distance from the solid rock, and then the intervening space is packed tightly with rock thrown in behind and stamped down.

Varying with the supporting capacity of the ore, more or less ground can safely be left open while being worked; but, as a rule, all spaces are filled at the earliest possible moment. I think it will be understood from what I have said that the ore gradually becomes extracted and replaced by an equal volume of rock, and it is to be expected that some day a rock filling placed by hand will stand in place of a mass of ore which consisted of many millions of tons.

The number and weight of diamonds declared at the Department of Lands and Mines, British Guiana, during the fiscal year 1908-9 were as follows: Number, 56,982; carats, 5189, the largest weight for the last four fiscal years.

*Discussion of D. W. Brunton's paper, "Mining and Metallurgy in Western United States," read before the Spokane meeting of the American Institute of Mining Engineers, Bull. No. 37, A. I. M. E.

†Mining engineer, Rosslund, B. C.

Recent Developments in California Oilfields

State's Oil Production Exceeds That of Gold; Savings Banks May Loan Funds on Some Oil Stocks. No More Cheap Oil on the Coast

PROGRESS IN VARIOUS DISTRICTS

The value of the output of the oil of California in 1908 and 1909 exceeded that of the gold by several million dollars. It is but a few years since fuel oil was selling for 15c. per bbl., while the price is now 50c. or higher according to the grade and quantity to be delivered. The indications are that lower prices will never again obtain, but that production will be restricted by agreement when necessary, as was done for six months by some of the large companies during 1909. Some contracts as high as 65c. per bbl. are reported recently made with the Standard Oil Company.

STATUS OF OIL SECURITIES RAISED

The State bank commissioner of California has declared that the stock and bonds of the Standard, Union and Associated oil companies of California are fit collateral upon which State savings banks may loan their funds. The oil bonds and stocks have been accepted as security by some of the commercial banks of the State, but have not heretofore been regarded as suitable collateral by the bank commissioner.

The Standard Oil Company is credited with the intention of withdrawing from the occupancy of all presumptive oil lands in the State upon which it was not drilling on Sept. 7, 1909, the date upon which the Secretary of the Interior withdrew several million acres from entry. The amount of land so given up amounts to 2400 acres situated to the west and southwest of Buena Vista lake and north of Maricopa in Kern county. The company is said to concede that it does not hold any sort of right to these lands under the changed attitude of the administration toward public lands regarded as oil bearing.

The Standard has been boring in the hills of Tertiary age, near Altamont, to the east of Livermore valley in Alameda county. One bore extended to the depth of 3000 ft. A little showing of oil was encountered at various depths down to 1200 ft., but none deeper. The company has abandoned the district and carted away its plant. The Daisy well, farther east on the slope toward Tracy is still boring. There are healthy seepages in the vicinity of these wells but the formation is declared to be disturbed.

PETROLEUM INVESTMENT COMPANY

Prominent oil men and capitalists have joined hands with John Baker, Jr., in the organization of the Petroleum Investment Company, capitalized at \$250,000, for the

purpose of financing companies for the development of petroleum lands in California. It is stated that a staff of competent men will be placed in the field to secure good properties and that branch offices will be established in other cities to place its securities. Mark L. Requa and F. W. Bradley, well known in metal mining, are among the directors, indicating that the trend of investment in this State for this year is toward oil rather than metal deposits.

In the McKittrick oilfield in Kern county, there has been more or less trouble with water during the last five years, although not of a serious nature. Plans are said to be under way to remove this water by means of compressed air. The Shamrock well at McKittrick has been producing for eight or more years, and it is estimated that, including the original price of the land and all other costs, the cost per barrel has been only one-sixteenth of one cent. This seems incredible but is vouched for by an old operator.

A record for rapid drilling was made by the Overland Oil Company at its No. 12 well, situated about 12 miles northeast of Bakersfield. The drilling was commenced on Jan. 4, and oil was obtained on Jan. 9 at a depth of 365 ft. A Parker pump was installed and production commenced at the rate of over 40 bbl. per day. One of the Santa Fe wells in the Kern River field is notable for the depth attained, 5050 ft., although no oil was found.

ACTIVITY IN SAN JOAQUIN VALLEY

The region to the west and southwest of Buena Vista lake in Kern county, in the extreme south end of the San Joaquin valley, is now the scene of extensive operations. Here are situated the Maricopa and Midway fields, and a new town, called Taft, has been laid out. A brick hotel is about to be built. The Honolulu gasser has a fine showing of oil at a depth of 2300 ft. On account of the gas pressure some difficulty was encountered in drilling, which was overcome by the use of a rotary drill. Should the Honolulu prove a good producer this may indicate that the whole range of the Buena Vista hills will be profitable oil land, as the formation lies almost unbroken. The Standard, Union, United, Hawaiian, Hamilton and other companies are drilling in this general district. The Standard Oil Company has a contract with the Ethel D. and M. & M. companies for 400,000 bbl. of 19-gravity oil, and with the St. Law-

rence for 500 bbl. daily; and it is also said to be getting 2000 bbl. daily from the Santa Fe 2-6 gusher. So far the Standard is in undisputed possession of this field, but the Producers Association has its pipe line all but completed with storage tanks at Maricopa and will be a competitor of the Standard later.

In the vicinity of Maricopa some of the wells are securing oil at a depth of from 870 to 1200 ft. The Ethel D, No. 1 and No. 2 wells are now both flowing, the former with a daily output of 1000 and the latter with 200 bbl. The Eagle Creek well, although not finished, has been flowing. The Carbo Oil Company has two wells each 800 ft. deep with 275 ft. of oil sand. Each well produces about 100 bbl. per day.

The Associated Oil Company is rushing to completion its pipe line from Coalinga to McKittrick. The line will be 60 miles long, and the McKittrick oil, after arriving at Coalinga, will be transported through the Coalinga-Porta Costa pipeline, now building, to tide water.

The experimental well of El Cerrito, which was sunk to a considerable depth in the Kreyenhagen field, 21 miles in an air line southeast of Coalinga, has been abandoned, and the next well will be bored farther to the west.

Well No. 2 of the Unity Oil Company, about 5 miles northwest of Coalinga, struck a gas pocket at a depth of 630 ft. on Jan. 9. The tools were blown out of the bore high into the air and the gas became ignited. After forming a spectacular blaze for 48 hours the fire was extinguished with steam. It is planned to use this bore as a gas well and sell the gas for fuel. The Silver Tip gusher has settled down to a production of 700 bbl. per day.

In the Salt Lake field at Los Angeles, McDor well No. 1 is continuing its daily production of 350 bbl. The Associated Oil Company, in the extreme eastern part of the field, has wells about 1800 ft. deep, each with a daily product of 50 or more bbl. The total yield of the Salt Lake field is about 8500 bbl. daily.

At Whittier in Los Angeles county, the Murphy Oil Company has one flowing and one pumping well, with a combined daily output of 1300 bbl. The Central Oil Company now has well No. 5 down 3200 ft. and is in productive oil sand. Well No. 52 of this company has been cased off, but will be allowed to flow soon. The oil of the Whittier field is of a superior grade for refining.

Equipment and Practice at Florence-Goldfield Mill

Arrangement of Batteries Facing Each Other Not Commended; Carpet Tried in Place of Amalgamating Tables; High Operating Costs

B Y H. G. M O R R I S *

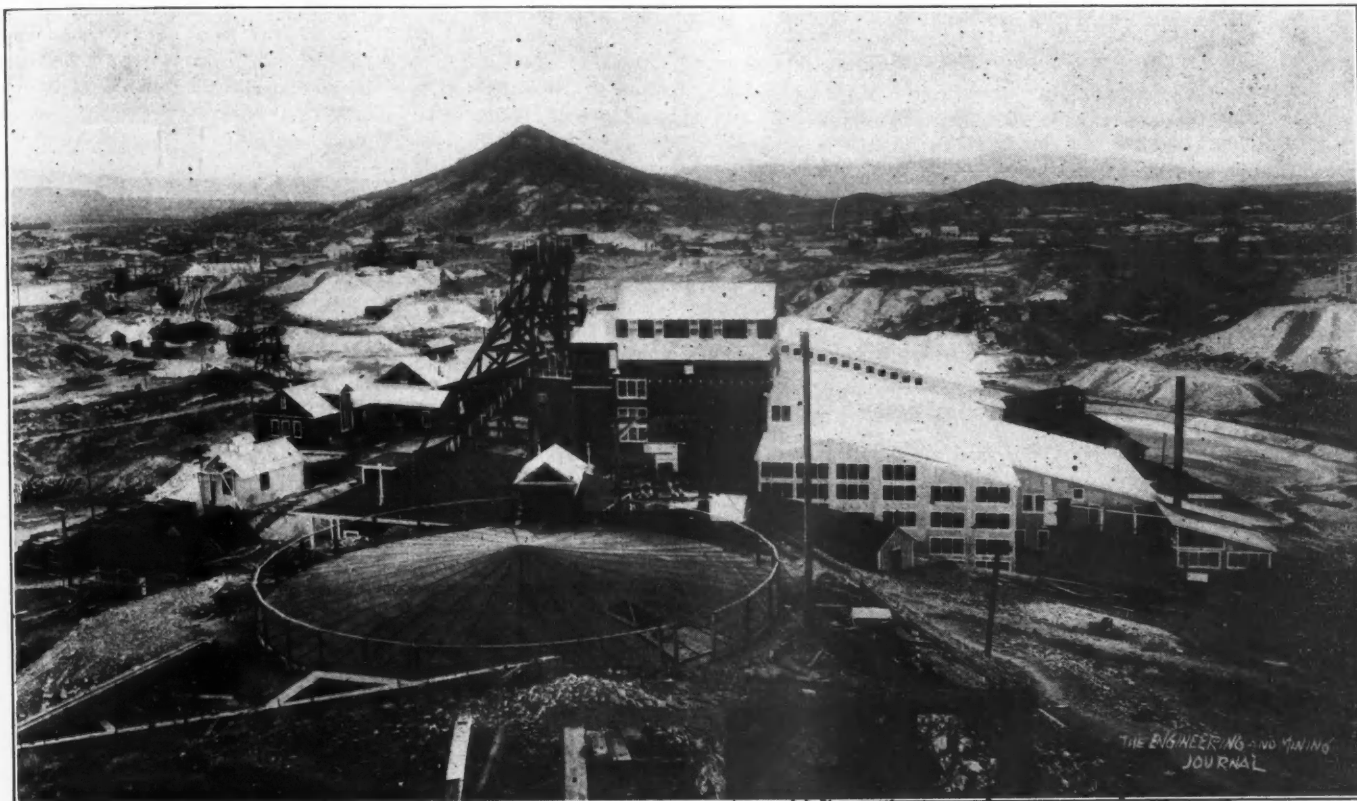
The ore treated at the Florence-Goldfield mill, Nevada, varies from a sulphide taken from the lower levels to a straight oxidized ore from nearer the surface; the mill at times running entirely on either of the above classes of ore and at other times on a mixture. During the early days of the property almost all mining was done by leasers, who in accordance with the terms of their contracts placed all ore assaying \$30 or less in dumps at the disposal of the parent company; these

MILL SITE AND DESIGN

The complete overhauling and remodeling of the mill was carried out by T. G. Lockhart, general manager, and myself as superintendent and chief engineer. It is situated at the collar of the main working shaft, the ore being dumped directly from mine skips into a 400-ton mill storage bin. A temporary aerial tram from the Little Florence shaft also dumps into this bin. Ores are drawn from this storage bin into cars, weighed and dumped

it was not deemed advisable at the time the mill was overhauled to change the arrangement.

The first battery of 20 stamps, made by the Colorado Iron Works, is fitted with Perfect ore feeders, wide inside-amalgamation mortars and 950-lb. stamps having a drop of $5\frac{1}{2}$ in., 108 times per min. The second battery of 20 stamps was made by the Joshua Hendy Iron Works, being fitted with suspended Challenge ore feeders, narrow Treadwell-type mortars,



FLORENCE-GOLDFIELD MINE AND MILL, LOOKING TOWARD COLUMBIA MOUNTAIN

dumps have contributed a heavy tonnage to the mill.

The composition of the ore is approximately 55 to 60 per cent. quartz, 20 to 25 per cent. kaolin and 12 to 15 per cent. alunite, with varying quantities of bismuth, antimony, copper and iron sulphides and occasionally a small percentage of copper oxides. Gold is associated with the sulphides and is also free, the free gold varying from pieces as large as a pin head to particles so fine as to be invisible without the aid of a glass. Varying and small quantities of silver also occur in the ore.

*Formerly mill superintendent, Florence-Goldfield Mining Company, Goldfield, Nev.

on a $1\frac{1}{2}$ -in. grizzly, oversize from grizzly being crushed by a No. 4 Sampson crusher (this crusher has lately been replaced by a No. 4 Gates gyratory crusher). The crushed ore then joins material passing through the grizzly, is elevated and automatically distributed by belt conveyers to two 100-ton storage bins, each of which acts as storage for 20 stamps.

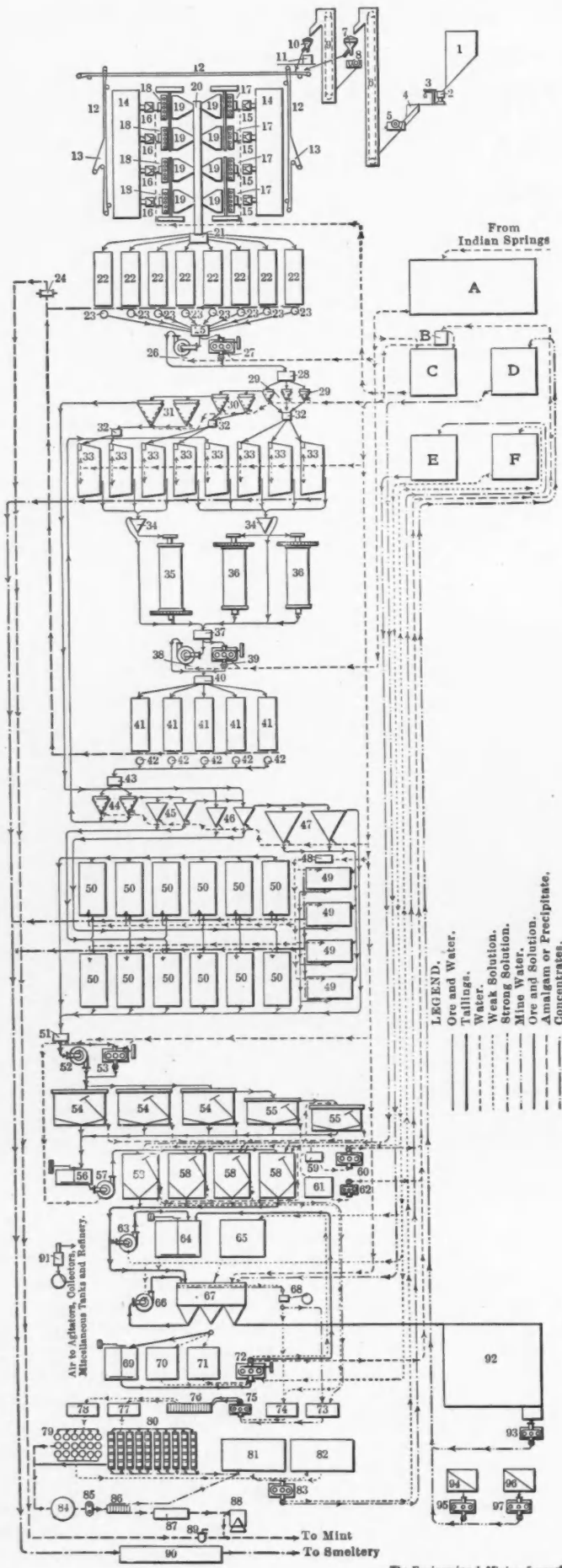
The stamps are installed in two batteries of 20 stamps each, directly opposite and facing each other. Generally speaking, this method of installing stamps is not to be recommended, as it wastes headroom, but as one battery and the foundation for the second was in place,

and 1050-lb. stamps having same detail of drop as the first battery. Screens on all batteries are 16 mesh, No. 22 wire, of the rolled slot type, so woven as to make the long way of the slot vertical when tacked on the frames. Each cam shaft drives 10 stamps, each 20 stamps having a separate line shaft driven by a 50-h.p. motor.

AMALGAMATION UNIT OF MILL

Ore from the batteries is distributed over eight primary amalgamating tables, each 5x16 ft., each table being fitted with $\frac{1}{8}$ -in. copper plates, 48x60 in., electroplated with one ounce silver per square foot. Each table has three drops of $\frac{1}{2}$

FLORENCE-GOLDFIELD MILLEQUIPMENT.



- A—Reservoir, 49x15 ft., cap. 210,000 gal.
- B—Equalizing tank, 5x6 ft.
- C—Water tank, 18x16 ft.
- D—Mine water tank, 20x18 ft.
- E—Strong solution tank, 18x12 ft.
- F—Weak solution tank, 18x12 ft.
- 1—Mine ore bin, cap. 400 tons.
- 2—Mattheson automatic dump car, cap. 18 cu.ft.
- 3—Fairbanks platform scales, cap. 5000 lb.
- 4—Grizzly, 4x6 ft., 1¼-in. openings.
- 5—No. 4 Samson crusher.
- 6—10x6-in. bucket elevator.
- 7—Snyder sampler.
- 8—No. 1 Samson crusher.
- 9—8x5-in. bucket elevator.
- 10—Snyder sampler.
- 11—Sample box and sampling floor.
- 12—3 18-in. belt conveyers.
- 13—2 Stephens-Adamson trippers.
- 14—Butters ore bins, cap. 150 tons each.
- 15—4 C. I. W. Perfect tappet feeders.
- 16—4 J. H. suspended Challenge feeders.
- 17—Four 5-stamp, 950-lb., C. I. W. mortars.
- 18—Four 5-stamp, 1050-lb., J. H. mortars.
- 19—Apron launders.
- 20—12-in. battery launders.
- 21—Distributing box.
- 22—8 Amalgam plates, 5x16 ft.
- 23—8 Mercury traps.
- 24—Cleanup barrel, 24x36 in.
- 25—Sump tank, 2x5x5 ft.
- 26—4-in. Traylor centrifugal pump.
- 27—7x9-in. Aldrich triplex ball-valve pump.
- 28—Distributing box.
- 29—Three 30-in. hydraulic classifiers.
- 30—Two 48-in. hydraulic classifiers.
- 31—Two 60-in. hydraulic classifiers.
- 32—3 distributing boxes.
- 33—8 Card concentration tables.
- 34—Two 60-in. thickening cones.
- 35—5x15-ft. Abbe trunnion tube mill.
- 36—Two 5x14-ft. W. S. M. trunnion tube mills.
- 37—Sump tank, 2x5x4½ ft.
- 38—4-in. Traylor centrifugal pump.
- 39—7x9-in. Aldrich triplex ball-valve pump.
- 40—Distributing box.
- 41—5 Amalgam plates, 5x16 ft.
- 42—5 Mercury traps.
- 43—Distributing box.
- 44—Two 48-in. hydraulic classifiers.
- 45—Two 60-in. Callow cones.
- 46—Two 60-in. Callow cones.
- 47—Two 96-in. Callow cones.
- 48—Equalizing tank with float valve.
- 49—4 No. 3 Delster tables.
- 50—Twelve 6-ft. Frue vanners.
- 51—Sump tank, 4x4x5 ft.
- 52—4-in. Traylor centrifugal pump.
- 53—7x9-in. Aldrich triplex ball-valve pump.
- 54—Three 34x16-ft., 20-deg., cone-bottom collector tanks.
- 55—Two 34x12-ft., 20-deg., cone-bottom collector tanks.
- 56—Disintegrating tank, 18x6 ft.
- 57—4-in. Traylor centrifugal pump.
- 58—Four 18x16-ft., 45-deg., cone-bottom agitators.
- 59—Sump tank, 5x2x3 ft.
- 60—8x10-in. Deming triplex pump.
- 61—Overflow water tank, 18x6 ft.
- 62—4x6-in. Deming triplex pump.
- 63—4-in. Traylor centrifugal pump.
- 64—Butters pulp storage tank, 24x14 ft.
- 65—Butters solution storage tank, 16x16 ft.
- 66—4-in. Traylor centrifugal pump.
- 67—90-frame, 3-hopper Butters filter box.
- 68—Two 14x14-in. Gould vacuum pumps.
- 69—Excess pulp tank, 17x10 ft.
- 70—Excess solution tank, 17x10 ft.
- 71—Excess water tank, 14x13 ft.
- 72—7x9-in. Aldrich triplex ball-valve pump.
- 73—Strong solution gold tank, 18x6 ft.
- 74—Weak solution gold tank, 18x6 ft.
- 75—5x6-in. Aldrich triplex rubber-valve pump.
- 76—36x36-in. 50-leaf, Shriver filter press.
- 77—Strong solution gold tank, 16x6 ft.
- 78—Weak solution gold tank, 16x6 ft.
- 79—18 zinc barrels, 22-in. diam., 25 in. deep.
- 80—10 zinc boxes, 24x24 in. x 16 ft.
- 81—Strong solution sump, 8x24x12½ ft. deep.
- 82—Weak solution sump, 14x24x12½ ft. deep.
- 83—5x6-in. Deming triplex pump.
- 84—6x6-ft. lead-lined acid tank.
- 85—4x6-in. Knowles belted pump.
- 86—18x18 in., 40-leaf Shriver filter press.
- 87—Precipitate drying furnace.
- 88—Fabrè Du Faur furnace.
- 89—Retort furnace.
- 90—Concentrate drying room.
- 91—Leyner compressor.
- 92—Tailings pond.
- 93—4x6-in. Deming triplex pump.
- 94—Engineers' shaft.
- 95—Mine pump.
- 96—Rogers shaft.
- 97—Mine pump.

FLOW SHEET, FLORENCE-GOLDFIELD MILL

in. each. After passing the primary plates the ore is concentrated, reground in tube mills and passes over five secondary amalgamating tables, having the same specifications as the primary tables.

After exhaustive tests lasting over several months, it was found cheaper to operate and a higher extraction was obtained by spreading Brussels carpets over the amalgamating tables, allowing the nap of the carpets to catch the particles of free gold in lieu of the quicksilver. Every eight hours these carpets are removed and run through a box filled with water and containing a series of rollers which remove all particles of free gold and pulp. The residue from this box is then treated with quicksilver in a cleanup barrel in the ordinary way.

[Since this article was written, advices from Goldfield state that the carpet tables have been abandoned and the practice of amalgamating on copper plates again adopted.—Ed.]

CONCENTRATION UNIT OF MILL

After leaving the primary amalgamating tables the ore is elevated by means of a 4-in. Traylor centrifugal pump to a series of double-cone hydraulic classifiers from which appropriate sizes of pulp are drawn for eight Card tables. The entire tailings from the Card tables are then dewatered by using the tables as classifiers and also with the aid of cones set between the Card tables and the tube mills. Thickened pulp from the bottom of these cones is then fed into the tube mills by means of spiral feeders. There are three tube mills, two each 5x14 ft., and one 5x15 ft., their function being to grind all pulp so that 80 per cent. will pass a 200-mesh screen.

After passing through the tube mills the ore is elevated, passes over the secondary amalgamation tables into three double-cone hydraulic classifiers. All oversize is returned from the bottom of these cones to the tube mill, the overflow flowing into Callow tanks where the ore is suitably thickened for concentration on 12 Frue vanners and 4 Deister slimers. Tailings from the vanners and Deisters are then pumped into the settling plant contained in the same building. The rate of concentration varies from 23 to 17:1. The concentrates are sold to local samplers, who reship to smelters.

Tailings from the vanners and Deister tables are pumped into settling tanks by means of a specially constructed, vertical Aldrich triplex pump, which has the advantage of requiring the minimum amount of repairs and by actual measurement taken at this place requires one-half the power used by a centrifugal pump performing the same duties. The special features in the construction of this pump are ball valves, also two rings cut around each pump cylinder just below the packing; these rings are supplied with fresh water which washes all gritty material off

the plunger during each upward stroke, thereby preventing the cutting out of packing and plungers. On the fine-concentrator tailings (80 mesh and finer) this pump gives excellent satisfaction, but on coarser material (30 mesh and finer) the results were not so good.

CYANIDE UNIT OF MILL

All tailings, wash water, etc., from the vanners and Deisters are delivered alternately into one of three redwood settling tanks or collectors, each of which is 35 ft. in diameter by 16 ft. high, fitted with cone bottoms, peripheral-overflow launders, leveling strips and adjustable decanters. From the bottom of these collectors the thickened pulp is drawn by means of 8-in. quick-opening valves and delivered to the agitating tanks to be cyanided. The overflow from the three

The agitating tanks were originally intended for some form of mechanical agitator and the dimensions do not, therefore, conform to those worked out in Mexican and Australian practice, the diameter being too great for the height. This difficulty was effectively remedied, however, by placing an apron around the top of the center pipe so that when the pulp boils over its upper end, it is spread out radially and falls back into the agitating tank midway between center and circumference. The level of the agitating pulp is kept about one foot lower than the upper end of the center pipe.

Cyanide is added to the pulp while in these tanks, and agitation effected with compressed air at 30 to 40 lb. per sq.in. Length of agitation, specific gravity of charge and strength of solution all vary with the ore from the different parts of



FLORENCE-GOLDFIELD MILL AND TAILINGS POND

settlers passes by gravity to two clarifying tanks, 35 ft. diameter by 12 ft. high, fitted in the same way as the aforementioned collectors, the overflow from the last clarifier passing into the water sump. Clear water may at times be drawn directly from the collectors into this water sump by means of decanters. From the sump the water is delivered by a direct-connected triplex Deming pump to the general mill-water supply tank.

There are four agitating tanks, each 18x16 ft. fitted with 45-deg. cone bottoms, 8-in. quick-opening bottom-draw-off valves, decanters, 16-in. center pipes and $\frac{3}{4}$ -in. compressed-air-supply pipes. This style of agitator, modelled after the Paçhuca, is new to this country and is among the first adaptations of Mexican and Australian practice to be installed.

the mine. After agitating a sufficient length of time the pulp is drawn off through 8-in. bottom-draw-off valves and sent by gravity to the Butters 90-leaf filter box.

A 14x14-in. Gould vacuum pump draws the gold-bearing solution through the filter leaves forming a cake 1 in. thick. The solution is delivered to the gold tank from which it is pumped through a 36x36-in. Shriver clarifying press (which is taken down and cleaned every 40 days); from the Shriver press the solution is passed through the zinc boxes. The 1-in. cake of ore formed on the Butters filter after washing is discharged to the waste dump. The gold slimes from the zinc boxes are acid treated in the usual way, dried and melted in Faber Du Faur coke furnaces.

SUMMARY OF COSTS AND EXTRACTIONS

The accompanying table gives the monthly costs and per cent. extraction obtained during the first nine months of 1909.

MILLING AT FLORENCE-GOLDFIELD.

	Cost of Milling, per Ton.	Extraction by Bullion Yield, Per Cent.
Jan., 1909.....		90
Feb. ".....	\$3.042	91
March ".....	2.694	90.10
April ".....	4.099	90.49
May ".....	3.085	90.58
June ".....	4.47	86.40
July ".....	3.90	91.09
Aug. ".....	4.14	90.31
Sept. ".....	3.68	93.21

These milling costs would be considered very high for almost any other place except Nevada; in reality, however, they compare favorably with other plants of this type handling the same tonnage in this section. Some idea of milling costs in southern Nevada may be had from the following: Cost of water per ton of ore treated, \$0.246; power, \$0.796; labor, \$1.231. These figures represent an average month.

Recovery of Flue Dust*

BY CHARLES W. GOODALE†

The friction system, designed for the recovery of flue dust from furnace gases, which was mentioned by Mr. Brunton as having been installed at Great Falls, Mont., has not been in use long enough to obtain a knowledge of its efficiency, but the following explanation of the system will be of interest.

Screening tests on the blast-furnace charges of smelting ore and on the fine concentrate treated in the McDougall furnaces, show a high percentage of fine material, which would naturally be carried into the flues, and at a high velocity of the furnace gases through the flues a considerable loss in dust would inevitably occur.

ARRANGEMENT OF WIRE BAFFLES

Before deciding upon the friction system, a flue was built 300 ft. long, 4.5 ft. high, and 4 ft. wide, through which the furnace gases could be drawn in measured volume and temperature, and at varying velocities. Two tests were made, maintaining a velocity of about 500 ft. per min., and with no obstructions or dust arresters in the flue. The amount of dust was determined per unit volume of gas; then similar determinations were

*Discussion of D. W. Brunton's paper, "Mining and Metallurgy in Western United States," read before the Spokane meeting of the American Institute of Mining Engineers; Bull. No. 37, A. I. M. E.

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made with baffle plates, Freudenberg plates, numerous contractions and expansions, and with wires. It was found that the wires gave nearly as high an efficiency of dust recovery as the baffle plates, and with much less frictional resistance to the passage of the gases. It was then decided to build a dust chamber of such dimensions that the furnace gases would not have a velocity greater than 500 ft. per min., and to fill this chamber with steel wires.

All the furnace gases from the several departments are assembled through individual flues in an uptake in the furnace building. From the top of this uptake a crosstake leads over the buildings and tracks to the dust chamber. The crosstake is 34 ft. wide and 20 ft. high. The main dust chamber is 367 ft. long, 176 ft. wide, 21 ft. high. Steel-wire netting, 1½-in. mesh, is bolted to the I-beams of the roof, and at alternate intersections of the netting wires, steel dust-arresting wires, No. 10 gage, are hooked on, weighing about 1 lb. each and reaching nearly to the floor of the chamber. From the entrance to the chamber, and for a distance of about 150 ft., the space is fully occupied by wires; then comes a length of about 50 ft. with no wires, then 150 ft. filled with wires.

CONDENSATION OF ARSENIC FUMES

In the vacant space, air ducts, both from the basement and the roof, are provided, so that the temperature from that point on can be reduced and the condensation of arsenic effected on the wires. The purpose of this arrangement is to collect, as far as possible, the dust which is carried along mechanically by the furnace gases in the first part of the chamber, which leaves the condensable elements to be recovered in the upper part. Experience has shown that at or below the condensing temperature of arsenic, the wires become heavily coated, and it is therefore necessary to shake them. Provision has been made for this, but the arrangement can hardly be clearly described without a photograph or drawing. The dust chamber is divided longitudinally by a partition wall, and dampers placed at the lower and upper ends of the chamber make it possible to deflect all the gases through either half if it is so desired. Leading from the dust chamber to the chimney, which is 506 ft. high and 50 ft. in diameter at the top, is a flue 1200 ft. long, 48 ft. wide, and 21 ft. high.

In the floor of the dust chamber there are more than 1000 steel hoppers, arranged in 22 lines, and a complete system of tracks enables the dust to be drawn from any hopper at any time. The crosstake is also provided with hoppers, and a hopper crane draws off the dust and conveys it to chutes leading down into the bottom of the uptake, where there are hoppers from which the material can

be drawn into the charging cars for the reverberatory furnaces.

There are 1,215,000 wires in the dust chamber, weighing about 608 tons, and nearly 3500 tons of structural steel in the flue system.

Recording thermometers and pressure gages have been placed at the entrance and exit of the dust chamber and in the flue near the chimney, so that complete information regarding conditions will be available.

The use of wires as dust arresters was patented in Germany by Rösing, who also took out a patent for it in the United States in 1890. The Freudenberg plates used in our experiments were of sheet iron and were suspended parallel with the direction of the flow of the gases.

Shannon Copper Company

The Shannon Copper Company, operating at Clifton, Arizona, has nearly doubled its output in the last five years, having shown a steady increase from 157,316 tons for the fiscal year ended Aug. 31, 1904, to 307,271 tons mined during that ended Aug. 31, 1909. Of the latter tonnage, 186,453 tons were smelting ore and 120,808 were concentrating ore. The income account is shown in an accompanying table.

INCOME ACCOUNT.

17,553.213 lb. fine copper.....	\$2,328,467
1,745 oz. gold.....	34,899
87,116 oz. silver.....	44,496
	\$2,407,862
Copper inventory, Aug. 31, 1909..	321,337
	\$2,729,199
Operation.....	\$2,007,365
Development and exploration....	48,221
Freight, reining and eastern expenses.....	272,671
Copper inventory, Aug. 31, 1908..	316,604
	\$2,644,861
Net profit.....	\$84,338

No detailed statements of mine or mill operations are given, but, as the copper inventories of Aug. 31, 1908, and 1909, are practically the same, and basing an estimate on the output quoted at 307,271 tons of ore, the average recovery seems to have been in the neighborhood of \$7.80 per ton.

New orebodies were found in ground that had been supposed to be barren, and a good grade of ore was developed below the Ore tunnel. The Shannon & Arizona railroad from the mines to the smeltery, about 10 miles, is expected to be in operation about Feb. 1, 1910, when the Shannon company promises to ship at the rate of 1000 tons per day.

A saving of \$45,000 in the item of power was made during the year. A reduction of 32.7c. per ton is reported to have been made in the smeltery, and 14c. in the concentrating plant, but these savings were offset by the fact that 2.57 lb. of copper less per ton of ore were recovered than in the preceding year.

Premier Diamond Mine, near Pretoria, Transvaal

Largest Diamond Pipe in the World Mined by Hand; Estimated That It Can Be Worked by Open Cut to Depth of 1200 Feet

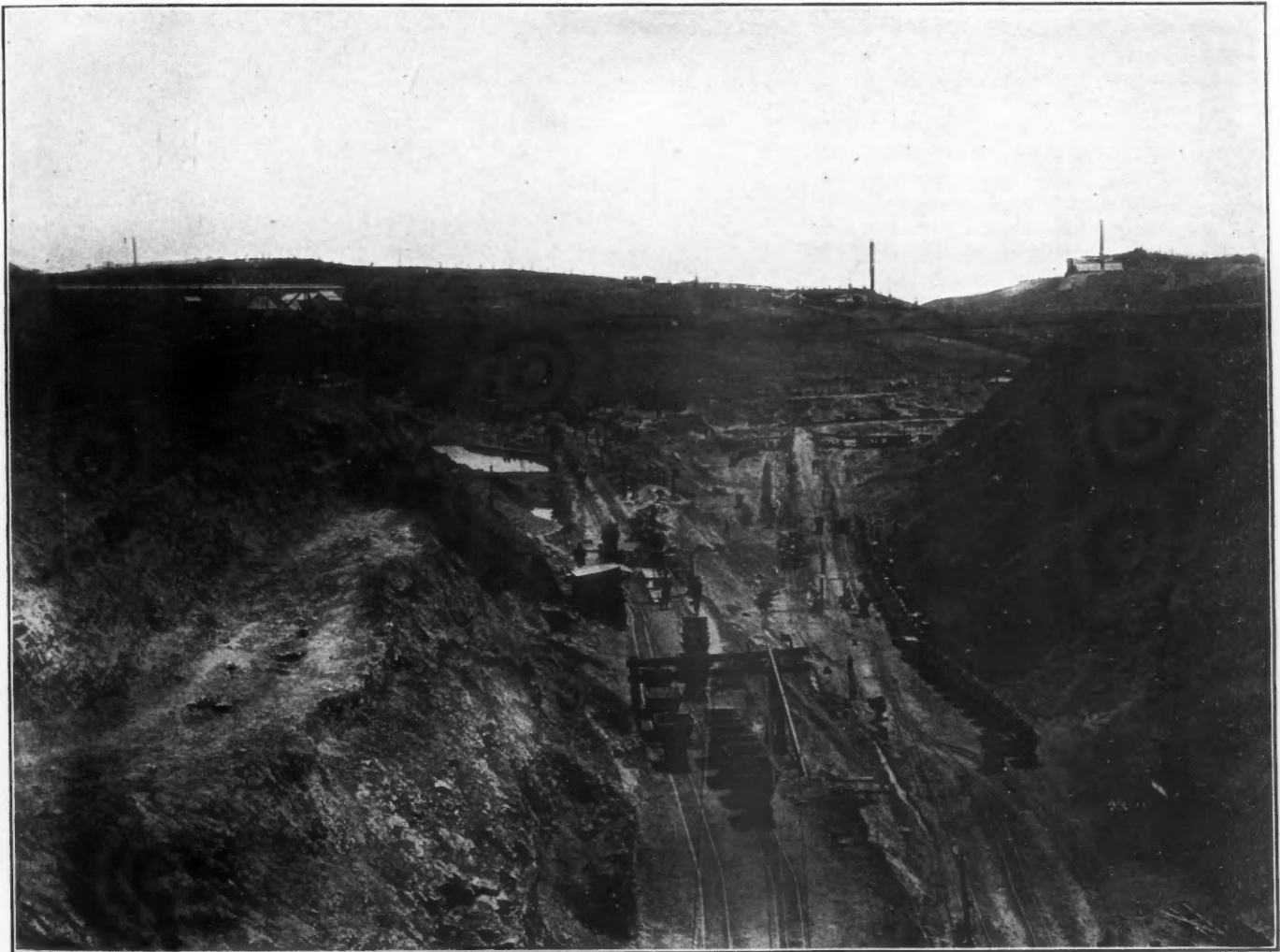
B Y E . M . W E S T O N *

The Premier Diamond mine is situated in the Transvaal, on the high central plateau of South Africa. It is on the farm, Elandsfontein No. 85, about 26 miles east of Pretoria, and near the railway line to Delagoa bay. The original Boer owner evidently named the farm because he saw the eland antelope grazing near a spring (fontein). It lies on the watershed dividing the Elands and Pienaars rivers. The pipe is about 4800 ft. above

leading from this depression; but the owner of the farm, a conservative Boer farmer, refused to allow any prospecting on his farm and would give no option to purchase. He required £80,000 cash. J. M. Cullinan, having reason to believe in the existence of a pipe in the depression, succeeded in convincing others and the farm was purchased. The date of the discovery of the pipe is given as November, 1902.

comparing photograph shows the method of working these terraces. Owing to the large area of the pipe and the hard rock forming the rim, it is hoped to be able to carry open-cut operations down to 1200 or 1500 ft. It is estimated that to this depth (1200 ft.) the contents of the pipe will be 500,000,000 loads of 16 cu.ft., giving a life of 40 years treating 1,000,000 loads per month.

Nine bore holes have been put down



OPEN CUT AND GEARS OF THE PREMIER DIAMOND MINE

sea level, and forms the bottom of a large depression, surrounded by hills of quartzite and sandstone of the Pretoria series and not far from the contact of the red granite of the bushveldt. No other really valuable pipes have been discovered in this vicinity.

Before the war, diamonds had been found in the alluvial bed of a stream

*Mining engineer, 20 St. Mary's building, Johannesburg, South Africa.

The pipe is of an irregular oval shape, about half a mile long by one-quarter mile wide, having an area of 3,561,300 sq. ft., about 78 acres.¹ This area has already been excavated to a depth of about 170 ft. The mine is being worked in open-cut terraces, 50 ft. in height; an ac-

¹The areas of the pipes at Kimberley are as follows: Kimberley pipe, 33 claims; De Beers pipe, 22; Du Toit pipe, 48; Bultfontein pipe, 30; as against area of Premier pipe, 3570 claims.

to depths varying from 300 to 1000 ft., showing diamonds in their cores. Down to a depth of about 80 ft. the blue kimberlite of the pipe was decomposed to yellow ground, covered again by sandy soil and loam. In this upper portion of the pipe a great concentration had taken place, the lighter portion of the gangue having been denuded, leaving a concentrated product rich in diamonds. This, with the fact that some parts of the pipe

are richer than others, accounts for the very high yield given at first and the great decline in grade of the gravel shown in the accompanying table.

EQUIPMENT AND PRODUCTION

The first treatment plant or gear (as it is called in diamond mining) was erected in April, 1903. It consisted of three pans (afterward to be described), one 12 ft. and two 14 ft. in diameter, driven by a 64-h.p. engine. In 1904 was added a second gear of eight pans, 14 ft. in diameter, driven by an 85-h.p. engine. At the end of 1905 the erection of a third gear capable of handling 20,000 loads per 24 hours was begun. This consists of 40 pans, 14 ft. in diameter, arranged in 5 units and driven by two vertical, triple-expansion, condensing engines, each capable of delivering 1500 h.p., one being kept in reserve.

The distribution of the horsepower consumed is as follows: Each unit of pans, 225 h.p.; main haulage line, 250; jigs or pulsators, 50; conveyers, 33; pumps, 160. The electric generating plant consists of two 340-k.v.a. 3-phase alternators, giving a voltage of 5000 to 5300 volts. This current is used for pumping, etc. The No. 3 gear is driven from a main shaft running at 200 r.p.m. The lighting plant comprises two 125-kw. direct-current dynamos. Steam is generated in six Babcock & Wilcox boilers of 3000 h.p., hand fired.

Until the beginning of 1909 these three gears had produced about 1½ tons of diamonds from 24,250,000 loads, treating an average of 27,000 loads per day. The largest diamond found in the world, the Cullinan, weighing about 3025¼ carats was found here. This was presented to the King of England and cut into two brilliants, weighing respectively 516½ and 309 3-16 carats, in addition to smaller stones. Another gear, No. 4, is in course of erection at the side of the No. 3 gear, and this is

weather in vast floors, several miles square, for from three to six months, when the rock became pulverulent and was readily disintegrated in the pan. Only about 17 per cent. then required to be crushed. The flooring operation is, however, an expensive one, necessitating two handlings and two long hauls, while theft has to be guarded against by fencing and the use of 2000-c.-p. searchlights during the night.

At the Premier mine what is known as the direct double-treatment system is used. By this means the cost of treatment is greatly reduced. Very large diamonds are, indeed, liable to be broken up; but very large diamonds are not always easy to dispose of. The shareholders of the company received only £50,000 for the Cullinan stone which was valued

hammer and shovel, and loaded into trucks running on temporary lines parallel to the working face. This method is evidently preferred to that of using large blasts, steam shovels and heavier trains. Native labor is usually easy to obtain as the work is not underground; about 8000 natives and 800 whites are employed in the mine and works.

Trucks are run to one of the branches of the main haulageway, and when they reach the apex of the incline over the treatment plant they leave the wire and gravitate along the bridge over the hoppers, tip automatically over the grizzlies, right themselves and reengage the return wire to the mine. Grizzlies are set 2½ in. apart; the oversize goes to gyratory Comet crushers and then joins the undersize which passes direct to two sets



WORKING FACE OF BLUE GROUND

YEARLY PRODUCTION OF THE PREMIER MINE

Year Ended Oct. 31.	Loads Treated.	Diamonds, Carats.	Value.	Carats per Load.	Per Carat Value.	Per Load Value.	Cost per Load.
					£ s. d.	£ s. d.	s. d.
1903	76,931	99,208	£137,435	1.29	1-7-8	1-15-6	4-7
1904	939,265	749,653	866,030	0.798	1-3-1	0-18-5	2-7
1905	1,388,071	845,652	994,687	0.609	1-3-6	0-14-4	3-3
1906	2,988,471	899,746	1,277,739	0.301	1-8-5	0-8-6	2-5
1907	6,538,669	1,889,986	1,702,630	0.290	0-18-0	0-5-2	2-4
1908	8,058,844	2,078,825	1,536,719	0.258	0-14-9	0-3-10	1-10

divided into 7 units, some of which are working. This will enable the two older gears to be discarded and 45,000 loads per day to be treated in one central plant 200 ft. above the level of the surrounding country, thus giving room for the disposal of over 1,000,000,000 loads of tailings without elevating.

METHOD OF TREATMENT

The original method of treating blue ground, first practised at the De Beers at Kimberley, was to allow the rock to

at many hundred thousand pounds. To deal with the enormous daily tonnage raised from the Premier mine would have required floors of a size quite outside the practical limit, requiring a large capital outlay and locking up a large amount of capital in untreated material. The present grade of the mine would not allow of any such scheme.

The ground is broken in 50-ft. benches by drilling long holes as shown in the photograph. The broken ground is spalled by natives working with pick,

of 4-ft. corrugated rolls, crushing to 7/8 in. From the rolls it is elevated and discharges into hoppers having four chutes, distributing to four top pans of each unit. These pans are shallow circular steel tanks having an inner central discharge. In these revolve circular arms, fitted with triangular teeth set in a spiral. These teeth and the centrifugal force send the heavier deposit containing the diamonds to the outside rim of the pan, while the lighter material flows over the central rim as slime and particles requiring further grinding.

The concentrated material is continuously removed by a patent trap from the outside rim. The concentration effected is about 100 to 1. The central overflow from the top pan passes through a set of 6-ft. smooth rolls set to reduce to 3-16 in., and is retreated in the bottom pans. The tailings pass to elevators and then to the waste dump. The concentrate is

carefully classified in trommels, about five classes being made, and then treated on pulsators. These are simply jigs, adapted to deal with this material. These jigs reduce the bulk of the concentrate about 75 per cent., leaving about 70 loads of enriched concentrate per day.

THE GREASE TABLE

Before the invention of the grease table

grades, if necessary, boiled in nitric or hydrofluoric acid, and then go to the valuer. The tailings from the grease table are reground in a tube mill, passed over a pulsator and sorted by hand. As shown in an illustration none of the gears are roofed over, the general mildness of the climate permitting this. Overhead electric traveling cranes quickly make repairs and renewals.

900 ft. long, across the Wilge river and the installation of a pumping station containing four triple-expansion pumps, capable of pumping 4,000,000 gal. per day through a line of 20- and 21-in. pipe, 23 miles long, under a head of about 500 ft. The cost of water delivered at the mine is about 2d. per 1000 gallons.

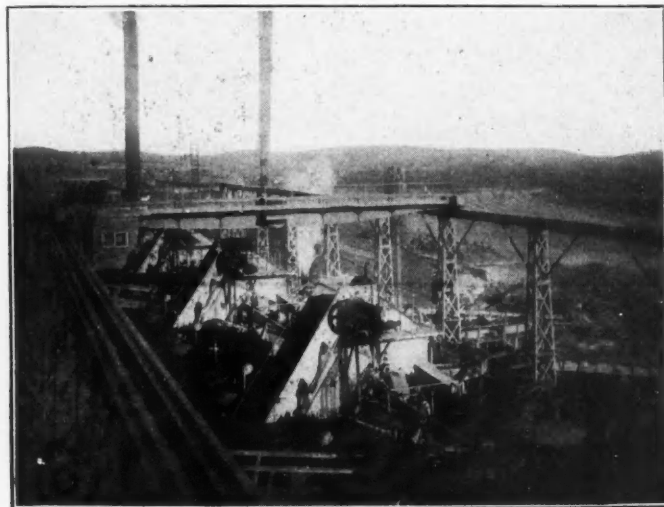
Before the discovery of the Premier mine, the De Beers company had a mo-



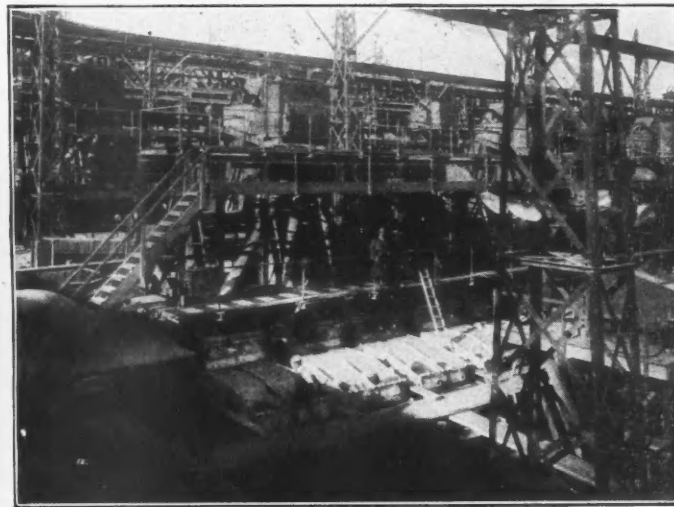
FACE OF NO. 1 WORKINGS



WORKING BENCHES AND HAULAGE STATION



WASHING PANS AND OVERHEAD CRANES



VIEW OF GEAR SHOWING PULSATORS

by Kirsten, of Kimberley, this large residue had to be sorted first by whites on tables and afterward by natives. Kirsten's discovery was that grease had a selective affinity for diamonds and other precious stones. To take advantage of this a stepped panning table, having a side panning motion, is employed. The diamond-bearing material is fed to this table and most of the stones adhere to the grease. This is scraped off every few hours and treated first by boiling in water, when the grease rises to the surface and is collected and used again.

The diamonds are cleaned in hot caustic soda solution, sorted into sizes and

GOVERNMENT CONTROL

Under the diamond ordinance of the Transvaal, the government is entitled to 60 per cent. of the profits of the company, after capital costs have been prepaid. In practice this means that the government owns a controlling interest in the company. The law allows the government to take 60 per cent. of the area of the pipe, but the government permits this company to work the whole mine under the above arrangement. Capital cost has so far been in the neighborhood of £1,750,000, and has included a large water-supply scheme, involving the construction of a concrete weir, 20 ft. high and

nopoly of the diamond market and could regulate the production to suit the demand. The advent of the Premier mine, and to a lesser degree of the Voorspoed and Roberts Victor mines in the Orange River Colony, has, however, altogether altered the situation. The 5,000,000 to 6,000,000 carats produced by the Premier, together with the depression of trade in America, has already produced one crisis in the diamond market.

What the future will bring forth is hard to calculate. The directors of the Premier mine have built up a reserve fund of £400,000 and are committed to the policy of large production for the reason

that, owing to the low grade of the mine and the low value per carat of the diamonds, averaging now about 12s., the mine must be worked on a large scale to pay. The future yearly production is estimated at about 3,000,000 carats; the bulk of this, however, is composed of stones of poor quality which do not affect the price of the really fine stones to any great extent.

The Voorspoed mine in Orange River Colony has a pipe of an area of 805 claims (30x30 Cape ft.). The yield of diamonds averages 16.60 carats per 100 loads. Two gears are soon to be at work, treating a total of 9000 loads per day at a cost of 1s. 6d. per load, so that this mine alone will yield about 400,000 carats per annum. Large diamond pipes are being developed near Bembesi, Rhodesia, and a large production from marine or acolian deposits has been started in southwest Africa in German territory; diamonds have also been discovered in Tan-

brought ruin to the market; but with such a low-grade mine this policy is forced upon the company. Owing to the expansion of the gold industry and the revival of agriculture and other industries in South Africa, even the diamond mines are feeling the shortage of labor and the new gear on the Premier mine is not fully employed owing to this shortage. The gold mines are now 50,000 natives short of requirements, and as much as £5 per head is being offered for natives on a nine months' engagement.

To an outsider the Premier mine seems to offer a splendid opportunity for the employment of modern American methods of handling ground with a minimum of labor, such as are employed in the Mesabi iron ranges, and shortage of labor should not, apparently, stand in the way of any production desired, though perhaps the already large expenditure of capital would be unduly swelled by any such change in methods. A single steam

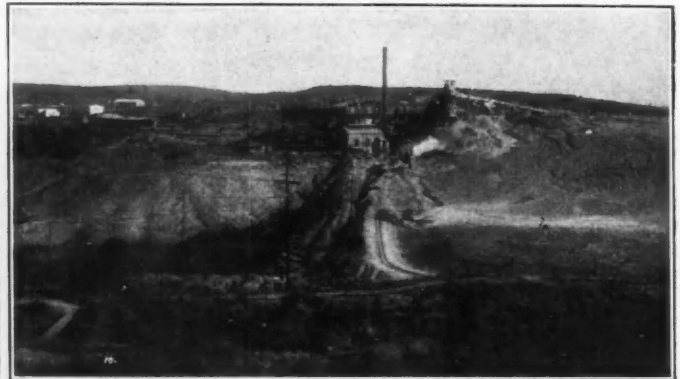
The costs were £4 16s. 8d. per ton of lead concentrates, and 18s. 6d. per ton of zinc concentrates; the recoveries being 74.7 per cent. of lead in the lead concentrates and 85.5 per cent. of the zinc concentrates.

Of the total production, 19,464 tons of lead concentrates were smelted at Cockle creek and 20,600 tons were sold locally. Practically the whole of the zinc concentrates was sold. At Cockle creek lead concentrates have been smelted, but the distilling of zinc concentrates has been suspended owing to results (in consequence of the reduced value of the lead and silver in residues) being less favorable than those obtainable by selling.

The directors report that a suit has been commenced against this company by the Ore Concentration company, in which a claim is made for damages, and for an injunction, on the ground that the flotation processes used by the corporation at Broken Hill are an infringement of cer-



GENERAL VIEW OF OPEN WORKINGS



NO. 2 GEAR, PREMIER DIAMOND MINE

ganyika near the copper mines. Should certain dredging enterprises in Brazil succeed, the output from South America may increase. All indications point to an enlarged output in the future, and the question must be faced: can the world absorb an increasing production?

DIAMONDS ALWAYS IN DEMAND

Diamonds are almost indestructible and do not suffer from wear, so that the demand must depend on the general state of the world's wealth. This is increasing and must increase, and there is no reason to anticipate that the fascination the gem has always exercised over the feminine mind is going to grow less. Could the public be given any of the benefit of the reduction of price, the diamond would tend to displace some of the cheaper and more popular gem stones. But the price of large diamonds appears to have little relation to the retail price of manufactured jewelry.

Had the grade of the Premier mine remained at a figure near what was at first anticipated, no doubt the company's policy of large production would have

shovel, loading into a truck constructed as a side-discharge hopper, running on the same rails as the shovel and having numerous doors to allow the loading of the present small trucks, would not be a very expensive experiment should labor continue to be scarce.

The Sulphide Corporation, New South Wales

The Sulphide Corporation, of New South Wales, reports a profit for the year ended June 30, 1909, of £153,382. The new mill has justified expectations and the tonnages, costs and recoveries in this plant have shown important improvements. The tonnage of crude ore treated was 195,332, from which a production of 42,354 tons of lead concentrates carrying 32.3 oz. silver and 60.1 per cent. lead, and 67,981 tons of zinc concentrates carrying 16.6 oz. silver, 11.4 per cent. lead and 42.5 per cent. zinc were obtained.

tain Elmore patents. As the action on similar grounds taken in England against the Minerals Separation Company, whose processes the Sulphide Corporation are using, had recently been decided by the unanimous judgment of the House of Lords in favor of the Minerals Separation Company, the directors of the Sulphide Corporation feel no anxiety about the result of the Australian action, even if it should be further continued.

The new mill treated 195,332 tons. In the lead section the product was 42,354 tons of lead concentrates assaying 60.1 per cent. lead and 9.9 per cent. zinc, and 152,978 tons of byproducts. The zinc section treated 157,907 tons, obtaining 67,981 tons of zinc concentrates carrying 42.5 per cent. zinc and 11.4 per cent. lead, and 89,926 tons residues. The recovery of both sections combined was 94.8 per cent. silver, 97.5 per cent. lead and 89.5 per cent. zinc. There has been a marked improvement in grade of products which was secured concurrently with a considerable reduction in working costs.

The London Copper Market in 1909

In January following the holidays an active business was done with consumers. Similar activity was reported from New York, where cheap parcels of refined were readily absorbed, and producers were at length able to realize the prices for which they had been holding. Predictions of expanding trade had been freely uttered for months past, and the outlook was generally regarded as hopeful. The official market opened Jan. 4, with cash standard at £63 17s. 12d., and three months' at £64 12s. 6d. Disquieting political news, general weakness in the stock and share markets, and some stringency in finance resulted in a persistent decline in copper throughout the month, which completely falsified the hopeful predictions. The month closed at prices lower than had been known since the previous July, £58 5s. for cash standard, and £59, 26s. 6d. for three months'.

February opened inauspiciously, with weakness in the stock and share markets and general depression in trade. Leading producers of the metal, finding the trade unresponsive at recent level of prices, reduced the price of electrolytic without attracting any large volume of business. The immediate result on the London market was a drop to £58 5s. for three months' standard warrants. The American market was further disturbed. In the prevailing discouragement refined copper was offered very freely, but response from the trade was meager and confined mostly to a few German manufacturers. The lowest for standard copper was touched on Feb. 26 when cash warrants were sold at £55 17s. 6d.; and the official market closed on that day with cash warrants £56, and three months' £56 15s.

March started with a sharp advance, prompted by improved political outlook in Europe and recovery in New York from the lately prevailing disquietude. Reports were also current of large quantities of the metal marketed in America. Speculative enterprises subsided, and American producers found it necessary to make some concessions in price in order to attract their home consumers. Late in the month large sales of American copper to Europe imparted additional strength to the London market where—on March 29—4000 tons changed hands, chiefly to cover bear sales. Prices then stood at £57 for prompt standard, and £57 13s. 9d. for three months'; and the month closed with a firm market thereat.

April on the whole was uneventful. At the outset there was active covering of bear sales, whereby the three months'

price was raised to £58 5s. An immediate reaction followed. By April 8 speculative interest had subsided and the tendency was weak in consequence of unsteadiness in the New York markets; values of standard being £57 1s. 3d. for cash warrants and £57 13s. 9d. for three months'. After the Easter holidays increased activity was prompted by publication of the American Producers' statistics, revealing a substantial increase in production but also a greatly increased volume of deliveries. The actual improvement in trade generally was insignificant in Europe, and more particularly in the United Kingdom where consumers remained reserved. The market was dominated by the speculative element and closed strong, in sympathy with bullish advices from Wall Street, at £57 12s. 6d. for cash warrants, and £59 7s. 6d. for three months'.

In May statistics disclosed an unexpected reduction of 1269 tons in the visible supply. The consuming industries in Europe showed some welcome signs of revived activity, chiefly manifest in electrical work in Germany as also in improved demand from English engineers and shipbuilders and substantial orders from India. Prices eased somewhat at the close in consequence of profit-taking coupled with some bear selling, but the undercurrent appeared strong. Final values were £60 17s. 6d. for cash standard, and £61 13s. 9d. for three months'.

June opened with every indication of a strong market, £62 being freely paid for three months' standard, but a few hours sufficed to initiate a pronounced relapse due to selling pressure of a very aggressive character. There was great activity, the speculative interest broadening, while trade orders were on a larger scale than had been seen for a long time previously. The situation, however, was obviously artificial and lacking consumers' support. The turnover on the London market during the month was unusually large, but it moderated toward the close.

In July fortnightly statistics disclosed an increase of 5118 tons in the visible supply, due mainly to heavy imports from Japan, Chile and Spain, and particularly from the United States. Speculators were accordingly encouraged to support the London market, though consumers remained distrustful and several tired holders liquidated their commitments. The tendency in copper was optimistic until July 23 when the three months' price touched £60 13s. 9d., at which point support was withdrawn. The market became listless and closed at £59 5s. for three months'.

In August business was resumed with

an initial advance of 10s. per ton which, however, quickly lost 5s.; and the market remained thus almost unchanged for several days. European trade was disappointingly dull, but prices were well maintained by optimistic reports from America. On Aug. 12 three months' warrants touched £61 10s., after which values relapsed by about 10s. as a result of realizations which, however, were well absorbed. The market was subsequently weakened by some unsteadiness in American finance, whereby the three months' price was lowered to £60. Closing prices were £59 15s. for cash warrants, and £60 13s. 9d. for three months', the market being rather quiet after recent activity, but with a firm undertone inspired by evidence of improving trade.

In September statistics for second half of August disclosed an increase of 7366 tons in the visible supply, which gave the market a shock, reducing values by about 15s. at the opening; but outside influences were sufficiently favorable to arrest further decline for a while. Speculative interest, however, gradually subsided, and industrial demand was eagerly satisfied by dealers, so that the tendency was gradually downward. The American Producers' statistics revealed an increase of 5625 tons during August, which naturally caused further weakness: lowest prices being touched on Sept. 13 when £58 2s. 6d. was accepted for cash standard. The highest prices of the month were paid on Sept. 22, £59 10s. for cash, and £60 7s. 6d. for three months; liberal offerings being well absorbed. At this point a break occurred, prompted by heavy reselling; but consumers' orders were important enough to arrest any serious decline. Closing prices were £59 6s. 3d. for cash standard, and £60 2s. 6d. for three months'.

In October an increase of 3464 tons in the visible supply discouraged buyers at the outset. Prices fell daily until—on Oct. 6—£57 11s. 3d. and £58 10s. ruled for cash and three months' respectively. The reduction brought out some fair trade orders. After some depression sentiment changed, influenced by better support from the consuming industries and by more encouraging advices from America; and speculative interest quickened and broadened up to the end of the month when cash warrants commanded £57 11s. 3d. per ton, with £58 15s. for three months'.

November was an eventful month. Statistics for second half of October showed the visible supply increased to 99,357 tons, which induced heavy selling whereby prices were forced down until

three months' standard touched £58 3s.9d. There was then a slight recovery due to sustained purchases made in view of the persistent reports of favorable negotiations proceeding among the leading American producers, and in spite of equally persistent denials thereof from interested quarters. The advance in price induced a large volume of speculative realization which eased values. On Nov. 22 the advance was suddenly checked by the decision of the court adverse to the Standard Oil Company

and to commercial trusts generally, which was thought to be inimical to the projected scheme of the copper producers. A further relapse ensued, but was partly recovered on the last day of the month, when standard stood at £58 12s. 6d. for cash, and £59 15s. for three months'.

December started with a weak market in the absence of active speculation and pending further enlightenment concerning the American situation. Prices were steady, however, round about £58 7s. 6d.

for cash standard, and £59 10s. for three months', further fall being arrested by early news of large American purchases for consumption and by an improved demand from European consumers. A revival in the electrical trade in Germany contributed to the general improvement, as also did the publication of the American Producers' statistics. Business diminished in volume as the Christmas holidays approached, but with no diminution of the pervading confidence in the general commercial outlook.

Mining Stocks on Various Exchanges in 1909

In the accompanying tables are given the sales of stock of mining and metallurgical companies during 1909 on the New York Stock Exchange, Boston Stock Exchange and on the Boston curb market, together with the high, low and closing quotations. The table of the Boston curb stocks includes only the most active securities and those not already published in the New York curb market table in the JOURNAL of Jan. 15. The Boston Stock Exchange table does not include those stocks also listed on the New York exchange.

New York Stock Exchange transactions amounted to 19,993,303 shares of mining and metallurgical stocks exclusive of sales of United States Steel; the Boston Stock Exchange recorded the sale of 8,095,071 shares; and on the Boston curb market, 20,176,873 shares of stock and \$321,065 in bonds were traded in.

MINING STOCKS ON THE NEW YORK STOCK EXCHANGE IN 1909.

	High.	Low.	Close.	Total Sales.		High.	Low.	Close.	Total Sales.
Amalgamated Copper	96½	65	90½	9,344,636	National Lead, pfd.	113½	102½	110	43,010
Amer. Sm'ting and Ref.	105½	77½	103	5,244,320	Newhouse Mines and Smelters	6	1½	3½	243,112
American Sm'ting and Ref., pfd.	116½	101	112½	199,450	Ontario	5½	2	2½	16,504
Amer. Smelters Securities, pfd., B.	92	80	90	87,380	Phelps-Dodge & Co.	200	200	200	465
Anacosta	54½	37½	54½	979,815	Quicksilver	9½	1½	3½	112,246
Batoplias	5½	2½	3	71,866	Quicksilver, pfd.	10	3	4	33,955
Colo. Fuel and Iron	53	29	49	1,496,670	Tennessee Copper	49	33½	40½	301,845
Colo. Fuel and Iron, pfd.	115	67	115	4,320	U. S. Red. and Ref.	17½	10	11	17,900
Federal Min. and Sm'ting	95½	55	82	4,610	U. S. Red. and Ref., pfd.	39½	24	28½	14,255
Federal Min. and Sm'ting, pfd.	94	80	89½	26,792	U. S. Steel	94½	41½	91	34,133,822
Granby Consolidated	110½	91	110	28,438	U. S. Steel, pfd.	131	107	125	1,349,453
Homestake	93	73	80	6,854	Utah Copper	67½	39½	60½	803,403
National Lead	94	71½	89	883,164	Virginia Iron, Coal and Coke	75½	57	73½	23,028

MINING STOCKS ON THE BOSTON STOCK EXCHANGE IN 1909.

	High.	Low.	Close.	Total Sales.		High.	Low.	Close.	Total Sales.
Adventure	10½	4½	6½	78,286	North Butte	85½	47½	50	1,211,197
Allouez	62½	33½	58	40,058	Old Dominion	59½	47½	55	88,360
Atlantic	18	8	11½	96,282	Osceola	170	123½	164	30,508
Boston Consolidated	23½	10½	22	295,276	Parrot	36½	26	20½	135,698
Boston & Corbin	24	17½	23½	145,134	Quincy	96	83	90½	12,093
Calumet & Hecla	690	585	680	3,260	Shannon	18	13½	17½	171,902
Centennial	44½	28	38	62,455	Superior	67	34	65½	167,073
Copper Range Consolidated	86½	68½	84½	218,863	Superior & Pittsburg	18½	12½	16½	135,844
Daly-West	12	7½	9	29,373	Tamarack	90	62	68	18,027
Franklin	19	13	18½	154,595	Trinity	17½	9½	11	79,760
Greene Cananea	14½	8½	11½	569,605	United Copper, Com.	16½	7½	8	7,894
Isle Royale	33½	22½	28½	176,460	U. S. Oil	39½	28	37½	107,507
Lake	74½	16	72½	510,202	Utah Cons.	49½	37½	46	136,782
Mass Mining	18½	4	6½	206,331	Victoria	6	3	5½	30,134
Michigan	13½	5½	7½	43,650	Winona	13½	4½	12½	102,413
Miami	28½	12½	28½	367,468	Wolverine	158	139	150	3,923
Mohawk	70½	57½	69	60,383	U. S. Smelting	59	39	54½	628,243
Nevada Consolidated	30	16½	27	120,023	U. S. Smelting, pfd.	54	44	53	186,005

TRANSACTIONS ON THE BOSTON CURB MARKET IN 1909.

	High.	Low.	Close.	Total Sales.		High.	Low.	Close.	Total Sales.
Ahmeek	245	135	225	3,119	Gold Prince	0.05	0.01½	0.05	3,200
Arizona & Michigan	1½	0.40	0.44	28,497	Gold King	1½	0.06	0.06	10,930
Arizona	1½	0.10	0.55	108,989	Hancock	14½	11	11½	2,590
Barnes King	0.87½	0.85	0.85	1,200	Hassayampa	0.20	0.05	0.10	72,023
Beaver Carbonate	1½	1	1	33,920	Helvetia (paid)	7½	4½	6½	62,161
Begole Syndicate	21½	1½	3	26,945	Indiana	9½	5½	8½	46,590
Bingham-Central-Standard	0.4	0.25	0.34	23,385	Keweenaw	5½	4½	4½	2,505
Bingham Mary	0.12	0.04	0.05	1,950	Laramie-Hahns Peak	1½	0.74	0.99	79,690
Bingham Mines	4½	2½	3½	14,949	Mollie Gibson	0.36	0.18	0.23	70,535
Black Mt.	3½	0.50	0.50	49,536	National Mining	0.83	0.26	0.62	1,036,149
Boswycolo	0.11	0.07	0.08½	284,090	Nevada-Douglas	4½	2	2½	38,011
Bullfrog Mining	0.20	0.03	0.05	158,980	Nevada-Utah	3½	1	1½	231,293
Calaveras	6	3½	5½	15,640	Ojibway	14½	12	13½	11,974
Cactus Development	6½	2½	6½	74,020	Oneco	3½	0.75	3	37,040
Calumet & Corbin	3½	0.29	1	58,905	Raven (full paid)	0.80	0.56	0.70	32,467
Champion Copper	0.35	0.05	0.12	471,600	Ray Central	4½	2½	3½	145,940
Chemung Mining (\$9 paid)	23½	13½	15½	11,176	R. I. Coal	12½	3½	12½	337,011
Chemung Mining (full paid)	18½	15½	16	2,423	Shattuck & Arizona	23	15½	23	3,185
Chief Cons.	2½	1½	2½	225,110	Superior & Globe	1½	0.75	1½	32,723
Corbin Copper	11	4½	8½	117,777	Vulture	9	5	8½	236,345
Eagle & Blue Bell	1½	0.50	0.75	5,445	Western Utah	2½	1½	1½	2,000
Globe Consolidated	7½	4	4	8,245	Yuma	3	1	2½	118,585

Ore Dressing in the Coeur d'Alene—V

Heavy Construction and More Compartments Recommended for Jigs.
Attrition Losses Heavy. Explanation of High Lead Content of Middlings

BY EDWARD S. WIARD*

In the four instalments of this paper treating the subject of ore dressing in the Coeur d'Alene district of Idaho I have covered the subject up to and through the sizing of ore in trommels. A discussion of the types of jigs used in the Coeur d'Alene and the general jigging practice obtaining, is next in the logical sequence of topics to be considered.

FRAMING OF JIGS LIGHT—HOPPER BOTTOMS NOT USED

Fig. 1 shows the usual type of Coeur

the jig, thus effecting a considerable saving in the floor heights.

Coeur d'Alene jigs are almost universally flat bottomed. When run with the hutch discharging intermittently this product forms a bed of varying depth and with a level top surface. The action of the jig keeps the surface perfectly level. On the down stroke of the plunger the water encountering the flat surface tends to form eddies and rises through the screen with velocities varying from point to point. When foreman of the Last Chance mill I attempted to put in the jig

the slats of the screen frame may be made lighter and more widely spaced, thus compensating somewhat for the loss of area of opening. Furthermore the punched plate does not blind so readily as the cloth, is more readily freed from clogging grains by the scratching tool, and is little damaged in the operation of scratching.

JIGS HAVE TOO FEW COMPARTMENTS

In Richards' work¹ on ore dressing will be found a vast amount of data on the dimensions, fittings and mode of operation

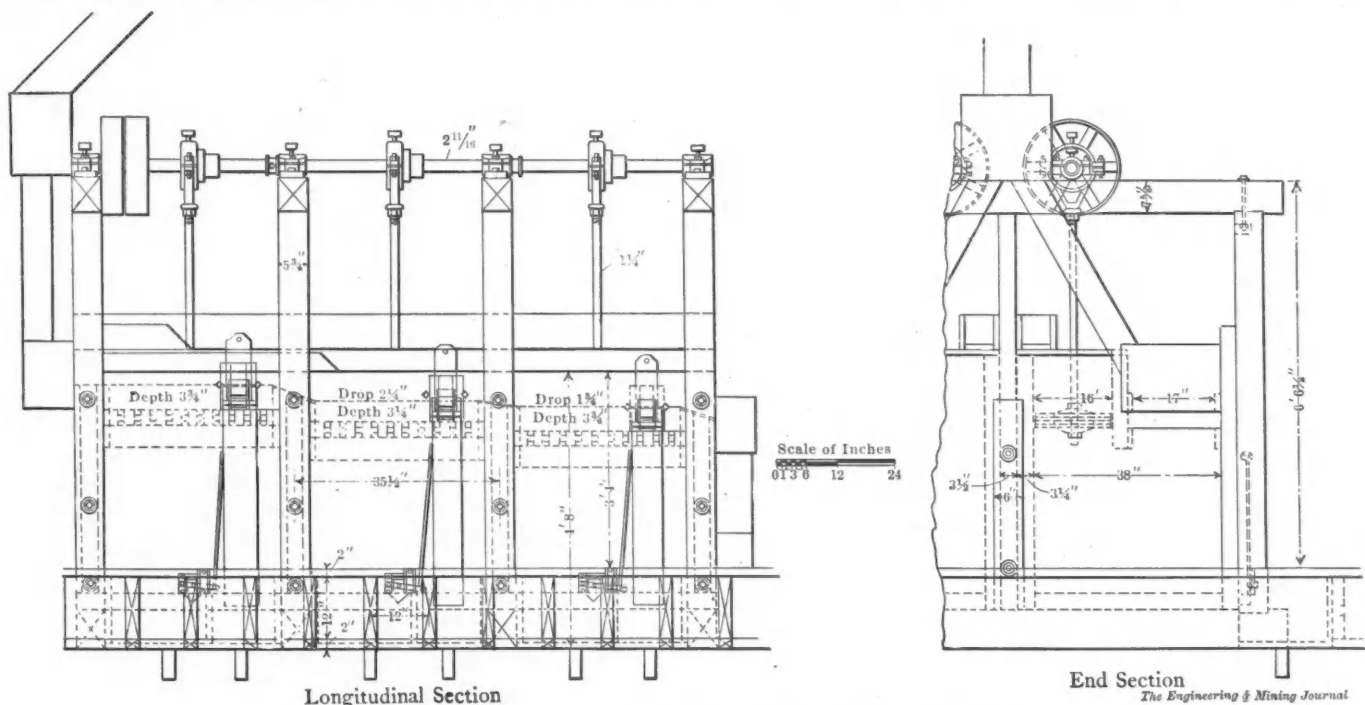


FIG. 1. DETAILS OF JIGS USED IN COEUR D'ALENE MILLS

d'Alene jig. Some criticism of this particular design can be made. For example, the posts and caps are very light and the mode of securing the caps to the posts is not as good as having a long tie rod pass through the cap and sill. In a great many mills all over the continent the sills of the jigs are set on the floor, but this makes a towering construction the bed of which can only be reached by climbing on a foot board secured to the side. I have introduced Fig. 1 to show how the Coeur d'Alene jigs are installed so as to bring the bed to a convenient height above the jig floor. The sill timbers of the jig rest directly on the mill timbers and the floor is built about

*Mining engineer, Denver, Colo.

boxes hoppers sloping from the plunger side of the jig to a point near the hutch-discharge orifice, the slope of the inclined boards being between 30 and 35 deg. In putting in these hoppers rods were freely used. Nevertheless the project was a failure, for a few day's operation of the jigs loosened all the false construction and necessitated shutting down the jigs to remove the floating lumber. I concluded that to keep a hopper in place it must be framed in the jig box when the machine is built. In constructing Harz jigs the heaviest and stanchest construction will speedily pay for itself. Punched plate for jig screens is gaining in favor in the district. While the area of opening is less than with screen cloth it is so much stiffer that

of jigs and this includes much information regarding the Coeur d'Alene. It seems unnecessary for me to publish any of my notes on these points, and I will therefore devote the remainder of this section to discussing what I consider a serious fault of the Coeur d'Alene Harz jig practice, i.e., the lack of a sufficient number of jig compartments devoted to making middlings.

The greater part of the work of experimenters in jigging has been done with pure or very nearly pure mixtures of minerals. Jarvis reports in his paper² on jigging that "the results indicate that in order to separate sphalerite and quartz,

¹"Ore Dressing." Richards. 4 vol. McGraw-Hill Book Company.

²Trans. A. I. M. E., XXXVII.

a jig of at least three compartments should be used; since smaller differences in the specific gravity of these minerals require a longer time to effect the separation. In the case of a heavy mineral, such as galena, one or two compartments will effect a perfect separation." I agree to this statement provided the word pure be used before each mineral name, or, in other words, if the test ore comes from narrow seams of pure ore in a pure gangue. Unfortunately ore seldom occurs this way.

At Wardner the orebody is typically an aggregate of fissures the centers of which are nearly pure galena. From the centers out on either side the percentage of galena gradually lessens until finally unmineralized quartzite is reached. The centers of the seams yield ore which could be sorted out underground. Next to this zone is ore which could be sorted out in a surface picking plant or yield coarse concentrates; then follows a jig-middlings zone and finally a tailings zone. The error of too few compartments for middlings is best seen in the two-compartment bull jigs which make middlings as well as tailings.

In Fig. 2, I have attempted to represent the distribution of the lead in 100 lb. of bull-jig feed which assays 8.53 per cent. lead. I have made the curve of the diagram in broken lines for simplicity in calculation. For each per cent. the abscissas show the number of pounds of material; for example, there is 0.25 lb. of 40 per cent. ore, 0.75 lb. of 20 per cent. ore, 0.06875 lb. of 67 per cent. The sum of these abscissas equals 100. The area bounded by the broken lines and the vertical and horizontal axes also equals 100. The area of any particular part of the diagram will furnish the number of pounds of material in that part; for example, there is 5 lb. of material from 40 to 80 per cent. Suppose it is desired on the bull jig to make a 50 per cent. concentrate, then out of the 100 lb. of feed it will be necessary to remove all the ore from 80 to 36 per cent. grade inclusive. This will amount to 6.375 lb. of concentrate having an average specific gravity of 5.7, the original ore having a specific gravity of 3.46.

In calculating specific gravities I have assumed the galena in each piece of ore of a specific gravity of 7.7 and the gangue material of 3. At Wardner the country quartzite is largely replaced by siderite of specific gravity 3.9 to 4.2. Passing into the second compartment there will be 93.625 lb. of ore containing 5.7 per cent. lead and having an average specific gravity of 3.30. The specific gravity of the heaviest grain entering this compartment will be 4.9. By making the concentrate of little lower grade it would be possible to make the richest grain passing into the second compartment of a specific gravity of 4.2 which

according to Dana is the specific gravity of the purest sphalerite. I feel inclined at this point to make the statement that if three compartments are necessary for sphalerite four are necessary for galena. At the bottom of the diagram I have cross hatched an area which shows graphically the material of 2 per cent. and lower grade. The average grade in this block is 0.78 per cent. lead and the weight as shown by the diagram 50.092 lb. I will assume that out of the original 100 lb. of feed this weight and grade of material is the tailings or

percentage of the material entering the second compartment. In the third compartment, or second middlings compartment, the 5.5 to 2 per cent. grains would reach the screen much more quickly than if there were but two compartments; and once on the screen they would be in the positions least affected by the forward motion of the ore and water in the compartment. There is of course a creep of the lower or middling layer toward the tail board in both the two- and three-compartment jigs. This creep with the ore under discussion would be greater

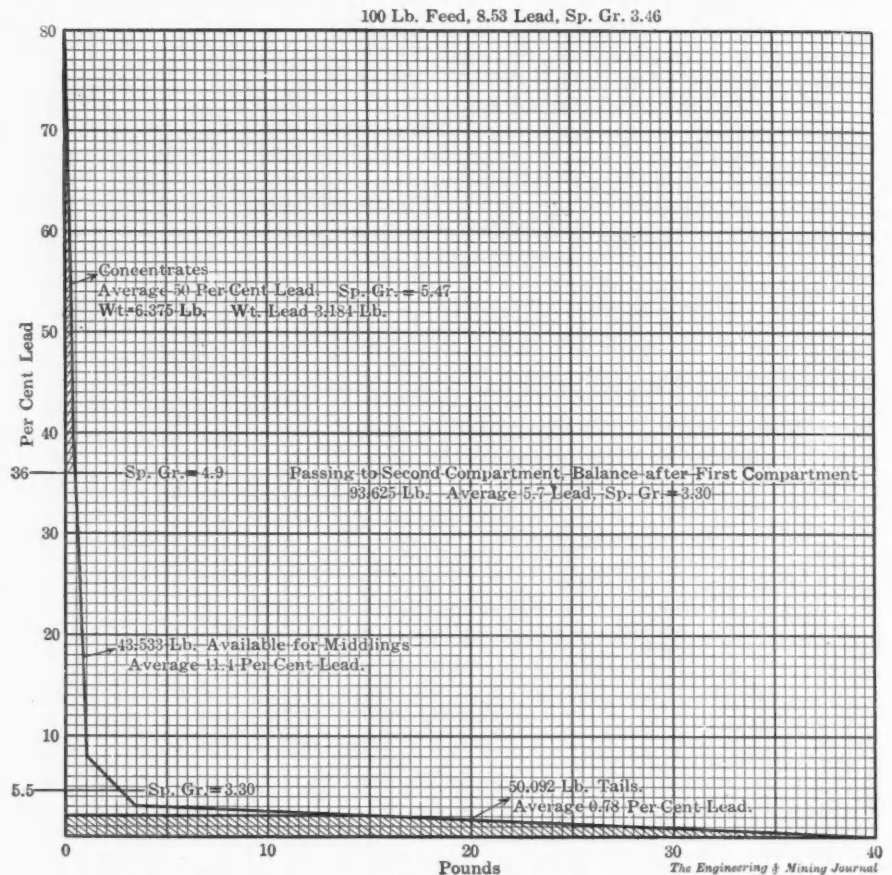


FIG. 2. DIAGRAM SHOWING DISTRIBUTION OF LEAD IN JIG PRODUCTS

rather that it is desired to work to this limit.

PROGRESSIVE SETTLEMENT OF GRAINS LIMITS JIG SEPARATION

This would be extra good work for a jig of any number of compartments and with good close sizing. It could not be done in a two-compartment jig because there must be progressive settlement of the grains in the order of their settling power. If the ore be closely sized the 36 per cent. grains would settle first in the second compartment and by the time the grains of about 3 per cent. grade began to settle to an appreciable extent they would be so far forward in the compartment that they would be carried over the tail board by the current of ore and water in the compartment. If the jig had three compartments, grains ranging in percentage of lead from 36 to 5.7 could be removed in the second compartment. The latter figure is the average

in the latter case, but not much so, because of the comparatively small difference in specific gravity between the second-compartment middlings of a three-compartment jig and those of a two-compartment jig. I would judge that loss from this action would be greater in the two-compartment jig because the middlings would be richer than the second-grade middlings from the three-compartment jig.

One way of considering the discharging actions removing concentrate and middling is to regard the columns inside the dam as balancing the column in the compartment outside, and to assume that motion producing discharge is caused by the continuous entry into the compartments of material which will form concentrate or middling and which would destroy the equilibrium of the columns did it not produce flow. Under this conception, where d and d' equal the depth

of material in the dam and compartment respectively and s and s' the corresponding average specific gravities of the two columns, ds would equal $d's'$. In the Cœur d'Alene an average figure for the depth of ore in the first compartment of a bull jig is about $5\frac{1}{2}$ in. The concentrate stands $1\frac{1}{2}$ in. lower. In the second compartment the depth of the bed of ore is on an average 5 in. and the middlings in the dam $4\frac{1}{2}$ in. I have taken these measurements with the water drained from the sieves. The above conception of the mode of discharge would only be possible so long as the specific gravity of the discharging middling or concentrate remained unaltered.

There is a distinction to be observed here. If tests were being made with a mixture of pure galena and quartz the proportion of galena might be varied widely without requiring any change in the setting of the gate of the discharge. In this case there would be decided changes in the grade of the feed without any change in the specific gravity of the concentrate. In the actual practical work of jigging, the specific gravity of concentrate is constantly changing and where a uniform grade of concentrate is desired the jigman must frequently change the height of the gate to meet the shifting conditions. If for the sake of argument it is assumed that the thickness of the concentrate and middling on the screen is 1 in., and that the average width of the section in approaching the discharges is equal to the width of the compartment, then the velocity of the middling and concentrate approaching the discharges in a two-compartment jig will be respectively 1.6 ft. and 0.14 ft. per min.; providing the compartment be 18 in. wide, the rate of feed be 100 lb. in 2 min., and the ore of the character shown by the diagram. In making these calculations I have assumed that the moving layers were 50 per cent. water. I have further assumed that all the material between 2 and 36 per cent. could be removed as middlings averaging 11.4 per cent. lead.

ROUNDED GRAINS IN CONCENTRATE

This explains why Cœur d'Alene coarse concentrates show so many grains rounded by the jigging action. One has only to remember that the difference in volume between a sphere and the smallest inclosing cube is 42.5 per cent. to appreciate how serious may be the attrition loss. However, I do not believe that the elimination of the suction factor would be especially helpful in preventing attrition losses. In the Richards pulsator jig the compartments are small, the tonnage treated large and the rate of travel of the bottom grains toward the discharges must be much greater than in the Harz jig. I believe that the comparatively short time the concentrate grains are being jigged in this machine is

a more helpful factor in preventing loss by attrition than the elimination of the suction action.

In the first section of these articles I stated that I would explain my reason for assigning the high lead content to the jig middlings. A sizing test of the feed of a Cœur d'Alene mill taken below the No. 1 rolls would disclose the fact that there is an increase in the lead and silver content as the size diminishes. This ore on passing into the trommels yields oversize products for the jigs, the leanest passing to the bull jig and slightly richer oversizes to the other jigs. A reference to Fig. 2 will show that the middlings from the bull jig are richer than the original feed. This is due to the fact that only the richest portion of the feed is removed as concentrates. If a low-grade concentrate were made the reverse might be true, i.e., the jig middlings might be lower than the feed. This middlings product being returned to the original stream of ore flowing through the trommels enriches it. By these successive enrichments the feed to the Wifley tables and vanners becomes notably higher than that of the ore entering the mill.

ROLLER MILLS

In the mills of the Cœur d'Alene district 5-ft. Huntington mills are exclusively employed for regrinding the finest material from the rolls. At the Bunker Hill mill, roller mills of this type 6 ft. in diameter have been successfully employed for grinding high-grade material of about 2-in. size.

El Rayo Mines Company

The first annual report of the El Rayo Mines Company contains a clear description of the company's properties in Chihuahua, Mexico, the work done to Nov. 20, 1909, and balance sheet and profit and loss account as of Oct. 31, 1909. The production for the year ended Oct. 31, was 43,008 tons having a value of \$14.03 per ton, \$603,427 gross, from which \$507,455 was recovered. Operating costs were \$341,729, leaving a net profit of \$165,726. The operating costs were apportioned as follows, the figures in brackets being per ton costs: Mining, \$72,749 (\$1.69); development, \$39,529 (\$0.92); milling, \$59,870 (\$1.39); cyaniding, \$72,289 (\$1.68); general, \$38,124 (\$0.88); bullion expense, \$19,262 (0.45); concentrate expense, \$39,906 (\$0.93); total cost per ton was \$7.94. An extraction of 84 per cent. was obtained.

George A. Schroter, the consulting engineer, estimates the actual ore reserves, blocked out on at least three sides, as 50,000 tons averaging \$15.70 per ton, a total of \$785,000. In this estimate he includes nothing beyond the

visible limits of the orebodies. In addition, he notes ore underfoot in the lowest workings of the Descubridora 125 ft. long and 4 ft. wide assaying \$30; in the upper workings of the Adela a body of ore 175 ft. long and 4 ft. wide assaying \$20 has been opened and still shows in the face; in the lowest workings, the Pettit tunnel, six orebodies are shown, totaling 746 ft. in length and of an average width of 3 ft. assaying \$24. There is much virgin ground above this tunnel. There is a total of about five miles of workings on the property, 8462 ft. of which were driven during the year.

In regard to ore occurrence the country rock is a rhyolite traversed by fissure veins. The main vein is traced over 7000 ft. The ore occurs in large, irregular lenses in the vein, and may become barren and again enriched at distances of 50 to 200 ft. either above or below the stopes. The average content of pyrite is given at 4 per cent., and the approximate proportion of gold to silver is 85:15 in value.

The mill is connected by a 3000-ft. surface tram to the Descubridora and El Rayo tunnels, and by one 1250 ft. in length to the Pettit tunnel; an aerial tram, 2600 ft. long, carries the ore from the San Jose tunnel. In the mill the ore is passed through a rock breaker, and from there is crushed by rolls in cyanide solution; from the rolls it goes to Huntington mills, and from there to classifiers. The coarser portion of the pulp is passed through Australian grinding pans. The pulp is concentrated in Frue vanners, and from the vanners it goes to the cyanide plant.

In the cyanide plant, the pulp is cone classified to sands and slimes, which are cyanided separately. The slimes are agitated and sent to a Butters filter. Zinc-dust precipitation is employed. A new method of feeding zinc dust by an automatic feeder was designed by J. S. Colbath, the manager, which reduced the zinc-dust consumption from 3000 to 1000 lb. per month.

Arkansas Diamond Fields

Progress in diamond mining in the Arkansas field in 1909 was slight. Development consisted of experimental and testing work in a small plant erected last August. No attempt has been made as yet to work the mines on a commercial basis. Plans, however, have been drawn for a plant to handle the diamond-bearing dirt on a commercial scale. There has been more or less delay on account of the lack of capital to invest in these new fields. Up to the present time, possibly 1000 diamonds have been obtained, ranging in size from mere fragments to 6 carats. The diamond-bearing areas are found in Pike county, only a short distance from Murfreesboro.

A European Electric Colliery Railway

A Plan Whereby Isolated and Distant Coal Seams May Be Economically Worked without the Installation of a New and Expensive Plant

BY J. B. VAN BRUSSEL*

The accompanying photograph and diagrams refer to a European electric colliery railway, which presents several points of interest both for traction engineers and for colliery owners and managers. The line connects a colliery with a new opening situated at about $2\frac{1}{4}$ miles distant. The coal at this new opening is loaded into cars which are made up into a train of 36, and hauled by means of an electric locomotive to the screening plant installed at the colliery. In this way the installation of a large amount of new and expensive stationary plant is avoided, and it is possible to work new isolated seams economically, which would otherwise be a doubtful commercial undertaking.

The most interesting feature of the installation is the electric locomotive. The difficulty of constructing a suitable

necessary to adopt some different arrangement by which larger motors could be employed.

The design of the locomotive actually supplied is shown in the accompanying drawing, Fig. 1. The body is supported on two bogie trucks, each of which is equipped with a single 56-h.p. 500-volt Siemens-Schücker railway motor, the aggregate capacity being, therefore, 112 h.p. The two axles of each bogie are connected together by side rods, in order to utilize the whole weight of the locomotive for adhesion (see Fig. 2), and one of the axles is driven through spur gearing by the motor.

This gearing consists of two equal gear wheels and one pinion, the pinion being fixed on the motor axle, one gear wheel on an intermediate shaft, and one on the driving axle. In this way the motor is

CONSTRUCTION OF THE LOCOMOTIVE BODY

The locomotive body is built up on two main longitudinal steel girders, which are themselves supported by cross-beams from the bogie centers. The space between the bogies is utilized for the lower part of the driver's compartment. In this way the height of the locomotive is reduced so that the line can be taken under a roadway without excessive excavation. On the roof of this compartment is fixed a frame, forming the base of two current collectors of the Siemens bow type, which are of such a length as to allow of a considerable range in the height of the trolley wires. The movable portion of the collector is made in two parts, viz., the main frame of light steel tubes hinged at the bottom to the fixed base, and the small bow carried by this frame. The action of the

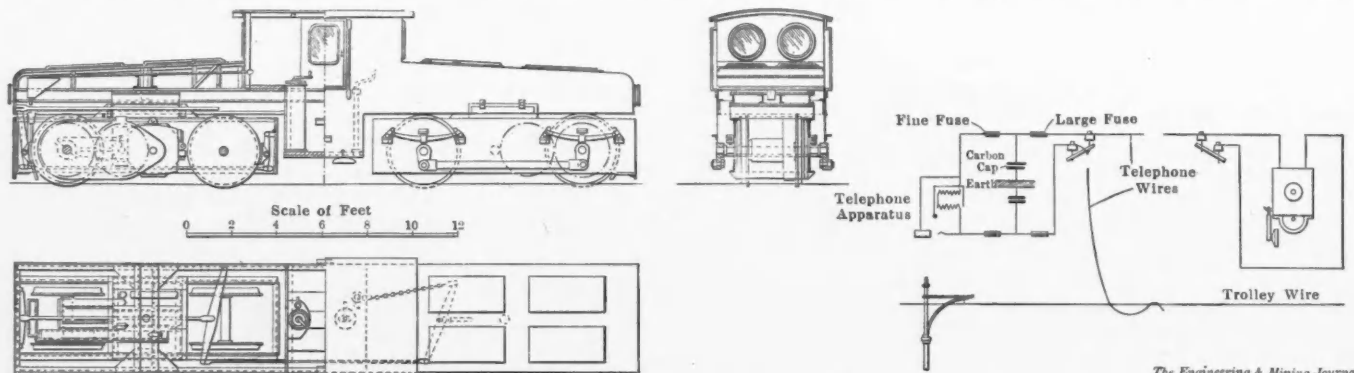


FIG. 1. PLAN AND SECTIONAL ELEVATION OF LOCOMOTIVE, ALSO DIAGRAM OF PROTECTIVE DEVICE FOR TELEPHONE CIRCUITS

locomotive may be appreciated from the following conditions:

Length of line.....	about $2\frac{1}{4}$ miles
Maximum gradient against the load.....	1 in 24
Length of maximum gradient.....	about 720 yd.
Average gradient against the load.....	about 1 in 47
Gage of the track.....	26 in.
Load to be hauled (exclusive of loco.).....	25 tons
Time allowed for each journey of two miles.....	10 $\frac{1}{2}$ min.
Frequency of service.....	2 double journeys per hour.

From these conditions it will be obvious at once that a powerful locomotive is necessary, and at the same time that the narrowness of the gage imposes severe restrictions on the motors if suspended on the bogies in the usual way. Under the conditions stated above, the largest motors that could be got in between the wheels would have a capacity of about 20 h.p. for one hour. A locomotive with four such motors would not perform the required service, and it was

not restricted axially by the narrowness of the gage, but only by the distance between the side frames of the bogie. As the motor occupies the space in the center of the bogie, the usual arrangement of center pin and bolster is in this case impossible. The center is mounted on an arch built of steel plates and beams which rests on the top of the side frames, and the center pin is carried by cross-beams rigidly fixed to the locomotive body. There are also fixed to the body, side-rubbing blocks which bear upon similar blocks supported on the bogie by means of helical springs, not shown in the illustration. There is thus as much flexibility in this construction as in the standard bogie with bolster and bolster springs. The center pins are spherical in shape, and work in cup-shaped centers, so that ample bearing surface is provided for transmitting the tractive force from the bogie to the frame of the locomotive body.

various springs tends to raise the main frame and to keep the small bow in a vertical position. The pressure of the trolley wire balances this spring action in such a way that both the small bows are always trailing at a small angle in whichever direction the locomotive may be running.

The electrical equipment includes, in addition to the two 56-h.p. motors and the current collectors, one series-parallel-brake controller of the Siemens standard pattern, and the usual controlling resistances, automatic circuit breaker, etc. The controller is fixed in the driver's compartment so that the driver has no difficulty in operating it in either direction of running. There is also provided the usual equipment of hand brakes.

The cars used for carrying the coal are of the ordinary colliery type, and it is, therefore, necessary to arrange the draw-gear on the locomotive at a suitable

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height above the rail level. This is done by fixing a central buffer with hook and chain on the end frame of the bogie, the outer ends of both bogies being utilized for this purpose, so that the locomotive is double-ended. With this arrangement the tractive force transmitted by the frame of the locomotive body is only that due to one motor.

DIMENSIONS OF THE LOCOMOTIVE

The particulars and leading dimensions of the locomotives are shown in an accompanying table. Some interesting trials have been made to ascertain the tractive resistance of the locomotive and of the cars. The tests were made by allowing a train to start from rest on a down grade, and measuring the distance passed over

at an average speed of nine miles per hour, the tractive resistance was 15.5 lb. per ton.

The track consists of Vignole rails weighing 50 lb. per yd., the gage being 26 in. The line is a single track for most of the distance. The overhead line consists of two trolley wires of hard-drawn copper wire of 80 sq.mm. cross-section. These wires are supported by means of side brackets bolted to lattice poles, which are set in concrete foundations beside the track.

A telephone line is installed by means of two wires supported by insulators on the tail ends of the brackets. This line is tapped at six points between the colliery and the distant opening, and the driver of the locomotive carries with him

gap does not discharge, and there should be any leakage to earth in the telephone apparatus, the fine fuse will melt and cut off the connection with the overhead wire. These devices, which are made by Messrs. Siemens & Halske, of Berlin, are used in large quantities on the Continent.

Power is supplied to the locomotive from a 200-kw., direct-current, compound Siemens generator, giving 500 volts on no load, and 550 volts at 120 kw. coupled direct to a Belliss engine running at 375 r.p.m. The power house is situated about 600 yd. from the railway near the colliery and is connected to the overhead line by means of two positive and one negative insulated feeders run through earthenware pipes in a trench.

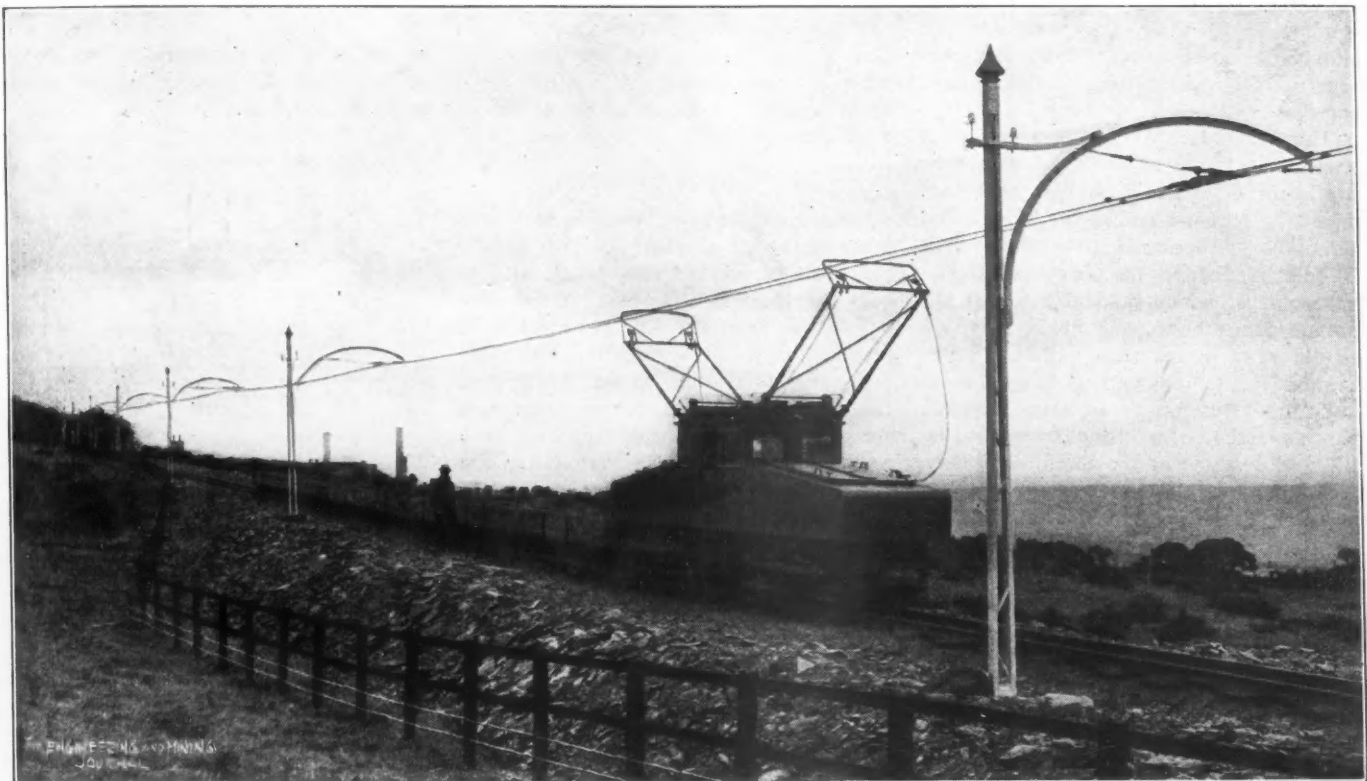


FIG. 2. SHOWING LOCOMOTIVE WITH THE TWO AXLES OF EACH BOGIE CONNECTED TOGETHER BY SIDE RODS, IN ORDER TO UTILIZE THE WHOLE WEIGHT OF THE LOCOMOTIVE

before coming to rest again on the next ascending grade. The following results were obtained: For a train of 10 cars

LOCOMOTIVE DIMENSIONS.

Total weight, including about 4 tons of ballast.....	14 tons
Gage.....	26 in.
Overall length.....	27 ft. 9 in.
Overall width.....	4 ft. 11 in.
Height to top of driver's compartment.....	7 ft. 4 1/2 in.
Minimum height of trolley wire.....	8 ft. 0 in.
Maximum height of trolley wire.....	14 ft. 6 in.
Distance between bogie centers.....	14 ft. 9 in.
Wheel base.....	9 ft. 7 in.
Diameter of wheels.....	2 ft. 11 1/2 in.
Motors.....	Two 56 h.p. motors
Height of drawgear above rail.....	10 1/2 in.
Height of buffer above rail level.....	15 in.

alone at an average speed of 5.8 miles per hour, the tractive resistance was 36 lb. per ton. For the locomotive alone

a portable telephone with which he can make connection through the plug boxes fixed on the poles.

On each of these points at which the line is tapped a protection device is inserted to guard against the danger of shock if either of the telephone wires has come into contact with the overhead wires supplying the locomotive. This device consists of two large fuses, two carbon gaps, and two fine fuses arranged as shown in the diagram, Fig. 3. The large fuse melts with a current of 3 amp., and the fine fuse with 0.3 amp. In the event of either wire being subjected to any voltage greater than 350 volts, the corresponding carbon gap arcs across to earth and the current immediately blows the large fuse; in case the

Gas Engines in Africa

One firm in Africa has supplied over 100 suction-gas-engine plants during the last two years. The largest was of 230 h.p. and the smallest of 6 h.p., with an average capacity of 40 h.p. Charcoal is the fuel in the majority of plants though producers are furnished and guaranteed to operate on semi-bituminous coals. The charcoal consumption per brake horsepower-hour varies, depending on the per cent. of full load carried by the engine and its size, but the consumption rarely exceeds 2 lb. While the cost of a gas-power plant complete is about twice that of a similar steam plant, the power cost per hour is 5:8 in favor of the producer plant and gas engine.

The Longwall Mines of Illinois

Coal Undercut in Fire-clay Beneath; Overlying Shale Produces Sufficient Pressure to Force Down Coal without Use of Powder

BY W. F. PELTIER*

The first discovery of coal in the United States was in Illinois in 1689. Father Hennipin, one of the early explorers of the Mississippi valley, found coal near the city of Ottawa, Ill.

The area of the coalfields of Illinois is nearly 35,000 square miles, or about 60 per cent. of the area of the whole State. The coal measures of the State consist of 16 coal seams, ranging from 1 to 12 ft. in thickness, and are numbered consecutively from the bottom upward, and belong to the eastern interior coalfields.

The exact date of the first coal that was mined is not to be found, but there are records which show that coal was mined in Jackson county in 1810. The Illinois coal report of 1908 shows that the total product for the year was 49,927,452 tons, of which 5,267,671 tons were produced in the longwall fields, or about 12 per cent. of the total output.

Most of the longwall mining is done in Grundy, Bureau and La Salle counties, but this method of mining is carried on in different sections of the State, especially at Assumption, Ill., which is the deepest coal mine in the State, measuring 1004 ft. from the surface to the bottom of the coal.

In writing this article I shall confine myself to the longwall mines in Bureau and LaSalle counties. The coal seams located in this locality are remarkable, not only for their variety in quality, but they are free from horse-backs, faults, jumps and other irregular formations that are encountered in other seams. Overlying the coal is a flexible shale or soapstone, and underlying it is a bed of fire-clay ranging from 6 in. to 2 feet.

There are two distinct methods of extracting coal by longwall, known respectively as, "longwall retreating," and "longwall advancing." The former may be left out of consideration, for it is not in use anywhere in this State, but it could be used to great advantage in many fields. The other system is known as the Scotch longwall, and is used throughout this district and is best adapted for thin seams. This method means extracting out all the coal in the first operation, commencing at the extreme end of the shaft pillar and mining out the whole seam toward the property limits. The entries and haulage-ways are maintained by building walls or packs of rough material obtained from the roof and floor of the mine. This sys-

tem is also used to good advantage where coal is found at a great depth, as it would be unprofitable if not impossible to work it by the room-and-pillar method, from the fact that the enormous weight of the strata immediately above the seam would have a tendency to either crush the pillars or force them into the floor of the mine, resulting in closing up the entries and haulage-ways entirely.

The mines in this district vary in depth from 350 to 600 ft., and are developing what is known geologically as the No. 2 seam which is 3 ft. 6 in. thick, and is known commercially as "third vein coal."

METHOD OF OPERATION

Before commencing to mine away the seam there is a pillar of coal left around the shaft to prevent subsidence, also to keep the shaft in alinement. Great care is taken to keep the pillar as solid as is practical, and only roads that are absolutely essential are driven through it. The main headings are driven 10 ft. wide away from the shaft, and when they have reached the limits of the shaft pillar, the side main entries are turned off at right angles to the main headings. Off these latter entries are turned the main cross entries, 225 ft. apart, at an angle of 45 deg., from which the rooms are turned with 60-ft. centers, running in a direction of 45 deg., leaving 42 ft. of ground from the center of each room at the coal face. (See accompanying map.) The rooms are driven 225 ft., then are cut off by another cross entry. The main entries are turned 1200 ft. apart.

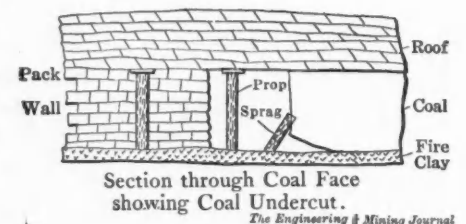
As the headings advance, the face gets longer and longer, and the excavated space is filled up completely with all refuse and slate that is brushed from the top, with the exception of roads left for the conveyance of coal to the shaft bottom. There is also a narrow space left open for ventilation as the workings advance along the entire face line. Overlying the coal seam is a flexible shale, which after the coal is undercut in the fire-clay by hand to a depth of 3 or 4 ft., produces sufficient pressure to force down the coal without crushing it. This pressure breaks down the coal without the use of powder, thus producing a large percentage of lump coal.

Most all the mines in this district are laid out with the primary object of regulating and controlling the pressure of the roof strata, keeping just sufficient weight on the face to obtain the greatest amount of large coal, with the least ex-

penditure of labor and at the same time preserving the roof with a small amount of timber.

Great care is taken to keep the space between the pack walls and face well propped, to assist in protecting the roof parallel to the general face line. Some of the advantages gained by this system as compared with room-and-pillar, are:

- (1.) The recovery of the whole seam.
- (2.) A greater recovery of large coal by obviating the necessity of cutting ribs and the fact that powder is not used to bring down the coal.
- (3.) The ventilation is more easily controlled and more effective, for the air



SHOWING METHOD OF SPRAGGING THE COAL FACE

courses are shortened by driving the air along the face, which greatly reduces the friction on the air and requires less power to drive the fan.

LONGWALL CONDITIONS IDEAL

The conditions of this field for longwall are ideal, the roof being flexible shale, fire-clay bottom, and more than a sufficient amount of gobbing material at hand, to fill in and build up good pack walls. Most of the mines are perfectly dry and free from firedamp. Some of the disadvantages of longwall are:

- (1.) The high mining rate which is nearly set off by a cheap freight rate.
- (2.) Large amount of timber used by the miners; in fact, for every ton of coal produced it requires one and one-half 4-ft. props.
- (3.) Large amount of rock handled by company men, that is hoisted to the top and dumped to the surface at the rate of one car of rock to every 7 cars of coal.

Undercutting the coal is done entirely by hand. Mining machines are not considered in this locality. Haulage is done exclusively by mules, although mechanical haulage would prove itself of material advantage in this field.

The shafts throughout this district are double compartments, though there are

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several that are arranged to handle two cars end-to-end, or tandem fashion. The tipples are built mostly of steel and equipped with all modern appliances to handle and screen the coal with the least amount of breakage, for commercial purposes. In fact, one of the first steel tipples that was erected in Illinois was built by the Spring Valley Coal Company in 1895. This company possesses over 50 square miles of land and operates

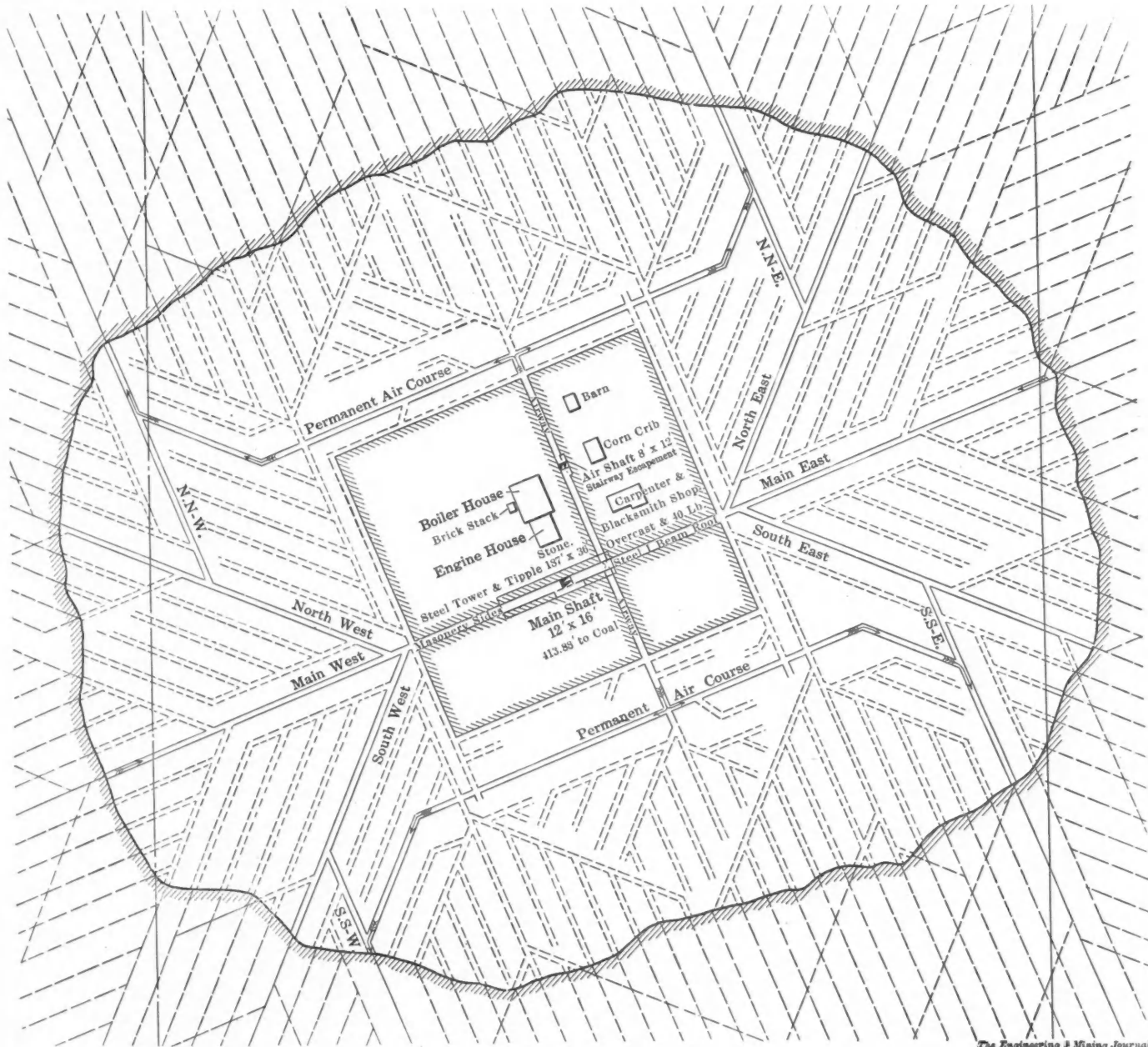
steel I-beams spaced 4 ft. apart and supported by masonry walls.

Coal washing in this field is not carried on very extensively, except by the Spring Valley Coal Company which has a washer that has a capacity of 1000 tons per day; also the Illinois Third Vein Coal Company has a similar washer, but of a smaller capacity. The mines in this field make only about 12 to 15 per cent. of fine coal in mining.

New Experiments on Coal Dust Explosions at Lievin

By E. WALCH*

The experimenting station of Liévin, lately described in the JOURNAL has now increased its main gallery to 230 m. long. Those in charge have recently completed



GENERAL PLAN SHOWING METHOD OF WORKING AN ILLINOIS LONGWALL MINE

five mines. The engine houses are mostly built of fireproof material, and contain first-motion hoisting engines of the Corliss type. The boiler houses are built of fireproof material, and contain from four to six tubular boilers, 150 h.p. each. The hoisting is done entirely with steel cages, running on 60-lb. steel rails used for guides. Most of the shaft bottoms are 14 to 16 ft. wide and 250 to 400 ft. long. The roof is protected by 12-in.

One of the most important elements which bears upon the success of longwall advancing, is that it is highly essential that the whole face line should advance at the same time, and the faster the face can be advanced, the sooner it is under strong roof. This means the weight of the roof will more gradually settle upon the pack walls and props, also allowing sufficient pressure to break the coal after it is undermined.

many experiments on the efficiency of the advertised means of preventing dust explosions, viz., water sprinkling and schistification. Researches have been conducted on new lines with interesting results. The experimenters placed at a point in the gallery, a sufficient volume of fireproof materials, able to be moved by the violent drafts that precede and ac-

*Paris, France.

company the flame of a dust shot, and obtained some interesting results.

The most characteristic test was carried on, Nov. 3, as follows:

The deposit consisted, as in previous instances, of clayey materials disposed in a heap 10 m. long and 62 cm. high, its volume being 9.6 cu.m. and the free cross-section of the gallery being thus reduced from 2.8 sq.m. to 1.84 sq.m. This deposit was placed at 170 to 180 m. from the start of the dust shot. The dust was made of crushed Liévin coal with 30 per cent. volatiles, giving 35 per cent. refuse on a 200-mesh sieve. Dust was evenly deposited on the ground at the rate of 450 grams per cubic meter of gallery. The same proportion was placed on the clayey heap and doubled, further to increase the chances of the shot spreading to the mouth of the gallery, which is 230 m. long. The dust shot was caused at the closed end of the gallery by firing 240 grams of gun dynamite in a 55-mm. steel mortar.

The following result occurred: The flame did not spread beyond the heap and did not light up the dust deposit laid on the last 50 m. of the gallery. Besides the shot was considerably slower than usual, spending about 2 sec. to run the 180 m., while it would not have taken more than 1½ sec. to reach the mouth of the gallery under normal conditions.

RESULTS OF OTHER TESTS

Other tests carried on in placing the 10-m. heap at the mouth of the gallery, with the same proportion of coal dust showed similar results. The flame which would have been otherwise voluminous and would have extended some 60 m. outside, was but a short dart-shaped one about 5 m. long. The behavior of the shot was also quite different, its speed being about one-half the usual speed when the gallery is free from noncombustible material.

In one case only, when the heap occupied only one-quarter of the gallery area, was the shot able to resume its travel on the second part of the gallery with the violent and extra-rapid character it possessed. However, the flame was blown out by the earth heap.

Mr. Taffanel, chief engineer of the station, suggests the following interpretation of these results: The change in the behavior of the dust shot is in connection with the change of nature of the waves that reflect themselves near the end of the gallery, a change which influences on the formation of condensed and impact waves, that are characteristic of the violent period of the explosion.

The extinction of the flame is due to the swelling of the heaped materials by the gases that precede and accompany the flame. It is noticed that, out of the 10 cu.m. of clayey materials, about 5 cu.m. are blown away and projected to as far as 60 m. as well as on the walls

of the gallery. It is natural that the combustion cannot continue in a medium which is so full of fireproof materials.

The experiments are not yet numerous enough to allow for a generalization. Tests are to be carried on to see if the same effects can be obtained in placing the heaps on the sides of the gallery so as to admit of hauling. However, these results are interesting owing to the simple contrivances used and in view of the uncertainty of the methods advertised up to now.

A Portable Telephone Equipment

BY HENRY M. PAYNE*

There are few large mines today that are not equipped with telephones, at least along the main haulways. Operators have realized that saving of time underground is even more important than on the surface, and many mine fires have been promptly extinguished by aid summoned by telephone.

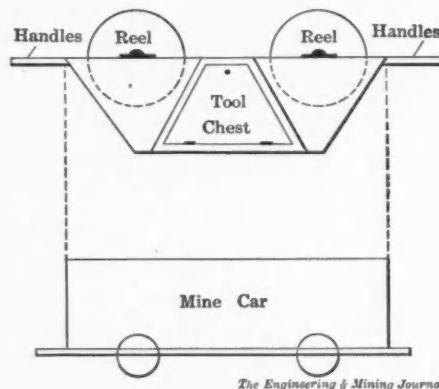


DIAGRAM SHOWING ARRANGEMENT FOR PORTABLE TELEPHONE

In most of the large mines of England and Germany the "inter-ringing" system is used, and the general manager's office and house may be at all times in immediate communication with any part of the workings. Not only in times of disaster may such an equipment be of advantage, but whenever a miner is injured, arrangements may be made on the surface for his immediate care upon arrival at the top of the shaft. (In this connection, a small air-tight can of sterilized bandages and a tourniquet should be kept easily available, in each district of the mine.)

It sometimes happens however, that the telephone lines are broken down, by an explosion, or that it is desired to establish communication to a part of the mine not so equipped.

For such service, an apparatus similar to that shown in Fig. 1 is easily made, simple in operation and easily portable. It should be so built as to fit over the top of, and down into the mine car, with handles on the ends, at each corner, by

*Mining engineer, Morgantown, W. Va.

which it may be quickly lifted out and carried, in similar manner to a stretcher, to any location in the mine.

The two reels should hold at least 2000 ft. of heavily insulated telephone wire, with the inner end passed out at the center of the reel for instant connection with a portable telephone set.

One end of the axle should project slightly, and have a square shoulder on which a crank may be placed to wind up the wire. In the center is a small tool chest for wire cutters, tape and the usual paraphernalia, and the portable telephone set. Such an apparatus can be constructed at home by any company and will prove very efficacious in any underground emergency.

Coal Consumption in San Francisco

SPECIAL CORRESPONDENCE

J. J. Moore, of San Francisco, estimates the monthly consumption of coal in that city at 100,000 tons per month, but the Western Fuel Company and the Pacific Coal Company estimate less than 50,000

IMPORTS OF COAL AND COKE AT SAN FRANCISCO, JAN. TO NOV. INC., 1905.

Country of Export.	Coal, Long Tons.	Coke, Long Tons.
Australia.....	74,316	17,968
British Columbia.....	167,316	.....
Japan.....	7,011	.....
Chinese Empire.....	506	20
England.....	700	7,928
Scotland.....	.....	10,115
Germany.....	.....	32,052
Belgium.....	.....	5,260
Italy.....	.....	6,313
France.....	.....	220
Total.....	249,801	79,876

tons. In this connection the accompanying table of imports of coal and coke, from January to November, inclusive, is interesting.

Volumetric Determination of Tungsten

A volumetric assay for tungsten is described by E. Knecht and E. Hibbert in *Proc. Chem. Soc.* The process is based on the fact that tungstic acid is reduced by zinc and hydrochloric acid to tungsten dioxide, which, in presence of excess of acid, yields a clear, light brown solution. If now a solution of a ferric salt be added, the dioxide is oxidized to the trioxide. The end point is perceived by the disappearance of the intense blue color of the intermediate compound corresponding with tungsten pentachloride, the reaction



being quantitative. It is thus possible to determine tungsten volumetrically in the presence of iron.

QUESTIONS and ANSWERS

Inquiries for information are answered in this department as promptly as possible, but more or less delay is often unavoidable. Many inquiries involve a good deal of investigation and these can be answered only when the general interest in the subject is conceived to justify the expenditure for the time required. Correspondents should refrain from asking for advice that ought to be obtained by professional consultation with an engineer. We will not answer questions pertaining to the value of specific mining enterprises. Inquiries should be framed concisely.

ZINC SALTS DIRECT FROM ORE

I own a property in New Mexico from which I am thinking of producing zinc chloride and sulphate direct from the ore at the mine. Can you inform me as to the markets for these products; also as to any publications treating of their manufacture and uses?

G. H. U.

The markets for zinc chloride and zinc sulphate are too limited to make it worth while to consider the production of those substances at a mine in the far West, quite aside from the questions of transportation and the difficulty of making good commercial products (especially zinc chloride) directly from ore. The manufacture of zinc sulphate is described in *THE MINERAL INDUSTRY*, Vol. IV, p. 83, "Production of Zinc Vitriol from the Zinc-Lead Ores of the Harz," by Bruno Kerl. As to zinc chloride, the literature is too scattered for easy reference.

ELECTROLYTIC TREATMENT OF COPPER ORE

Can you give me some information with reference to treatment of copper pyrites? I am told that there exists a treatment by which the copper ore is first burned and then treated by electrolysis for the extraction of the copper and would ask for information on the subject and approximate data regarding amount of power required for an output of 300 lb. of copper per day.

A. S. G.

There are numerous processes for the extraction and electrolytic precipitation of copper, but none has been a distinctly commercial success. There is only one place in the world, in Poland, where such a process is in use at the present time. The ore occurs in a belt of limestone containing copper ore interspersed in strips with calcspar and some quartz. The mineral is almost entirely copper glance.

The product of the mine is divided into rich ore with 50 per cent. of copper, which is separated underground, and mixed ore with 16 to 20 per cent. copper, containing calcite and pieces of limestone, and which is improved by hand-picking at the surface. The ore as brought from the mine is crushed by rolls, mixed with 5 per cent. of damp brick earth and molded into blocks. These blocks are dried by the waste heat of the furnace and subjected to a partial roasting in a low kiln fired from the out-

side, with a free access of air, which converts the copper into sulphate and oxide.

The roasted ore is crushed fine and lixiviated in lead-lined tanks, with the spent liquor of the electrolytic baths containing about 5 per cent. of free sulphuric acid. A liquor containing about 5 per cent. of copper and 1 per cent. of free sulphuric acid is obtained. After passage through a filter press, this is electrolyzed in vats of about 35 cu.ft. capacity. Insoluble anodes of lead plates in cloth bags, and thin copper cathodes are used. A current of 1000 amp. at 2.5 volts, corresponding to a density of about one ampere per square decimeter of cathode surface, is used, producing metallic copper, free sulphuric acid and oxygen. The deposited copper, about 1.1 gram per ampere-hour, is nearly equal to the theoretical amount.

The power consumed per kilogram of copper is 2.28 kilowatt-hours or $3\frac{1}{2}$ horsepower-hours. The liquor is exhausted in about 35 hours, when it is returned to the extraction vats for the treatment of fresh ore. The cathodes remain in the bath for about a month, when the deposit (1 to $1\frac{1}{4}$ in. thick) is removed and sold. It is of greater purity than ordinary electrolytic refined copper. The four baths are served by a Siemens dynamo furnishing a current of 1000 amp. at 12 volts.

The whole process is so simple that the entire plant is supervised by a single man in the mill. We understand that a similar plant is being erected in Central Asia.

VALUE OF COBALT MINING PROPERTY

I have some stock in a Cobalt property, which is apparently under excellent management and which is economically and intelligently developing and operating its property. The property has paid moderate dividends and, presumably, will pay more, yet the stock does not seem to be as high as I think it should be in comparison with the other stock on the market, both mining and industrial, considering the earnings and also what myself and the management of the company consider the probable future earnings of the property. What is the basis for a critical judgement on such mining-stock investments as this?

D. E. M.

Mines like those at Cobalt seldom have large ore reserves developed, and those ore reserves are seldom in accord with the market price for the stock. This is characteristic of many good but speculative mines. For instance, the Batopilas mine in Mexico, which has earned large profits for the past 22 years has as many times been absolutely without reserves. The deposits occurred irregularly, but with sufficient frequency in a large area to bring the average output to a profitable amount. So with the Cobalt mines the work in the district has demonstrated that

there are many veins, some of which do not appear on the surface, and the companies having a large area there have an opportunity and a reasonable expectation of developing a large amount of rich ore to the area unit. In general it may be indicated that the veins are not likely to go to great depth, but inasmuch as they have been so very rich and there have been so many of them in the mineralized belt of the district, the camp and the individual properties in it may be said generally to be good speculative mines. In a stock of this kind the investor should look for a high rate of dividend, higher than he does in mines where there are large reserves blocked out and ore in sight sufficient for 20 or more years ahead. Such mines as the latter may well sell on a 10 per cent. basis, whereas a mine at Cobalt for instance should have 15 to 20 per cent. or more yearly income on the market price. It would seem that the Cobalt stocks have in the past sold too high, as the public placed a speculative value on these high-dividend stocks far in excess of the actual value indicated by the ore reserves, and without recognizing the strong speculative element in properties of this character.

Some of the conservative companies operating in the Cobalt camp consider it sufficient, under the conditions there existing, to have an ore reserve equal to one-third of the market value of their stock. This would hardly be safe for mining companies in districts less rich and without the peculiar persistency in distribution which characterizes the Cobalt area.

In this connection, applying not only to the Cobalt stocks but to other mining stocks, particularly in developing properties that have an element of the speculative character, it is well to add the further axiomatic caution that the general public should not invest in such stocks more money than it can afford to lose.

MARKET FOR BISMUTH ORE

Can you tell me where to find a market for bismuth ore, and the approximate price per unit at that market?

A. B. H.

The only possible purchasers of bismuth ore in the United States is the United States Metals Refining Company of Grasselli, Ind., and the Monsanto Chemical Company, of St. Louis, Mo. Probably any of the metal houses in New York would negotiate sales for export. In Europe, Johnson, Matthey & Co., of London, are the chief buyers. The market for bismuth is closely controlled by the European combination. It is impossible to state open quotations. In a general way, ore containing 10 per cent. bismuth is now worth \$90 to \$100 per metric ton. Ore containing 15 per cent. is worth 1.7 times as much; 20 per cent., 2.3 times; 30 per cent., 3.7 times.

Personal

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

S. F. Shaw is returning to New York from Costa Rica.

F. M. Kurie, of Philadelphia, has gone to Arizona for a month on mining business.

Walter Harvey Weed has returned to New York from a professional trip in the West.

William M. Brewer, who has been in New York some time, left for Victoria, B. C., last week.

E. A. Wall, of Salt Lake City, Utah, who has been in New York recently, has sailed for Europe.

Edward S. Wiard left Denver, Colo., last week for Sonora, Mexico. He will be gone about a month.

A. B. W. Hodges, general manager of the Granby Consolidated mines in British Columbia, is in New York.

H. W. Hardinge has returned to New York from an investigation of the Porcupine district goldfields of Canada.

A. E. Drucker has been appointed consulting metallurgist of the Oriental Consolidated Mining Company in Korea.

J. Yeandle has been placed in charge of the Barron mine of the Real del Monte y Pachuca Company at Pachuca, Mexico.

Hallet R. Robbins, of Seattle, Wash., is in Denver, Colo., after having spent several weeks in Boston on professional business.

George P. Hyde, of Detroit, Mich., is in charge of operations for the Bisbee Extension Development Company, near Bisbee, Arizona.

Leopoldo Salazar has been appointed secretary of the Mexican Institute of Mining and Metallurgy in place of Kirby Thomas, resigned.

Frederick H. Morley left Denver, Colo., Feb. 2, for Hermosillo, to spend several months in professional work in the state of Sonora, Mexico.

A. F. Dick-Cleland will take charge of the San Carlos Gold Mines, Ltd., an English syndicate operating at Mezquital del Oro, Zacatecas, Mexico.

William E. Ellis has returned from a trip to the United States and has again taken charge of the Guebeshe mill at Ocotlan, Oaxaca, Mexico.

Henry Valle y Cumbre is in charge of the operations and the erection of the 30-ton concentrating mill of the Almaloya company at Ameca, Mexico.

S. H. Brockunier, of Wheeling, W. Va., has just completed an examination of the coal underlying the J. B. Ford tract in Wetzel county, West Virginia.

Filipe Gomez de Campo, recently with La Esmeralda, is now superintendent of Santa Maria de la Paz mine at Matehuala, San Luis Potosi, Mexico.

Joseph A. Durfee has been appointed superintendent of the new open-hearth steel plant of the Maryland Steel Company, at Sparrows Point, Maryland.

Dr. B. E. Joseph, of Chicago, who is connected with the Copper Range Company, has been inspecting mines in the Autlán district, western Jalisco, Mexico.

Julian Kennedy, of Pittsburg, has been appointed engineer to supervise the building of the new blast furnace plant of the Rogers-Brown Iron Company, at Buffalo.

Juan Felix Brandes, of Denver, Colo., has returned from Mexico and Colorado, and will spend several weeks in Boston and New York on professional business.

Albert Spies has resigned his position as editor of the *Electrical Review* to become managing director of *Foundry News*, a new paper published in New York.

Prof. A. P. Coleman, of Toronto University, has been awarded the Murchison medal by the Royal Geological Society of London, England for distinguished geological investigation.

Dura B. Andrews, recently of Oaxaca, Mexico, but now with the Milan Mining & Milling Company, of West Milan, N. H., has been made superintendent of the mines and mill of that company.

A. J. Condee, mining superintendent for the Rindge estate, has left Los Angeles, Cal., for the Rindge properties in Colombia, South America. He will return to Los Angeles in time for the first boat in the spring to Nome, Alaska.

Andre Weill, of Paris, France, is in Ottawa in the interests of the Creuzot Steel Company, which contemplates establishing an electric smelting plant in Canada. Mr. Weill has inspected a number of water-power sites in the district.

Henry B. Nedham has been chosen president of the Maryland Coal Company in place of J. E. Knapp, resigned. He has been secretary and treasurer for a number of years and is thoroughly acquainted with the affairs of the company, besides being an authority on all matters connected with the seaboard bituminous trade.

R. C. Gemmell, general superintendent of the Utah Copper properties, has been made assistant general manager of all of the companies of which D. C. Jackling is general manager, these including Utah Copper, Ray Consolidated, Gila and Chino. F. G. Janney, mill superintendent of the Utah Copper company, will have general charge of the milling operations of all of the companies. John M. Hayes, cashier of the Utah Copper Company, will have direction of the consolidated offices of that company and Boston Consolidated.

Obituary

George H. Caldwell died at Foley, W. Va., Jan. 20. He was born in Virginia, but for a number of years lived in Nebraska. About 10 years ago he returned to West Virginia and become general manager of the Dingess Run Coal Company; he had held that position since.

Robert Marshall died at Pittsburg, Feb. 1, aged 83 years. He was born in Ireland, but came to Pennsylvania when a young man, and became a contractor. He opened several important coal mines in western Pennsylvania, and was also prominent in the early development of the Lima oilfield in Ohio.

A. F. Wuensch, of Denver, Colo., died suddenly at Albuquerque, N. M., Jan. 22, aged 54 years. He was born in Marietta, Ohio. When 25 years old he went to Colorado, settling at Leadville, where he invested in mines, which formed the foundation of the estate which he had accumulated. He was a member of the American Institute of Mining Engineers, Colorado Scientific Society and for years was identified with mining interests as engineer, mine manager and writer on mining subjects.


On Feb. 6 an automobile going from Kelvin, Arizona, to the Ray copper mines ran close to a heavy charge of dynamite, the fuse of which had just been lighted. The explosion of the charge shattered the car, and killed the six passengers, who were R. P. Coleman, of Salt Lake City, W. H. Freeland and Walter C. Frenz, all mining engineers; A. S. Bieber, J. C. Griffin and J. B. Joyce, civil engineers. The motorman, who was also killed, had been warned, but probably supposed he could pass before the charge exploded.

Societies and Technical Schools

Scranton Mining Institute—The annual meeting was held at Scranton, Penn., Jan. 20. Papers were read by Col. R. A. Phillips, J. P. Jennings, A. H. Welles, William Allen and Dr. B. B. Mahon, the topics being mine explosions, the education of the miner and aid to the injured. J. P. Jennings, district superintendent of the Pennsylvania Coal Company, was chosen president for the ensuing year.

Engineers' Society of Western Pennsylvania—The 30th annual meeting was held in the Fulton building, Pittsburg, Jan. 18, E. K. Morse presiding. The annual report of the directors was read, indicating the general prosperity of the society. The membership of the society at the close of the year was 835. The following officers were elected for the ensuing year: President, E. K. Morse; vice-president, J. O. Handy; treasurer, A. E. Frost; directors, A. R. Raymer and Willis Whited.

EDITORIAL CORRESPONDENCE

REPORTS FROM OUR OWN REPRESENTATIVES ON
IMPORTANT EVENTS FROM MANY IMPORTANT
MINING CENTERS OF THE WORLD 

San Francisco

Feb. 4—The State mineralogist of California has issued a circular to the producers of mineral substances, asking for more coöperation in reporting the amount and value of the products and calling attention to the value of such statistics to the public. Realizing that the producers often do not desire to have the output known, it is stated that any information sent will be kept secret and used only in compiling the total production by counties.

The first water from the new Government dam on the Colorado river, near the the Yuma Indian reservation, will be turned into the canal March 1, on which date a portion of the reservation will be thrown open to public entry. The charges for the building of the irrigation system amount to \$55 per acre, payable in 10 yearly instalments.

As a result of representations of producers, it is possible that the gold output of the Yukon and British Columbia will hereafter be sent to the mint in Ottawa. The charge of $\frac{1}{8}$ of 1 per cent. now exacted by the Dominion assay office, will, however, need first to be abolished, as the San Francisco mint does not make this charge and shippers to that mint get the full value of the gold with a trifling charge for the copper added for coinage. Most of the gold of the Pacific coast finds its way at present to the San Francisco mint, either directly or through the refiners.

The Butte Lode Mining Company, Kern County, has notified leasers whose terms expire on February 1, that the leases will not be renewed. This mine has been largely developed by leasers. The management has, however, adopted a new policy, and will hereafter supervise the mining and extraction of ore, while development work will be carried on under the contract system.

Butte

Feb. 4—The hearing of the order to show cause why the city council of Butte should not be enjoined from granting the Davis-Daly company the right to run a tramway through the streets of Butte from the Colorado shaft to the Great Northern tracks resulted in the dismissing of the injunction proceedings by the local district court.

Manuel H. De Hora, late general manager of the British-Butte Mining Com-

pany, has begun suit against that company for \$22,000, alleged to be due him as a salary for 22 months. It is the contention of the company that there was no agreement with De Hora about his compensation and that the sum he claims is out of proportion to the reasonable value of his services.

The monthly report of the government assay office at Helena shows that \$109,860 in precious metals was received during January, which is somewhat smaller than the amount received for the same month in 1909. Fergus county lead in Montana production with \$51,951.

Salt Lake City

Feb. 5—The United States smeltery, at Bingham Junction or Midvale, as it is now known, is running a full capacity and treating a large tonnage of lead ore. About 1100 tons of charge are smelted by the furnaces per day, of which approximately 800 tons represent ore. Since the closing down of the Knight plant at Silver City the United States company is receiving the ores of the Colorado and Iron Blossom, as well as from other mines of the Tintic district. At the present time the lead furnaces are the only ones in operation, as the copper plant is being redesigned to meet the requirements of the Federal court, which will allow the smeltery to operate as long as the percentage of sulphur dioxide escaping with the fumes does not exceed 0.75 per cent. by volume. The lead plant with its baghouse and treatment of the fumes by zinc oxide comes well within the limit set by the court. The success of this treatment has caused the United States company to design a plant along similar lines for its copper furnaces. This plant will be separate from the lead plant and will have its own baghouse. The fumes will be neutralized here as from the lead furnaces by zinc oxide. This is produced in a separate furnace in which the dust from the zinc mill is mixed with coke and burned to zinc oxide. The zinc-oxide fume is led into the roaster flue near the roasters, and travels about 1500 ft. before reaching the baghouse, mixing with the gases on the way. An excess of zinc oxide is used to neutralize the acid fumes and protect the bags which would otherwise be quickly destroyed.

The United States zinc plant, situated near the smeltery, is producing about 45

tons of concentrates per day. These are from the company's mill and are largely from Bingham ores. The Huff electrostatic separators make a clean separation of the zinc and iron. Little or no change has been made in the process since the mill started in October, 1909. Experiments are now being carried on with a new Huff process for the wet separation of zinc.

The testimony in the case of the Silver King Consolidated vs. the Silver King Coalition is being heard daily in the United States court. This case involves an accounting for ore taken from the Vesuvius claim, which is owned jointly by both companies. The time in which the defendant company can testify in support of their account expires Feb. 15; the examination of their witnesses is now in progress.

The Great Salt lake has lately risen above the western end of the Southern Pacific trestle, known as the Lucin cut-off, and threatening passing trains. The lake is now higher than at any time within the memory of white men. The west end of the cut-off, being 6 ft. lower than the rest of the causeway, is the chief danger point. If the lake continues to rise, it will necessitate elevating most of the piling, and in the meantime trains will have to be sent around by the old Promontory route. When the Lucin cut-off was constructed the track was about 20 ft. above water level.

The large mines of the Park City district are now operating with full forces, the Silver King Coalition, Daly-West, American Flag and Little Bell being regular shippers. Prospecting is being carried on at a number of other operations. Since the recent elections an open town has been declared and gambling in all its forms are being practised openly. This makes Park City one of the few camps where gambling is still openly permitted. So far the winter has not been unusually severe, but all transportation about camp is by means of sleds.

Indianapolis

Feb. 7—The miners and operators failed to reach an agreement at their joint wage-scale conference at Toledo. It was apparent from the start that the two sides were so far apart on the question of admitting the Illinois miners to seats in the conference in the absence and refusal of the Illinois operators to participate that they could not reach an

agreement. The miners insisted on the Illinois miners being seated and the operators were equally insistent that they be excluded. In the final Friday night session the miners still insisted that the Illinois miners be seated asserting that it was not their fault that the Illinois operators had refused to participate. "The convention adjourned with everybody in good humor," said President Lewis. He says that it is the understanding that another conference will be called before April 1. The time will be removed somewhat from the influence of the recent convention, and possibly Illinois will be left out.

Under the Indianapolis convention decision no district has the right to sign a scale of wages with the operators until all districts have conferred and signed. In the opinion of some of the leaders the wishes of the mine workers can be ascertained by referendum vote. If so, a convention may not be called.

The operators have issued a statement of their view of the case.

In this they state that the insistence of the miners that the Illinois miners be seated was in the hope of forcing the Illinois operators into the joint conference. In their statement the operators further express the "hope that another convention may be called in which we can participate," declaring themselves to be in favor of settling affairs with the miners by means of joint district conferences and exonerating themselves from all blame for the failure of the present effort.

The Indianapolis miners' convention grew more and more turbulent to the end. At times the scenes on the convention floor were almost riotous. There is little doubt of an attempt to disrupt the convention and only the courage of President Lewis guided the deliberations to the final adjournment.

Birmingham

Feb. 7—Investigations as to mineral lands, coal in particular, in Fayette county, Ala., about 65 miles west of Birmingham, have brought about a discovery of natural gas and a company is being organized by Dr. G. B. Crowe, to use this gas for commercial purposes. A plan is on foot to pipe the gas to Birmingham, Columbus, Miss. and Memphis, Tenn. The borings went through some valuable coal deposits, though a little distance down. There are no coal operations in Fayette county at present.

Scranton, Penn.

Feb. 5—There have been a series of mine squeezes at various collieries throughout the Lackawanna valley during the last week. None of these have been of a serious character as far as the surface was involved, but they covered an extensive area. One of these squeezes occurred in the 5-ft. vein of the Leggett

Creek mine, belonging to the Delaware & Hudson. The squeeze occurred at night and extended out a large area in a thickly populated suburb of Scranton. It roused all the people in the neighborhood from their beds in a bitterly cold night, although as a matter of fact there was not the slightest danger either to life or property. The ground was riven in various places by the partial subsidence of the roof of the vein, but the cave was insignificant in depth.

There was a squeeze at the Marvine mine a few days later, which, at first was thought would lead to serious results. The workings of the Leggett Creek and the Marvine mines run above or below each other where they came in contact and in some instances parallel. When the squeeze occurred, the inside foremen thought it advisable to remove all the mules that were in the colliery. The disturbance fortunately was of a very slight character, and the officials of the mine are now of the opinion that the worst is over in both mines.

The situation caused by the wholesale cancellation of miners' certificates in Luzerne county has led to an extraordinary situation. It is stated authoritatively that over 90 per cent. of the miners who have had their certificates cancelled will not be able to pass the prescribed examination and that all of them who fail to do so will be thrown out of work or have to seek positions as miners' laborers. It may be recalled that some weeks ago there appeared an article in the JOURNAL which stated that during the past 20 years, miners' certificates were bought and sold wholesale all through the anthracite regions to foreigners with little or no experience in the mines beyond what they were able to acquire as laborers during a few months and, in not a few cases, in the space of a few weeks. Many of these men never saw a mine until they arrived in the anthracite regions. They are generally ignorant, addicted to drink and disinclined to learn the English language, although the law prescribes that before a certificate is issued to a coal worker, he must have worked two years as a mine laborer and be able to answer 12 questions in English, together a few other tests which depended upon the applicant's knowledge of English, his intelligence and his general experience in the coal mines.

These certificates could be purchased in any saloon owned by a foreigner in the neighborhood of a mine. The price of a certificate varied. The cost depended upon what the traffic in these forgeries would bear, the cost of the certificate bearing a definite relation to the ignorance of the purchaser. Things have been going on in this way since the law went into effect 20 years ago. Protests against the existence of this public scandal passed unheeded. So long as the

coal in the surface veins was unexhausted, and the production of coal from the lower veins became increasingly hazardous, foreigners were instrumental only in bringing about their own death by scores, and these accidents affected public opinion but slightly. Now, however, as the mines are becoming more gaseous, and as an accident brought about by the ignorance of one miner may bring disaster to all men and boys working in that particular mine and has done so in a limited extent in some mines, public opinion has become aroused and demands that the scandal shall cease.

The first attempt in this direction was made in Lackawanna county. Bad as the state of affairs was there, it was infinitely worse in the neighboring county of Luzerne, where it has come to light that not only were 90 per cent. of the miners holding certificates not entitled to them according to the provisions of the law, but that these men are absolutely unable to qualify by passing the simple examination. Some time ago, the judges of Luzerne county court wiped out several district mine-examining boards that were accused of graft and incompetence. A new board was appointed, the divisional boards being abolished. This new board in the discharge of the duties which are imposed upon it by law, insists that those who have applied to it for certificates must pass the examination that is prescribed by the Chief of the State Bureau of mines, and the consequence is that most of them are likely to be turned down in this particular county, one of the most extensive and productive in the anthracite regions.

Toronto

Feb. 4—A. P. Turner, president of the Canadian Copper Company, gave evidence before the House of Commons committee on mines and minerals, Feb. 2, as to the operations of the International Nickel Company. He stated that it was in no sense a trust. It had simply included under one management the mining company, the refining company and the selling company, which, prior to its formation, had been separately engaged in exploiting the Canadian product. The two other great outside companies, the Mond and the French Nickel Company, were in no sense allied, but were competitive. The refining of nickel was now done to the extent of 82 per cent. in Canada. In the early state of the industry they could refine a little above 10 per cent. About \$5,000,000 was invested in the Canadian plants, employing from 1500 to 2000 men, and the company had spent at least \$250,000 in experiments with the object of enabling them to complete the refining in Canada. The company had no sentimental reasons for incurring the expense of freight in shipping the worthless part of their matte

to New Jersey, but owing to the chemicals they had to use, including more than ton for ton of salt cake, a by-product of factories near the New Jersey plant, any further refining done in Canada would render them unable to compete with the New Caledonia ores. The profits were very small. Wallace Nesbitt, speaking as a stockholder, protested against the treatment accorded the industry by the newspapers, which had apparently entirely misconceived the facts. It was only recently that investors had got any return for their money, and at present they only receive 6 per cent. An export duty on the ore would undoubtedly result in the closing of the works in Canada.

The construction of the peat-testing plant at Ottawa, undertaken by the Mines branch, has been completed and nearly all the machinery which is to be installed, has arrived. Over 50 tons of peat has been stored for demonstration purposes, and it is expected that the plant will be in operation in the course of a few weeks.

It is announced that the Wilson claims in the Porcupine goldfield, eleven in number, about 2 miles southwest of Porcupine lake, have been sold to McCormick Brothers, of New York, for \$1,500,000. Their representative, Mr. Geddes, spent two weeks in making an examination of the properties.

Mexico

Feb. 1—The American Smelting and Refining Company is making overtures for the acquisition of the smeltery of the Compañía Metalúrgica Nacional of Matehuala. Sixty pesos is being offered per share of 100 pesos, par value. Since the Dolores y Anexas copper property of the American Smelters Securities Company has discontinued shipping its low-grade self-fluxing ores to the local smeltery at Matehuala, the operations of the smelting company have been discouraging. The copper mines of Matehuala are producing between 8000 and 10,000 tons of self-fluxing copper ores of an average tenor of 6 per cent. to 8 per cent. copper, and preparations are being made at the Dolores y Anexas property to produce in the next few months at least the above amount monthly.

A trial run has been made of the 20-ton Lane mill and concentrating plant of the Certuchena y Anexas mines in the Ahuacatlan district, Tepic. An accident to the flywheel of the engine has delayed for a few weeks the first regular campaign. There are 14 mines in the group, and 30,000 ft. of workings of which the larger part date back several decades. The principal metal is gold.

The investigations of the house of John Taylor & Sons, of London, in the Sierra Juarez district of Oaxaca have

been completed, and the probabilities are that the district will not be entered. This house was the first foreign interest to enter Mexico, and about 85 years ago its engineers were scattered throughout Oaxaca, Zacatecas, Hildago, and other states. The broad wagon roads being used in the Pachuca camp today were built during the first half of the 19th century by John Taylor & Sons.

There is considerable friction between the foreign employees of the National Railways of Mexico and the company. The policy of the company is to educate and work up Mexicans to positions of responsibility such as conductors, dispatchers, and engineers; but the Mexican is somewhat adverse to starting in at the bottom and by hard work and faithful service work up to the positions now held by foreigners and obtained only by graduating from this practical school of experience. The foreigners threaten to leave in a body unless the Mexicans work into their positions by beginning at the bottom.

London

Feb. 1—There has been so much activity lately in West African mining ventures that the annual reports of the Taquah and Abosso mines, the publication of which has been this year somewhat later than usual, have been received with much interest. These two mines are the principal mines on the basket goldfield and the Taquah mine is one of the oldest mines in West Africa. According to one of the government reports the title to this property dates back nearly 30 years when it was acquired by a Mr. Bonnat, a Frenchman, who was the first to discover the richness of the Taquah main reef. The mine is on one of the best oreshoots so far discovered, and its record is looked forward to with great interest by the owners of other properties in this belt. The present mill commenced crushing, September, 1907, and for the first 10 months a yield of 60s. per ton was obtained or 67.5s. including gold from trial runs. Either of these was a satisfactory yield and gave promise of profitable operations. The working costs during this period were, however, high, amounting to about 42s. per ton or 48s. when depreciation of plant is included in the costs. For the year ended June 30, 1909, less satisfactory results were obtained, the yield being 55s. 7d. per ton, and the costs about 48s. excluding depreciation. If depreciation is included in the costs, there was no profit earned. The ore reserves, which are now being computed on a new basis, namely, that of milling tonnage, show a considerable reduction over the previous year. From the figures given in the 1909 report, it appears that the estimates of the previous year were considerably exaggerated. The value of the ore reserves at the end of

June, 1908, less the value taken out of the mine during 1909 is in excess of the value of the ore reserves at the end of June, 1909, a discrepancy which is the more noteworthy when taking into consideration the amount of new development that has taken place during the interval. With regard to the schedules of working costs, exception may well be taken to the exclusion of development expenditure from working costs. This custom, which is by no means peculiar to the Taquah mine, of speaking of working costs from which one of the main items of expenditure is omitted is both misleading and absurd. Whether the actual cost of development is charged or a computed charge on the development-redemption system, the amount should always be included when working costs are discussed. The company has had an unfavorable year, but the general manager expects to do much better in the future, concluding his report by saying that both as regards development and treatment an improvement has set in.

As regards the Abosso mine the financial results for the year ended June 30, 1909, are much the same as during the preceding year. The tonnage treated is somewhat larger but the yield has come down from 50s. to 45s. per ton, a decrease which is offset to some extent by reduced costs. The cost of working at this mine which produced 60,702 tons was 33s. 3d. per ton, including development and London expenses. If depreciation is added the costs came to nearly 38s. The development of the mine has been so satisfactory that the directors have decided to enlarge the production plant to treat 200,000 tons per annum. The capital of the company has been increased so as to provide funds for this extension. The ore reserves on June 30, 1909, are estimated at 350,888 tons averaging 14.4 dwt. or 60s. per ton. This grade, it must be remarked, is considerably higher than that milled during the last two years.

The working results of these two mines and especially the costs will for reasons mentioned above receive close attention from those interested in West African mining. The indifferent results obtained by mining that ground, acknowledged to be the richest portions of the basket goldfield, are not encouraging to the owners of poorer sections. A considerable reduction in operating expenses is needed before profitable mining can be spoken of with confidence and until such reductions have been demonstrated it would be well for the public to leave speculation in West African mines, especially in the basket mines, alone. If they do wish to speculate let them at all events figure out the capital and the profits required for an adequate dividend on this class of security or better still let them take advice of some engineer of standing and not trust to their own or their stock broker's optimism.



THE MINING NEWS

REPORTS OF NEW ENTERPRISES NEW MACHINERY.
INSTALLATIONS DEVELOPMENT WORK AND PROPERTY
TRANSFERS THE CURRENT HISTORY OF MINING

Arizona

GILA COUNTY

Inspiration—A 60-h.p. hoist is being installed at the Joe Bush shaft. Raises are being put up from the 400-ft. level, for the purpose of blocking ore. All advance work on this level is in ore. At the Scorpion shaft, the crosscut southward on the 275-ft. level is 200 ft. long and continues in ore. The 185-h.p. compressor at the tunnel will be installed as soon as it arrives. The tunnel is 80 ft. long and in granite-porphry. T. R. Drummond is general manager and Thomas Tighe superintendent.

Cordova—The churn drill is about 400 ft. south of the third drill hole started on the Miami and 300 ft. southeast of the nearest one on the Inspiration. The first sulphide was encountered by this hole at 40 ft. and continues to the present depth of over 200 ft. Granite-porphry is the formation. Underground, the drifting from the 475-ft. level of the Sullivan shaft, several hundred feet south of the drill, is in schist carrying copper. The length of the drift is 440 ft., and it is now being driven northeast toward the Miami southern boundary. M. E. McCarthy is general manager and A. Ball superintendent.

Miami—Three churn drills are in operation at the southwestern part of the property. These are 400 ft. apart and are drilling at three corners of one of the 400-ft. squares. The third hole is 400 ft. north of the drill at work on the Cordova ground and the ore was encountered by this hole at 20 ft. deeper than that by the latter drill. At 90 ft., the copper content is about 2 per cent. The depth of holes Nos. 1 and 2 is 500 and 383 ft. respectively and the ore has nearly a 2 per cent. content. About 2500 tons of waste and ore are being hoisted through the No. 1 and No. 4 shafts, a week. Preparations are being made to begin the steel erection at the concentrator.

Arizona-Michigan—On Feb. 2, the company paid to the original owners of its property, 10 per cent. of the purchase, amounting to \$15,000. A payment of 25 per cent. of the balance is to be made Feb. 1, 1911, and 55 per cent. on Feb. 1, 1912. The workings to date consist of a 500-ft. shaft, with crosscuts running north and south on the fifth level for distances of 460 and 440 ft. respectively. The south crosscut is in quartzite and the

north crosscut is in diabase. Drifts have been driven from this crosscut for 82 ft. east and 38 ft. west, but work has now been discontinued in them. The company has about 640 acres.

Arizona-Commercial—During the temporary shut down of the smeltery, while the water jackets are being repaired, a small force of men has been kept at work in the two sixth-level winzes and in the two crosscuts on the 700-ft. level. In the drift running west from the winze located 550 ft. from the Eureka shaft, between the sixth and seventh levels, an 8-in. streak of ore assaying 56 per cent. copper and 26 oz. to the ton in silver was struck Feb. 1, about 450 ft. from the Eureka shaft. The Black Hawk vein at that place is 6 ft. wide and the grade of the ore is improving slightly as drifting continues. The company is planning to enlarge its furnace to double its present capacity of 500 tons and also to install a converting plant in the near future.

Globe Mining Company—The crosscut on the 400-ft. level of the shaft of the Mineral Farm group has been driven 60 ft. in diabase and is now opening up a sulphide vein showing some chalcopryrite. The lode which the crosscut is to open lies over 30 ft. farther west. President J. F. Hechtman is in charge.

MOHAVE COUNTY

Golconda—The 1909 zinc output of this mine was 7100 tons, netting \$136,000 and averaging 46 per cent. zinc. This is a ten-fold increase over the previous year. It is expected that the Tub mine of the same company will output an amount equal to this for the year to come. The Golconda output has been entirely from above the 235-ft. level, and the mine is only opened to 337 ft. with a strong oreshoot in the bottom. Work is under way on the Prosperity tunnel, which will cut the vein 165 ft. below the present bottom.

Gold Bug—O. B. Amsden, superintendent, reports the cutting of the oreshoot on the 400-ft. level. Crosscutting on the 500-ft. level is under way. H. J. Marmein is manager.

YAVAPAI COUNTY

The Columbia district is half way between Prescott and Phoenix, seven miles east of Castle hot springs. The district has been neglected for many years, but recently has come into attention by reason of the good gold content of the ores.

The Columbia company has a lease on the American mines and 10-stamp mill, and is preparing to operate and develop. The company also has a bond on other properties in the district and expects to be able to operate the mill from ore taken out in development. The Cary claim has been sold recently to a Phoenix company, and the Crescent mine has been placed under bond to a New York company. Both are developing. On the Uncle Sam mine a small force is at work taking out ore, which is of a high grade. A number of individual operators are at work in the district. The ore is on a contact between eruptive formations.

YUMA COUNTY

Shamrock—This property, 8 miles northwest of Vicksburg, is developing on a wide copper vein. T. J. Prescott, Phoenix, is manager.

California

AMADOR COUNTY

South Eureka—The orebody encountered in this Sutter creek mine at the 2700 level, appears to be the same size and quality as that met on the levels above. Twenty stamps are being added to the mill.

Bunker Hill—In the last six months the mill at this mine crushed 18,439 tons of ore which yielded \$155,873. Eight dividends were paid during the period.

INYO COUNTY

The New Coso company has installed new machinery and is shipping 90 tons of ore weekly. At Fish Springs the Commetii property is regularly producing and extensive development is planned for the Buckeye company.

MARIPOSA COUNTY

1909—This company, near Hornitos, is to sink 100 ft. deeper before milling.

Champion—From this mine, at Coulterville, under lease to Bagby, Willburn & Quinn, a pocket yielded \$7444 recently.

Mariposa Commercial—This company, at Mount Bullion, is about to pump out the Princeton mine to the 800 level and start drifts toward the Green Gulch claim.

MENDOCINO COUNTY

Kempe & Man, of Fort Bragg, are opening a new quartz mine below Noyo, and have put in a hoist and a tramway. At the Jacobsen mine, at Mitchell creek, a number of men are at work.

MODOC COUNTY

White Quartz—Broaches & Brown, operating a lease on this mine in Hoag district, have found a rich vein in a shallow shaft.

MONTEREY COUNTY

Los Burros—Several carloads of machinery have been sent to King City for these mines and will be carried in by teams.

NEVADA COUNTY

Erie—The Dublin Bay shoot near Graniteville, has been encountered in the tunnel at a vertical depth of 200 ft.; the "pay" is 6 ft. wide and mills \$50 per ton. R. G. Eckis is superintendent, and S. H. Brockunier consulting engineer.

Colling—Machinery is being put on this mine at Rough and Ready.

Grover-Murphy—Work has been started in earnest on this Nevada City mine; machinery has been installed, including a compressor.

Champion—Tributing has been stopped in these Nevada City mines. The company is to reopen the Providence mine and sink the shaft deeper. The Nevada City mine will be reopened by tunnel and electric machinery will be installed. George E. Fitzgerald is general manager and T. A. Kelley is superintendent.

PLACER COUNTY

Davenport—On this mine at Auburn, a 5-stamp mill has been installed. N. E. Davenport is owner.

PLUMAS COUNTY

Engels—A smeltery will soon be erected on this copper mine, Taylorsville. Machinery has already been delivered. Henry Engels, 15 Liberty street, San Francisco, is manager.

SAN BERNARDINO COUNTY

Orange Blossom Extension—This gold and copper mine is 10 miles north of Amboy. Operations have been resumed after nine months close down, during which time, through President J. A. Hodgman, an indebtedness of \$54,034 has been obliterated. Over 3000 ft. of underground development and a depth of 715 ft. (water level) has been made, with every level showing low-grade ore. By continuation of the work outlined, it is expected the mine will become a producer. Where the orebodies above the water level remained unleached values are \$10 to \$50 per ton in gold. Where the ore has been leached the values are \$3 to \$4. In development and improvements the company has expended over a quarter of a million dollars.

SHASTA COUNTY

The Mount Shasta Power Company filed articles of incorporation at Redding Jan. 4. This company has a water right of 200,000 in. of water at the Big Bend of

the Pitt river and proposes to divert all of this through a tunnel seven miles long delivering the water at a sufficient height to allow of the generation of 250,000 horsepower.

The use of fire arms in holding mining claims received a check at the Sybil mine in French gulch, Shasta county, recently. A man after being put off by a deputy marshal by order of the Federal court, returned later with a gun to dispossess the keeper. The court decided it was time to restrain the offender and he was fined \$200.

Victor—This Red Bluff corporation will erect a 5-stamp mill on the Bonanza mill at Knob, in Harrison gulch district. P. H. Coffman, of Red Bluff, is secretary.

Climax—This mine, near Igo, is to be reopened by H. W. Robinson, and a cyanide plant built.

Mad Mule—This mine, at Stella, is under bond to Arizona men and is being worked under superintendence of Albert Egerton.

Happy Jack—Two Nissen stamps will be placed on this group near Shasta. The mine is under bond to Charles J. Paige.

Uncle Sam—This mine at Kennett, owned by J. O. Jilson and I. A. McIntosh is being equipped with electrical power.

SIERRA COUNTY

Wisconsin—This drift mine, north of Forest, owned by V. C. Slattery, of San Francisco, has been bonded to John W. Greenbanks, of Forest, and will be put in operation again. There are three tunnels.

Omega—This drift mine, west of Forest, is running its gravel mill steadily.

Alleghany Quartz Channel Company—This company at Alleghany has obtained control of the Gold Star mine and extensive improvements will be made.

Golden Fraction—This mine on Chips flat has been bonded by George Taylor to Los Angeles men.

SISKIYOU COUNTY

Homestake—This property, at Etna, John Boyle, manager, has been sold by F. H. Osgood, of Seattle, to the Pluto Mining Company and new machinery will be installed.

Carter Tunnel—J. W. Pickard is superintending operations at this mine and has ordered a new 5-stamp mill.

SONOMA COUNTY

Big Ledge—This company, on Pine mountain, near Melitta, R. Kluepfer, manager, will install a mill.

Oom Paul—This mine at Oro Fino has been purchased by Mr. Pickard, of Seattle and a 10-stamp mill will be installed.

Zarina—An electric plant has been put in on this mine at Etna Mills.

TUOLUMNE COUNTY

Tarantula—A compressor with drills has arrived for this mine at Chinese camp.

Draper—A large electric motor is being installed at this mine for running the mill.

Dondero—This mine, Yankee hill, has been purchased by P. M. Baumgardner, of Chicago.

Knight's Creek—In this section of the county, Collier & Herbert have struck a new shoot of ore, and are working the rock in an arrastra.

Colorado

TELLER COUNTY—CRIPPLE CREEK

The January output in the Cripple Creek district was 59,964 tons, the gross bullion value of which is placed by mill and smeltery officials at \$1,290,440. Unfavorable weather conditions restricted the production. The month's profits include \$112,500 in dividends, \$40,000 earned by lessees, and \$65,000 distributed among shareholders in close corporations, a total of \$222,500.

Three important Cripple Creek mining companies have just issued their annual reports for 1909. Total receipts of \$895,848 are reported for the Vindicator Consolidated Gold Mining Company on a net production of 31,644 tons. Treatment charges amounted to \$228,810, mine expenses to \$321,632; paid to lessees, \$213,351, leaving a gross profit of \$132,054. Dividends to the amount of \$112,500 were paid by the company in 1909. Total receipts of the Findley Consolidated Gold Mining Company for the year were \$76,796, after deducting treatment charges and lessees' share from the total production of 6819 tons valued at \$155,664. The company cleared its indebtedness during the year, leaving a balance January 1 of \$16,406. The annual report of the Gold King Mining Company states that the total production from 1892 to 1909 amounted to 67,715 tons with a gross bullion value of \$1,460,362; for 1909, 2895 tons with a value of \$56,681. The total valuation placed on the resources of the company is \$1,253,928.

Golden Cycle—Announcement has been made by President John T. Milliken that an option has been granted to a British syndicate on the stock, the option running until Feb. 28. The corporation has already made examination of the property which includes the Golden Cycle mine at Victor, the mill in Colorado Springs, and the coal lands east and north of Colorado Springs. It is unofficially stated that the company holding the option is the Goldfield Consolidated Mines Company, now operating at Johannesburg, South Africa. In his letter to stockholders, Mr. Milliken states that should the sale be consummated, the

shippers of the district will be protected from a monopoly of the milling interests.

SAN JUAN DISTRICT

Tomboy—The returns for January are as follows: Mill ran 28 days; crushed 8800 tons; yielding bullion, \$34,000; concentrates shipped, \$39,000; expenses, \$47,500; profit, \$25,500.

Idaho

BOISE COUNTY

Gold Hill—The mine is now pumped out and a large force is working on the lower levels. A new 100-ton mill has been completed. E. E. Carter is manager and W. L. Bowron superintendent.

IDAHO COUNTY

Penn-Dixie—The company at Dixie, has completed its 25-ton mill and is continuing development successfully. The ore is gold bearing. S. R. Gayton is manager.

Indiana

CLAY COUNTY

Rosebud—Fire broke out in the mine west of Cloverland, Jan. 27. The fire is supposed to have started from an explosion of gas setting fire to the timbers. The mine is the largest in the Seeleyville district, loading 30 cars of

GREENE COUNTY

Florence Coal Mining Company—This company has been organized to open coal shafts. The office will be Jasonville. The directors are: J. W. Graham, H. L. Doney and J. H. Persons.

VIGO COUNTY

Fairmount Coal Company—This company has filed articles to operate near Fairmount. The office will be in Terre Haute. Hugh Shirks is president.

Kansas

A. O. Ihseng has secured a lease on 220 acres of the Murphy land in North Empire and he will develop the deep ore in the dolomite formation. He will sublease all the ground above the 160-ft. level.

Kentucky

Elk Valley Consolidated Coal Company—This new company has purchased four coal mines in Muhlenburg county, with a large tract of coal land adjoining. C. D. M. Greer, of Memphis, Tenn., is president and manager. The properties purchased and merged are: Wickliffe mine, at Browder, from the Wickliffe Coal Company; the Elk Valley and Diamond Block mines, at Elk Valley, from the Elk Valley Coal Company, and the Louisville & Atlanta mine, at Drakesboro, from the Drakesboro Coal and Coke Company. The combined properties have a frontage of two miles on Green river, a navigable stream, and

extend from that river to the Louisville & Nashville railroad. The mines last year produced about 5500 tons of coal per day.

Michigan

COPPER

Hancock—The winze, or sub-shaft sinking on the No. 3 lode adjacent to No. 1 shaft is down to the 18th level, at this point it will be intersected by the second working crosscut from No. 2 shaft. Drifts from the 10th to 17th levels continue opening a good grade of stamp rock and it is estimated that fully 700,000 tons of rock is blocked out, enough to keep two modern heads in operation for two years. No. 2 shaft is sinking at a depth of 2100 feet. and is nearing the point where it will cut the No. 2 lode. It is estimated that this shaft will cut No. 1 lode at 2150 ft. and the Quincy or Pewabic lode at 3500 feet.

Oneco—No. 5 drill hole has reached the Oneco lode at 978 ft. The lode found to be about 30 ft. wide, 15 ft. of it carrying copper and 8 ft. of this highly mineralized. This lode was exposed in the No. 3 hole at a depth of about 13 ft. with practically the same results. The second drilling outfit has been started to cut the new amygdaloid formation that was exposed in No. 5 hole at 356 ft., at 1900 ft. southwest of No. 5 hole.

Keweenaw—Drilling to the north from the bottom of the Medora shaft has been discontinued without revealing anything important. The drill is now operating in the opposite direction to cut the Calumet, Osceola and other lodes to the south. Shaft sinking on the Kearsarge lode continues with the copper contents of an encouraging nature.

Lake—Rock shipments averaging 100 tons daily are being made to the Franklin mill, from the openings of the 2d, 3d, 4th and 5th levels. All the levels continue to open ground of about the same characteristic richness as noted. Sinking has been resumed in the shaft below the 6th level at which point the crosscut is nearing the lode.

Franklin—Sinking is going forward in the two shafts sinking on the Pewabic lode. No. 1 is to the 28th level and the lode opened by the crosscut at 27th level is well mineralized. No. 3 shaft is below 1400 ft. but lateral openings have not been started. Drilling is being done to expose the Hancock Lodes.

Bohemia—This company has been organized with a capital of 100,000 shares at \$25 par value, of which 75,000 shares have been issued, 45,000 shares being sold for the treasury at \$8. The tract comprises 960 acres, known as the Henwood tract, ½ mile northwest of the Indiana. A small amount of exploratory work was done on the western portion by the former owners, but it is planned

by the new company to direct attention to the eastern portion in view of striking the various formations exposed by the Indiana and the Lake.

Missouri

JOPLIN DISTRICT

Moore—A strike has been made on the land southeast of Cave Springs.

Falls City—This company has secured the Black Cat lease in the West Joplin sheet-ground district and will build a 300-ton mill. This mine was worked with a small mill without success as the small ore content required a large mill.

Fullerton—This company has sold the 80-acre tract at Porto Rico to Mr. Frederick for \$70,000.

Montana

BUTTE DISTRICT

Tuolumne—At 20 ft. below the surface a drift is being run on the footwall side of the main vein to ascertain its apex so that more information may be obtained for the settlement of the controversy with the North Butte company. On the 1200-ft. level, stoping is being done and the management states that the ore will average 15 per cent. copper. The 1000-ft. level is also being opened up and it is the intention of the company to explore the vein every 200 ft. from there to the surface to prove the apex. The Tuolumne management states that it believes about \$8,000,000 worth of ore has been taken by the North Butte.

British-Butte—A special meeting of stockholders has been called for March 3, for the purpose of authorizing a mortgage on the company's property for \$226,000 to Shirley H. Jenks, representing the British stockholders. It is hoped that by this means the present indebtedness can be taken care of. The diamond drill on the property recently reached a depth of 1205 ft., but bedrock was not reached so it was decided to suspend operations with the drill. J. W. Murphy, one of the local stockholders, has been elected president.

Butte Central—Rumors continue that operations will soon be resumed at the Ophir mine. A meeting of stockholders has been held at Wilmington, Del., to consider plans.

Butte Copper and Zinc—The Emma mine which has not been operated in a number of years, is now being sampled by experts in the interest of Eastern capitalists. A contract has been let for the unwatering of the shaft and when this is completed the mine will be sampled for the purpose of ascertaining its zinc content.

DEER LODGE COUNTY

Southern Cross—Ten 4-horse teams are handling the company's ore. No stoping is being done and all of the ore is taken out in the course of development.

MADISON COUNTY

Stella—In an action brought by D. R. Snider against Mike O'Conner an injunction has been served on the latter shutting down the mine pending the action.

Conrey Placer—Manager Kammerer states that a new gold dredge will be installed in the spring. The dredge will have a capacity of 200,000 yd. of gravel monthly and will dig to 60 ft. It will be operated electrically. By means of the new dredge much of the property can be worked over.

YELLOWSTONE COUNTY

Roundup—This coal company has recently purchased 1000 acres of coal lands east of Roundup from J. C. Lohman, W. F. Strait, Alexander Roy and J. W. Newton. A shaft 190 ft. deep will be sunk. Machinery has been ordered. L. J. Cake will be in charge.

Nevada

ESMERALDA COUNTY

Operations in the Goldfield district outside the proved zone are increasing notably. The Yellow Tiger has resumed with ample capital, work has been started on the Atlanta leases by J. A. Houlihan and by J. O. Buckley. The strike in the Campbell lease on the Diamondfield-Black Butte is improving. The C. O. D. Consolidated and Gold Bar have disclosed ore at 300 ft. Several operators are working in the dacite belt south and southeast of the camp. The Davenport, 4 miles southwest of Goldfield, is promising.

NYE COUNTY

Chloride Cliff—This Bullfrog mine will install a mill. J. Irving Crowell and Donald Findley have recently completed a sampling of the property.

Johnnie—The control of the company has passed to A. D. Meyers and T. A. Johnson and the mine will be extensively developed. The property is equipped with a mill with Nissen stamps and a Lane mill. The mill capacity will be increased to 200 tons daily.

Tonopah Extension—The new 30-stamp mill is about complete and is being operated at a reduced capacity while the final repairs, etc., are being completed. J. G. Kirchen, general manager, has gone east leaving his brother, Charles Kirchen, in charge. Dr. Walter Techow is mill superintendent.

Tonopah Mining—About 270 men are employed on two shifts and an output of between 400 and 500 tons per day maintained. Records for the 10 months past show an average of about 14,000 tons per month, of an average content of gold 0.314 oz. and silver 28.15 oz. It is treated at the company's mill at Millers, Nev. A depth of 80 ft. has been reached in the new, two-compartment shaft being sunk on the Sand Cross claim, west of

the Red Plume. Ore is being hoisted at the Silver Top and Mizpah shafts, while only waste is raised at the Red Plume.

Ohio

Goshen Coal Company—This recently organized company has acquired the properties formerly owned by the Philadelphia, the Goshen, the East Goshen, the Beaver Dam, and the Cleveland & Tuscarawas coal companies. These include seven mines—which produced 510,000 tons coal in 1909—and 6600 acres of unmined coal, covering over one-half of the Tuscarawas county coalfields. C. L. Cassingham, of Cleveland, O., is president and general manager. The company is now issuing \$525,000 in 6 per cent. mortgage bonds, for the purpose of improvements and extensions at its mines.

Oklahoma

A strike has been made about 3 miles southwest of the Miami camp that bids fair to start a new camp. The ore was struck at 70 ft. and is rich and free from iron.

Mission—The 500-ton mill at the Mission mine, Quapaw camp, has started.

Lolita—This company has bought the Omaha mill at Quapaw and is moving it to Miami.

Quapaw Gas Company—The company is installing its line through Oklahoma as fast as possible. The line will be completed in 60 days.

Pennsylvania

ANTHRACITE COAL

Lehigh Valley Coal Company—This company has purchased the Stevens colliery owned and operated by the Stevens Coal Company, of West Pittston. The colliery is in Exeter borough. The opening of the Stevens mine took place 60 years ago, when a man named Price drove a drift into one of the veins and sold the product of his enterprise to the farmers in the neighborhood. In 1888, the late A. B. Stevens of Scranton, leased the lands upon which the colliery is and began to operate it on an extensive scale. Later the lease was transferred to the Lehigh Valley Coal Company, which owned the adjoining lands. Later on, it was again transferred to the Stevens Coal Company, together with 250 acres of the adjoining coal lands. In 1891, the control of the Stevens colliery passed from the hands of the Scranton people to J. Amherst Wisner, of Brooklyn, N. Y., and several other capitalists. The company has been managed for a number of years by H. W. Kingsbury, of Scranton. The colliery produced 169,000 tons of excellent coal in 1907, and employs over 300 men and

boys. It is estimated that over 1,000,000 tons of coal remain in the tract.

South Dakota

Homestake—The company is receiving about 30 to 40 men per day to work on the property. They are coming largely from Joplin, Missouri, Wisconsin and Colorado, and seem to be a good class of men, with few foreigners. It appears probable that the management will refuse to employ the Slavonians who are the only ones of their old employees still maintaining the strike. They make good workers, but the leaders of the federation found it easy to deceive them as to the chances of winning the strike. About one-half of the men in Terry on the first of the year have left and it is anticipated that many of those in the camp will be ready to go to work when the other companies decide to start up. The Homestake has two mills running with ample ore supply and will start the third as soon as mechanics can get it in shape. It appears probable that the mine will be running at full capacity in a short time.

Utah

JUAB COUNTY

Yankee Consolidated—This company expects to mill its dump in the near future to secure funds for pushing development. It is estimated that there are \$20,000 or more in the dump. Milling arrangements may be made with the Godiva company.

Chief Consolidated—This company has offered to take over the stock of the Eureka City company on the basis of one share of the Chief for five shares of Eureka City.

SALT LAKE COUNTY

North Utah—The crosscut which was being driven north of the shaft in the Butler-Liberal section of this property is reported to have struck 2 ft. of solid galena. The company is now taking ore from four places in the mine. W. D. Bohm is manager.

Utah Apex—The first shipment of 55 tons of ore made by the Utah company to the American Smelting and Refining Company under the new smelting contract is reported to have carried 41 per cent. lead, 11.8 oz. of silver, 1.6 per cent. copper. The gross value per ton was \$32.33. The 107 tons of concentrates which were treated under the old contract carried 32.2 per cent. lead, 8.4 oz. of silver and 1 per cent. copper, with a gross value of \$23.29 per ton.

SUMMIT COUNTY

New York—The shaft has been sunk to 1000 ft. and a crosscut is being run to the southeast to intersect ore encountered on the 850. Fifteen men are being worked in two shifts.

American Flag—Regular shipments are being made. The purchase of the Constellation group was recently effected.

Little Bell—Shipments are being made and a dividend of \$15,000 was paid last month. Good ore is being mined from the incline from the 700-ft. level.

Ontario—With the connection of the Ontario tunnel and the 2100-ft. level of the Daly-West all work ceased through the old No. 3 Ontario shaft. Crowther holds a lease on the workings above the 700-ft. level and is taking out some ore.

Utah-Treasure Hill—Prospecting work is in progress.

Grasselli Mill—About 70 tons of zinc middlings from the Daly-Judge are being treated daily. A bid is being made for similar material from the Silver King Coalition.

Wyoming

CARBON COUNTY

West Virginia-Wyoming—The company is installing new machinery at Rambler and will sink to 1000 feet.

Wyoming Coal Mining Company—The company will install a locomotive-haulage system next April, at Monarch.

Canada

ONTARIO

Preparations are being made to sink several shafts on the claims owned by McArthur & Co., of Glasgow, Scotland, at Porcupine. Free gold has been found on Stewart and Harper properties in Shaw township.

ONTARIO-COBALT

Shipments of ore from Cobalt for the week ended Jan. 28 were as follows: Cobalt Central, 41,299; Colonial, 63,660; Crown Reserve, 123,071; La Rose, 123,500; McKinley-Darragh, 46,027; Nipissing, 306,852; Trethewey, 65,000; total, 769,409 pounds.

Trinity—This mine has been sold under liquidation proceedings to Henry E. Jungling, of Buffalo, N. Y., for \$12,500.

Beaver—The shaft is being enlarged and timbered and several new buildings are in course of construction, the mine in the meantime being closed down.

Bailey—The power plant to operate six drills has been installed and is in readiness for development work on a large scale so soon as a supply of electric energy is available.

Mexico

CHIHUAHUA

Esmeralda—The Parral Mining Company, operating the Esmeralda properties, Parral, is planning a 100-ton milling plant. Tests are now being made. Wade Armstrong is manager. W. P. Fairman and Dr. H. P. Leopold, of Philadelphia, are interested.

Alvarado—James I. Long has been appointed manager, succeeding F. C. Morehouse, resigned. Mining has been suspended pending the readiness of the mill of the Palmilla Milling Company, which is an affiliated concern.

San Enrique—This property, in the Almaloya section of the Parral district is showing encouraging development, under the direction of V. C. Joslyn.

Dolores—Recent reports show the production of this mine for three years to have been over \$3,000,000. Dividends of 18 per cent. per annum are now being regularly distributed.

Capuzaya—The new management will start extensive work at the Parral mine. It is claimed that the explorations in the Palmilla have shown an extension of the orebody into the Capuzaya ground.

HIDALGO

Cortez Associated—This Boston company has extensive properties near Jacala. Development will be undertaken.

JALISCO

Philadelphia Copper and Gold—A 25-ton experimental plant, for direct cyanidation of gold-silver ores, will be placed in commission on Feb. 15. The gold deposit, discovered in connection with the development of the company's San Vicente copper veins, Ameca district, is being opened by 4 tunnels, 150 ft. apart, giving a depth of 600 ft. In the lowest tunnel the vein has been crosscut 35 m. The ore runs from 12 to 15 grams gold and 2 oz. silver.

Magistral-Ameca—The 100-ton concentrating plant, using the Elmore process, will be ready for operation in April. Crushing equipment is for a capacity of 200 tons. Reverberatory smelting furnace will be built later. The company announces blocked out 35,000 tons running 7½ per cent. copper, and 150,000 tons running 4 per cent.

SONORA

Green-Cananea—The January output is reported as 1750 tons of copper bullion containing 464 oz. gold and 85,132 oz. silver. The annual meeting will not be held until June.

Yaqui River Smelting and Refining Company—Plans for blowing in this company's smeltery at Toledo are under way. A. E. Klauser, president, is at the property.

Cerro de Plata—This company is working an antiqua near Imuris, with 30 men and has found ore below the old workings.

Palomas—A \$10,000 instalment has been paid by English purchasers of the Palomas placer fields.

Chicago Exploration Company—This corporation has purchased the Mina Mexico in the Sahuaripa district. Little development work has been done recently.

ZACATECAS

San Carlos—Arrangements are being made to use direct water power in the operation of the 50-stamp mill, which will be soon placed in commission after long idleness.

Africa

RHODESIA

Gold production in December is reported at 55,446 oz., making for the year 1909 a total of 623,389 oz. fine, or \$12,885,451. This total is an increase of \$609,057, or 4.96 per cent., over the previous year. There were 208 mines in operation in December. Other production reported for December includes 19,845 oz. silver, 13 tons copper, 72 tons lead and 1120 tons chrome ore. Coal output was 13,584 tons.

Australia

NEW SOUTH WALES

Broken Hill Proprietary Company—The refinery in the four weeks ended Jan. 19 produced 295,820 oz. silver, 5553 tons lead and 44 tons hard or antimonial lead. Of this 247,687 oz. silver and 5089 tons lead were from purchased ores. There was also produced 4985 tons zinc concentrates, containing 61,585 oz. silver, 321 tons lead and 2318 tons zinc.

Dutch East Indies

Ketahoen—This company, in Sumatra, mined and treated during 1909 by crushing, amalgamation and cyaniding 48,020 tons of ore, the yield being 26,033 oz. gold and 37,820 oz. silver. The profits were \$145,926, or \$3.04 per ton. Ore reserves Dec. 31 were 144,000 tons, averaging \$12 per ton.

Redjang Lebong—Ore mined and treated in 1909 by this company, the largest in Sumatra, was 94,500 tons, the yield being 77,777 oz. gold and 429,160 oz. silver. The gross profit was \$1,138,866, or \$12.05 per ton. Ore reserves Dec. 31 were 307,000 tons, of an average assay value of \$18 per ton.

South America

BRAZIL

Brazilian Goldfields Ltd.—This British company operating in southern Brazil has formed three development organizations and is operating extensively. André P. Griffiths, London is the mining engineer for the company.

BRITISH GUIANA

Exports of gold from the colony for the year ended Dec. 31 were 73,089 oz. bullion in 1908, and 64,977 oz. in 1909; a decrease of 8112 oz. The bullion reported in 1909 was equal to \$1,129,811, or 54,660 oz. fine gold. Exports of diamonds in 1909 were 5646 carats, valued at \$39,060; an increase of 679 carats over the previous year.

\$ • THE MARKETS • \$

CURRENT PRICES OF METAL • MINERALS • COAL AND STOCKS • CONDITIONS AND COMMERCIAL STATISTICS

Coal Trade Review

New York, Feb. 9—In the East the bituminous coal trade is working under better conditions. Car supply is still irregular, but transportation conditions are better. Demand continues to improve gradually. The anthracite trade is without incident.

In the West demand is good, and there is beginning to be some rush to put in supplies, in order to prepare for a possible stoppage of mining in April. The car supply is reported to be improving, but there are delays in moving coal, owing to bad weather and deficient motive power on many roads. The wage scale continues to be the chief point of discussion; the general feeling seems to be that some settlement will be reached before April.

The Wage Scale Conference—The conference over the mining scale which began at Toledo, O., Feb. 2, was in session only one day. The Illinois operators refused to send delegates, and the operators from the other States voted that the miners' delegates from Illinois, should not be admitted. The miners insisted that as Illinois is one of the competitive States, its delegates ought to take part, whether the operators were present or not. On this point neither side would give way, and the conference adjourned without day. It is generally believed, however, that another meeting will be arranged before long.

Pittsburg Coal Company—The proposed voting trust for this company was not formed, as holders of sufficient stock to give the trust control did not assent. The position of the company seems uncertain, and will probably remain so until the annual meeting next month, which will show where the controlling interest is held.

COAL TRAFFIC NOTES

Coal shipments by districts over Norfolk & Western road, six months of fiscal year from July 1 to Dec. 31:

	Commercial.	Company.	Total.
Pocahontas	4,767,400	602,495	5,369,895
Tug River	751,625	61,528	813,153
Thacker	742,070	261,942	1,004,012
Kenova	319,864	95,444	415,308
Clinch Valley	279,216	28,517	307,733

Total 6,860,175 1,049,926 7,910,101

Pocahontas district shipments were 68.5 per cent. of the total.

Alabama coal production in 1909 is reported by State Mine Inspector Flynn at 12,567,000 short tons, with several

smaller mines still to report. This shows an increase of 1,044,000 tons over the previous year.

Anthracite shipments in January are reported as follows, in long tons:

	1909.	1910.	Changes.
Reading	1,056,104	1,185,122	I. 129,018
Lehigh Valley	895,401	873,640	D. 21,761
N. J. Central	630,085	617,009	D. 13,076
Lackawanna	762,636	829,786	I. 67,150
Del. & Hudson	566,052	489,290	D. 76,762
Pennsylvania	484,682	550,272	I. 65,590
Erie	548,077	547,125	D. 952
N. Y., Ont. & West.	240,308	214,374	D. 25,934
Total	5,183,345	5,306,618	I. 123,273

Three companies—the Philadelphia & Reading, the Delaware, Lackawanna & Western and the Pennsylvania—show increases; the others small decreases. The total gain for the month was 2.4 per cent.

New York

ANTHRACITE

Feb. 9—Cold weather has supported and increased the usual steady demand, and business has been good. Though cold, the weather has not been stormy and coal is moving with less difficulty.

Schedule prices for large sizes are \$4.75 for lump and \$5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes quotations are, f.o.b. New York harbor points, according to grade: Pea, \$3@3.25; buckwheat, \$2.35@2.50; No. 2 buckwheat or rice, \$1.85@2; barley, \$1.40@1.50. The lower prices are generally for washery coal.

BITUMINOUS

Car supply is still a vexing question in the seaboard bituminous trade. There has been some improvement on the Baltimore & Ohio; notably the Fairmont and Somerset districts are getting more cars. On other roads also the car situation is better. On the other hand, transportation is bad, coal being delayed by storms and zero weather. Seaboard supplies, therefore, are still irregular.

Buying is better for New York harbor and the Sound, but it is mostly the low-priced coals that are wanted. The far East is out of the market at present. Prices are unchanged; fair grades of soft coal can be had about \$2.60, f.o.b. New York harbor, with better grades bringing up to \$3. There is not much demand for the higher grades. Gas coal is still in only day-to-day supply.

In the coastwise vessel market rates have an upward tendency. Medium sized boats ask 80@85c. from New York to points around Cape Cod; while 90c.@\$1 is paid to some of the smaller ports.

Birmingham

Feb. 7—Coal operations in Alabama are steadily improving and the railroads are being urged to furnish more and more cars. The demand for coal promises to hold up through the year, in fact business coming in from outside the State appears to be of a lasting nature, the contracts covering a long period.

There is a steady demand for coke in this State and the ovens in operation are not keeping up with the demand.

Chicago

Feb. 8—The coal market has practically resumed its normal state, owing to the continuance of mild weather and the consequent relief from railroad congestion. Screenings still continue high, but this is in part due to increased use of this size. Steam coals in general are weak, and domestic coals are by no means strong, in the absence of zero weather anywhere in Chicago territory. Lump and egg from Illinois and Indiana mines bring \$2@3; run-of-mine sells for \$1.75@2 and screenings are held at \$1.60@1.85 per ton.

Of the coals from east of Indiana, Hocking is steadiest, selling well at \$3.15 and not troubled with overshipments. The same can hardly be said of smokeless coal, which is beginning to show its old condition of too large supply for the maintenance of prices. Lump smokeless brings \$3.75@4; run-of-mine sells for \$3.20@3.45. Youghiogheny is steady at \$3.30 for gas and \$3.15 for steam. Anthracite is lagging, the trade being scattering, with nut still in comparatively large demand and small supply.

Cleveland

Feb. 7—Interest is centered on the wage scale conference. The preliminary failure, it is generally believed, will not prevent a renewal of the negotiations between operators and miners.

Locally trade is good. Car supply is better and transportation is much improved, so that deliveries are more freely made. The demand for slack continues.

Prices are a little off, owing to better supply. Quotations are, f.o.b. Cleveland, for Middle district \$2 for 1¼-in.; \$1.85 for ¾-in.; \$1.75 for run-of-mine; \$1.65 for slack. No. 8 district \$2.25 for 1¼-in., \$2 for ¾-in., \$1.90 for run-of-mine and \$1.85 for slack. Pocahontas is \$3.10 for lump and \$2.45 for run-of-mine. Massillon domestic, \$2.95 for lump and washed nut.

Indianapolis

Feb. 7—No sooner had the Toledo conference adjourned than there began a scramble on the part of consumers and big coal dealers to make contracts for coal for March delivery. Operators who have a production of free coal received offers of high prices, but so far as known no contracts were made. On a second thought Indiana operators believe that they can get more money than now offered for free coal in case of a strike; though the purchasers under such contracts will be able to buy for less if there is no strike.

Pittsburg

Feb. 8—The only question at Toledo was what the miners and operators would disagree upon, as no approach to a settlement of the wage scale to date from April 1 could be expected at so early a date. The local coal market is firm but not particularly active. Prices are unchanged, at \$1.15 for mine-run and nut, \$1.25 for ¾-in., \$1.40 for domestic 1¼-in. and 85@90c. for slack.

Connellsville Coke—The market has gone to pieces, and coke is offered at very low prices, while there are no buyers. The Connellsville coke industry pays the penalty of its excess of optimism last fall, when it pushed prices up and up until the lowest asking prices on furnace coke on contracts for this year were about \$3, and some operators were holding out for \$3.25 or even higher. Since then the market has been declining, but only slowly, and a number of consumers have gone elsewhere for their coke, to West Virginia and the various Pennsylvania districts outside of Connellsville. It has been the rule in the trade, that in periods of dullness, certain blast furnaces seek cheaper coke, and in periods of prosperity, return to Connellsville. This time the usual quota did not return to Connellsville. The iron industry promises no increase in consumption, but rather a decrease, and the only solution for the Connellsville coke trade will be the idleness of some of the plants making second-grade coke.

Prompt furnace coke is offered at well below \$2.25 at ovens, and could probably be had at \$2, but there is no market. A week ago a sale was made for delivery over February, March and April, about 5000 tons monthly, at \$2.30. This week a contract could hardly be made at less, but there is no inquiry along this line. Some good grades of 72-hour foundry coke have been offered at \$2.60@2.75, for prompt shipment, and the market is quotable approximately at that range. There is no talk of contracts.

The *Courier* reports production in the Connellsville and lower Connellsville region in the week ending Jan. 29 at 474,496 tons, and shipments at 4958 cars to

Pittsburg, 8954 cars to points west of Pittsburg and 979 cars to points east of Connellsville, a total of 14,891 cars.

St. Louis

In spite of the fact that the weather has remained mild all week, the market for lump coal has rallied and prices are better now than they have been for the past two weeks. The demand from dealers throughout the country is very light, but the railroads are beginning to store coal heavily, which is having a steadying effect on the market. The storage movement has not become general with manufacturers, though a large number of industries are beginning to figure on storage coal and a few of them have begun to snap up any cheap coal they could obtain.

The car situation is getting worse in every direction. The Illinois Central operators have been practically out of business for some time. One to 1½ days' work is all they have been able to get in a week. Not only do cars seem to be short, but motive power is lacking. Indications are that after next week the Illinois Central will take all coal that is mined on the road. The differential that has prevailed on coal that will go out of town has entirely disappeared.

The market on screenings has ceased off a little owing to the fact that so much railroad lump is being made. High-grade coal is still bringing good prices, though very little domestic coal is being made, owing to the railroad demands. High-grade screenings have come down in sympathy with low-grade coals, and are not bringing within 50c. per ton of what they were several weeks ago.

Quotations current are given as follows, the first price named in each case being at mine, the second, f.o.b., St. Louis: Standard 6-in. lump, \$1.75 and \$2.27; 2-in. lump, \$1.30 and \$1.82; mine-run, \$1.10 and \$1.62; 3-in. nut, \$1.10 and \$1.62; small nut and pea, \$1 and \$1.52; screenings, 65c. and \$1.27.

Springfield, Mt. Olive and Staunton, 6-in. lump, \$2 and \$2.52; 2-inch lump, \$1.50 and \$2.02; mine-run, \$1.40 and \$1.92; screenings, \$1.10 and \$1.62.

Franklin County, 6-in. lump, \$2.25 and \$2.92; 3-in. nut, \$2 and \$2.67; 1½-in. screenings, \$1.25 at mine.

Carterville, 6-in. lump, \$2 and \$2.67; 3-in. to 2-in. nut, \$1.90 and \$2.57; 1½-in. screenings, \$1 and \$1.67.

Anthracite is in good demand and the supply seems to be much better than heretofore. Even chestnut seems to be coming forward more freely and trade is brisk in spite of the fact that dealers are buying cautiously on account of the season being so near the end.

Scranton, Penn.

Feb. 8—Work at the anthracite mines is excellent at present. The breakers

are working full time and in a great number of cases overtime. Upon their January wages the miners obtained an increase of 7 per cent. on the sliding scale, the largest increase that they have had since it went into operation. There is no trouble at any of the mines throughout the anthracite districts, certainly not in the neighborhood of Scranton, Wilkes-Barre, Carbondale or Hazleton. The demand for anthracite is exceptionally good. The cold weather that set in at the beginning of December has continued uninterrupted since, eating up the last of the coal that the operators had stored up in anticipation of a strike 12 months ago.

Foreign Coal Trade

Nova Scotia Coal—Shipments from Nova Scotia mines, year ended Dec. 31, long tons:

	1908.	1909.	Changes.
Dominion	3,243,007	2,469,493	D. 773,514
Nova Scotia Steel ..	644,638	785,015	I. 140,377
Acadia	320,122	278,131	D. 41,991
Intercolonial	244,897	249,218	I. 4,321
Inverness	256,910	230,752	D. 26,158
Cumberland	362,339	216,325	D. 146,014
Smaller Cos.	300,565	368,743	I. 68,178
Total	5,372,478	4,597,677	D. 774,801

The total decrease in 1909 was 14.4 per cent. The loss was due to the strike at the Dominion Coal Company's mines.

Welsh Coal Market—Messrs. Hull, Blyth & Co., Cardiff, report prices of coal as follows, on Jan. 29: Best Welsh steam, \$4.14; seconds, \$4.02; thirds, \$3.90; dry coals, \$3.96; best Monmouthshire, \$3.66; seconds, \$3.54; best small steam, \$2.34; seconds, \$2.10. All prices are per long ton, f.o.b. shipping port, less 2¼ per cent. discount.

Iron Trade Review

New York, Feb. 9—The iron and steel markets show but little activity generally; many buyers seem to be discouraged by the upset in Wall Street.

There is some movement in structural steel and a number of small contracts have been placed, besides a few larger ones. Some large rail orders have been placed, the Baltimore & Ohio taking 78,500 tons, divided between Steel Corporation plants and the Bethlehem works. Other companies have placed a total of 68,000 tons. It is to be noted that over a third of the orders call for open-hearth steel rails, from the Bethlehem and the Maryland Steel companies and the Gary works of the Steel Corporation.

Pig iron in the West has been quiet, but in Eastern territory there has been fair buying of foundry and basic pig. Virginia furnaces have been actively in the market and have taken most of the Eastern orders, making, it is said, concessions of 50c., and in a few cases 75c. a ton to secure them.

Some buying of heavy steel and other scrap abroad is reported. This has been helped by the new Treasury decision, which admits practically all scrap at \$1 per ton duty.

Lake Iron Ore—Receipts of Lake Superior iron ore at Lake Michigan ports in 1909 reached a total of 6,929,831 tons. The larger deliveries were 4,673,810 tons at South Chicago and 1,921,818 tons at Gary.

Baltimore

Feb. 7—Imports for the past week included 502 tons manganese ore from Antwerp; 4195 tons cupreous pyrites from Huelva, Spain; 17,150 tons iron ore from Cuba.

Birmingham

Feb. 7—While pig-iron buying in Southern territory has not been as active as it was expected, conditions are still considered satisfactory. There is a steady operation of blast furnaces, though some have been turned from foundry iron to basic, for which there is a good demand. The quotations are hardening a little around \$14.50 per ton for No. 2 foundry, delivery during the second and third quarters of the year. There is a little immediate delivery iron being sold at \$14 per ton, but the amount is not great. The books for the first quarter of the year are well covered while the aggregate for the second quarter is not bad. There is no iron accumulating worthy of comment; the stocks on hand have been reduced materially since December. All companies in this section of the country are right up in delivery of iron.

There is no change in steel, cast-iron pipe and foundry and machine-shop conditions all being good.

Chicago

Feb. 8—The iron market continues firm, with foundry buying still light, but well distributed, and malleable interests largely furnishing the activity of the market. There is no depression of prices; \$14 Birmingham continues to be the lowest figure on Southern No. 2, which means \$18.35 Chicago. Southern agents are optimistic, expressing the opinion that buying is bound to increase steadily, though perhaps slowly, and Northern furnaces are closely sold up for first-half output. There is little disposition to enter into third- and fourth-quarter contracts at current prices, on the part of furnace agents, and melters are running rather closely to current needs, though inquiries about future supplies are increasing. Northern No. 2 continues to bring \$19@19.50. Some weakness appears in Lake Superior charcoal iron, which brings \$19.50 and is in better supply than demand.

The condition of the market for iron

and steel products is very satisfactory to producing and selling interests. Coke is rather dull, being in large supply, but the price holds to \$4.50 for the best Connellsville.

Cleveland

Feb. 7—Ore buying seems to be over for the present, and there is little or nothing doing. Eastern furnaces have been light buyers and may come in later.

Pig Iron—There are rumors of concessions made by furnaces, but no definite information. Quotations are \$19.50 @ 19.75 for bessemer; \$18 for basic; \$17.50 @ 17.75 for No. 2 foundry; \$17 @ 17.25 for gray forge.

Finished Material—More inquiries are reported for bars, and some for structural material. Mills are rather conservative about taking orders for delivery later than June.

Philadelphia

Feb. 9—There is much less anxiety to purchase pig iron for future delivery than even a week or two ago. There is something in the air that keeps buyers back and indifferent. No one can give a strong reason for the slackening in demand, as much iron is being melted. Prices are strong and outside of several proffers from Southern furnaces there is no iron offered on the market. Several additional lots of malleable have been taken for immediate delivery. Basic iron is easier to get for forward delivery but the old quotations are not so strongly adhered to. Basic is \$18.50; No. 2 X foundry \$19; while \$18 is asked for gray forge.

Steel Billets—Makers are showing a disposition to accommodate prospective buyers for late delivery on more reasonable terms.

Bars—Sales are up to average both at stores and mills.

Scrap—Scrap has not developed the activity which numerous recent inquiries indicated as probable. Dealers are holding all their stock at top prices and are not seeking customers.

Pittsburg

Feb. 8—A chill has come over the whole iron and steel trade since the first of the month. The quietness in January was expected, but not that the second half would be quieter than the first half of the month. As for February, some slight improvement at least was looked for, whereas the market from being quiet has turned dull. Prices of finished steel products show a slight weakening tendency at points, unimportant perhaps in itself but important by reason of the contrast furnished with a period of over six months of continued improvement. The weaknesses thus far apparent comprise only a return to the 1.45c. price on steel bars on

contract, a price which was understood to have been withdrawn Jan. 1 in favor of 1.50c., and a willingness on the part of some wire mills to book some additional tonnages on old low-priced contracts which were supposed to have been worked out. There are definite reports of cutting in fabricated steel.

Apparently the causes of the trouble are unrest over the situation at Washington and the stocking up by jobbers and manufacturing consumers in the closing months of last year.

Pig Iron—There has been a decrease in production, but it is due to furnaces not working as well as in December, rather than to the blowing out of any considerable number. Exact prices are not quotable, there not being enough business to test the market. We quote nominal prices, f.o.b. Valley furnaces—90c. higher at Pittsburg—unchanged from last week at \$19 for bessemer, \$16.75 for No. 2 foundry and \$16.50 for basic. Virginia furnaces have dropped 50c., to \$15, furnace, on No. 2 plain, 2 to 2½ per cent. silicon. Southern pig iron is held by most sellers at \$14, Birmingham, but for balance of this quarter \$13.75 can be done, representing a slight further weakening.

Steel—The market for unfinished steel is very quiet, there not being enough inquiry to test prices, which are nominally unchanged at \$27 @ 27.50 for bessemer and \$27.50 @ 28 for open-hearth billets; \$28.50 @ 29 for sheet bars and \$35 for rods. Plates and shapes are 1.55c., Pittsburg.

Ferromanganese—The market is quiet with prices quoted at \$44, Baltimore, for prompt delivery, freight to Pittsburg being \$2.30 per ton.

Sheets—New business is rather light, but the mills are comfortably sold ahead, chiefly on contracts made before the latest advance. There has been relatively little business placed at the present prices of 2.40c. for black and 3.50c. for galvanized and these prices therefore have not been seriously tested. Electrical sheets bring full prices without any trouble, while blue annealed remain firm at 1.90c. Corrugated roofing remains at \$1.70 per square for painted and \$3 for galvanized.

St. Louis

Feb. 7—The market for pig iron has been a little more active this week than last, though still slow. More interest is being shown, however, as a good many inquiries for both large and small lots have been received. A few buyers are now venturing into the second half. Not much business has been actually closed this week, though indications are that tonnage will improve from now on. Prices remain unchanged at \$15 per ton Birmingham or \$18.75 St. Louis for No. 2 foundry.

Metal Markets

New York, Feb. 9—The metal markets have been generally quiet, with a weaker tendency on some lines, and no special incident to report.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Dec. 1909..	\$10,579,304	\$ 2,083,772	Exp. \$ 8,495,532
" 1908..	7,367,707	5,152,732	" 2,204,975
Year 1909..	132,880,821	44,086,966	" 88,793,855
" 1908..	81,215,456	50,276,293	" 30,939,163
Silver:			
Dec. 1909..	5,297,965	4,167,276	Exp. 1,130,689
" 1908..	4,726,289	4,409,454	" 316,835
Year 1909..	57,592,309	46,151,282	" 11,441,027
" 1908..	51,837,671	42,224,130	" 9,613,541

Exports from the port of New York, week ended Feb. 5: Gold, \$142,676, chiefly to Panama; silver, \$588,721, principally to London. Imports, \$89,963; silver, \$80,330, from the West Indies and South America.

Foreign trade of the United States for the full year, as reported by the Bureau of Statistics of the Department of Commerce and Labor:

Merchandise:	1908.	1909.
Exports.....	\$1,752,835,447	\$1,727,383,128
Imports.....	1,116,374,087	1,475,520,205
Excess, exports.....	\$ 636,461,360	\$ 251,862,923
Add excess of exports, silver.....		11,441,027
Add excess of exports, gold.....		88,793,855
Total export balance.....		\$ 352,097,805

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

Gold—Quotations on the open market in London are unchanged at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin. Supplies arriving were divided between the Bank of England and Paris.

Platinum—Business is reported steady and prices are unchanged, dealers asking \$28.50@29 per oz. for refined platinum, and \$34.50 for hard metal.

Silver—The market has continued steady around 23¾d. China has been both a buyer and a seller. On account of the Chinese New Year the market is likely to continue dull for the week.

SILVER AND STERLING EXCHANGE

Feb.	3	4	5	7	8	9
New York....	51½	51¼	51½	51½	51¼	51¼
London . . .	23¾	23¾	23¾	23¾	23¾	23¾
Sterling Ex. .	4.8625	4.8625	4.8625	4.8625	4.8605	4.8610

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, Jan. 1 to Jan. 27, as reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India.....	£ 456,100	£590,500	I. £ 134,400
China.....	80,000	127,000	I. 47,000
Straits.....	61,000	.....	D. 61,000
Total.....	£ 597,100	£717,500	I. £ 120,400

India Council bills in London sold at an average of 16.09d. per rupee.

The work of the British mint in 1909 is reported as follows, in number of pieces struck:

	British.	Colonial.	Total.
Gold.....	16,167,814	.....	16,167,814
Silver.....	22,846,050	2,750,072	25,596,122
Bronze.....	36,748,544	525,000	37,273,544
Nickel.....	.....	34,102,000	34,102,000
Total.....	75,762,408	37,377,072	113,139,480
Total, 1908	91,921,993	34,561,049	126,483,042

In 1908 there were 12,134,058 Colonial coins of aluminum; but no coins were made from that metal last year.

Copper, Tin, Lead and Zinc

Feb.	Copper.			Tin.	Lead.		Zinc.
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	London, £ per ton.		New York, Cts. per lb.	St. Louis, Cts. per lb.	
3	13¾	13¼	59½	32½	4.65	4.50	5.60
4	13¾	13¼	59½	32½	4.65	4.50	5.65
5	13¾	13¼	59½	32½	4.65	4.50	5.55
6	13¾	13¼	59½	32½	4.65	4.50	5.60
7	13¾	13¼	59½	32½	4.65	4.50	5.55
8	13¾	13¼	59½	32½	4.65	4.50	5.47½
9	13¾	13¼	59½	32½	4.65	4.50	5.50

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.

Copper—The further break in the stock market at New York was again reflected by a decline in standard copper at London. Moreover some large lots of refined copper in the hands of speculators were thrown over. The conditions finally led some of the selling agencies here to make concessions in their prices, and electrolytic copper has been freely offered at 13½c. delivered 30 days, to domestic manufacturers and at the same price, c.i.f. for delivery in Europe, these terms being equivalent to about 13.30@13.35c. net cash, New York. At the lower level more interest was shown by domestic consumers, but the business transacted was of relatively small volume. Sales for export have also been small. Business in Lake copper has been quite insignificant. The market closes unsettled at 13¾@13¾c. for Lake copper, and 13¼@13¾c. for electrolytic copper in cakes, wirebars and ingots. Casting copper is quoted nominally at 13¾@13¾c. cents.

Copper sheets are 18@19c. base for large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 15¼c. base, carload lots at mill.

The standard market was depressed throughout the week, sales of both spot

and future taking place for several days below £59 and £60 respectively. On Wednesday, the market reacted slightly in anticipation of the statistics which are to be published on Feb. 10, and which are expected to make a most favorable showing. The close is cabled as firm at £59 8s. 9d. for spot, and £60 6s. 3d. for three months.

Refined and manufactured sorts we quote: English tough £63; best selected, £63@£63 10s.; strong sheets £73@£74 per ton.

Copper exports from New York and Philadelphia for the week were 5815 long tons. Our special correspondent gives the exports from Baltimore at 2961 tons.

Tin—Transactions in the London market during the week under review have been particularly small. Neither the bull nor the bear party displayed any interest and therefore the market presented a very dull appearance. The close is steady at £147 15s. for spot and £149 7s. 6d. for three months.

With the exception of a little more activity among dealers toward the end of last week, the domestic market remains as dull as it has been right along. Spot tin seems to be more plentiful and the premium is gradually disappearing. At the close tin can be bought at 32¾ cents.

Lead—Due to liberal offers from St. Louis, the market is somewhat weaker and closes at 4.50@4.52½c. St. Louis, and 4.65@4.70c. New York.

The London market is unchanged at £13 7s. 6d. for Spanish lead, and £13 10s. for English lead.

Spelter—On account of the entire absence of buying of any kind, the market is in very bad shape. Sellers have been reducing their prices daily, without being able to interest consumers. At the close the market is weak and nominal at 5.60@5.65c. New York, and 5.45@5.50c. St. Louis.

New York quotations for spelter Feb. 3 were 5.75@5.80c.; Feb. 4, 5.70@5.75c.; Feb. 5, 5.65@5.70c.; Feb. 7, 5.62½@5.67½c.; Feb. 8, 5.62½@5.65c.; Feb. 9, 5.60@5.65 cents.

The London market is unchanged, the close being cabled at £23 5s. for good ordinaries, and £23 10s. for specials.

Base price of sheet zinc on Feb. 7 was again reduced ¼c. per lb., and is now \$7.50 per 100 lb. f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The A. B. Cockerill Smelting Company, which owns works at Bruce, Gas City, Laharpe and Pittsburg, Kan., and Nevada, Mo., has passed into the charge of the bondholders, represented by the National Bank of Commerce, of St. Louis, and George E. Nicholson, of Kansas City. Only the Altoona and Gas City plants are in operation at present.

Other Metals

Antimony—The market is dull, with sales only of small quantities. Prices are unchanged. Cookson's may be quoted at 8½c. per lb., and U. S. 8c., with 7½@ 7¾c. named for outside brands.

Aluminum—Current quotations are 21 @ 22c. per lb., for No. 1 ingots.

Quicksilver—The market is easier. New York quotations are \$50 per flask of 75 lb. for large lots. Jobbers ask 70c. per lb. for small quantities. San Francisco, \$49@50 for domestic and \$2 less for export orders. The London price has been reduced to £9 10s., with jobbers selling at £9 7s. 6d. per flask.

Nickel—Large lots, contract business, 40@45c. per lb. Retail spot, from 50c. for 200-lb. lots, up to 55c. for 500-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. In Germany 450@475 marks per 100 kg., at factory in Silesia.

Spanish Metal Exports

Exports of metals and minerals from Spain, 10 months ended Oct. 31; reported by *Revista Minera*, in metric tons:

Metals.	1908.	1909.	Changes.
Pig and manuf. iron	25,064	50,345	I. 25,181
Copper	11,745	14,139	I. 2,394
Copper precipitate..	16,879	14,839	D. 2,040
Lead	158,000	155,986	D. 2,014
Zinc	1,886	1,584	D. 302
Quicksilver.....	1,805	1,490	D. 315
Minerals.			
Iron ore.....	6,339,310	6,460,604	I. 121,294
Manganese ore	18,843	10,782	D. 8,061
Copper ore.....	986,708	934,067	D. 52,641
Lead ore.....	2,603	3,185	I. 582
Zinc ore.....	98,745	106,119	I. 7,374
Pyrites.....	1,228,576	1,141,758	D. 86,818
Salt.....	495,842	486,294	D. 9,548

Imports of phosphates, 140,163 tons in 1908, and 147,417 in 1909; increase, 7254 tons.

Zinc and Lead Ore Markets

Platteville, Wis., Feb. 5—The base price of 60 per cent. zinc ore opened at \$47 and closed at \$45 per ton; lead ore \$56@55 per ton.

SHIPMENTS, WEEK ENDED FEB. 5.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Mineral Point.....	690,000		230,300
Platteville.....	617,780		
Benton.....	370,850		
Harker.....	320,353		
Highland.....	249,800		
Council Hill.....	160,000		
Rewey.....	66,000		
Montfort.....	60,000		
Cuba City.....		88,000	
Total.....	2,534,783	88,000	230,300
Year to Feb. 5.....	7,734,780	702,229	1,556,980

There was also shipped during the week to the separating plants 2,461,820 lb. zinc concentrated.

Joplin, Mo., Feb. 5—The highest price reported paid for zinc sulphide ore was \$48 per ton, the assay base ranging from \$45 down to \$40 per ton of 60 per cent. zinc. Zinc silicate ore sold highest at \$28, the general base being \$22@26 per ton of 40 per cent. zinc, but some scrap lots were picked up on a \$20 base. The average price, all grades, was \$41.46. Lead ore sold as high as \$55, with some ore selling at \$53@54. A few bins of ore shipped this week brought as high as \$57, being sold before the decline in price. The average price, all grades, was \$54.22 per ton.

Demoralization of the zinc ore market continued up to the week-end, but the closing down of a number of mills tonight brought the downward trend to a sudden end, and today's market indicated more strength than has been apparent this year.

SHIPMENTS, WEEK ENDED FEB. 5.

	Zinc, lb.	Lead, lb.	Value.
Webb City-Carterville	4,058,720	1,257,090	\$119,488
Joplin.....	1,755,390	223,550	46,409
Duenweg.....	840,000	91,660	40,137
Alba-Neck.....	547,750		12,598
Aurora.....	416,300	83,770	10,351
Galena.....	418,120	54,240	10,231
Carthage.....	381,400		8,772
Granby.....	378,770	7,600	6,240
Badger.....	240,080	35,460	6,238
Miami.....	149,940	152,560	5,692
Spurgeon.....	266,830	37,320	4,475
Cave Springs.....	162,630		3,496
Quapaw.....	104,970	39,350	3,161
Jackson.....	116,180		2,439
Carl Junction.....	96,090		2,113
Totals.....	10,033,170	1,982,600	\$261,840

6 weeks..... 59,705,840 11,074,440 \$1,648,204
 Zinc value, the week, \$208,072; 6 weeks, \$1,333,316
 Lead value, the week, 53,768; 6 weeks, 314,888

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		34.37		50.50	
March.....	37.40		34.71		50.82	
April.....	38.63		37.01		55.63	
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.

Chemicals

New York, Feb. 9—There is little change in the general market, which continues steady, with some tendency to improve.

Copper Sulphate—The market is firm and there is no deviation from recent prices, which are \$4.10 per 100 lb. for carload lots, and \$4.35 per 100 lb. for smaller parcels.

Nitrate of Soda—Quotations are steady at 2.10c. per lb. for spot and 2.07½c. for futures.

Messrs. Mortimer & Wisner, New York, report the position of nitrate in the United States on Feb. 1 as below, in long tons:

	1909.	1910.	Changes.
Stocks, Jan. 1.....	9,140	14,000	I. 4,860
Imports Jan.....	14,800	31,200	I. 16,400
Total supplies.....	23,940	45,200	I. 21,260
Deliveries Jan.....	18,890	26,800	I. 7,910
Stocks, Feb. 1.....	5,050	18,400	I. 13,350
Afloat for U. S. ports...	99,300	106,500	I. 7,200

Quantities afloat include all cargoes due to arrive at United States ports by May 15 next.

Arsenic—Domestic production is said to show a slight increase; foreign dealers are unable to sell at as low a price as American dealers offer. Quotations are easier, at \$2.62½@2.75 per 100 lb. for white arsenic.

Mining Stocks

New York, Feb. 9—The general stock markets have been depressed and the break of last week continued, with heavy declines in quotations on trading largely professional. Amalgamated Copper, Steel common and American Smelting were leaders in the decline, touching the lowest prices made for some time. At the close there was a rally, but the turn was not heavy.

On the Curb also there was depression and general losses in quotations. The copper stocks were weak, led by Miami and Nevada Consolidated. Other stocks shared in the general fall, which seemed to reach all divisions of the market.

Boston, Feb. 8—Copper shares have been weak and at times the market for them was demoralized in sympathy with the erratic movements of Wall Street stocks. Through it all Lake and North Lake shares have held fairly firm. Quotations might have been wide at times but any attempt to buy these shares always caused sharp advances in price. Indiana has been much in the same position. This specialty has been taken from the Curb and put on the unlisted department of the Stock Exchange, as has Ray Consolidated.

North Butte is behaving better and no attempt is being made to force the price. Severe declines have been recorded in Amalgamated and other copper stocks, due to forced selling and lack of support, which has given them the lowest prices for a long period.

Arizona Commercial after a very pretty spurt to around \$44, broke to below \$40. This decline was due to the conversion of bonds into stock and the marketing of the stock in anticipation of the exchange. There has been some exchanging of Calumet & Arizona into Granby Consolidated stock although there has been little

