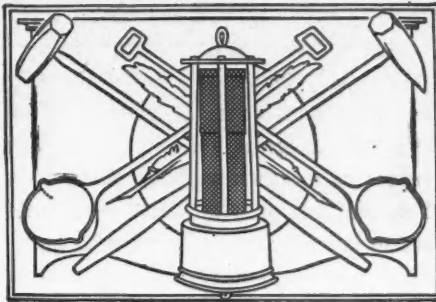


# THE ENGINEERING AND MINING JOURNAL

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\*Illustrated.

## The Copper Statistics for August

The report of the Copper Producers' Association for August was, strange to say, interpreted unfavorably by the general public. Some of the most thoughtful of the daily newspapers commented to the effect that the production of the month was an absolute high record and that this showed clearly that production has not yet been brought under organized curtailment. Neither of these ideas is correct. The average daily production in August was 4,122,700 lb., which is to be compared with 4,239,700 lb. in June, the maximum on record. Curtailment of production, inaugurated about Aug. 1, could not by any possibility become apparent in the August refinery statistics.

In fact, the American statistics for August showed a decrease of 1,759,433 lb. in the accumulation, and combining the American and European statistics, the total decrease for the month was 5,534,633 lb. As we have previously pointed out, the statistics for either side are likely to go up while those for the other go down, and a correct view can be obtained only by looking at the two together.

The favorable character of the August statistics is determined by the fact that there was an actual decrease of stock in spite of the heavy production, the latter having not yet experienced in any way the effect of the curtailment by the smelters. That the curtailment is a real thing is already becoming manifest from the smelter reports for August that are now being published from day to day. The smelters who have so far reported appear to have produced only 54,455,283

lb. of copper in August against 59,759,401 in July.

It may freely be admitted that the reduction in stocks in August was due to conversion of some part of the visible supply into invisible. European advices state that stocks which do not appear in the statistics are accumulating on the Continent, and, of course, everyone should know that the domestic deliveries of 67,731,271 lb. in August did not represent actual consumption, but to some extent the replenishing by manufacturers of the depleted stocks in their yards. This, however, is precisely the manner in which a turn of the copper situation toward the right direction was to be expected, as has been previously pointed out in these columns. Manufacturers in this country allowed their stocks to run down below the safe working basis, relying upon their ability to draw from the refineries without concern as to price so long as the market was weak. This policy naturally became unwise after the turn of the tide.

## The Illinois Strike Settlement

Reference was made last week to the settlement of the coal-miners' strike in Illinois, after five months of heated controversy. The apparently complete surrender of the operators was mitigated by clauses in the agreement limiting the cost of shot-firers, providing for arbitration of minor disputes, and arranging for an earlier and more reasonable method of arranging new wage scales when the present agreement expires.

The surrender of the operators after their long fight was undoubtedly due to

the fact that a considerable proportion of them—not a majority, but a large minority—had become restive under a loss of trade to Indiana, Ohio and West Virginia mines, which threatened to become permanent. The majority yielded, to prevent a break in their association which might make united action impossible in the future.

The strike had reached a point where it became a deadlock which could only be broken by some such surrender, or by bringing in nonunion miners to take the place of the strikers. Apart from the difficulty and cost of such action, however, it was practically put out of consideration by the miners' qualification law of the State. This provides that no man can work as a miner without a certificate of competency, being similar in most respects to the Pennsylvania law. The certificates are issued by district boards, which must be composed of "practical miners, engaged in the actual work of mining coal." The result is that the district examining boards are generally composed of members of the miners' union; and it is entirely within their powers to refuse certificates to any new comers.

Under these circumstances the operators apparently realized that there was no hope of breaking the strike by nonunion labor from other States. Their only alternatives were surrender or loss of trade, and they chose the former. An additional cause, of which little has been said, was the strong political pressure brought to bear in favor of the miners.

### Steel Corporation Orders

With the beginning of the present quarter the United States Steel Corporation adopted the practice of reporting the total of unfilled orders on its books each month, instead of each quarter, as formerly. The report for Sept. 1 gives this total—including all kinds of material—at 3,537,128 tons, which compares with 3,970,931 tons on Aug. 1 and 4,257,794 tons on July 1; the decreases being 433,803 and 720,666 tons respectively. At first sight this looks like an unfavorable trade position, but perhaps it is not quite as bad as it looks. New business in July and August was not as large as in some other months of the year, but there are other causes to be considered.

The tendency to contract for short deliveries only and to avoid commitments

running over long periods has been a marked feature of the trade for some time past, and now exists to a greater degree than has been the case in years. It has been encouraged by the course of the Steel Corporation itself, which has for some time declined contracts offered running into 1911 at the present range of prices. This indicates a belief in early advances, but it does not agree with the belief of the great majority of buyers, who see no reason to expect higher prices. The result has been to throw some business to independent concerns, who agree with the buyers, but more largely to help in confining business to short orders. This, we believe, has been responsible for the greater part of the decline in Steel Corporation outstanding orders.

The present outlook is for a moderate gain in business through the remaining months of the year. This view is confirmed by the steady growth of the small construction demand, which has been an important feature of the trade for several months past. Any attempt to advance prices, however, would give a serious check to the improving tendency, and the best judgment is that none will be made.

### Barometric Pressure and Liberation of Firedamp

An article in this issue that should be read carefully by every colliery engineer is "Barometric Pressure and Liberation of Firedamp," by Mr. Morin, translated from a recent number of *Annales des Mines*. This pertains to a subject that has been much more carefully studied and more extensively discussed in Europe than in this country. The *JOURNAL* has, however, during the last four or five years published many contributions about it, and has emphasized the importance of the question.

Mr. Morin carried on his investigations in a thoroughly scientific way. His report is admirable for its lucidity and development of conclusions that are bound to carry weight because of the rationality of the whole study.

Mr. Morin states flatly that there is a relation between barometric pressure and liberation of firedamp, that gaseous collieries are more dangerous under certain atmospheric conditions than under others, and this conclusion is reached not by a mere comparison of the coincidence of

colliery explosions and periods of falling barometer, but by comparison between the evolution of gas, as shown by samples of mine air, and the height of the barometer. Mr. Morin goes further, and recommends precautionary measures.

In the enunciation of a broad principle of this kind, American conditions are not likely to differ from European, but it would be desirable to have a confirmatory study made in this country on the same lines as that of Mr. Morin. This is something that might very well be undertaken by the U. S. Bureau of Mines. We do not forget that investigations of this subject have already been made by private interests in this country, results of which have been published in the *JOURNAL*, but we think we put it mildly in saying that they have not yet been exhaustive.

The curtailment of pig-iron production made a little further progress in August, but is still at rather a high point, being now at the rate of about 25,500,000 tons a year. The reduction in make has been proportionately greater at the steel works furnaces than at the merchant furnaces. There are various estimates of unsold or unused stocks; the most reliable put the total on Sept. 1 at 1,900,000 tons, of which 400,000 tons were held by steel companies and 1,500,000 tons by merchant furnaces. Nearly two-thirds of the last named quantity was at Alabama and Virginia furnaces. On the other hand, stocks in the users' yards are known to be everywhere very low, short buying having been the rule, even with large consumers. Buyers have thrown the burden of carrying stocks on the producers, as in some other trades this year.

The speculative movement abroad which for a short time carried silver above 25d. in London, is entirely over, and prices have dropped to nearly the level which prevailed in the earlier months of the year. The exports to India are fairly steady, and during the past week some new buying for China developed. The present prospect is that there will be little change for some time to come. The weak point is in the large stocks held in India which were reported on Sept. 1 to be about 10,400,000 oz., or 45 per cent. greater than a year ago. Buying power in India is good, however, and it is believed that these stocks will soon be absorbed.



## CORRESPONDENCE and DISCUSSION

Views, Suggestions  
and Experiences of Readers

### Calculation of Recovery in Concentration

My attention has been drawn to the methods for determining details of the results of concentration proposed by Messrs. Theodore J. Hoover<sup>1</sup> and R. S. Handy<sup>2</sup>, and can well believe that Mr. Handy was able to determine the relative efficiency of different types of concentration tables in the manner he describes, because the conditions under which the tables were worked were identical in each case. It does not, however, follow that the weights of the ore and tailings could be accurately determined by calculations based upon the weight of samples cut by sampling machines which may be set to cut a certain percentage, more or less, of the material. In sampling over 800 tons of ore, slight error in the weight of each cut would lead to a considerable error in the total estimated weight, and no smelter would accept such a method of weighing ore.

Furthermore, in neither discussion has any account been taken of floating tailings. These are generally of higher assay value than the sands which remain and represent a certain loss. For example: With galena ore, once ground, at least 8 per cent. of the feed will be carried off during concentration and this loss will increase with each regrinding of the residues. Hence the difficulty in applying the formula.

#### HANDLING OF QUANTITIES OF ORE INTRODUCES ERRORS

Mr. Handy's experiments appear to have been made with a considerable tonnage of ore. At one time I also carried out numerous experiments in concentration on a large scale, believing that in this manner greater accuracy would result, but the difficulties in collecting, weighing and sampling the tailings and rough ore in a satisfactory manner were so great that it was impossible to avoid losses of considerable magnitude. The collection, weighing and sampling of several hundred tons of tailings of greatly varying richness is extremely difficult and to obtain a fair average sample it would be necessary to dry and thoroughly mix the material. On account of the great bulk of the rough ore and the tailings, in comparison with the concentrate, any error in the assays of these will render

useless the results of an experiment based on them.

#### BETTER RESULTS OBTAINED USING SMALL QUANTITIES

It appeared that more reliable samples might be obtained in using a less quantity of ore or experimenting on a smaller scale and it was found that a more reliable method of making tests in concentration was to obtain a fair average sample of the ore after crushing and to cut this down to about 100 lb. and then concentrate this by means of a batea. The batea was used in a tank of water with an overflow to a second receptacle for receiving the float slimes; in this manner the concentrates were collected in the batea and the sands and float slimes in the two tanks, and each product could be collected without loss, and weighed, sampled and assayed. By taking a larger sample of ore and dividing it into several parcels of equal assay value and concentrating these to different degrees of richness, the extraction percentage could be noted in each case, and when these were plotted to scale a curve was formed, giving the ratio of extraction for any degree of concentration of the particular ore under consideration.

#### METHOD GIVES RELIABLE RESULTS

The above method of testing the degree to which any ore may be concentrated with advantage can be easily carried out at a small expense, and will give reliable results if care be taken in sampling and assaying, and the whole operation may be carried out by one person, preferably the assayer or manager of a mine. There is no necessity to assume anything, the results being as accurate as an assay. On comparison of the results obtained as above with those obtained in the mill it will be found that the loss is greater in the mill.

WILLIAM L. WALTON.

Wembley, Middlesex, Eng., Aug. 24, 1910.

### Mineral Law of Texas

In references to the notices that have appeared concerning proposed changes in the mining laws of Texas, I beg to say that I have been trying to get the governor to recommend to the legislature, changes in the mineral law, especially relating to oil, natural gas and coal. The requirements of an absolute purchase should be changed to that of a royalty basis.

Should he submit the question, I will endeavor to get the legislature to authorize the leasing of lands in such a manner that those who desire to develop, may do so upon a royalty basis.

J. T. ROBINSON.

Commissioner, General Land Office,  
Austin, Tex., Aug. 3, 1910.

### Standards of Work

The suggestion of A. Livingstone Oke that the JOURNAL devote an occasional page to "standards of work" and that its readers will help by sending the complete itemized data on practical operations, is a most useful one. If Mr. Oke had started such a movement by giving us some data it would have been appreciated. With the hope that his suggestion will be followed by others, I submit the averages for the last three months for La Noria Development Company's mine, Sombrete district, Zacatecas, Mex. There is nothing to boast about in the figures. They probably represent the average for a poorly paid Mexican camp where the miners, for some generations, have been allowed to have pretty much their own way.

#### CONDITIONS IN SOMBRERETE DISTRICT

The country rock is a shaly lime containing considerable silica, moderately hard, but in places quite soft. The vein, in which 90 per cent. of the work is done, is either solid quartz or recrystallized and silicified country rock, this being about as hard as ordinary fresh granite. About a fifth part of the work is done in the quartz. All drilling is by contract and by double-hammer, with a single pair of workmen to a face. The air is good; altitude, 7500 ft. The average daily earning for the period taken here was 1.12 pesos. We pay 40 pesos per meter for faces in the solid quartz, and 20 pesos for the softest ground, with 2 pesos more for mucking in each case. The men work harder and make less on the hard ground than on the soft.

#### COST DATA

The averages given in the accompanying tables include three faces, nine crosscuts, two raises and two winzes. One winze and one raise were in rock softer than the average. The faces are about 1.5x2.0 m. (5x6½ ft.), the crosscuts 1.3x1.9 m. (4 ft. 3 in. by 6 ft. 3 in.), and the raises and winzes 1.5x1.3 m. (5x4¼ ft.) The labor item for this work includes muck-

<sup>1</sup>ENG. AND MIN. JOURN., Aug. 13, 1910.

<sup>2</sup>ENG. AND MIN. JOURN., June 11, 1910.

ing. Three holes 60 to 80 cm. deep are generally considered a shift's work for a pair of men. The powder is 40 per cent., Mexican make. The candles are the small, tallow, Mexican sort, three of which are about equivalent to one such as is used in the States. It will be noticed that the average length of fuse used is 1 ft. 10 in. Yet no one here can re-

TABLE I. COST PER METER OF ADVANCE.

	Dynamite, Pounds.	Caps.	Fuse, Feet.	Candles.	Labor, Pesos.	Total Cost, Pesos.	Advance per Shift, Centimeters.
Faces...	13.8	46	83	81	23.80	30.46	5.13
Cross-cuts...	11.0	51	85	67	22.10	27.70	5.59
Raises...	5.8	26	60	61	17.50	25.30	5.93
Winzes...	9.3	24	81	62	19.20	27.30	5.76
Averages...	10.0	42	77	68	21.15	28.50	5.42

TABLE II. COST PER FOOT OF ADVANCE.

	Dynamite, Pounds.	Caps.	Fuse, Feet.	Candles.	Labor.	Total Cost.	Advance per Shift, Feet.
Faces...	4.21	14.0	25.3	24.7	\$3.63	\$4.65	0.167
Cross-cuts...	3.35	15.5	25.9	20.4	3.37	4.23	0.196
Raises...	1.77	8.0	18.3	18.6	2.67	3.87	0.194
Winzes...	2.84	13.4	24.7	18.9	2.92	4.17	0.189
Averages...	3.05	12.8	23.5	20.7	3.23	4.35	0.178

member when anyone was hurt because of short fuse, although a large part of the miners here have spent all their lives in this one mine.

ARTHUR O. CHRISTENSEN.  
Sombrerete, Zac., Mex., Aug. 27, 1910.

## QUESTIONS and ANSWERS

### CHINA CLAY DEPOSIT

I should like more information regarding the china-clay deposit mentioned by R. F. B. in his inquiry published in the JOURNAL, Sept. 3, as I have clients who desire to secure such a deposit near Washington or Baltimore. Will R. F. B. kindly write the JOURNAL, giving additional data regarding his property and the nature of his deposit?

R. K. M.

### VALUE OF CELESTITE DEPOSIT

Will you kindly inform me through the columns of the JOURNAL what are the uses and value of the mineral celestite.

W. L. R.

There is but a limited market for strontium minerals and especially for celestite, the strontium sulphate. Celestite is sparingly used in pyrotechnics for making red fire, although for this purpose the

nitrate, carbonate and chlorate and the strontium-potassium chlorate are much more used. The carbonate is also used in making iridescent glass. The hydrate is largely used in the preparation of beet sugar, and in the separation of crystallizable sugar from molasses. The use of this compound depends upon the property of the oxide and hydrate of strontium to form saccharates, which are readily decomposed by carbon dioxide. Strontium hydrate is said to be preferable to lime for use in sugar manufacture as the saccharate of strontium is more granular than that of lime. The acetate, arsenite, bromide, iodide, phosphate, lactate and strontium caffeine sulphonate are used in medicine. The chloride is sometimes used in alcoholic solution to produce red flames; the monosulphide in luminous paints, because of the phosphorescent properties, and the hydrated dioxide for bleaching. The peroxide, one of the later productions of the electric furnace, is used as an oxidizing agent for organic compounds.

### ANALYSIS OF BAUXITE

What is the approximate analysis of American bauxite, especially that which is mined and sold in the Southern States?

J. G.

The pure mineral bauxite contains 73.9 per cent.  $Al_2O_3$  and 26.1 per cent.  $H_2O$ . The commercial bauxite of Georgia varies between wide limits as follows:  $Al_2O_3$ , 49 to 62 per cent.;  $Fe_2O_3$ , 2 to 5;  $SiO_2$ , 2 to 10;  $TiO_2$ , 1 to 3; and  $H_2O$ , 19 to 32 per cent.

### HARD AND REFINED PLATINUM

In the JOURNAL, prices are quoted for "refined platinum" and "hard metal;" will you kindly explain the meaning of these terms? Does "refined platinum" refer to the cast and rolled sheets, wire, etc., or to platinum reduced chemically to the form of platinum sponge?

L. P. M.

By "refined platinum" is meant platinum in the form of ingot. Manufactured forms sell at an advance over the ingot price dependent upon the nature of the article. "Hard metal" is the trade name for iridium-platinum, which contains from 5 to 25 per cent. iridium, the amount being usually from 10 to 15 per cent. Iridium has the property of hardening platinum, and increasing the wearing qualities. The principal use for hard platinum is for making electrical contact points and also in the manufacture of crucibles. "Ordinary" platinum, is commercially pure, although not chemically pure. There is always a trace or more of iridium in commercial platinum, but the small quantity present does not affect the hardness to any appreciable extent. Chemically pure platinum is not used except for delicate scientific research, in which the presence of foreign elements would interfere with accuracy.

## Operations at the Tooele Smelting Works

### SALT LAKE CORRESPONDENCE

Four of the five reverberatory furnaces at the International Smelting and Refining Company plant have been fired, and three furnaces are smelting. Smelting began 13 months after the railroad was extended to the site. The plant was constructed within the appropriation of \$3,000,000, and there have been but few mechanical troubles or complications in beginning the new work. The first furnace was started July 24, and slag was tapped Aug. 15. Matte was drawn Aug. 27. Two converters blew this to blister copper, which was poured into molds formerly used at the Highland Boy. The first copper is to be made into souvenirs.

Twelve of the thirty-two McDougal roasters are furnishing calcines for the furnaces, and more are being started. Each furnace, when running at full capacity, requires eight roasters to supply it. Twenty-two of the roasters from the Highland Boy are installed in the McDougal building, the other 10 being new. The building of the plant required 9000 tons of steel, 2500 tons of which came from the Highland Boy plant. About 200,000 cu.yd. of dirt were excavated, and 26,000 cu.yd. of plain and reinforced concrete used in the power house, buildings and foundations. The 350-ft. stack required 1,850,000 brick.

The waste heat from the gases between the furnaces and the stack is utilized for making steam. In front of four of the five furnaces in the reverberatory building are 750 h.p. Sterling boilers. At present two of these boilers are being used. The smaller hand-fired boilers will be dispensed with shortly and held in reserve.

Up to the present, Utah Consolidated ore only has been used. The tramway delivered an average of 700 tons per day for the week ended Aug. 27. Approximately 100 tons per hour, or the normal capacity of the tram, have been delivered for eight or nine hours, but this has not been kept up owing to buckets working loose on the Bingham side, and to various other rough edges, which are being rounded into shape. Concentrates from the South Utah Mines and Smelters, which started its mill Sept. 2, will soon be received. This company is under contract to deliver 100 tons of ore or concentrates daily, when the mill has been brought up to capacity.

The International is employing a number of men from Butte at the reverberatories and converters, and has also on its payroll men who formerly worked at the Yampa and Highland Boy. When the plant is in full commission, the capacity will be about 1200 tons per day.



C. H. Repath is the engineer in charge of the work, E. P. Mathewson is general manager and H. N. Thompson is superintendent of the plant.

### August Operations of Goldfield Consolidated

The preliminary report of the operations of the Goldfield Consolidated Mines Company for August, 1910, shows that 24,170 dry tons, representing a gross value of \$889,968, were mined. According to this information the tonnage mined in August was increased by 2365 tons, representing an increase of \$59,334 in gross receipts, over that mined in July. The average grade of the ore mined was, however, only 1.78 oz. gold per ton as against ore averaging 1.84 oz. per ton mined in July.

#### RESULTS OF MILLING OPERATIONS

The performance of the mill in August was as follows: Dry tons milled, 24,170; average value per ton, \$36.82; total value, \$889,968; loss in tailings, \$58,453; total realized, \$831,515; percentage extracted, 93.43. The extraction fell off from that

#### AUGUST PRODUCTION.

	Wet Tons.	Dry Tons.	Oz. per Ton.	Value.
Combination.....	4,875	4,641	1.50	\$144,400
Mohawk.....	8,313	7,913	1.29	210,855
Red Top.....	4,022	3,929	2.06	167,448
Clermont.....	8,077	7,687	2.31	367,265
Total.....	25,287	24,170	1.78	\$889,968

attained in the three months preceding which figures were: May, 95.2 per cent.; June, 95.47; July, 94.03.

#### AUGUST EXPENSES.

	Amount.	Per Ton.
Bullion tax and marketing bullion.....	\$16,000	
Administration, etc.....	16,000	
Total general.....	\$32,000	\$1.32
Mining.....	80,000	3.31
Transportation.....	3,300	0.14
Milling and cyaniding.....	\$58,200	
Marketing concentrate residues.....	9,600	67,800 2.81
Construction.....	25,000	1.03
Net cost.....	\$208,100	\$8.61
Loss in tailings.....	58,453	2.42
Total costs and losses.....	\$266,553	\$11.03

A profit of \$25.79 per ton was realized from treating ore of a value of \$36.82 per ton.

The total profit for August was \$623,415 or \$49,400 more than that realized in July. In July the percentage of profit was only 69.11 as against 70.05 in August. In August for the first time since March the mine produced approximately full tonnage. This might have been reached in July except for some shortage of water. The management states that there is no reason to expect any shortage in the future.

#### DEVELOPMENTS

J. R. Finlay, general manager, of the Goldfield Consolidated, states that the mine looks well. The total advance in exploration work for August is given as 3297 ft., divided as follows: Combination shaft, 476 ft.; Mohawk shaft, 1086 ft.; Red Top shaft, 227 ft.; Laguna shaft, 259 ft.; Clermont shaft, 1249 ft.; total, 3297 ft. New ore was taken from the main levels as follows: Combination 180-ft. level, 285 tons averaging 5.95 oz. per ton; 380-ft. level, 215 tons averaging 1.06 oz.; Mohawk, 350-ft. level, 198 tons averaging 1.54 oz.; 450-ft. level, 95 tons averaging 0.41 oz.; 600-ft. level, 255 tons averaging 0.64 oz.; Clermont, 750-ft. level, 10 tons averaging 2.40 oz.; Laguna, 600-ft. level, 125 tons averaging 0.48 oz.; total, 1183 tons averaging 2.14 oz per ton. The showing of the Combination was particularly good, resulting in the opening of the Hampton orebody at the bottom level of that mine. A stope is being opened there that promises to be a good one.

#### ORE IN MOHAWK IRREGULAR

At the Mohawk mine the developments are reported to continue with fair success

between the Mohawk proper and the Red Top. One stope, particularly, on the 350-ft. level, near the Mohawk shaft, has been very promising. On the main level the ore was barely of pay grade, but as soon as stoping on it was begun a great improvement was noted. It is fair to say that the orebodies in this particular tract are irregular, and it is difficult to know just what importance to attach to them. However, it is certain that large amounts of ore will be mined from bodies that have been partially opened up during the last three months.

At the Laguna shaft a small orebody of rather low grade has been encountered. The level now being opened in this mine is 230 ft. vertically below the bottom level of the Red Top, so that any ore opened will indicate a considerable tonnage. At the Clermont no ore of consequence was discovered during August. Some promising showings have been encountered recently, but the management states that it is too early to report on them definitely. Construction work is stated to be progressing satisfactorily at both mine and mill and the entire plant is said to be in good condition. It is expected that the completion of work now on hand will, in the course of two months, substitute some economies for the expense of construction.

### Life of Rand Mines

#### JOHANNESBURG CORRESPONDENCE

Lionel Phillips, one of the directors of the house of Eckstein, has been lecturing on the Rand gold deposits. He emphasized the probability of further discoveries of gold-bearing reef on the Witwatersrand and stated that, in his opinion, the part already discovered could not be exhausted within the present century. Mr. Phillips is, of course, entitled to his opinions, but those who are familiar with the history of metal mining know that mining fields, though their lives are often prolonged by the cheapening of costs, must eventually become exhausted. There are too many deserted camps in America, Australia, Europe and elsewhere to allow one to ignore this fact.

#### RESULTS OF DEEP MINING UNCERTAIN

The average life of about three-fourths of the present producers on the Rand is only about 11 years. The Crown mine and East Rand Proprietary mines will be worked out in 30 or 40 years at present rates of production, and with regard to mining at great depths, it is really not known if it be either practicable or profitable. It may reasonably be expected that it will be possible to mine to 7000 ft. or over, but whether there will be gold sufficient to render it profitable is not known. Profits from the deep mines around Germiston, the Simmer, East Simmer Deep, Jupiter and Knights Central have been most discouraging. The Village Deep and Robinson Deep have not fulfilled first expectations. On the other hand, rich ore has been met with in the City Deep at about 3000 ft., and ore of average grade in the Brakpan mines and Cinderella Deep, below 4000 ft. But, as the rate of production is increasing, one is safe in predicting that in 15 or 20 years there will be little payable ore remaining above the 4000-ft. level on those portions of the Rand already developed.

#### ROCK TEMPERATURES ON THE RAND

James Moir, recently elected president of the Chemical, Metallurgical and Mining Society of South Africa, stated in a recent address that according to the latest researches, employing data obtained by Weichert and Schwartz, the rock temperatures at depth on the Rand would be as follows: 1000 ft., 70 deg. F.; 3000 ft., 77½ deg. F.; 5000 ft., 84 deg. F.; 7000 ft., 90 deg. F.; 9000 ft., 95 deg. F. He considers that at depths of over 4000 ft. artificial ventilation on a proper scale will be necessary, for unless the ventilation is good the workings will attain a wet-bulb temperature about the same as the rock and the working efficiency of miners rapidly falls off at a temperature above 80 deg. F. (wet bulb).

# DETAILS of PRACTICAL MINING

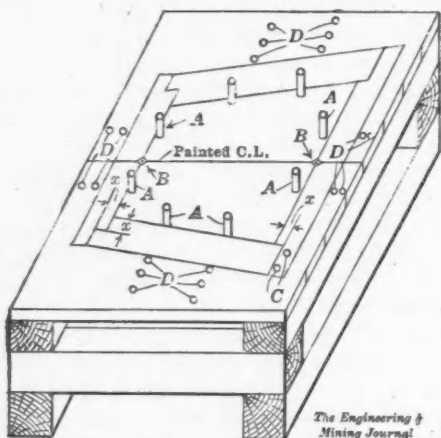
Notes of Interest to Prospectors and Operators of Small as Well as Large Mines. Things That Have to Be Done in Everyday Mining

## Framing Rough Timbers for Mine Sets

BY A. LIVINGSTONE OKE\*

It is frequently the case in remote districts that rough round timber only is available for mining purposes, and one has to make the best of it. Under certain conditions the use of the arrangement shown in the accompanying sketch will be found of advantage, as by its use, no matter how irregular the timber available, shaft sets may be framed so that they will be true to the dimensions chosen and have a workman-like appearance.

A bench or platform is built up to a



FORM FOR FRAMING ROUGH MINE TIMBERS.

convenient height for working with a saw. The inside outline of the timber set is marked off on the platform with chalk or paint lines, the center line is also laid off, and if desired, a suitable outside dimension. On the inside, dimension pegs *A* are placed, two to each member of the set. Holes *D* are also made in the platform in which pegs may be put to hold wedges against the outside of the timber when working at it.

Framing is started on the left-hand leg, two temporary pegs *C* being put in where later the sill-piece half check will come. The cap is next framed and last of all the sill piece. To aid in marking off the half check, a long, flat straight-edge is held up against the inside pegs; it is made as wide as the proposed half-check dimensions *X*. When the set is complete, nails *B* are driven in the cap and the sill to mark the exact centers. In

\*Mining engineer, Rodeo, San Juan, Argentina.

the case of a shaft set both the centers of the wall plates and of the end plates are marked with nails driven fully in.

### ERECTION OF DRIFT SETS

In erecting a set in a drift the sill is first placed in position, being lined off by the nails in the previous set and firmly fixed by wedging at the ends. The height of the sill is laid off by a straight-edge from the nearest set in place, allowing the proper grade. The sill being in place and firmly wedged, the legs and cap are put up. A plumb-bob is hung from the nail in the cap and the point is made to coincide with the nail in the sill by driving wedges behind the legs on each side. By using this care in placing timbering, the inside of the set will present a neat appearance in spite of all differences in the size and quality of the timber used.

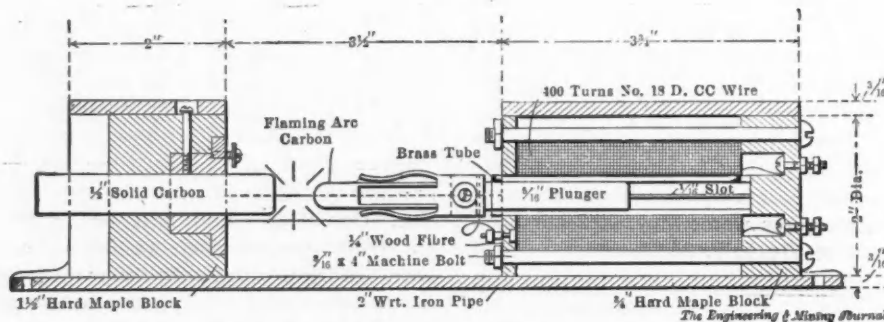
*f* then the assay of the entire original pile is:

$$c + (f - c) \left( \frac{D}{A+D} \times \frac{E}{B+E} \times \frac{F}{C+F} \right)$$

It will be noted that while *A* and *D*, *B* and *E*, and *C* and *F* must be similar units, it is by no means necessary that *D*, *E* or *F* be the same units, one may be pounds, another ounces and the third grams.

## Apparatus for Exploding Gas in Tunnels

E. F. Scattergood describes an apparatus that has been devised for exploding gas in the long tunnels of the Los Angeles aqueduct where gas has been encountered. Considerable amounts of explo-



SPARKING DEVICE FOR EXPLoding GAS IN TUNNELS

## A Short Formula for Samples Containing Metallics

BY DONALD M. LIDDELL\*

It is necessary occasionally to sample material containing large quantities of metallics, such as reverberatory slags, where with successive crushings the metallic portion must be thrown out. If it be assumed that the metallics are homogeneous, the accompanying formula may be useful.

Let the weights of metallics taken out at successive crushings be represented by *A*, *B* and *C*, and the corresponding weights of material not metallics by *D*, *E* and *F*; then the total percentage of metallics is:

$$100 \left( 1 - \frac{D}{A+D} \times \frac{E}{B+E} \times \frac{F}{C+F} \right)$$

If *C* and *F* be the final metallics and pulp, and their separate assays are *c* and

sive gas have at times developed in one of the long tunnels that run through an oil district. In order to protect the men from danger of explosion, electric sparking devices have been designed and installed for exploding the gas while the workings are clear of men. The accompanying illustration shows the details of the construction of the apparatus.

The sparkers may be used either with alternating or direct current; direct current is used on the Los Angeles aqueduct and the sparkers are regulated by means of a switch outside of the tunnel. They are absolutely positive in their action and cannot fail if properly trimmed when the miners leave the tunnel. Several times gases have been exploded with these sparkers, and after the explosions they have usually been found intact. Several may be used in a tunnel where gases are encountered, so that an opportunity may be given for extra trials before men are allowed to enter the tunnel.

\*Grasselli, Ind.

<sup>1</sup>Proc., A. I. E. E., Aug., 1910.

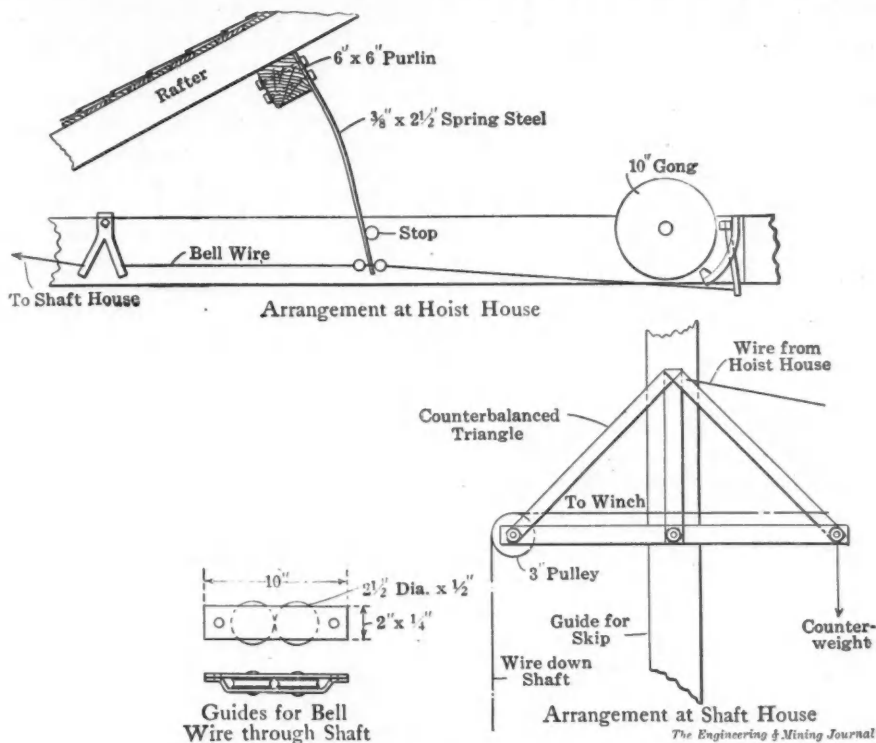


These sparkers would, in many instances, be applicable for use in mines, and through their use lives might be saved as there would be no necessity of sending men into portions of a mine to find out if explosive gas exists there.

### Hand Bell Signal Wiring

By GUY C. STOLTZ

The disadvantages of hand signaling are: The difficulties presented in counterbalancing the long line of bell wire necessary to reach the lowest levels in the shaft; in guiding the wire through the shaft over the several angles to the stations and to the hoist house with the least friction; and in keeping the system taut to eliminate all possible lost motion.



ARRANGEMENT OF SIGNAL-BELL WIRING AT PORT HENRY, NEW YORK

The system installed must be positive and hand ringing should accompany every electric bell or light-signaling installation.

In the accompanying illustration a satisfactory method of rigging is shown. The strap of spring steel introduced before the gong does away with any lost motion to the gong and keeps the wire taut to the counterbalanced triangle at the headframe. Here the wire is kept on a winch and the necessary length is guided over a small pulley to prevent kinks, and down the shaft by cranking the winch. A grip is clamped to the wire after the required length has been unreeled, and this, bearing against the triangle, makes the wire fast. In this way the wire is kept one length with no

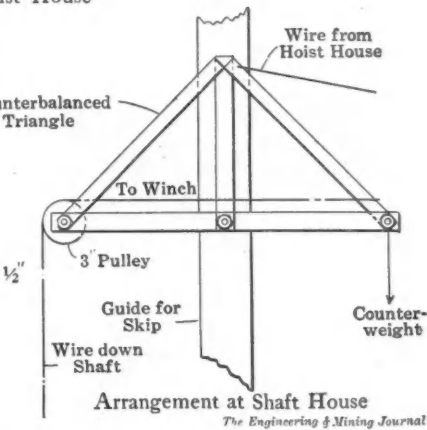
\*Mining engineer, Mineville, N. Y.

splicing and as longer wire is required on sinking, the winch has a supply. Hand rings for signaling are clamped to the wire at each station. The wire is guided through the shaft by passing between sets of 2 1/2-in. pulleys placed in an iron frame. This frame is secured to the shaft timbers. The counterweight is attached to the triangle in the headframe and is varied in amount as required.

### Cooling a Hot Journal Bearing

By W. F. BOERICKE\*

One of the journal bearings of a heavy direct-connected generator, often subject to overload, gave much trouble by heating, necessitating frequent shutdowns to cool off, with consequent delay and loss



ARRANGEMENT AT SHAFT HOUSE  
The Engineering & Mining Journal

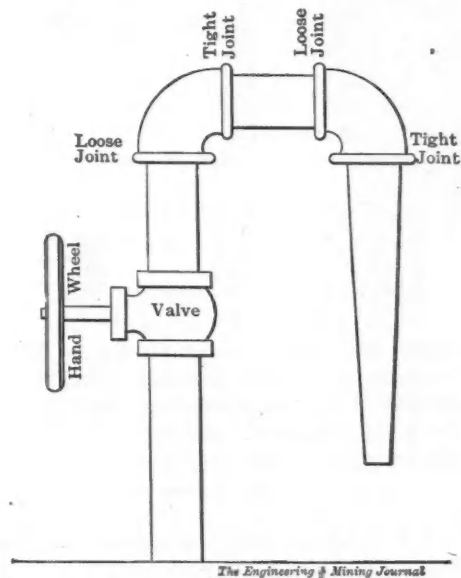
of power underground. No adjustment or lubrication did more than relieve it temporarily. Finally the head engineer had a 2-in. collar keyed on the end of the shaft about four inches from the journal bearing. Four 3/4-in. holes were bored radially through the collar into which were screwed iron rods. To the ends of the rods were bolted small fans of tin, three inches across and six inches long, turned at 45 deg. The fan thus improvised has a sweep of about 14 in. across the full side of the journal and when the generator was working a strong current of air played constantly upon it. This had the desired effect of keeping the journal cool and resulted in a considerable saving of oil, with a total absence of further trouble.

\*Care of Miffin & Linden Mining Company, Mineral Point, Wis.

### A Convenient Fire Hydrant

Mine buildings should always be well protected from destruction by fire by the establishment and maintenance of numerous hydrants at points of advantage about the works. In addition to reels of hose, fitted with nozzles, and always ready for instant use, with buckets and barrels filled with water at hand inside the buildings, there should be hydrants outside with as high a head of water available as possible. The location of these hydrants should be sufficiently near to make it possible to throw a stream upon the highest part of the adjacent buildings, but not so close to them that in case of a fire gaining considerable headway, a man would be forced to abandon the hydrant, by reason of the heat. The buildings should be protected by these hydrants on all sides.

A convenient and cheap hydrant for fire purposes may be made from 3-in.



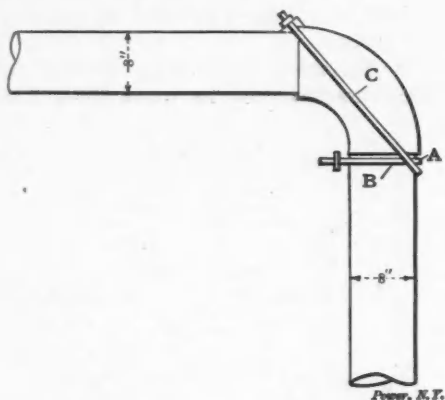
FIRE HYDRANT FOR USE ABOUT MINE AND MILL BUILDINGS  
The Engineering & Mining Journal

pipe, a suitable valve (straight-way preferred), and two elbows. The nozzle can be made from a piece of the same kind of pipe, having one end drawn down to a discharge of proper diameter, this depending upon the head and volume of water available. The pipe and elbows should have long and deep threads. Some of the joints should be screwed up tight and the others left loose, so that the pipe may be moved about readily, and the nozzle pointed in any desired direction. The accompanying sketch indicates the character of the arrangement here described. The valve should be fitted with a large handwheel, so that it may be opened or closed when necessary, speedily and without the aid of a wrench. When not in use the pipes can be moved about easily, and the nozzle will hang down in a vertical position as shown, but as

soon as the water pressure is turned on it at once becomes rigid, and considerable force is required to handle it. Another point, too often neglected, is a frequent trial of the fire equipment, to see that it is in working order.

### Curing a Leak in a Steam Pipe

The accompanying illustration shows a repair made on a leaky steam pipe which, according to *Power*, has held for several months. The leak was at *A*, where there was copper calking. The clamp *B* is a 5/8-in. iron rod, bent to the shape of a horseshoe, with both ends threaded. It was passed through holes in a piece of strap-iron, 7/8 and 2 1/2 x 12 in., then the nuts were put on and drawn



CURING A LEAK IN A STEAM PIPE

tight. The clamp *C* was put on in the same way, the only difference being in the size of the rod, which was 1 in. Then the copper was put in and clamp *C* tightened and the copper calked.

### Controlling the Curvature of Diamond Drill Holes

By EDWIN ELLIS WHITE\*

Several articles have been published during the last few years upon the curvature of diamond drill holes and methods of surveying them. It is well known that all inclined drill holes do not follow a straight line, but change their inclination, often quite rapidly. Even vertical holes often deviate considerably if they attain much depth. Methods of surveying drill holes, and particularly of obtaining the dip of a drill hole at any given point, have been studied carefully and brought to a considerable degree of perfection. The method used by the Cleveland-Cliffs Iron Company has been described by James E. Jopling.<sup>1</sup>

\*Mining engineer, Cleveland Cliffs Iron Company, Ishpeming, Mich.

<sup>1</sup>Trans. Lake Superior Mining Institute, 1909, and ENG. AND MIN. JOURN., Feb. 19, 1910.

### FACTORS CONTROLLING CURVATURE

The next practical step, if inclined drill holes are to be used with the greatest success for prospecting, is the control of curvature so that the hole may pass through any given point at depth. Of

are useful in causing the hole to change more or less rapidly. I refer to the clearance given the diamonds on the bit, the size of the core barrel, and the pressure put upon the rods.

Fig. 1 shows the curves which it is

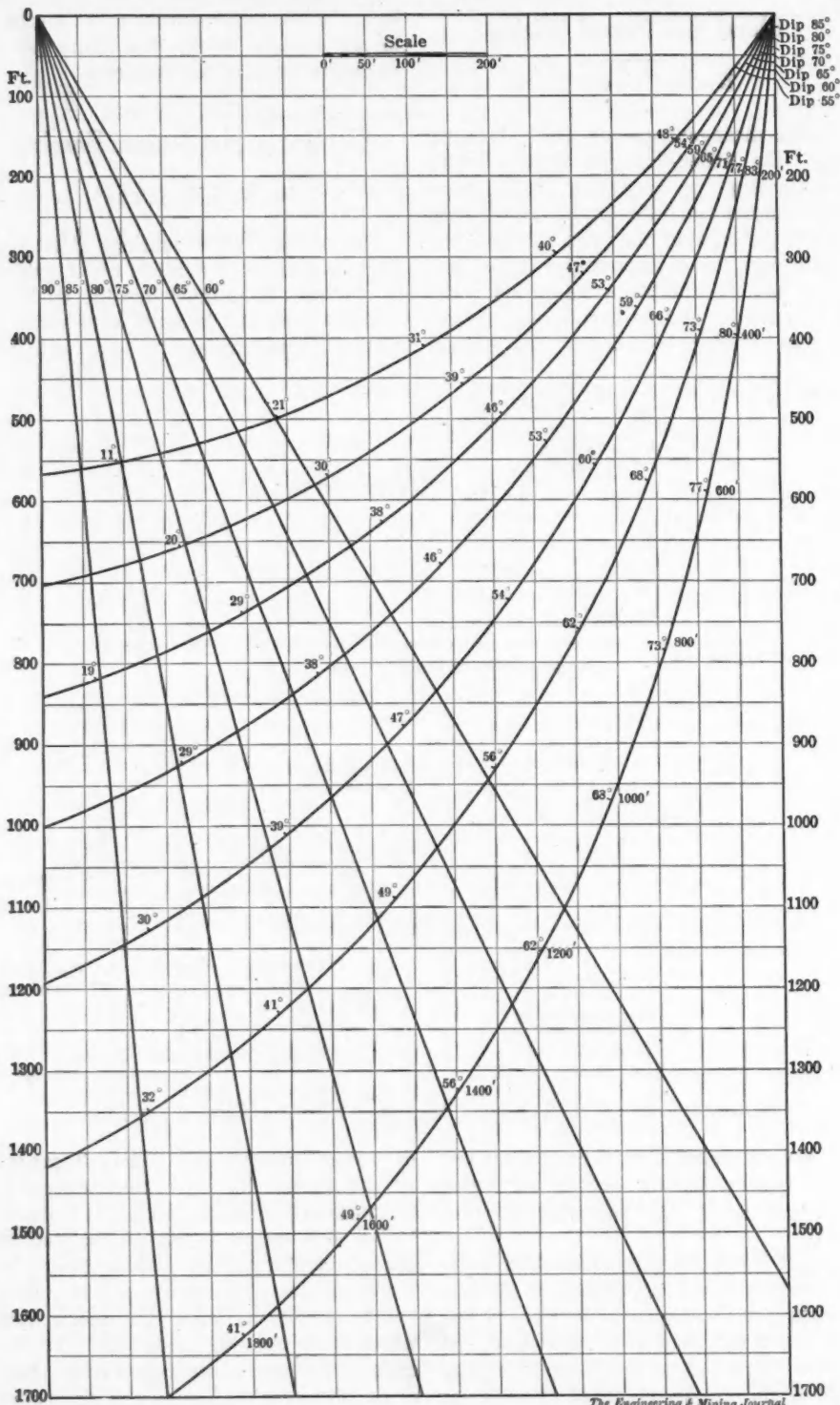


FIG. 1. ESTIMATED CURVATURE OF DIAMOND-DRILL HOLES WHEN DIPPING AGAINST THE SOFT ORE FORMATION

course the rate of change of inclination will vary considerably according to the rock passed through, the size or rods used, and depth and dip of the hole. These factors cannot readily be changed at any point in the hole, but there are other factors that may be changed which

expected that drill holes will take when started at angles varying from 55 to 85 deg. from the horizontal. Perhaps I should say that they are the curves which the drill holes can be made to take, as they flatten somewhat more rapidly than the average. It is found that a drill hole



may be flattened much more easily than it can be kept straight. As drill holes sometimes run much flatter than expected, it has been found best to make these curves flatter than the average, for if the hole does not go as flat as this, it can be made to do so by putting on more pressure, by using a smaller or more worn core barrel, and by giving the diamonds a trifle more clearance.

DETERMINING DIP AND POSITION OF HOLE

These curves are only typical of the soft-ore formation on the Marquette iron range, particularly in the North Lake district, which dips from 60 to 90 deg. from the horizontal, and only when the drill hole dips against the formation. The curves are compiled from the results of a great number of drill holes already sunk by the Cleveland-Cliffs Iron Company. By having a tracing of Fig. 1 and a blue print of this tracing, it is easy to determine where a hole should be placed and what dip it should have to reach the foot-wall at any given depth. This is done by simply sliding the tracing over the blue print until the drill hole intersects the foot-wall at the proper point.

Fig. 2 is an example of how closely the curvature of a drill hole may be controlled. It will be noted that the hole was drilled as usual to a depth of 400 ft., but as it was becoming somewhat too flat, it was kept as straight as possible from

on the intended curve. The heavy line, Fig. 2, shows the actual course of the drill hole and the light line the intended course.

Keeping Notes

BY HOWARD W. MORGAN\*

At a great many mines the system of keeping underground-survey notes in the ordinary field notebook is still in vogue.

till most of the figures had been dissolved from the pages and the book had been warped too crooked to go into your pocket.

After loading up your pockets with plumb-bobs, tape, lens, cord, candles, spuds, pencils and the other incidentals to a trip underground, about one notebook is all you care to carry. This means that notes from several different parts of the mine must be taken in one book. A book soon becomes filled and another started; soon there are shelves and shelves of books. Then some day you wish to find the complete notes of the *n*th level. Now for the dirty work! You know the rest. If you do not quit your job before you find them, the complete notes are garnered from some eight or ten different books out of a possible hundred, with great loss of time, temper and at the expenditure of some kind words.

NOTE TAKING ON CARDS SIMPLE, EFFICIENT AND COMPARATIVELY CLEAN

With apologies to "System," we offer the card index as the "cure-all." With a little time and thought a card system for keeping underground notes can be incorporated with the general office system in use. If there is no general card system, one can be worked out to fit the particular needs of any mine.

For the underground notes, cards are printed for "Point," "Distance," "Horizontal Angle," etc., and with heading spaces for the name of the workings, date, etc. These cards are carried underground in a leather case not much larger than the ordinary notebook covers. The case has two pockets, one for used and one for unused cards. In this way the cards are kept fairly clean and as the same card is taken underground but once it does not accumulate dirt.

On arriving at the office the cards are filed in the proper cabinet and indexed. When the notes are worked out in the office the "Latitudes," "Departures," "Elevations," etc., will be recorded on another card bearing these headings. All maps should be incorporated into the system and indexed.

The assay reports instead of being jumbled up in an assay record should be made on cards and filed in the proper cabinet. By a good system of cross-indexing, and numbering cabinets, maps and cards, you can turn immediately to any information you desire. Then when you wish the complete notes on the *n*th level you will find a card in the index that looks something like this:

NTH LEVEL.

	Cabinet.	Card No.
Underground notes.....	U	3-9-46
Office notes.....	O	3-9-47
Maps.....	M	73
Assay maps.....	A M	—15
Assays.....	A	—200 to 300

If there is anything you want to know about the *n*th level and cannot find it, it is your fault.

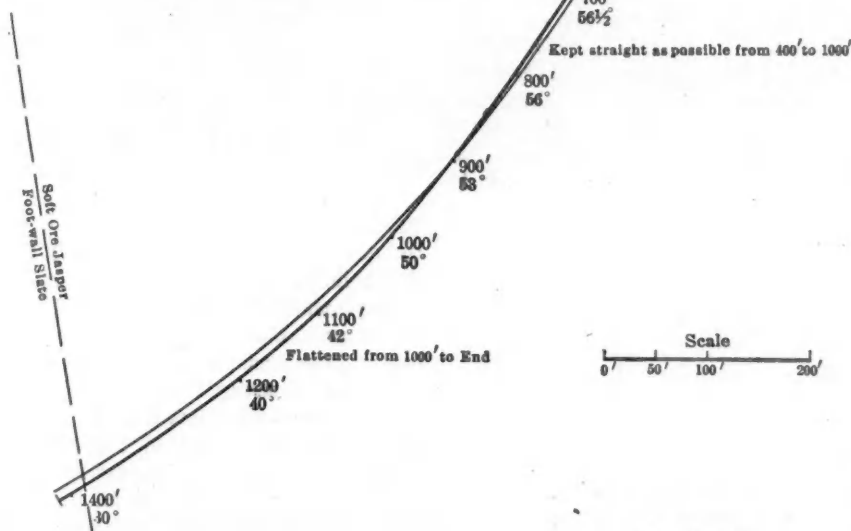


FIG. 2. DIAGRAM SHOWING COURSE OF DIAMOND-DRILL HOLE WHEN CONTROLLED

400 to 1000 ft. by using a little pressure, putting in a new core barrel and giving the diamonds a slight clearance. At 1000 ft. the hole was a little steeper than intended, and from this point to the end of the hole it was flattened intentionally by putting on more pressure, using an old core barrel, and giving the diamonds more clearance. At no point along the drill hole was it more than 9 ft. from its intended course. The inclination at 1400 ft. was 30 deg., just as estimated

It hardly seems necessary to name the objections to this system, as anyone who has ever used it can offer as many more. Have you ever seen a survey notebook used in a "red-ore" mine? After a short time in service nothing less than a shot or two will reveal the figures buried under the ore heaps of its smutty pages. Perhaps, too, you have worked in wet mines and carried your book underground

\*Care of Allis-Chalmers Company, Milwaukee, Wis.

# Gold and Coal Areas in Canadian Northwest

The operations of the Canadian Geological Survey are of growing extent and importance. In the introduction to the report for 1909<sup>1</sup>, Director R. W. Brock takes occasion to point out the inadequacy of the staff, particularly of the topographical division, to cope with even the most pressing of the work which presents itself, rendering it necessary to engage outside assistance. Specialists from abroad, more particularly from the United States, are said to have given valuable aid.

## PORTLAND CANAL; REGION INVESTIGATED

The first section of the report embodies the results of an extended tour of inspection made by Director Brock in British Columbia and the Yukon, to which special interest attaches owing to his observations regarding the Portland Canal region and the Stewart mining camp. The report of Fred Wright who, in 1905, while engaged in work for the U. S. Geological Survey in Alaska, made a geological examination of the upper part of the Unuk river in British Columbia, some 40 miles north of Stewart, is frequently cited. The character of the country is typical of southeastern Alaska. The valley of the Portland canal and Bear river is about a mile wide, flanked on either side by precipitous mountains, rising to a height of 5000 ft., with an occasional peak 1000 or 2000 ft. higher. Almost at the head of the canal, Salmon river enters from the Alaska side, and between it and Bear river is a mountain ridge which the international boundary follows for some distance. Bear river is joined from the east, about four miles from the mouth, by Glacier creek, and by Bitter creek about eight miles up stream; American creek enters from the north about 12 miles farther up stream. The majority of the well known claims are on Glacier and American creeks.

## CAMP IN ZONE OF METAMORPHIC SEDIMENTARIES

The camp lies in a metamorphic zone along what is probably the eastern limit of the Coast Range granite. This forms a long and relatively narrow belt, along and near the coast from the Fraser river to the White River basin in the Yukon, a distance of 1100 miles. Its width is from 30 to 60 miles. This body of granite, known as the Coast Range batholith was introduced into the pre-existent Paleozoic (?) sediments at some time between upper Jurassic and middle Cretaceous. The sediments near the granite contact are metamorphosed. Dikes from the granite form the adjacent schists, and inclusions

<sup>1</sup>Summary Report for 1909, Geol. Surv. Branch, Can. Dept. of Mines.

of the sedimentary rocks are numerous in the granite batholith for some distance from the contact, and are also found in isolated particles.

## TWO TYPES OF METAMORPHISM EVIDENCED

The metamorphism on the two sides of the Coast Range batholith is dissimilar. On the western contact the slates and argillites are changed to phyllites, mica schists, and in immediate contact frequently to gneiss. The strata are intensely folded and give evidence of having been deeply bruised at the time of metamorphism. Farther west from the contact the rocks were evidently nearer the surface at the time of the intrusion, and show more typical contact metamorphism and mineralization. The rocks along the inland contact of the granite are less altered, typical schists and gneisses are rarer; the contact line is more clearly defined; the rocks show contact metamorphism, and near the contact are often heavily mineralized with sulphides.

## CONTACT-METAMORPHIC ZONE FAVORABLE FOR PROSPECTING

The distinction between deep-seated metamorphism and contact metamorphism has here great economic importance—in the former, conditions preclude, as a rule, the formation of orebodies, while in the latter they frequently favor it. The most promising rocks to prospect, therefore, are those showing contact metamorphism, and in northern British Columbia, at least, the inland border of the granite is most likely to present this phenomenon, though it also occurs at a number of points along the coastal border. In recommending the contact of the granite as a point to prospect, the immediate contact is not specially meant, but rather the bordering zone influenced by the intrusion.

Throughout the entire length of the Coast-range batholith, wherever the invaded contact-metamorphosed rocks are exposed, or occur as large inclusions, in it they will probably be found attractive to the prospector. Such areas are found in the Bear River camp, in the Unuk River district, 40 miles north, and probably in the country between.

## PERSISTENCE OF VEINS CHARACTERISTIC OF STEWART

Two classes of ore were shown at Stewart, quartzose ore, carrying silver, gold and lead, and a pyritic copper-gold ore. The persistence of veins is noted. The quartzose ore contains galena, sometimes blende, argentite and native silver. Pyrite is sometimes plentiful, the copper

ore consisting essentially of pyrite and chalcopyrite.

## MODERN METHODS INCREASE AVAILABLE PLACER AREA IN YUKON

Treating of present conditions in the Yukon, Director Brock notes that the substitution of operations on a large scale with extensive engineering and mechanical aids, will mean the re-treating of practically all the worked-over ground and the underlying bedrock. An extensive scheme for power development is under way on the Klondike about 30 miles from Dawson, by which water from the north fork of the Klondike will be utilized to generate power to be transmitted over the whole district.

With a greatly increased number of plants it is claimed that it will still take years to work the gravels of the district by modern appliances. High-level gravels for which there was no available water, and claims which owing to mechanical difficulties could not be worked by the individual miner, will furnish a big additional field. The work done in recent years shows that the estimate by McConnell in 1906 of the future production of the territory at about \$63,000,000 was thoroughly conservative.

## POSSIBILITIES OF QUARTZ OREBODIES INVESTIGATED

Attention is being directed to the quartz possibilities of the Klondike and many claims have been staked, but there is so far nothing definite on which to base a judgment.

From a study of the character of the quartz and gold found, it is obvious that the gold is local in origin, derived from the basins of the pay gulches and creeks. It is practically certain that the gold of the gravels has come from the quartz veins. Developments on the Dome property tend to strengthen the supposition. Director Brock considers the prospects for developing lode mines in the Klondike quite as promising as in the lower Yukon.

The most attractive prospecting ground is naturally on the creeks which have had rich gravel. When the gravels of a creek appear to be enriched on a certain claim, it should first be determined if the excess supply has been derived from the White Channel paystreak. Only when this has not been the case may such enrichment be taken to indicate the presence of a rich vein in the immediate vicinity. If coarse or unworn gold makes its appearance where normally only fine and worn gold might be expected this would be indicative of a fresh local supply from a nearby source. Prospecting horizontally rather than vertically, by trenching or drifting, is recommended.



#### ALBERTA COAL AREAS GREATLY AUGMENTED

The principal discoveries of economic value described in the reports of field work are the extensions of the Alberta coal areas resulting from the explorations of D. B. Dowling, who in continuing his investigations northward, discovered a new and important coal basin, and the discovery of coal seams in the Wheaton River district of the Yukon by D. D. Cairnes.

Mr. Dowling summarizes the economic result of his investigation as follows: South of the Grand Trunk Pacific railway line, in the foothills, there are coal-fields of large extent, of which the nearest to the railway is situated in the outer portion of the disturbed foothill area. From it domestic and a fair grade of steam coal may be obtained. The area is situated on the headwaters of Embarras and Pembina rivers, and over a portion of it a seam of from 12 to 17 ft. can be

bearing horizon was observed to have about 20 ft. of coal seams.

#### BITUMINOUS COAL FOUND IN WHEATON RIVER DISTRICT

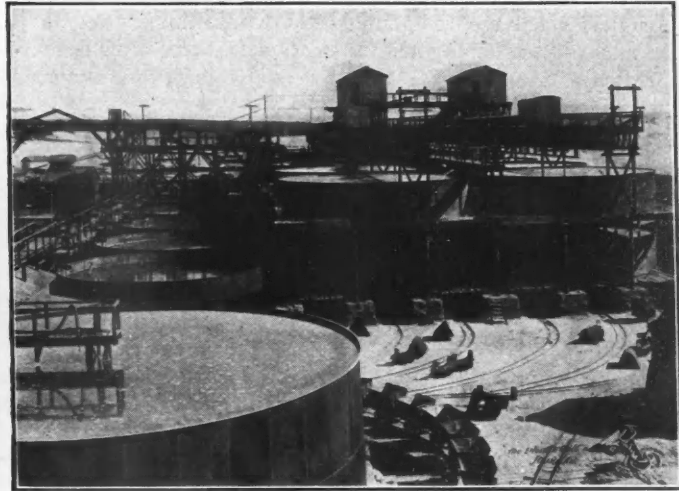
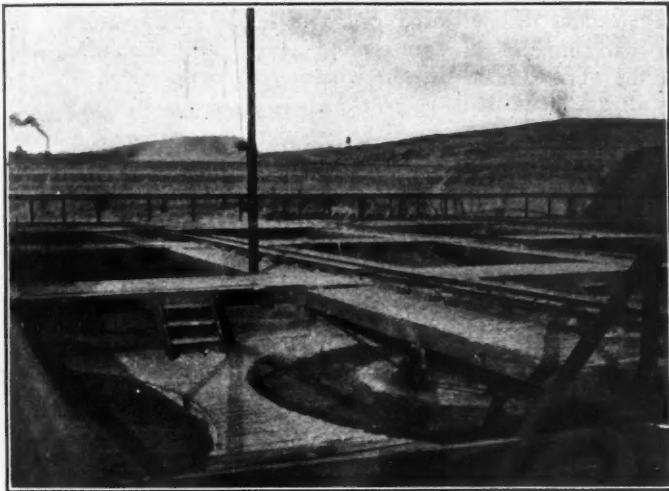
In the course of D. D. Cairnes' explorations in the Wheaton River district, Yukon Territory, the Tantalus conglomerates, which in the southern Yukon are known to be coal-bearing, were found outcropping about one mile west of the Union mines, on the ridge joining Bush mountain and Idaho hill, and search was made for coal. Three seams were discovered, one over 6 ft., one 18 in. and one at least 3 ft. wide.

The measures were traced from the summit of the ridge to near the valley bottoms of Schnabel and Follé creeks on the south and north sides respectively. These creeks are here two miles apart and, opposite the coal, are about 2000 ft. lower than the summit of the ridge between them. The belt of coal-bearing formation is about half a mile wide, and

Island lines furnishes the outlet for the El Paso & Southwestern. Practically all of the Phelps, Dodge & Co. metal tonnage has to find its outlet to the East over the Rock Island road, which connects with the El Paso & Southwestern. This deal, therefore, assures permanent and satisfactory traffic relations between the two interests.

#### Transition in Rand Cyanide Plants

It is interesting to note that the earliest cyanide plant erected on the Rand is still at work on the Robinson mine. The reproduction of a photograph of this plant is published herewith. The progress in cyanide practice made in late years is well shown by comparison with the illustration beside it of the modern plant at the Robinson Deep. This plant handles the ore from 300 stamps by sand and slime



THE FIRST AND ONE OF THE MODERN CYANIDE PLANTS ON THE RAND

mined. Higher-grade steam and coking coals may be obtained from more distant fields, situated behind high, rocky ridges. The areas containing the best grade of coal extend in narrow strips from the Saskatchewan river to near the Athabaska, behind the Brazeau, Bighorn and Nikanassin ranges respectively. The parts which seem mineable and easy of approach through gaps in these ridges, may be outlined as the Brazeau Range area on the Saskatchewan; the Bighorn basin from the Saskatchewan to the Brazeau rivers, and the southern part of the Nikanassin basin, drained by the McLeod and north branch of the Brazeau rivers. These areas may not be mineable outside a strip which is not much over a mile in width, but they have a total width of nearly 80 miles. A section of the measures near the Saskatchewan shows nearly 100 ft. of workable coal in about nine seams. Northward the seams possibly decrease in thickness and number, but on the McLeod the upper part of the coal-

the rocks comprising it are much folded and disturbed. The coal, which is bituminous and of the same age as that at Whitehorse and Tantalus, should make a good fuel.

#### Phelps, Dodge & Co. in Rock Island Railroad

It is announced that Phelps, Dodge & Co., Inc., has bought a large block of stock in the Rock Island railroad company and will have a large influence in the affairs of the railroad. Phelps, Dodge & Co., owns extensive copper properties in the Southwest, and the purchase of the Rock Island shares is in the interest of the El Paso & Southwestern railroad, a subsidiary of the El Paso & Northeastern company, a holding corporation owned by the Phelps-Dodge interests. This corporation controlled roads with a total mileage of about 500 miles, and the Rock

treatment. The Butters filter plant, erected on the Crown Mines, was to be working in August. A plant erected on the French Bobs mine, at Barberton, is treating 150 tons of slime per day with success.

#### Production of Hydrocarbons in California

The value of the petroleum produced in California in 1909 is placed by the State Mining bureau at \$32,398,187 and that of asphalt, bituminous rock and natural gas at \$2,440,537. This makes the valuation of the hydrocarbons produced reach \$34,838,714. No one familiar with conditions of the mineral industry in California 10 years ago would have predicted any such result as this. At that time the value of the hydrocarbons was very small indeed, but now their annual value has far surpassed that of the metals.

## Settlement of the Illinois Coal Miners' Strike

The long strike of the coal miners in Illinois came finally to an end on Sept. 9, when an agreement was closed in committee, which was formally ratified on Sept. 10 by both parties. The mines are to resume immediately, but it will take two or three weeks to bring about full operations, especially as a number of them have not yet completed the alterations required by the new mine safety law. Mining was suspended on April 1 last, pending negotiations over the new scale; a strike was formally declared a month later. The present settlement applies to the Northern district of the State; the operators of the Southern district settled with the miners about three months ago.

At first it looked as if the conference in Chicago last week would fail. The miners insisted on the terms of the so called Peoria demand; at first a majority of the operators voted against granting this, but the minority was strong and insistent, and threatened to break away from the association. Finally a committee of five was appointed with full authority to make the agreement. In connection with the miners' committee, the contract was made, the miners gaining most points, but conceding some changes from the Peoria claims, on the questions of shot-firers and of arbitration.

### THE AGREEMENT ON WAGES

The operators agree to pay the advance of 3c. per ton for the entire State, with 2c. additional differential for the Franklin-Williamson district; also a general advance of 5.55 per cent. in day wages. These are the same advances which have been generally conceded through the Central West. On the other disputed points the agreement is substantially as below.

### THE SHOT-FIRER CLAUSE

It is agreed that the cost of firing shots during the life of the contract shall not exceed the cost per ton for the same work during the previous contract except insofar as the 5.55 per cent. advance affects it. It is understood that this clause does not mean that the operator can avoid paying for the work actually necessary to be done by the shot-firers. It is also agreed that there shall be no shot-firers in mines where coal is undercut by hand or machines, except as mutually agreed. Where conditions in the past have necessitated shot-firers they will be continued; where conditions develop that they are not necessary, they can be discontinued.

### THE ARBITRATION CLAUSE

It was understood that the question of determining a method for arbitrating disputes would be taken up as the first order of business at the first joint board

meeting, and that until a definite plan is agreed upon any dispute arising will be referred to a commission composed of two operators and two miners with some one of the following as the fifth man: Wm. Morris, of Duquoin, Prof. Stoek, of Urbana, J. E. Williams, of Streator.

### MAKING A NEW AGREEMENT

It is mutually agreed between the Illinois Coal Operators Association and the United Mine Workers of America, District No. 12, that joint negotiations for the formation of a new wage contract shall begin on a date sufficiently in advance of the expiration of the present contract reasonably to insure the completion of these negotiations before March 10, 1912. But should conditions arise which apparently make it impossible to complete these negotiations before that date a commission shall be appointed composed of nine miners and nine operators together with three disinterested parties hereinafter named who shall sit together with the miners and operators with a voice in the affairs but without vote. This commission shall continue negotiations and complete the work of making a contract, settling all questions that have not been agreed to up to the date of the expiration of the contract, and shall continue in session for such time as is mutually agreed upon. All mines to continue at work without interruption providing negotiations are still pending and the same is mutually agreed upon. For the purpose of the above J. E. Williams, of Streator, Ill., Dr. Joseph A. Holmes, Washington, and William Morris, of Duquoin, Ill., are named as the three disinterested parties. In case of the inability or failure of any one of these three to qualify it shall be within the power of the other two to name a third disinterested party who shall sit with them on the commission; said person so appointed to be mutually agreeable to both parties in interest. This section is subject to the ratification of both organizations at the earliest date on which they convene in State convention.

## Novel Electric Driven Compressor Plant at New Modderfontein

### JOHANNESBURG CORRESPONDENCE

At the New Modderfontein mine a large electrically driven air-compressor plant of a design new to the Rand is being installed. The capacity of the plant will be 26,000 cu. ft. of free air per minute. There are four units of Belliss & Morcom high-speed compressors, compressing to 80 or 100 lb. pressure. They run at 160 r.p.m., such a high rate of speed being rendered possible by using valves of small lift, weight and inertia, constructed of steel concentric strips and designed by Pro-

fessor Hoebiger. These valves have come into great favor on the Rand, many old compressors having been remodeled and fitted with them; Walker Brothers, Ltd., England, have recently adopted a valve of similar design.

Each compressor is driven by a 1000-b.h.p., coupled, three-phase induction motor, 50 cycles, 2000 volts. These are provided with belt-driven phase advancers in order to keep the power factor between half and full loads at 0.8. One of the improvements in this station is that arrangements are made for cooling and filtering the air before compression. The air is drawn from a subway which terminates in a building having an airtight roof and floor and walls composed of sheets of cocoanut matting through which the air is filtered. Anyone who has noticed the air, in the neighborhood of many compressors, almost thick with sand blowing from tailing dumps and with dust from nearby roads, will appreciate the effect this precaution will have in reducing wear on valves, pistons and cylinders in the compressors. The pre-cooling of the air, of course, adds to the efficiency of compression.

## California Oil Dividends

Dividends paid by a number of California oil companies during August, 1910, together with the total dividends to date, as reported by the San Francisco Stock Exchange, are shown in the accompanying table.

AUGUST DIVIDENDS OF CALIFORNIA OIL COMPANIES.

Name of Company.	August 1910	Total Paid to Date
American Petroleum, pf.	\$ 16,500	\$ 261,975
American Petroleum, com.	82,500	1,388,142
Bay City	10,000	145,000
Caribou Oil and Mining	20,176	801,410
Claremont	10,000	375,000
Columbia	9,992	324,759
Eldorado	1,000	1,000
Euclid	3,500	141,500
Gypsy	35,000	40,000
Home	2,000	484,000
Kern River	2,000	110,000
Linda Vista	3,858	80,608
Mascot	10,000	40,000
Mexican Petroleum	87,693	3,411,807
Monte Cristo	50,000	640,000
Mountain Girl	7,000	7,000
New Penn. Petroleum	5,000	15,000
Palmer	18,020	340,451
Paraffine	3,000	30,000
Pinal	15,000	961,921
Record	7,500	92,500
S. F. & McKittrick	15,000	415,000
Sauer Dough	9,975	547,228
Section 25	10,000	60,000
Seson	7,000	139,000
Thirty-three	400,000	1,090,000
Union	124,813	6,992,320
United	40,375	2,380,837
Western Union	20,000	484,951
Total for August, 1910	\$1,069,917	.....

The August total is \$404,653 less than that for July, 1910, which amounted to \$1,474,570. This is doubtless in large measure due to the heavy reduction in the price of oil. The grand total of the dividends paid to date by California oil companies amounts to \$34,682,082.



# Some Economic Gold Deposits of Alaska

Nome and Fairbanks Principal Placer Deposits. Unga Island a Typical Shear Zone Deposit. Mineralized Dikes and Fractures on Douglas Island

BY FRANCIS CHURCH LINCOLN\*

Gold possesses a wider literature than any other metal. Only recently valuable works on gold have appeared in France,<sup>1</sup> England<sup>2</sup> and America.<sup>3</sup> Yet when I began to investigate the associations of gold, I could find no brief, systematic, geological descriptions of the more important economic gold deposits and was forced to compile such for myself. In the belief that these descriptions may prove useful to other investigators and to teachers of economic geology, I have prepared series of articles which pertain to North American gold occurrences.

Each deposit is treated under the following heads: History, geography, country (or bed) rock, ore (or placer) deposit, ore (or pay dirt), gold, and references. The lists of references give the sources of the material entering into the compilation of the various articles and are not bibliographies. While the descriptions are mainly compiled, observations made by the author are included in many instances.

## THE BEACH PLACERS OF NOME

Nome is on the southern shore of the Seward peninsula, Alaska. The existence of alluvial gold<sup>4</sup> in Seward peninsula was known as early as 1866, but no production is recorded prior to 1897, and the first discovery of commercial importance was made on Melsing creek, Council district, in March, 1898.

A party of prospectors, stormbound in the vicinity of what is now Nome, discovered gold on Snake river and Anvil creek, in July, 1898. One member of this party, J. J. Brynteson, securing two companions, returned to the district and on Sept. 20, 1898, discovered the rich placers of Anvil creek. The news of the discovery spread rapidly and by the summer of 1899 the population of Nome had reached 3000. There was no means of enforcing civil law—the only representatives of the Government being an officer and a small detachment of soldiers. Nu-

\*Mining engineer and geologist, 106 John street, New York.

<sup>1</sup>"L'Or dans le Monde," L. De Launay, 1907.

<sup>2</sup>"Gold," J. M. Maclaren, 1908.

<sup>3</sup>"Gold and Silver," W. R. Crane, 1908.

<sup>4</sup>A. H. Brooks, G. B. Richardson and A. J. Collier, "A Reconnaissance of the Cape Nome and Adjacent Gold Fields of Seward Peninsula, Alaska, in 1900," U. S. Geol. Surv. (1901).

F. H. Moffit, U. S. Geol. Surv. Bull. 284 (1906), 133-4., and Bull. 314 (1907), 134-144.

A. J. Collier, F. L. Hess, P. S. Smith and A. H. Brooks, U. S. Geol. Surv. Bull. 328 (1908).

P. S. Smith, U. S. Geol. Surv. Bull. 345 (1908), 206-216; and Bull. 379 (1909), 267-283.

merous disputes arose as to the ownership of claims, and the situation became serious.

## GOLD DISCOVERED IN NOME BEACH SAND

This condition of affairs was suddenly relieved through the accidental discovery that the beach sands were rich in gold, which was made almost simultaneously by John Hummel, an old Idaho prospector, and one of the soldiers. About 2000 men went to work on the beach and more than \$1,000,000 were taken out in two months.

Gold was found in the "second" beach in 1901; and in the fall of 1904, the rich "third" beach was discovered. In 1906, an "intermediate" beach was encountered; and the discoveries are brought down to date by the mention of the two "submarine" beaches which were located in 1907.

The production of gold from the Seward peninsula from 1897 to 1908 inclusive, was \$49,362,700. This exceeds the production accredited to any other region in Alaska. The bulk of the production of the Seward peninsula has come from the Nome district. In 1908 the peninsula produced \$5,120,000, of which the Nome district contributed more than all the other districts put together. About two-thirds of this production came from the beaches.

## GEOGRAPHY AND CLIMATE AT NOME

The Nome district lies between Bering sea on the south and the Kigluaik mountains on the north. The southern part of the district is occupied by a crescentic coastal plain. At both ends of this coastal plain, the uplands reach the seacoast, and north of it they increase gradually in height to an elevation of 2500 ft. at the base of the Kigluaik mountains, 25 miles from the coast. The streams take a southerly course to Bering sea across broad, gravel-floored valleys.

The climate is sub-arctic. On quiet days in winter the temperature falls as low as -50 deg. F., while in summer it rarely exceeds +80 deg. F. The annual rainfall is about 20 in. The streams freeze about the last of September and open the middle of May. The ocean freezes early in November and opens the middle of June.

Willows and grass grow along the watercourses. With this exception, the uplands are barren and the coastal plain is covered only by tundra.

## NOME BED ROCK

The bed rock of the coastal plain is deeply covered with Quarternary gravels and sands. Back of the coastal plain the uplands are carved from rocks of the Nome group, a complex mass of more or less altered sediments, intrusives and eruptives of Ordovician or Silurian age. This group includes a great thickness of quartz and calcite schists, greenstones and greenstone schists, together with a massive limestone called the Port Clarence limestone. The schists inclose massive limestone beds up to 100 ft. or more in thickness, and the Port Clarence limestone contains thin layers of interbedded schist.

Granite forms the headland at Cape Nome, and the core of the Kigluaik mountains. It is probably of early Cretaceous age. The schists are much fractured and contain quartz and calcite stringers, especially at limestone-schist contacts. In some places, metalliferous lodes of larger size occur, and one vein has been developed into a mine. That the Port Clarence limestone is not gold-bearing is indicated by its generally unaltered character and its distribution with regard to the placers. The mineralization of the district is believed to have taken place at the time the granite was intruded.

## PLACER DEPOSITS

The placers of Nome include ancient and modern beach deposits; ancient and modern stream deposits, and residual deposits. The gold in all these deposits was originally contained in quartz and calcite stringers and veins in the Nome schists and owes its present position to concentration caused by wave action, stream action and weathering. The richer deposits are due to reconcentration.

These placers occupy a roughly triangular area whose base extends 30 miles along the coast of Bering sea, and whose apex lies 25 miles inland near the head of the Nome river at the base of the Kigluaik mountains. The beach deposits are confined to the crescent-shaped coastal plain at the base of this triangle, and have a maximum width of four miles in its central portion which is near the town of Nome.

## SIX BEACH LINES AT NOME

Six beaches are known at present. These beaches have been formed during pauses in a gradual advance and retreat

of the sea which has been taking place since Pliocene time. The oldest and lowest beach which has been recognized is the "outer submarine," which lies from 300 to 1000 ft. inside the present beach and 34 ft. below sea level. After forming this beach in Pliocene time, the sea advanced slowly, pausing long enough at intervals to form successively the "inner submarine," "intermediate" and "third" beaches until it reached the steep bluffs about half a mile north of the third beach.

Then the sea began its retreat to the present beach, stopping long enough on the way to form the "second" beach. The "inner submarine" is about  $\frac{1}{4}$  mile north of the present beach, and 20 ft. below sea level. The "intermediate" beach is about  $1\frac{1}{2}$  miles inland and 22 ft. above sea level. The "third" beach is about 3 miles from the present shore and 78 ft. above sea level, and the "second" beach is about  $\frac{2}{3}$  mile inland at an elevation of 38 ft. Since the ancient beaches were apparently confined between the same headlands as the modern beach and their curvatures are greater, they are longer.

#### STRUCTURE OF NOME BEACH

The coastal plain ends on the coast in an escarpment from 10 to 20 ft. high. From the base of this escarpment a beach from 150 to 225 ft. wide slopes to the sea at an angle of four or five degrees. A blue clay bed occurs near the surface in the upper part of the beach and slopes seaward more steeply than the surface, so that half way down the beach it is from 5 to 7 ft. deep. Immediately above the clay is the pay streak, containing a higher percentage of the heavier minerals than the beds above. The higher beds include sands, gravels and occasional thin seams of clay. The surface material is usually sand with occasional shingle and gravel. The beach sand consists largely of quartz and mica- and chlorite-schist fragments. Reddish garnets form an important constituent and magnetite is always present, but usually forms less than 1 per cent. by weight. The pebbles are largely quartz. Occasionally small boulders are found.

The structure of the ancient beaches is similar to that of the present beach. They are, however, covered with stream and marine deposits which are in turn covered with "muck." Muck is the local name for fine, black, surface material composed of vegetable matter, clay, sand and ice. The ancient beach deposits with their overlying gravels and muck are generally frozen throughout. In some instances the old beach deposits rest upon true bed rock instead of upon a clay false bed rock, like the present beach.

The sands of the present beach carry colors nearly everywhere throughout its length of 30 miles, but the richest dig-

gings have been encountered in the central 20 miles of this stretch. As a rule the pay dirt occurs only upon the clay, several feet below the surface. The thickness of the productive layer varies from 6 in. to 3 ft. Sometimes a second pay streak occurs a foot or two above the other. The rich dirt lies in horizontal lenses similar to those formed by the sands and gravels. The sand of the pay streak differs in no way from that of the beach, save that it is usually finer and contains more of the heavy minerals.

The pay dirt of the ancient beaches is similar to that of the present beach. In the "inner submarine" it has a thickness of 3 ft. In the third beach it is thicker than anywhere else, ranging from 4 to 5 ft., with a maximum thickness of 16 ft. The width of this pay streak varies from 25 to 100 ft., which is also the width of the pay streak in the second beach, but there the thickness is only from 3 in. to 3 feet.

#### GOLD

The gold of all the beaches is mainly in fine, bright, yellow flakes. The gold from the older beaches is coarser, lower grade and less readily amalgamable than that from the younger beaches and is worth \$16.53 to \$17.80 per ounce.

#### ASSOCIATED MINERALS IN NOME PLACERS

Sulphides are the most common associates of the gold in the older beaches, but are comparatively rare in the younger. A large proportion of the concentrates from the "outer submarine" beach consist of sulphides of which perfect sharp crystals of arsenopyrite make up a large part. Pyrite and chalcopyrite are also abundant. Magnetite, ilmenite and garnet were present in small amounts. In the concentrates from the "inner submarine" beach, pyrite and arsenopyrite are still abundant, and the quantity of garnet and magnetite has increased. Garnet is frequently the most abundant mineral in the pay streak of the present beach, and magnetite sometimes makes up 8 or 10 per cent. of the sand. Ilmenite and pyrite also occur in small amount. The lighter portion of the pay dirt consists mainly of quartz, muscovite and chlorite.

#### THE STREAM PLACERS OF FAIRBANKS

The Fairbanks district<sup>1</sup> is situated in the Yukon basin in east central Alaska about 260 miles above the mouth of the Tanana river. The existence of gold on the Yukon has been known since 1869. Mining began far up stream in Canadian territory in 1881. In 1886, the Fortymile district was discovered on American soil and soon after the Sixtymile district on Canadian ground. The Circle dis-

trict was discovered in 1893 and the Rampart district in 1896, both in American territory. Then came the Klondike rush of 1897-8 which depopulated the American placer camps. The location of a trading post in the Tanana valley in 1901 was followed by the discovery of the Fairbanks district in 1902.

The production of the American portion of the Yukon basin from 1883 to 1908 inclusive was \$45,204,000. About two-thirds of this amount was produced by the Fairbanks district from 1903 to 1908 inclusive. The production of this district in 1908 was \$9,200,000.

#### TOPOGRAPHIC AND CLIMATIC FEATURES

The surface of the Fairbanks district consists of ridges with a uniform height of about 2000 ft. These ridges alternate with valleys containing southwest-flowing streams and are limited on the southwest by the Tanana flats which have an elevation of 500 to 600 ft. above sea level.

The temperature range is great, varying from -80 deg. F. in winter to +80 deg. F. in summer. The annual rainfall is about 15 in. Navigation opens about May 15, and closes about Nov. 1. Much of the surface is frozen permanently to depths which may exceed 300 feet.

Spruce, birch and poplar grow luxuriantly on the valley slopes and lower ridges, but the tops of the higher ridges are covered only by a scanty growth of grass, moss and low bushes.

#### BED ROCK IN THE FAIRBANKS DISTRICT

The bed rock consists predominantly of Pre-Ordovician schists mostly of sedimentary origin. Quartz- and quartz-micaschists are the most common types. They occur in thin alternating beds, are closely folded, strike northeast-southwest, and are intersected by two prominent sets of joint plains which are nearly at right angles to each other. This formation is called the Birch Creek schist.

Intrusions of granodiorite and porphyritic biotite-granite, probably of early Tertiary age, form the bed rock at the upper ends of some of the valleys. There are also numerous acidic dikes and a few inconspicuous basic ones.

Quartz veins are common. They occur both cutting and intercalated in the schists and with widths up to eight feet. The mineralization of the district probably accompanied or followed the intrusion of the igneous rocks, as in the Nome district.

#### ALLUVIAL DEPOSITS

The alluvial deposits of the Fairbanks district are frozen stream sediments of recent age. Tertiary peneplanation was succeeded by Pleistocene elevation which caused the cutting of the present valleys. The gold in the quartz stringers and schist became concentrated mechanically in the recent valleys. Subsequently the streams became less active as a result of

<sup>1</sup>References: L. M. Prindle, U. S. Geol. Surv. Bull. 337 (1908); L. M. Prindle and F. J. Katz, U. S. Geol. Surv. Bull. 379 (1909), 181-200.



decrease of precipitation or a lower average temperature, and the valley bottoms became covered with a mantle of material varying from a few feet to over 300 ft. in thickness.

#### THE FAIRBANKS GOLD-BEARING ZONE

The gold-bearing zone runs northeast toward the upper Chena basin and southwest to the Tolovana flats. It is at least 10 miles wide and has been traced about 30 miles.

The placer deposits are only in part coincident with the present courses of the streams. The streams occupy unsymmetrical valleys and are usually close to the steeper slope, while the placers are found upon the side of the more gradual slope, upon bed rock which has about the same elevation as the bed rock beneath the stream.

The placer deposits are generally separable, in vertical section, into three divisions: Muck, barren gravel and pay dirt. The muck overlies the main body of gravel and has a maximum thickness of 100 ft. Below the muck, the barren gravels range from 10 to 60 ft. in thickness. Besides lacking gold content, this gravel differs from the productive gravel in that it contains little or no clay. The entire deposit is usually frozen throughout.

#### PAY DIRT AT FAIRBANKS

The productive gravels are of recent age. They were deposited when the present streams were actively eroding their valleys and at what were then the deepest parts of the valleys. The value per cubic yard varies from \$1 to \$8.

The pay streaks range in width from 30 ft. or less to 800 ft., averaging about 200 ft. for the entire district. The total length of ground along which productive areas are scattered is about 75 miles.

The pay streaks include from a few inches to 8 ft. of gravel and clay, and from one foot to several feet of bed rock. The gravel consists of coarse, angular, slightly waterworn fragments of quartzschist, quartz-mica-schist and granite together with finer material of similar composition. A considerable amount of clay adheres to the gravel and to the surface of bed rock. Both coarse and fine material are irregularly intermingled. The gold is usually either distributed uniformly throughout the pay gravel or lies mostly near bed rock; but occasionally it is found in the joint planes of the bed rock.

#### CHARACTER OF FAIRBANKS GOLD

Most of the gold occurs in small flat nuggets, but some is coarse and nuggets worth over \$500 have been found. The gold varies from \$16 to over \$19 per ounce. The minerals most commonly associated with the gold are quartz, garnet, rutile and magnetite. Cassiterite, stibnite, bismuth, galena, arsenopyrite and

wolframite are also found. Quartz and bismuth are frequently intergrown with the gold.

#### THE APOLLO MINERALIZED SHEAR ZONE, UNGA ISLAND

The Apollo Consolidated mine is situated on Unga Island, Alaska. It began to produce in 1891, and in 1904 had produced between two and three million dollars in gold.

Unga Island is a member of the Shumagin group, which is south of the Alaska peninsula and southwest of Kodiak island. The mine is three miles west of the town of Unga and one mile west of the head of Delarof harbor.

The climate is characterized by less extremes than the other portions of Alaska. Unga island therefore enjoys a cool temperate climate and a moderate rainfall.

#### GEOLOGICAL FEATURES OF UNGA ISLAND

The country rock<sup>6</sup> consists of associated eruptions of andesite and dacite of late Mesozoic or Tertiary age. The ore deposit is a shear zone in the eruptive rocks, which has been mineralized by hot, ascending waters, probably of magmatic origin.

The deposit is nearly vertical and strikes north 43 degrees east. The King mine, about ½ mile northeast of the Apollo, is believed to be on the same lode.

The mineralizing waters have deposited crystals of gold-bearing quartz upon the walls of the shear zone and upon the included fragments of country rock, producing comb structure in the narrower spaces. The solutions have also propylitized the country rock for a considerable distance on either side of the lode.

#### CHARACTER OF THE ORE

The value of the ore on Unga island varies from \$1 to \$50 and averages \$8 per ton and the percentage of silver is the ore is caught on the plates, giving a bullion 767 fine. The value of the concentrates produced is from \$50 to \$60 per ton and the percentage of silver is greater in these than in the plate bullion.

The ore occurs in one shoot, varying from 5 to 40 ft. in width and pitching northward. The ore at the King mine probably constitutes a second shoot in the same lode. The structure of the ore is like that of the lode as a whole, save that it contains more fractured filling. The country rock has not been richly impregnated with gold, so the presence of ore depends chiefly upon the presence of a large amount of interstitial filling.

The principal gangue mineral is quartz. Calcite and orthoclase are also present. The primary ore minerals are pyrite,

galena, sphalerite, chalcopryrite, copper and gold. Cuprite and malachite occur with these as decomposition products.

#### UNGA ISLAND GOLD

The gold occurs in small grains tending to filiform and scaly configurations. Most of the surfaces are rough, but occasionally the microscope reveals the presence of a plane face on a gold grain. The gold is finely disseminated through the quartz and almost wholly unaccompanied by sulphides. Sometimes a few particles of galena occur with the gold. In other instances specks of gold are intimately mingled with tiny shreds of native copper, both metals being imbedded in the quartz and manifestly contemporaneous.

#### MINERALIZED DIKES, DOUGLAS ISLAND

The Treadwell ore deposit<sup>7</sup> is situated on Douglas island, Alaska. The first auriferous lode found in Alaska was discovered near Sitka, in 1877, but the first important production of gold was from the Treadwell mine, in 1882.

The placers of Gold creek, near Juneau, and the gold-quartz veins of the Silver Bow basin further inland, were discovered in 1880 by Joe Juneau and Richard Harris, two prospectors who had been sent out by N. A. Fuller, of Sitka, on the strength of a favorable report by John Muir. In 1881 the whole district was prospected and the claims which now make up the Treadwell group were located. In the fall of the same year Pierre Joseph Erussard ("French Pete"), the original locator of the Treadwell lode, transferred his claim to John Treadwell for five dollars.

#### MINING COMPANIES OF DOUGLAS ISLAND

The development of lode mining was greatly hindered at the outset by placer miners who held the ground forcibly and washed gold from the decomposed outcrop. A five-stamp mill was erected in 1882. There are now 880 stamps in operation. The Treadwell group includes four mines owned by three companies: the Treadwell mine belonging to the Alaska-Treadwell Gold Mining Company, the Mexican mine belonging to the Alaska-Mexican Gold Mining Company, and the Seven Hundred Foot and Ready Bullion mines belonging to the Alaska-United Company.

The total gold production of the Pacific Coast belt of Alaska from 1880 to 1905 inclusive was \$33,965,400. Of this amount the Treadwell group produced \$24,758,828. The production of these mines for 1908 was \$2,999,420.

<sup>6</sup>References: A. H. Brooks and C. Abbe, Jr., U. S. Geol. Surv. Professional Paper No. 45 (1906), 150.  
G. C. Martin, U. S. Geol. Surv. Bull. 259 (1905), 100.  
G. F. Becker, U. S. Geol. Surv. Ann. Rept. No. 18, Part III (1898), 83.

<sup>7</sup>References: F. D. Adams, *Am. Geol.*, Vol. 4 (1889), 88-93.  
C. Palache, Harriman Alaska Expedition (1904), 61-64.  
R. A. Kinzie, *Trans. A. I. M. E.*, Vol. 34 (1904), 334-386.  
A. C. Spencer, U. S. Geol. Surv. Bull. 287 (1906), 86-116.

## CLIMATE OF DOUGLAS ISLAND

The mines are situated near the inland shore of Douglas island, one of the smaller islands of the Alexander archipelago. The island is mountainous and is separated from the mainland by a narrow fjord known as Gastineau channel. Across this fjord and about 2½ miles distant is Juneau, Seattle, Washington, is about 900 miles distant by steamer.

The climate is temperate and humid, the annual rainfall being about 98 in. As a result, a dense growth of trees, mainly hemlock and spruce, covers the entire country.

## COUNTRY ROCK ON DOUGLAS ISLAND

The principal country rock is black slate, probably of carboniferous age. This slate has been formed by the strong metamorphism of carbonaceous and calcareous shales of uniform texture. Stratification and slaty cleavage are in accord, striking northwest-southeast and dipping about 50 deg. northeast beneath Gastineau channel.

Close to the shore of the channel is an interbedded band of greenstone about 300 ft. wide, which is believed to be a metamorphosed surface-lava flow.

Albite-diorite dikes probably of Middle Cretaceous age have been intruded parallel to the slate and greenstone. They appear interruptedly in a zone three miles long and 3000 ft. wide, mainly on the side of the greenstone toward the interior of the island. Thus, the greenstone practically forms the hanging-wall of the zone.

Narrow dikes of basalt cut the other rocks transversely.

## ORE DEPOSITS OF DOUGLAS ISLAND

The albite-diorite dikes which were intruded in Middle Cretaceous time were shattered and mineralized at some later period and some of them now constitute orebodies. The mineralization was effected by hot, ascending waters probably of magmatic origin.

Only dikes situated near the foot-wall of the greenstone have so far proved productive. Thus, the greenstone forms the hanging-wall not only of the intrusion zone, but also of the ore deposit. The mine workings have a horizontal extent of nearly 7000 ft., and the ore has been followed on its dip for over 1000 ft. and still continues downward.

The individual dikes vary in width from a few inches to over 200 ft. They pinch and swell along both strike and dip, but the variations are more frequent on the dip than on the strike.

## MINERALIZED FRACTURES

The mineralizing solutions filled the fractures in the shattered dikes, metasomatically altered the dike rock and occasionally impregnated the slate walls and horses.

The filled fractures rarely reach a

width of more than a few inches, although a few veins a foot or two across have been encountered and one vein 40 ft. wide has been found. The greater part of the filling occurs in fissures constituting two well marked systems. One system is approximately parallel to the structure of the country, while the other and more prominent system strikes slightly oblique to the strike of the country rock and dips in the opposite direction. The filling consists mainly of calcite, quartz, albite and a little pyrite.

The metasomatic alteration of the albite-diorite is unique. The rock originally consisted of albite-oligoclase phenocrysts in a ground mass of microperthite. The mineralizing solutions replaced much of the microperthite by albite. The comparatively insignificant amounts of hornblende and biotite present in the original rock were, as a rule, changed to secondary minerals, including epidote, chlorite, calcite, sometimes pyrite or pyrrhotite, and more rarely magnetite.

Impregnation of the slate does not always occur, and even when it does, rarely exceeds a width of two or three feet. In these instances the color has been changed from black to brown, owing to decarbonization.

## CHARACTER OF DOUGLAS ISLAND ORE

The value of the ore mined varies from \$1 to \$10 per ton, averaging about \$2.60. From 60 to 75 per cent. of the gold is free milling. Concentrates consisting of pyrite, pyrrhotite and a little magnetite and worth from \$30 to \$50 per ton, make up about 2 per cent. of the ore.

The gold is irregularly distributed throughout the dikes and no well defined shoots can be distinguished.

The structure of the ore differs from that of the mineralized dike as a whole mainly in that it contains more veinlets. In general, the greater the amount of fracture filling the greater the value of the ore, just as in the case of the Apollo lode, on Unga island. The amount of filling in the ore averages about one-fifth its bulk.

## ASSOCIATED MINERALS ON DOUGLAS ISLAND

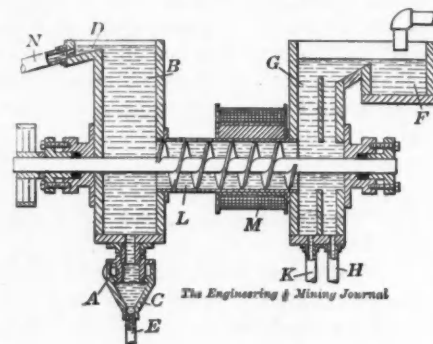
The principal non-metallic minerals in the Treadwell ore are albite, calcite and quartz. Smaller amounts of ferruginous calcite, rhodochrosite, rutile and graphite occur. The principal metallic mineral is pyrite, with considerable amounts of pyrrhotite and magnetite and smaller quantities of chalcopyrite, galena, sphalerite, arsenic, realgar, orpiment, arsenical pyrite, molybdenite and gold. No secondary lode minerals are believed to be present.

Visible gold is rare. It has been observed with the naked eye in coarsely crystalline calcite and also in association with pyrite and films of graphite. With

the aid of a microscope, Adams found particles of gold embedded in pyrite at and near its surface. The presence of molybdenite is said to indicate high gold content, but that mineral can hardly be an important carrier of gold on account of its limited distribution in the lode. It seems probable that the amalgamable gold is mainly present in the calcite and the non-amalgamable in the pyrite.

## Wet Magnetic Separation of Ore

Quincy Bent, of Lebanon, Penn., has patented (U. S. Pats. 954,015 and 954,016 April 5, 1910) a process and an apparatus for magnetically separating pulverized ore. The operation of the apparatus is as follows: The larger part of a stream of water from the inlet *A* flows upward into the washing chamber *B*, continues the rotating motion given it by the vortex admission device *C*, and finally overflowing at *D*. The other part flows downward and out through the pipe *E*. Water car-



BENT MAGNETIC ORE SEPARATOR

rying the crushed or pulverized ore enters the compartment *F* and from there flows to the settling chamber *G*, the baffle causing the heavy tailings to descend to pipe *H* and the lighter to *K*. As the ore descends in the settling chamber, the magnetic particles are drawn laterally into the passageway *L* by the solenoid *M* while the tailings fall to the bottom. The magnetic concentrates are advanced by the screw conveyer driven by the pulley at the end of the shaft, and are discharged into the upward stream of water in chamber *B*, through which they fall and leave by the pipe *E*. The upward flow of the water is strong enough to carry any small suspended non-magnetic particles to *N*, the overflow pipe.

Bounties paid by the Commonwealth of Australia, under the act for encouragement of manufactures, in the six months ended Dec. 31, 1909, were: Pig iron, 19,323 tons, \$56,347; steel, 897 tons, \$2618; puddled bars, 991 tons, \$2890; galvanized sheets, 141 tons, \$971; wire screens, 1513 tons, \$12,383; making \$74,409 in all.



# Pyrite Smelting and Sulphuric Acid Manufacture

Several Furnaces Desirable to Produce Gas of Uniform Composition and Quantity for Acid Manufacture. Proper Furnace Regulation Essential

BY F. J. FALDING\* AND J. PARKE CHANNING†

Pyrite smelting is a method of matte-smelting sulphide ores having iron as a base, usually in combination with copper, nickel, gold, silver, etc. (pyrite, pyrrhotite, chalcopyrite, etc.) This method of smelting involves the utilization as completely as practicable, as fuel for the smelting process, of that part of the sulphur contained in the ore, which is driven off as a gas in the preliminary operations of roasting or desulphurizing, as practiced in ordinary blast-furnace smelting.

The ore as it is taken from the mine is broken into moderate-sized pieces and together with the necessary flux is charged into the blast furnace with only sufficient coke to supply what heat the natural fuel in the ore (iron, sulphur, etc.) may be unable to supply.

A distinction has been made between pyrite and semi-pyrite smelting. In the first case the percentage of coke used to the charge is small, say from 1 to 6 per cent., while in the other the percentage is greater, say 7 to 12 per cent. This distinction is of doubtful accuracy, for so long as any coke at all is used, the smelting is only partial or semi-pyritic. The coke is used either because the sulphur and iron content of the charge is insufficient to provide fuel for the smelting process, or because the sulphur is inefficiently used on account of improper furnace construction or management.

## EXAMPLES OF FURNACE CHARGE

The following *pro forma* examples<sup>1</sup> of furnace charge (omitting fluxes) composed of pyrite or pyrrhotite, or mixed pyrite and pyrrhotite ores, containing for purposes of illustration copper, but not necessarily representing actual charges for matte smelting, will best explain the calorific power of the iron and sulphur contents:

(1) Charge of 100,000 kg. contains 32 per cent. sulphur over and above the sulphur required for the matte and 40 per cent. iron. When allowance is made for the complete oxidation of the available sulphur it is found that no addition of coke is required.

S 32,000 kg.  $\times$  2164 cal. per kg. = 69,248,000 cal.

Fe 40,000 kg.  $\times$  1173 cal. per kg. = 46,920,000 cal.

Total calories available per 100,000 kg. charge = 116,168,000.

(2) Charge of 100,000 kg. contains 22 per cent. sulphur over and above the sulphur required for the matte and 40 per cent. iron, then:

S 22,000 kg.  $\times$  2164 cal. per kg. = 47,608,000 cal.

Fe 40,000 kg.  $\times$  1173 cal. per kg. = 46,920,000 cal.

Total calories available per 100,000 kg. charge = 94,528,000 cal.

Heat shortage as compared with charge No. 1, 21,640,000 cal.

Calories available in charge No. 1, 116,168,000.

The amount of carbon required to supply this shortage of heat is:

2677 kg.  $\times$  8083.4 cal. per kg. = 21,640,000 cal., or of coke containing 85 per cent. carbon, 3.15 per cent. would be required to make up the deficiency of sulphur in this charge, as compared with charge No. 1.

(3) Charge of 100,000 kg. contains 12 per cent. of sulphur, over and above the sulphur required for the matte and 25 per cent. Fe, then:

S 12,000 kg.  $\times$  2164 cal. per kg. = 25,968,000 cal.

Fe 25,000 kg.  $\times$  1173 cal. per kg. = 29,325,000 cal.

Total calories available per 100,000 kg. charge = 55,293,000 cal.

Shortage as compared with charge No. 1 = 60,875,000 cal.

Calories available in charge No. 1 = 116,168,000.

Whence carbon required is:

7531 kg.  $\times$  8083.4 cal. per kg. = 60,875,000 cal.

or of coke containing 85 per cent. carbon, 8.86 per cent. would be required to make up the deficiency of sulphur and iron in this charge as compared with charge No. 1.

(4) If the available sulphur in charge No. 3 had been eliminated by roasting previously to smelting, then:

Fe 25,000 kg.  $\times$  1173 cal. per kg. = 29,325,000 cal.

Shortage as compared with charge No. 1 = 86,843,000 cal.

Calories available in charge No. 1 = 116,168,000.

Whence carbon required is:

10,743 kg.  $\times$  8083.4 cal. per kg. = 86,843,000 cal.

or of coke, containing 85 per cent. carbon, 12.64 per cent. would be required to make up the deficiency of sulphur in this charge as compared with charge No. 1.

In addition to the fuel value of the

there are other exothermic reactions supposed to take place in matte smelting. For example where the flux is quartz,  $2\text{FeO} + \text{SiO}_2 = \text{Fe}_2\text{SiO}_4$ , or according to Lang,  $2\text{FeS} + \text{SiO}_2 + 2\text{O} = (\text{FeO})_2\text{SiO}_2 + \text{S}_2$ . And where the flux is limestone,  $\text{CaO} + \text{SiO}_2 = \text{CaSiO}_3$ .

## AIR ADMITTED AT THE TUYERES DETERMINES CONSTITUTION OF THE GAS

In pyrite smelting, whether with or without coke, the constitution of the gases produced (apart from irregularities in the functioning of the furnace) will depend in the first place entirely upon the air admitted at the tuyeres. If only sufficient air is admitted at the tuyeres to provide oxygen for the oxidizing functions of the furnace, including such constituents of the charge as after oxidation pass out as furnace gases, then, if no coke is used, these exit gases will consist entirely of sulphur dioxide and nitrogen (together with flue dust and fume); or if coke is used, then the gases will consist of sulphur dioxide, carbon dioxide and nitrogen.

In neither case would the resulting gases be suitable for making sulphuric acid, as there would be no oxygen for the conversion of the sulphur dioxide to the trioxide ( $\text{SO}_2$  to  $\text{SO}_3$ ) nor would there be the technically necessary excess of oxygen.

If any excess of air is admitted at the tuyeres, there will be a corresponding excess of free oxygen in the resulting gas, whether smelting with or without coke. This excess can be so regulated that the resultant gases will have the proper composition as well as sufficient free oxygen for sulphuric acid purposes, provided: (1) That the carbon or coke on the charge is not in such excess that to admit sufficient air to provide the necessary free oxygen for the sulphuric-acid process, would dilute the resulting gas below 4 to 5 per cent.  $\text{SO}_2$  or below a practical strength for making sulphuric acid, and (2) that such admission of extra air at the tuyeres would not interfere with the smelting operation.

If such admission of air in excess at the tuyeres would interfere with the smelting process, then in both cases (with or without coke) additional oxygen would have to be added to the gas at some place between the top of the furnace burden (or the issuing point of the gas from the charge) and the apparatus where the further oxidation takes place;

\*Consulting chemical engineer, 55 Broadway, New York.

†Consulting mining engineer, 42 Broadway, New York.

<sup>1</sup>Data used are from "Metallurgical Calculations," by Joseph W. Richards.

or the excess of air may be admitted into the apparatus itself.

#### IMPOSSIBILITY OF CONTROLLING COMPOSITION OF GAS BY AIR SUPPLY AT TUYERES

If it were possible to maintain an exact and constant equilibrium between the oxygen supplied at the tuyeres and the oxidizable contents of the charge, then a gas of uniform composition would result. For many reasons this is technically an impossibility, and consequently the gas issuing from the furnace is irregular and fluctuating. Sometimes the free oxygen is excessive, sometimes it is normal, and more often it is deficient or entirely wanting (as evidenced by the volatilization of sulphur and presence of CO).

If the necessary quantity of oxygen were to be supplied at the tuyeres, then the volume admitted would have to be mechanically regulated in conformity with the analysis of the issuing gas. With the volume and pressure of the air remaining constant, the issuing gas must necessarily fluctuate as long as the charging of the furnaces is intermittent, for the furnace burden just after charging will contain more sulphur, iron and coke than it does just before charging.

If the regulation of the supply of oxygen is to be provided above the charge, this can be accomplished, either by increasing the draft which is used to carry away the gas and thus induce the admission of air through openings provided in the top of the furnace; or the contrary, by decreasing the draft to reduce the admission of air through these openings; or otherwise by taking all precautions against the admission of false air by providing air-tight furnace tops so that the gas will not be diluted and the draft remain constant, when any deficiency of oxygen can be supplied by mechanical contrivances such as fans, blowing engines, etc., which can deliver a controlled volume of air.

#### TWO SETS OF TUYERES FOR PROVIDING EXCESS AIR

If the furnace be provided with a second set of tuyeres above the smelting zone, the necessary excess of air might be provided without interfering with the smelting zone and in such a way as to secure the complete combustion of the sulphur which is partly driven off in the upper part of the furnace burden, and also to prevent the formation of crusts and bridges in the burden and probably also the more rapid formation of a higher-grade matte.

More careful attention to the method of charging the furnace in pyrite smelting will produce better metallurgical results as well as a more constant gas. Such considerations would be: (1) An approximate sizing of the constituents of the charge; (2) the more thorough admix-

ture of the charge; (3) the greater regularity in the distribution of the charge, and in the time of charging, smaller and more frequent changes being used—or some method of continuous charging.

From the above it is evident that to make the gas from pyrite smelting suitable for sulphuric-acid purposes two points are vital:

(1) That there shall be no coke in excess of a percentage on the sulphur content of the charge, which maximum percentage can be calculated for any given charge.

(2) That the furnace from the tuyeres up to the point where the gases are taken to the acid plant, must be so designed that a controlled quantity of air in excess of that required for the matte-smelting process can be admitted (a), at the tuyeres, or (b), between the tuyeres and the top of the furnace burden, or (c), between the top of the furnace burden and such points in the acid plant up to where the sulphur dioxide is completely oxidized, or (d), in part at any of these points. All admission of false air must be prevented as far as possible.

#### QUANTITY OF AIR REQUIRED

Referring to the *pro forma* charges, Nos. 1, 2 and 3, previously considered, the following calculations will show the quantity of air required and the resulting gas in each case. In these calculations, gas volumes are taken at 0 deg. C. and 760 mm. barometric pressure, air at 79 per cent. nitrogen and 21 per cent. oxygen by volume, and 77 per cent. nitrogen and 23 per cent. oxygen by weight. The sulphur content of the charge in every case is that available for forming SO<sub>2</sub> after deducting the sulphur required for the matte, etc.

#### PRO FORMA CHARGE NO. 1

In this charge there is assumed to be 32 per cent. S and 40 per cent. Fe available for oxidation. The 32,000 kg. of sulphur require 32,000 kg. of oxygen to form SO<sub>2</sub>, and 40,000 kg. of iron require 11,429 kg. of oxygen to form FeO, whence the oxygen required is 43,429 kg., and this takes 145,400 kg. of nitrogen to form air; therefore, the amount of air required is 188,829 kg. This will produce 64,000 kg. of SO<sub>2</sub> or 30.57 per cent. by weight, and 145,400 kg. of nitrogen or 69.43 per cent. by weight, making a total of 209,400 kg. of gas. Expressing the same in volumes, the 64,000 kg. of SO<sub>2</sub>  $\times 0.35 = 22,400$  kl. SO<sub>2</sub> or 16.2 per cent. by volume, and the 145,400 kg. N  $\times 0.8 = 116,320$  kl. N or 83.8 per cent. by volume, yielding 209,400 kg. of gas, or 138,720 kiloliters. To this gas must be added sufficient air to supply free oxygen for the oxidation of SO<sub>2</sub> to SO<sub>3</sub> together with a technical-working excess of air of at least 5 per cent. oxygen content. If 100 volumes of air be added

to 110 volumes of the above gas, the percentage composition of the 210 volumes of gas resulting would be: SO<sub>2</sub>, 8.5; O, 10.0; and N, 81.5 per cent. A gas of this composition would be eminently suitable for the manufacture of sulphuric acid.

#### PRO FORMA CHARGE NO. 2

This charge has available for oxidation: Sulphur, 22; iron, 40; and carbon, 2.667 per cent. (coke, 3.15 per cent). The 40,000 kg. of iron require 11,429 kg. of oxygen to form FeO, the 22,000 kg. of sulphur require 22,000 kg. of oxygen to form SO<sub>2</sub> and the 2,677 kg. of carbon require 7,140 kg. of oxygen to form CO<sub>2</sub>, making a total of 40,569 kg. of oxygen required. This will take 135,818 kg. of nitrogen to form air, so that the total amount of air required will be 176,387 kg. This will produce 44,000 kg. SO<sub>2</sub> or 23.2 per cent. by weight, and 9,817 kg. CO<sub>2</sub>, or 5.2 per cent. by weight, and 135,818 kg. N or 71.6 per cent. by weight, making a total of 189,635 kg. of gas.

By volume, 44,000 kg. SO<sub>2</sub>  $\times 0.35 = 15,400$  kl., or 11.9 per cent., 9,817 kg. CO<sub>2</sub>  $\times 0.509 = 4,997$  kl., or 3.9 per cent., and 135,818 kg. N  $\times 0.8 = 108,655$  kl., or 84.2 per cent., or a total of 129,052 kl. of gas. To this gas must be added sufficient air to supply free oxygen for the oxidation of SO<sub>2</sub> to SO<sub>3</sub>, together with a technical working excess of at least 5 per cent. oxygen. If 100 volumes of air be added to 147 volumes of the above gas, then the percentage composition of the 247 volumes of gas resulting would be: SO<sub>2</sub>, 7.1; CO<sub>2</sub>, 2.3; N, 82.1; O, 8.5 per cent. This gas would also be excellent for making sulphuric acid.

#### PRO FORMA CHARGE NO. 3

There is assumed to be available in this charge: Sulphur, 12; iron, 25; and carbon, 7.531 per cent. (coke, 8.86 per cent.) The 25,000 kg. of iron require 7,143 kg. of oxygen to form FeO, 12,000 kg. sulphur require 12,000 kg. of oxygen to form SO<sub>2</sub> and 7,531 kg. of carbon require 20,083 kg. of oxygen to form CO<sub>2</sub>, making a total oxygen requirement of 39,226 kg., which calls for 131,322 kg. of nitrogen to form air; whence the total amount of air required will be 170,548 kg. This will produce 24,000 kg., or 13.1 per cent. by weight of SO<sub>2</sub>, 27,614 kg., or 15 per cent. by weight of CO<sub>2</sub> and 131,322 kg., or 71.9 per cent. by weight of nitrogen, or a total gas production of 182,936 kg.

By volume, 24,000 kg. SO<sub>2</sub>  $\times 0.35 = 8,400$  kl., or 6.6 per cent.; 27,614 kg. CO<sub>2</sub>  $\times 0.509 = 14,056$  kl., or 11.0 per cent.; 131,322 kg. N  $\times 0.8 = 105,058$  kl., or 82.4 per cent., or a total of 127,514 kl. of gas. To this gas must be added sufficient air to supply free oxygen for the oxidation of SO<sub>2</sub> to SO<sub>3</sub>, together with a technical working excess of at least 5 per cent. oxygen. If 100 volumes of air be added



to 200 volumes of the above gas, the percentage composition of the 300 volumes of gas resulting would be: SO<sub>2</sub>, 4.4; CO<sub>2</sub>, 7.3; N, 81.3; and O, 7.0 per cent.

This gas could only be used for making sulphuric acid under any one of the following exceptional circumstances: (1) when other manufacturing costs are low; (2) with a market in the immediate neighborhood or with the acid used for consumption at the point of manufacture;

required for matte and, (1) the percentage of coke (85 per cent. carbon) required for the smelting process, and (2) the percentage of SO<sub>2</sub> in the gas produced. The air supply is that required for the oxidation of the iron, carbon and sulphur contents of the charge, and the further oxidation of all SO<sub>2</sub> produced to SO<sub>3</sub>, and an additional amount sufficient to provide 5 per cent. surplus oxygen.

The coke curves for fixed iron contents

1000 calories produced against 0.244 kg. per 1000 calories for iron. Where the charge is such, however, that no coke is required, a decrease in iron content causes a reduction in the amount of nitrogen introduced with the oxygen required by the iron, and a correspondingly richer gas, provided, of course, that this reduction of iron is not sufficient to make the addition of coke necessary. Thus it will be seen that at some high sulphur value the curves must cross.

Where coke is required for smelting, any increase in sulphur content enriches the gas by the addition of sulphur dioxide, and by a reduction of the coke required and of the carbon dioxide and nitrogen which the combustion of the coke adds to the total gas. Where coke is not required an increase in sulphur content adds to the gas in the first manner only, accounting for an abrupt change in the inclination of the curves, at the point where coke no longer forms part of the charge.

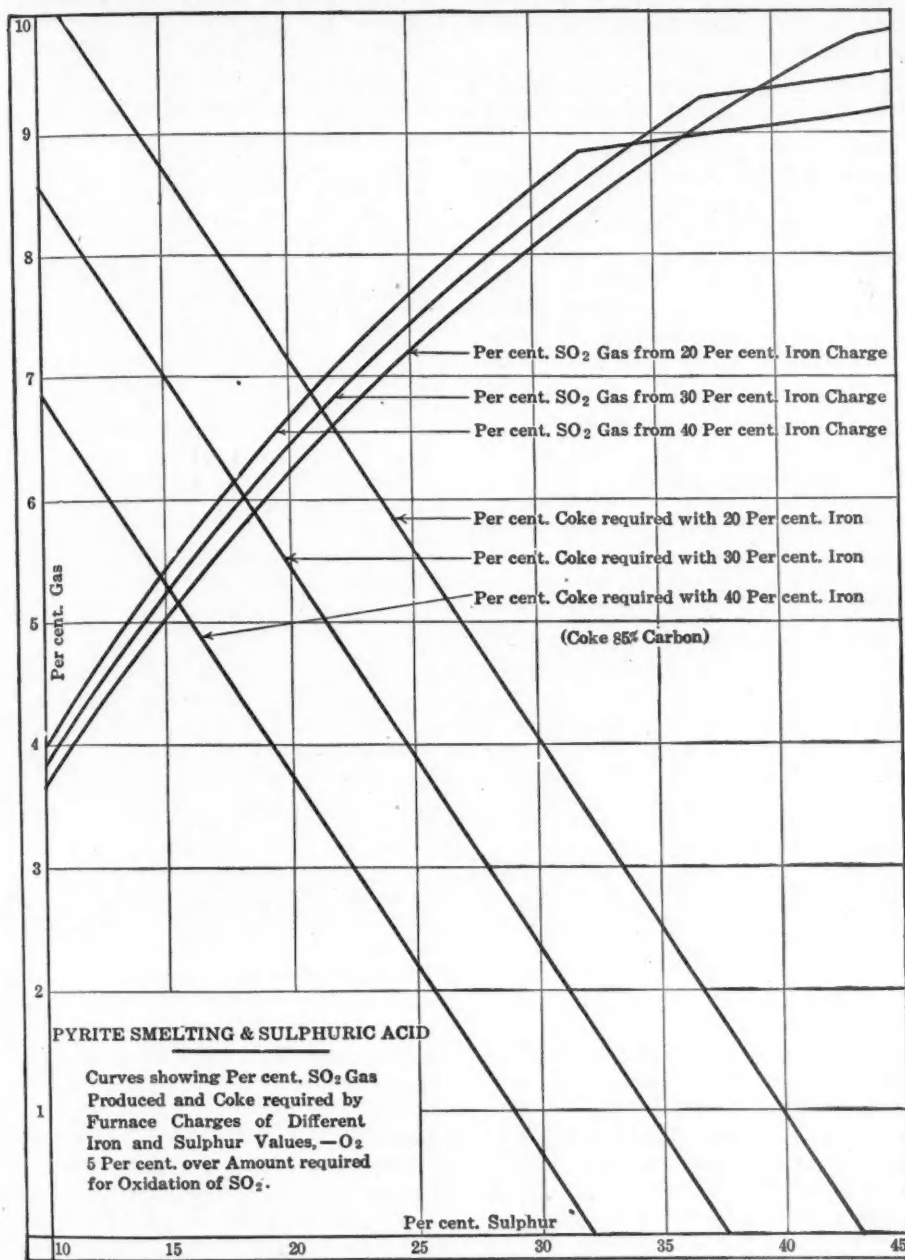
PRODUCTION OF A UNIFORM GAS SUPPLY DIFFICULT WITH ONE FURNACE

So far, the question of producing a gas from pyrite smelting, suitable for making sulphuric acid, has been considered from the point of view of one smelting furnace. Whether the gas from one smelting furnace can be used economically for this purpose is more or less doubtful. If all the precautions previously mentioned are observed and the furnace is properly regulated and great care taken in the management of the furnace, campaigns will undoubtedly be lengthened, interruptions to the process avoided and a reasonably uniform gas produced and, at the same time, the operation of the furnace will be greatly improved. But when the furnace is shut down for any reason it causes an interruption in the running of the acid plant which is undesirable.

The case is different, however, when there are a plurality of furnaces. In this case the furnaces must be provided with gas outlets discharging both into the main flue from which gas is taken to the sulphuric-acid plant and also into a bypass flue connecting with the stack or discharge into the air. Both these exits must be provided with well-fitting valves or dampers easily operated. Then it will be possible to cut out any furnace which is dead or for other reason is not producing a suitable gas and connect it direct to the stack. The other furnaces, discharging into a common flue, dust chamber or other reservoir from which gas is taken to the acid plant, will then produce an average gas which is much more likely to remain constant in its composition than the gas from any single furnace.

GAS REQUIREMENTS IN ACID MANUFACTURE

The principal requirement in sulphuric-acid making is a constant and steady sup-



CURVES SHOWING PERCENTAGE OF GAS PRODUCED UNDER DIFFERENT CONDITIONS OF CHARGE

(3) when other sources of supply of sulphur are costly.

GRAPHICAL REPRESENTATION OF RELATION BETWEEN SULPHUR CONTENT, COKE AND SO<sub>2</sub> IN GAS PRODUCED

Based on the foregoing data, the accompanying curves have been prepared, showing for furnace charges containing 20, 30 and 40 per cent. of iron the relation between the sulphur content, above that

bear a linear relation to the sulphur content, as any reduction in the sulphur content must be replaced by its heat equivalent in carbon.

The gas curves are a trifle more complex. At sulphur contents low enough to require the addition of coke, a reduction in iron content reduces the per cent. SO<sub>2</sub> in the gas, because the iron must be replaced by its thermal equivalent of carbon which requires 0.33 kg. of oxygen per

ply of gas of regular composition. In the acid plant the sulphur dioxide and oxygen contents of the gas have to be met by regular and corresponding percentages of nitrous oxides and water vapor and the regulation of these constituents becomes exceedingly difficult when the sulphur dioxide and oxygen content of the gas is unduly fluctuating. It is absolutely useless to expect to make sulphuric acid from pyrite-smeltery gases unless: (1) The furnaces and appurtenances have been thoroughly and carefully built or remodeled with a view to the production of a suitable and regular gas and the furnaces are maintained in such condition; (2) unless reasonable care is taken both as to charge, blast at the tuyeres and draft for the production of a suitable and uniform gas; (3) unless there is a complete harmonious understanding of the required conditions between the smeltery manager and the acid-plant manager, or unless the two plants are under the same direct control.

At the same time the production of a steady stream of gas of constant composition involves a regular and desirable metallurgical working of the furnaces, so that care in the management of the furnace pays for itself in both directions. The utilization of the gas from pyrite smelting in the manufacture of sulphuric acid, after the necessary changes have been made to the plant, involves nothing but reasonable care on the part of the smeltery manager. When the metallurgical functions of the furnace are at their best, then the gas will also be best suited for acid making.

#### INSTALLATION OF ACID PLANT AT SMELTERY NOT ALWAYS PROFITABLE

There is a general misapprehension, relative to the question of making sulphuric acid from smeltery fumes, and that is, that the sulphur costing nothing and being the principal item of cost in sulphuric-acid making, large quantities of acid can be made and profitably transported to any distance.

This is inaccurate in many respects, for the cost of changes to the smeltery plant and the additional cost of manufacture entailed by the fluctuating and often impure character of the gas produced must be taken into consideration as additional process costs against the by-product acid and in favor of the regular chemical manufacturer. The latter roasts pyrites in regular kilns carefully adapted for that special purpose and often has a substantial credit against the cost of making acid by the sale of the pyrites cinders as an iron ore to the blast furnaces. This credit will average about 70c. per ton of 60 deg. B. acid.

The cost of Spanish pyrites at central inland points such as Atlanta, Ga., or Columbus, O., will average about \$3.70 per ton of 60 deg. B. acid, and according to whether the cinder is sold or not, may

be said to vary between \$3 and \$4 per ton of 60 deg. B. sulphuric acid at inland cities. Some of these cities secure part of their pyrites locally. For instance, Chicago draws a certain amount of her supply from the marcasite which occurs with the Wisconsin zinc ores. St. Louis also has local pyrites mines. In fact, the by-product gases from the zinc smelteries will always control the acid production of that part of the United States from Chicago on the north to Memphis on the south, and extending possibly as far east as Cleveland and Pittsburg.

#### SITUATION OF SMELTERY DETERMINES QUESTION OF H<sub>2</sub>SO<sub>4</sub> MANUFACTURE

It is evident, therefore, that the profitable exploitation of the by-product gases at any given smeltery will be limited: (1) By a freight rate to point of consumption of from below \$3 minimum to \$4 maximum per ton of 60 deg. B. acid, at which point the manufacturer of the by-product acid and the regular manufacturer will be on the same footing; (2) the sale of such by-product acid must be made in a territory which cannot be more profitably entered by any other smelter who manufactures by-product acid.

For example, zinc ores are now brought east profitably from Colorado for smelting and the production of by-product acid. A smelter in Colorado could hardly compete as a sulphuric-acid maker with a smelter in Illinois who is an acid maker. The freight on ore is comparatively low, whereas the freight on acid is not only high, but as shipments must be made in tank cars, these cars have to be returned empty and have to be maintained in good condition, and as they are generally the property of the acid maker, the cost of maintenance and amortization must be added to the cost of acid.

### Searchlight District, Nevada

#### SPECIAL CORRESPONDENCE

Searchlight is situated in the southern part of Lincoln county, Nev., at the terminus of a branch of the main line of the Santa Fe railroad, leaving Goff, Cal. This old camp experienced great activity during 1905, 1906 and 1907; at present production is not large but it is probable that there will be an increase before many months. The principal operations of the district are those of the Quartette Mining Company, Duplex Mining and Milling Company and Searchlight Mining and Milling Company.

The Quartette mine, now under operation by Boston capitalists, is said to have produced about \$2,500,000 and to have paid dividends to the amount of \$375,000. It is developed by shaft to a depth of 1200 ft., with about 5000 ft. of drifts. The mine makes sufficient water to supply the mill. The shaft is equipped with a 100-h.p. Fairbanks-Morse gasolene

hoist and a 25-h.p. auxiliary hoist. Water is handled from the bottom of the shaft by a Cornish pump and from the 500 level by a triplex pump. Forty men are employed and the mine is producing about 2000 tons of ore per month; the average grade of the ore is about \$15 per ton in gold.

Ore now mined is treated by straight amalgamation, the mill consisting of gyratory crushers and 40 stamps. A 150-ton cyanide plant is treating the tailings produced by the mill in former days. The Quartette company owns 300 acres of patented ground in the main group and the same acreage in outside claims.

#### DUPLEX MINE

The Duplex mine has changed hands many times since its discovery in 1896 and is now being operated by G. F. Colton, of Los Angeles, the original locator. The first discovery of mineral in the district was made at this mine. Development has been extended to a vertical depth of 800 ft., with about 3000 ft. of drifts. The hoist is of the Fairbanks-Morse type and is operated, together with the pump, by power derived from gasolene engines. Ore is treated in a 10-stamp mill and 50-ton cyanide plant.

#### SEARCHLIGHT MINING AND MILLING COMPANY

The property of the Searchlight Mining and Milling Company, situated two miles northeast of Searchlight, has been operated almost continuously for about six years, and is now under control of Senator Carter and associates, of Los Angeles. The mine is developed by a 400-ft. shaft and makes more than sufficient water to supply the mill. The pumping problem has, at times, been a serious one, but it is understood that the situation is well in hand now. Present work consists in retimbering the shaft and opening some of the lower levels. It is expected that the mine will be in shape to produce about 30 tons of ore per day within a short time. There is a 10-stamp mill and a 50-ton cyanide plant on this property.

In addition to the above operations, there are some leasers and prospectors at work, but there is no property that holds out promise of becoming a large producer in the near future. The average ore of the district carries about \$15 per ton in gold and some promising prospects are open for development. Reports are heard of contemplated operations, but nothing definite has been learned regarding them.

The exports of phosphate from Tunis in 1909, according to U. S. Consular Agent Auguste J. Proux, were valued at \$5,923,000, against \$6,117,000 in 1908. The leading producer is the Société des Phosphates et du Chemin de Fer de Gafsa.



# The Asbestos Industry in Central Wyoming

BY F. H. BARROW \*

Central Wyoming may soon become an important factor in the asbestos industry, judging from present activity in that region. Within the last three months the district has been visited by a representative of the London company said to control 90 per cent. of the European product, as well as by several representatives of the larger Canadian operators. It is stated that they have endeavored to secure options on the various properties now being developed.

At present the following five companies are operating in the district: The United States Asbestos Company, North American, International, Wyoming Consolidated and Rochester-Wyoming. All save the latter have headquarters at Casper, Wyo. The Rochester-Wyoming is a new company, having recently taken over what is

development which, with the installation of machinery now in progress, will soon place Wyoming in the producing class. Only the two districts of asbestos-bearing rock mentioned have thus far been prospected to any considerable extent, but the presence of the rock is indicated by outcroppings from Casper mountain to Laramie peak, a distance of more than 100 miles.

## CROSS FIBER VEINS IN SERPENTINE

In both districts asbestos occurs in the serpentine in the form of cross-fiber veins; it is chiefly chrysotile, except for a small quantity of slip fiber which occurs sporadically in the serpentine. In the solid rock it is olive green and amber green in color, and when fiberized becomes a mass of fine, soft threads, in

fiber four inches in length has been found in small quantities. Some of the product from this mine, which was hand-cobbed and made into pipe covering, has been pronounced satisfactory.

State Geologist E. P. Hall, of Wyoming, who recently returned from an extended inspection tour of the Canadian fields near Thetford and Black lake, Quebec, is authority for the statement that the Wyoming fields are not only greater in area, but richer, and may be worked at about one-third the cost of the northern fields. In comparing the Canadian fields with those of central Wyoming, Geologist Hall says:

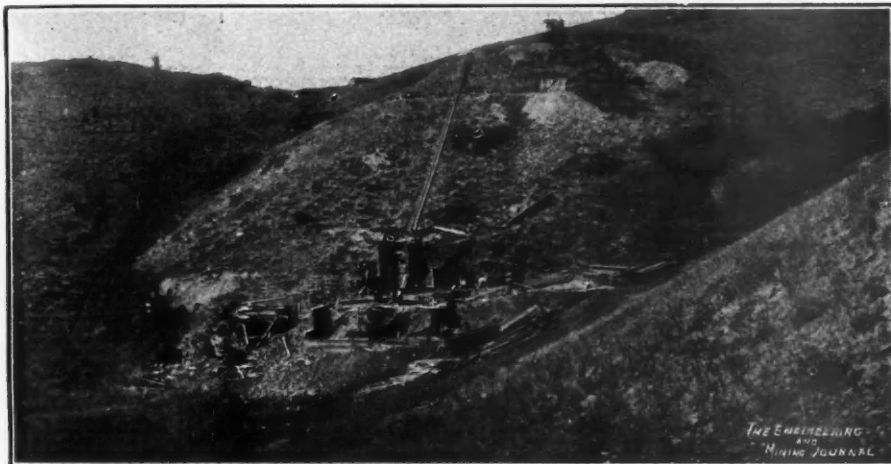
"Only 60 per cent. of the fiber-bearing rock in Canada is milled, and the balance is thrown aside, although they mill rock which contains as low as 3 per cent. asbestos. The Wyoming rock carries an average of 35 per cent. fiber, and in certain localities veins 300 ft. wide may be traced for miles. The Canadian fields produce only a small proportion of No. 1 and No. 2 fiber, while over half of the ore thus far taken from the Wyoming veins will carry spinning fiber."

## FIBER CLEAN AND FREE FROM IRON

Geologist Hall, in his report just made public, calls attention to the fact that the serpentine from Wyoming is so soft it may be mined and milled at about one-third the cost of handling the Canadian. The Wyoming fiber is so clean and free from iron that it may be used for many purposes—notably, water filtering—where the Canadian cannot.

Recently, a shipment of 1690 lb. of rock from the deepest shaft of the Wyoming Consolidated, put through the Powell mills at Lowell, Mass., turned out 748 lb. of fiber, over 40 per cent. The grades were as follows: No. 1, 138 lb.; No. 2, 83 lb.; No. 3, 80 lb.; No. 4, 90 lb.; No. 5, 353 lb.; No. 6, 4 lb. The "roofing," weighing 134 lb., was not included in the above figures. The cost of milling was estimated from this test at about one-third that of the Canadian.

Samples from the Casper district tested in Europe revealed a moisture loss of only 10.3 per cent., while the loss to the Canadian product under the same test was 12 per cent. In these tests the Wyoming product became brittle but did not fuse or crumble, while the Canadian asbestos fused and went to powder. Because of its high quality, the great area in which it is found, and the cheapness with which it may be mined and milled, the Wyoming product is bound to attract attention.



GENERAL VIEW OF CASPER MOUNTAIN ASBESTOS REGION, WYOMING.

known as the Wells properties in Mormon cañon near Glenrock, 25 miles east of the Casper district. This company recently shipped machinery from Denver. The others have been developing for several years, the Wyoming Consolidated having installed crushing, fiberizing and separating plants last fall which will be in operation during the coming summer.

## WYOMING ASBESTOS OF GOOD QUALITY

The discovery of asbestos in Wyoming is not new, for as early as 1905 it was mentioned in a Geological Survey report as "of excellent quality and good length, the dike having been traced and prospected for several miles." Indifferent development and remoteness from transportation have retarded the work in this region, but last year witnessed the introduction of large capital and intelligent

extreme cases four inches in length. The veins rarely attain two inches in thickness, however, the larger ones being generally jointed or banded parallel to the vein walls, thus parting the fiber into shorter lengths. These cross-fiber veins are so abundant in many places that they form from 30 to 60 per cent. of the banded rock.

## WYOMING FIELDS SAID TO BE RICHER AND GREATER IN EXTENT THAN THE CANADIAN FIELDS

The belts of banded rock range from one to 40 ft. in thickness. A part of the serpentine is covered by soil as in the Canadian field, but large exposures are found in the two districts named. Here weathering is deep and impairs the quality of the fiber. The best exposures of fiber are in some of the deeper shafts of the Wyoming Consolidated, where

\*713 Twelfth street, Washington, D. C.

# Experiments with Portland Cement Cupels

BY T. P. HOLT AND N. C. CHRISTENSEN\*

Old as is the process of cupellation, it still offers a large field for investigation, both as to the operation itself and the materials employed. The importance of proper temperatures is well recognized and much data are available on silver losses in the common bone-ash cupel. The effect of different materials used in the cupel has also been the subject of some investigation, but as yet mention has seldom been made of the use of portland cement for this purpose, although it has been substituted for bone ash in a number of assay offices. Since it is inexpensive and nearly always at hand, the assayer may find it a convenient make-shift if not a permanent substitute for bone ash.

## COMPOSITION OF CUPELS

A large number of experiments have been conducted at the Utah School of Mines to determine the relative merits of portland cement and bone ash for cupels. Cupels of cement were first made up with from 2 to 20 per cent. water. It was found that with less than 5 per cent. water they are fragile, and with 20 per cent. will not readily pass the cupel machine. Upon heating, the cupels with less than 5 per cent. water cracked about the edges, as did also those containing from 15 to 20 per cent. It was decided, from this preliminary work, to use cupels containing 8 per cent. moisture. They were stronger and remained intact in the furnace. Batches of 50 each of Red Devil portland cement, U. S. portland cement, half cement and half 60-mesh bone ash, and 60-mesh bone ash, were then made with as near uniform compression as possible.

## GASOLENE FURNACE USED

A gasolene furnace was used in which a good regulation of temperature was secured by increasing or decreasing the supply of fuel. Temperature measurements were made with a Le Chatelier thermoelectric pyrometer, consisting of a platinum wire and a platinum (90 per cent.) rodium (10 per cent.) wire connected to a high-resistance galvanometer. The instrument had previously been calibrated and the curve plotted from which the temperature for any deflection could be read. The junction of the thermocouple was inserted in a hole drilled in the side of the cupel and extending well beneath the bowl. By this method the actual temperature of the cupeling lead

\*State School of Mines, University of Utah, Salt Lake City, Utah.

button was secured, which would not have been the case if temperatures had been taken above the button. Some temperatures were, however, taken just above the molten lead for purposes of comparison.

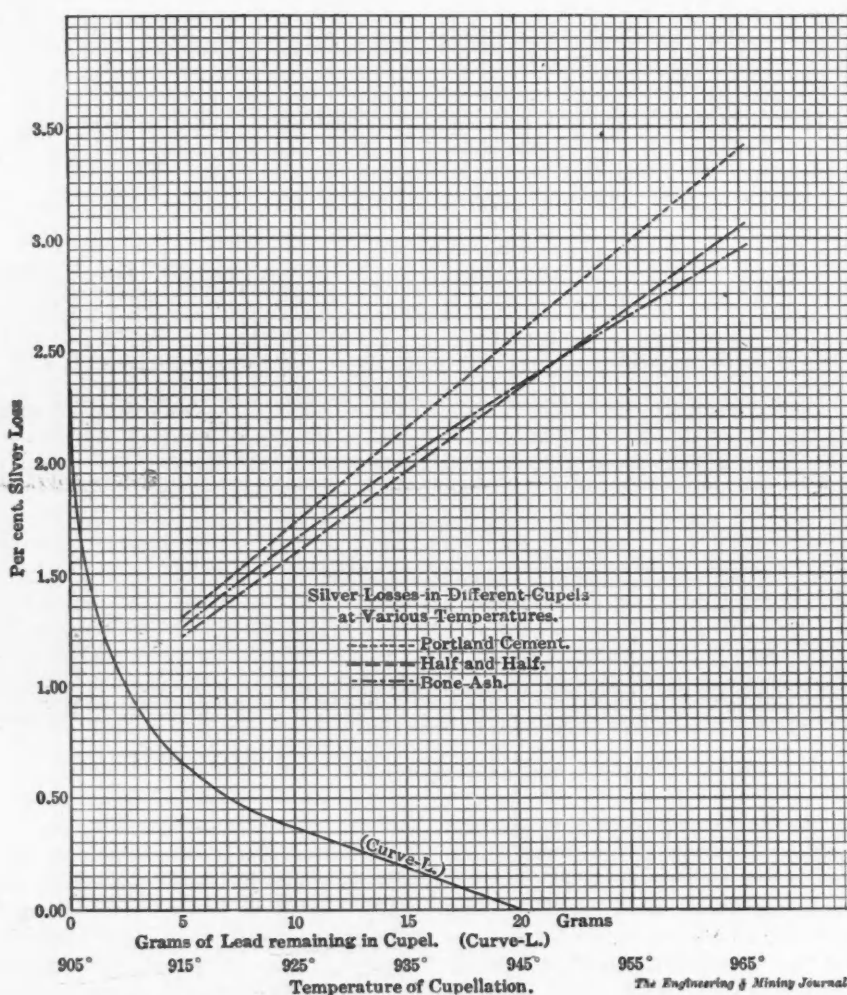
## DETERMINING SILVER LOSS

In making the silver-loss determinations, about 100 mg. of silver were wrapped in pure lead foil of the desired

too much moisture, due to imperfect drying, spitting occurred unless the cupels were well heated previous to introducing the lead button. If properly dried they gave no trouble.

## CUPELLATION SLIGHTLY FASTER WITH CEMENT CUPELS

The comparative rate of cupellation was secured by cupeling 20 grams of lead in each of the cupels, and noting the



## TESTS WITH PORTLAND CEMENT CUPELS

weight. The cupels were arranged in rows of four each, so as to secure uniform conditions in the four kinds tested. Two hundred fifty cupellations were performed in this series. In addition about 1000 have been run in the course of the regular work, and these have confirmed the results of the special work.

All the cupels used stood up well unless dried too rapidly, when a slight checking of the surface of the cement occurred. The age of the cupel did not affect the results. If the cupels retained

times at which the buttons opened and the silver beads "blinked." In this the cement cupels had a slight advantage over the bone ash, though it seemed that the litharge was absorbed in all cases as fast as it was formed.

Though the litharge was readily absorbed, the amount of material used in each case varied, more cement than bone ash being required to absorb the same amount of lead oxide. The diffusion of the litharge in the cement was greater. The absorbing power of the cement was



about three-fourths and of the "half and half" about four-fifths that of the bone ash. This was determined by weighing the cupels before and after cupellation (blanks of each kind being run to correct for moisture loss), the difference being the amount of litharge absorbed. The cupels were then carefully broken and the parts saturated with litharge, again weighed, the unused portion of the cupel being determined by difference.

It should be noted here that the diffusion of the litharge increases with the amount of water used in making the cupel. About 50 per cent. more cement is required to absorb a given weight of litharge when the cupels were made up with 12 per cent. moisture than when 2 per cent. was used. This is regarded as due to the fact that a large number of grains of cement become chemically set and are thus rendered impervious to litharge. In other words, the porosity of the medium, essential to successful cupellation, is partly destroyed. The silver loss also seems to vary with the amount of water used, reaching a minimum with 6 per cent. However, the results on this point are not conclusive.

#### TEMPERATURE MEASUREMENTS

A special series of temperature measurements was taken to see if there is any difference in the temperature of cupellation in cupels of different materials. It was found that the temperature in all cases is the same, the button freezing as soon as the temperature fell to about 900 deg. C. During the cupellation when the temperatures in the cupels (that is, of the lead buttons) were 910, 930 and 950 deg., the corresponding temperatures just above the lead were 690, 720 and 770 deg.

#### RELATIVE SILVER LOSS

The point of most vital interest in the investigation was the relative silver losses in the different cupels at various temperatures. Table 1 shows the average losses for about 100 cupellations at average temperatures. From this table it is seen that for temperatures at which cupellation should be conducted, the silver losses are practically the same in all cases. It should be noted, however, that for the first few temperatures the "half and half" has the advantage over both the cement and the bone ash. With an increase in temperature to 945 deg. C. the "half and half" and bone ash have the same per cent. loss. And both have a slight advantage over the cement. With a still further increase in temperature to 965 deg. C. the bone ash has the advantage, followed closely by the "half and half," both having a considerable advantage over the cement. This is graphically shown in the accompanying illustration.

A special series was also run at an average temperature of 930 deg. C. with cupels made of Red Devil cement, a high grade of fine bone ash, ordinary 60-mesh bone ash and half cement and half extra quality bone ash. The silver losses were respectively 1.99, 1.79, 1.83 and 1.44 per cent. The point of special interest in this case is the much lower loss, in the extra "half and half," even though the extra quality of bone ash shows a higher loss than ordinary 60-mesh bone ash.

#### SURFACE OF THE CUPEL

It is evident from these experiments that the material of the cupel plays an important part in preventing or augmenting the silver loss, not in a chemical but in a physical way. The action which takes place appears to be that the molten lead is "dry" with regard to the cupel.

TABLE 1. LOSSES AT VARIOUS TEMPERATURES.

Average Temp., Deg. C.	U. S. Port. Cement. Per Cent.	R. D. Port. Cement. Per Cent.	"Half and Half." Per Cent.	Bone Ash. Per Cent.
915	1.30	1.34	1.21	1.26
925	1.81	1.72	1.54	1.70
945	2.53	2.56	2.42	2.42
965	3.37	3.42	3.05	2.96

The lead oxide which forms on the rounded surface of the lead runs down upon the cupel surface, to which it is "wet" and is therefore readily absorbed. In this way the surface of the cupel acts as a membrane permeable to the litharge but impermeable to the molten lead and thus mechanically separating the two. From this it is readily seen that the character and material of the surface of the cupel are of great importance. If it presents spots of material which are "wet" by the lead, or which combine with the litharge to form material "wet" by the lead, there will be an absorption of lead and a consequent loss of silver. It should be noted in this connection that the "half and half" cupels had a much smoother and finer-grained surface than either the cement or the bone ash, and the silver loss is also lower. It appears that there is a considerable field for experiment as to those mixtures that will best fulfil these requirements.

#### SILVER LOSSES MAINLY DUE TO TEMPERATURE CHANGES

A short series of cupellations, for the purpose of finding the losses in lead buttons of different sizes, showed that there was a slight increase in silver loss with an increase in the size of the lead button, but that this loss is not nearly so important as that due to a slight change in temperature.

A series of cement cupels was also run to determine the time at which the loss occurs, the result of which is embodied in the accompanying curve. These

results confirm those of the previous series, showing that the loss is low and uniform until the latter part of the operation, when the loss increases rapidly. This point of increase is probably determined by a certain degree of saturation of the lead by the precious metals, the loss being greatly accelerated by the increasing concentration at the end of the operation.

Some assayers claim that by cupelling in an old cupel placed upon a new one that the silver loss is greatly reduced, but as far as could be observed from a number of trials the loss is not lowered by this means.

One of the advantages noted for cement is, that where it is necessary to assay the cupel, the cement yields a much more fusible slag than the bone ash. The saving in the assay bill resulting from the substitution of cement for bone ash would also be an item worth considering where several hundred cupellations are run each week.

#### SUMMARY

In conclusion the main results may be summed up as follows:

(1) Portland cement presents a cheap and convenient substitute for the bone ash commonly used for cupels.

(2) Neat cement with from 6 to 10 per cent. moisture gives a strong cupel that does not check and will absorb its own weight of litharge.

(3) The silver loss due to absorption is about the same as for 60-mesh bone ash, the difference being insignificant compared with that due to a slight increase in temperature.

(4) Cupels made of a mixture of cement and bone ash gave a smaller silver loss than either one alone, and the physical properties of the cupel are also superior.

(5) The process of cupellation is dependent upon the fact that the capillarity of the cupel is "wet" with respect to the litharge, and "dry" with respect to the lead and the precious metals. Consequently the physical surface of the cupel has an important bearing on the absorption losses.

On July 30 an explosion of dynamite occurred at the new Croton aqueduct, at Kitchawan, N. Y., whereby two men were killed. The coroner could find nothing to throw light on the cause of the accident, but one theory is that lightning exploded the dynamite. The dead men, and two other men, both of whom were injured, were at work in a tunnel, when 10 pounds of dynamite suddenly went off. A severe thunder storm was raging at the time, and it is considered not unlikely that lightning ran along the rails into the tunnel and struck the dynamite.

# Conditions for Gold Dredging in French Guiana

Climatic Conditions Bad; Only Inefficient Native Labor Available.  
Creek Beds Dredged; Cost for Elysee Boats 23-31c. per cu.yd.

BY ALBERT BORDEAUX\*

The rocks so far known to exist in French Guiana are for the most part Pre-Cambrian, all without fossils. The following have been differentiated: Granitic gneiss, amphibolites, mica schists, talc schists and clay schists; granite, diorite and diabase, melaphyre; quartzites, fine-grained sandstone and quartz veins; limonite, a distinct cavernous variety (*roche à ravets*).

Gold has been detected in a few irregularly distributed quartz veins, in disseminated quartz boulders and mainly in the gravel of the rivers. Silver, copper and lead have been but little sought. The gold-bearing formation has a general easterly and westerly direction, the distance from the seashore varying from 50 to 100 km., the width being 40 to 50 km., with another similar zone along the southern part of the upper Mana and Maroni rivers.

## GOLD PRODUCTION

No statistics of gold production were collected in French Guiana until 1866, from which date the records of the custom taxes are available. But gold was discovered as early as 1852, and as a large portion of the production always escapes through Brazil and Dutch Guiana, owing to lower taxes, the figures are incorrect and low. They are as follows, per decade: 1866-76, 7,368,060 kg.; 1876-86, 18,446,379 kg.; 1886-96, 20,795,722 kg.; 1896-1906, 31,081,485 kg.; 1906-10, 16,000 kg. (estimated to end of 1909); total, 93,691,646 kg., valued at about \$56,000,000. Probably a more accurate total would be about twice the above figure, say \$100,000,000, including the Carservene output from 1894 to 1900.

## EARLY GOLD DISCOVERIES

The first discovery of gold in French Guiana was made on the Orataye river in 1852, and later on the Oropu, Cirube and other rivers. In 1873 the famous placers of the Sinnamary system were opened. Saint Elie, Dieu Merci, Adieu-Vat and Couriège alone produced about \$10,000,000. The placers of the Mana system (Enfin, Pas-Trop-Tôt, Elysee) date from 1878, their production being about \$5,000,000. The date of the discovery of the Ama placers on the Maroni and its tributaries along the Dutch Guiana boundary was 1888. In 1893 the famous Carservene discovery was made in the territory in dispute be-

tween France and Brazil, and in six years about \$18,000,000 were produced from this region. The Trini gold discoveries in 1901 attracted a big rush of miners, but the grade of the ground was irregular, a few large nuggets being scattered through large barren zones. The most recent discoveries were made in 1902-03 on the upper Mana tributaries, and in 1907 lower on the Kokioko, also a tributary of the Mana.

## PRODUCTION MAINLY FROM ALLUVIAL DEPOSITS

Apart from the production of the small quartz ledge of Adieu-Vat, all of the gold won in French Guiana has been taken from the creek beds mostly by the old sluicing system. This method gave a fair remuneration without a large outlay of capital. For the last two or three years, however, the grade of the stream gravel has been gradually diminishing until it has become impossible to pay the high wages that formerly prevailed, and were unable to prevent unlicensed miners from working the ground of the companies, without entailing large expense for expelling them. An agreement has, however, been reached lately whereby unlicensed miners are allowed to work on the sole condition that they sell the gold they win at a fixed rate to the company on the property of which they mine. Owing, however, to the large amount of gold that is stolen, and the competition between the miners' and the companies' stores, the profit has been so greatly reduced that promoters of new undertakings are forced to look for a more economic method of recovering the gold.

Hydraulicking with water forced from pumps was tried in English Guiana, but was not practicable owing to the high cost of pumping the water. Dredges and excavators hence remained as the only hope for successful operations, and the requirement of excessive manual labor eliminated excavators from consideration. Dredges have been tried for the last two years in Lezard, Sparwin and Courcibo creeks.

## ADVANTAGES OF THE DREDGE

The fact that prospecting work may be executed with great accuracy is an advantage of dredging. It is easy to dig pits along the banks of a river and this should be done in Guiana, as the proportion of gold is often as high under the banks as in the river bed. Dredging is at present confined to large creeks, unsuit-

able for sluicing and not very wide, the watercourse seldom exceeding 10 m. in width. A width of 30 to 50 m., should be dredged. To test the ground, usually from one to two cubic meters of the payable seam are extracted. This gravel is washed in a "long tom" to determine the gold content. Pits are generally dug from 30 to 35 m. apart on both sides of the river. The cost of prospecting one kilometer along a stream is about \$3000 (\$4800 per mile) but it is necessary that this be done before erecting a dredge that may cost ten times that amount. As stated, the fact that a very accurate idea of the value of the ground to be dredged can be obtained from preliminary prospecting is one of the conditions that makes for success in dredging operations.

## REQUIREMENTS FOR DREDGING

For the success of a dredge, the following conditions are necessary: (1) Close prospecting to prove the payable ground and secure at least five or six years of dredging for amortization of the capital invested; (2) soft bed rock easily dug by the buckets as this is often rich in gold; (3) gravel containing no large boulders; roots, etc., that may be removed without excessive trouble; (4) no cemented gravel; if mixed with clay the dredge will have to be provided with apparatus to disintegrate it; (5) gravel of a depth not greater than 10 m. It is unusual for dredges to dig as deep as 15 or 20 m. as they do in California. The depth of digging is one of the main points to be considered before ordering the dredge, as upon this depends the dimensions of its gears, pins and various appliances.

## DIFFICULTIES ENCOUNTERED IN FRENCH GUIANA

The difficulties of dredging in Guiana arise mainly from the climatic conditions. All along the rivers there is a tropical forest with its enormous trees that must be felled and burned over before the dredge can operate. The felling of the trees is, however, rather an easy matter as the roots spread over the surface of the ground so that the fall of one tree carries several of its companions along with it. On the other hand, the burning of these hard woods when they are green is a difficult matter.

The quantities of dead wood, tree trunks and branches entangled together in the gravel and payable clay dirt are another hindrance to dredging operations

\*Mining engineer, Thonon les Bains, Savoy, France.



in this region. It is necessary to use powerful dredges, manned by skilful winchmen in order to overcome these difficulties.

#### NO LARGE BOULDERS

Luckily no large boulders occur in the dredgeable creek bottoms; they are more abundant in the small creeks worked by hand labor. The bed rock is also quite soft and easily dug. The pay dirt usually has an average thickness of three to six meters, the river banks often being three to four meters high above the pay dirt. They are composed of vegetable loam, clay, sand and gravel, with decomposed rock. The amount of barren ground to be washed is thus six or seven times that of the pay dirt, so that it would seem advisable to erect a special apparatus for removing this material. A grab dredge

or four men with shovels on the platform to separate the clay from the edge and bottom of the bucket. A mechanical apparatus could be devised to accomplish this purpose.

#### BAD CLIMATE COMPELS USE OF NATIVE LABOR

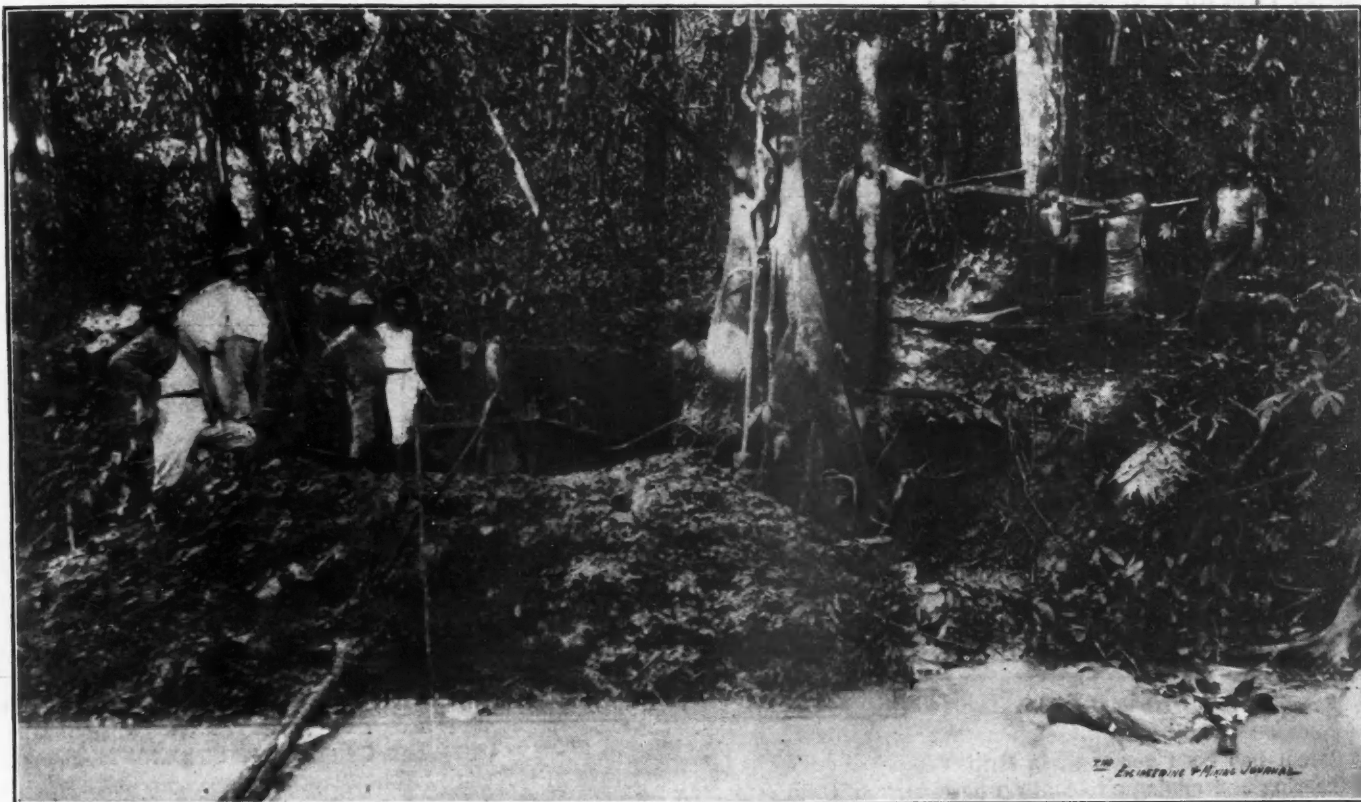
The climate of Guiana is wet and tropical, tending to produce anemia and fever so that only the most healthy are able to resist it. Dredges must operate in swampy country where slimy water from intermixed, rotting, tree trunks and boughs of evil-smelling woods, increase the liability to all sorts of tropical fevers.

The natives are extremely awkward and poor workmen. A few mines, as the Adieu-Vat, have tried importing Italian miners, but this supply is inadequate. The experiment was not successful. The

as they must be carried in canoes. Dredge hulls cannot be made of wood, because it cannot resist the attacks of the insects and worms that infest the waters in such climates and would soon eat through any wooded structure. This means that a steel hull is required. Accidents and repairs are always a serious difficulty to operating dredges in remote localities, as production may be stopped for weeks while expenses continue, before the necessary parts or tools can be brought in. One practical way of minimizing all these troubles is to have a capable man to superintend operations.

#### COST OF DREDGING AT ELYSEE PLACER

The following figures are based on the results of the first season's work at the Elysee placer. There are two dredges operating here, but these could not work



NATIVE GOLD DIGGINGS ON ROCHE CREEK, FRENCH GUIANA. SHOWS CHARACTER OF GROUND TO BE DREDGED

might be applicable for this work, but this would mean doubling the operating expense, and furthermore the material thus removed might be a hindrance to the dredge following behind.

#### STICKY CLAY CAUSES TROUBLE

There is usually a very tight clay around the pebbles in the pay dirt, and this causes much trouble in the sluices by forming clay balls from which the gold cannot be washed without a thorough hand cleaning by natives. I have seen this clay so tightly stuck to dredge buckets that it returned again and again with every revolution of the bucket chain despite all efforts to remove it with water sprays. It was necessary to station three

native is accustomed to the food and to the climatic conditions; a European requires better food in order to resist disease. Treating the Italians the same as natives, they all either died or had to return to Europe. After a great deal of patience it has been found possible at the Elysee placer to put natives in charge of a dredge under a white overseer, who must be ready for all emergencies.

#### TRANSPORTATION DIFFICULT

Another difficulty that must be overcome in Guiana is that of transportation along the rivers, which are extremely tortuous. It is difficult to handle heavy and cumbersome pieces of machinery,

at full capacity on account of the conditions above enumerated. The daily capacity of these dredges proved to be from 300 to 400 cu.m. instead of 1000 cu.m. as expected. The costs per day are as follows: Fuel (23 cords at \$1.30) \$30; labor (ten men per shift of eight hours at \$1.11, including food) \$34; engineer and foreman, \$5.50; clearing away wood, \$16; repairs, water, tools, etc., \$5; freight, general expense and management, \$40 (subject to change); total, \$120.50. Handling from 300 to 400 cu.m. (390-520 cu.yd.) per day at the above rate means a cost of 30 to 40c. per cu.m. dredged (23 to 31c. per cu.yd.). A shift includes three men for shoveling the clay from the buckets. Wages average 80c. per

day, and 32c. per day for food, according to the contract.

#### EQUIPMENT OF GUIANA DREDGES

In order to obtain better results from dredging in Guiana the dredge should be provided with the following modifications: (1) An automatic bucket-cleaning device at the top of the gear; (2) buckets of a rather flat shape to facilitate discharging; (3) an endless-belt tailings elevator or sluices extending some distance astern of the dredge in place of an elevator; (4) an arrangement for the direct transportation of the barren gravel to the stern of the dredge thus avoiding obstruction; (5) a special device for obtaining pure water for the pump; (6) a riffle table for saving nuggets.

#### YIELD AT THE ELYSEE PLACER

Careful experiments were made with the No. 1 and No. 2 dredges at the Elysee placer in 1907 and 1908. The No. 1 placer washed 126,000 cu.m. (164,500 cu.yd.) of gravel, producing 80 kg. (2572 oz.) of gold; the No. 2 dredge operated nine months, washing 40,000 cu.m. (52,200 cu.yd.) of material, from which 18 kg. (578.7 oz.) of gold were obtained. During the experiment another creek was carefully prospected and the result being successful a third dredge erected in 1909. From the latest reports 8 kg. (257.2 oz.) of gold were produced with this dredge in March and 10 kg. (321.5 oz.) in April of 1910, or about three times more than the monthly results obtained for 1906 with the principal dredge. The total production from the three dredges for May, 1910, was 22 kg. (707.3 oz.) of gold from about 11,000 cu.m. (14,370 cu.yd.) of gravel. A profit of nearly \$9000 was made during this month.

### A New Type of Giant Excavator

By F. A. TALBOT\*

Interest has been centered, in British engineering and mining circles, in a new type of giant excavator which is now at work at the Pilling brickfields of J. B. Forder & Sons, Ltd., and which possesses many ingenious features. At these brickfields the clay pit is about 60 ft. in depth and the problem that has confronted the owners for several years was the discovery of a type of machine which could cope with the peculiar conditions prevailing. It is essential that the face should be cut from top to bottom so as to secure a thorough mixture of the clays. In order to get a uniform brick it was essential that the top and bottom clays should be in equal proportions. The brick-makers employed the ordinary type of steam shovel for some years and although they secured the heaviest types, the depth of the pit entailed the use of three of

these machines, working in galleries at different levels, accompanied by subsequent mixture of the product from the three cuts.

#### EXCAVATOR TO CUT A 60-FT. FACE

To meet these peculiar conditions, A. R. Grossmith, an English engineer, evolved a new type of excavator working on the cantilever revolving-crane principle. This machine works on a face 60 ft. high and has a 75-ft. radius of action.

The general lines of the excavator may be gathered from the accompanying illustration. The jib of lattice-girder construction, tapered at both ends, is 80 ft. long, which, together with the large pulley wheel at the head, gives an overall length of nearly 90 ft. The jib is set at an angle of 45 deg. and is mounted at the forward end of a heavy frame on the carriage. The latter has a wheelbase of 17½ ft., mounted on two pair of

scopis and it is operated by wire cables from a self-controlled engine on the main frame.

The head pulley is 8 ft. in diameter and this feature, as American practice has shown, reduces the liability of injury to the rope. Another interesting feature is the oscillating bucket and its attendant mechanism. A vital point about this machine is that the face of the cut instead of being concave as results from the use of the ordinary steam shovel is maintained at a perfect angular slope, so that caving is entirely eliminated.

#### MACHINE EASILY OPERATED

The machine is easy to handle and owing to the simplification of the control one man can easily attend to the various operations. The machine illustrated herewith works on a slope 60 ft. high and makes a cut 150 ft. wide at the top by about 30 ft. wide at the bottom. An-



GIANT EXCAVATOR MAKING 60-FOOT CUT—TWO CARS LOADED SIMULTANEOUSLY THROUGH HOPPER IN FOREGROUND

wheels, on a gage of 12½ ft. As the excavator is of the revolving type the frame comprises a circular mild-steel ring or girder 2½ ft. in depth by 18 ft. in diameter, and the revolving carriage travels on a track of 90-lb. rail.

#### IMPORTANT FEATURES

The engine frame itself consists of two parallel rolled-steel joists, 7x20 in., and the jib is pinned to one end of these, while the other end carries the boiler and the counterweight. Two stout members meeting at the top and forming a triangle constitute the cantilever for the jib stays. The bucket arm or muck pole is also of lattice-girder construction, 50 ft. in length, and is carried at an unusual height on the main jib, which is supported by two wire ropes. Its motion is tele-

other advantage is the clean cut effected by the bucket, reducing cleaning up at the base of the slope to the minimum.

The capacity of this particular machine has never, for lack of opportunity, been tested to its maximum. The bucket is 3 cu.yd. capacity, and the arm makes one swing per minute. The machine weighs 70 tons. In this particular case, it excavates 700 tons of clay per shift. The builders, Rubery, Owen & Co., are constructing several machines of varying capacity for railway building and general surface-mining operations.

The output in 1909 of the gold placers in the Innoko valley in Alaska is variously estimated at \$300,000 to \$400,000. A Government survey of the district is now under way.

\*15 Wilbury Crescent, Hove, England.



# Barometric Pressure and Liberation of Firedamp

Results of Numerous Experiments Indicate That the Outflow of Gas in a Mine Is Influenced by the Variations in Atmospheric Pressure

B Y L E O N M O R I N \*

Although opinion on this question is still divided, it is considered more and more probable that variations in barometric pressure exert a powerful influence on the rapidity with which firedamp escapes into the atmosphere of coalmines.

## PREVIOUS EXPERIMENTS

Galloway's investigations in England, although somewhat superficial, convinced him of the importance of noticing barometric changes, and a rule to this effect was put into the Mines Regulation Act. In Germany, experiments made in 1875 and 1877 by Schondorff and Nasse, established the danger to be apprehended during a period of low pressure, especially in mines comprising large areas of old workings. The French commission on this subject rendered a report in 1880 in which they questioned the influence of atmospheric pressure, although Le Chatelier did agree that worked-out areas would be more susceptible than new workings to changes in pressure.

In 1885, Koehler made an extended test at the Karwin mines in Westralia, his first step being to ascertain, by comparison, that variations of pressure inside and outside the mine were simultaneous and identical in amount. By plotting together his observed pressures and his percentages of methane, as determined by careful analysis of 10-liter samples, he drew the following conclusions: The percentage of firedamp in the mine air increases with a fall in atmospheric pressure, and conversely. The more abrupt the fall in pressure the more rapid the increase in percentage of gas, and conversely. The percentage of gas does not depend upon the absolute atmospheric pressure. If, after a rapid rise in pressure, the barometer stays constant or shows only a slight further rise, a gradual increase in percentage of gas will be noted, or if, after a quick fall in pressure, the barometer stays fixed or shows only a slow further drop, a slight decrease in percentage of gas will follow; the maximum gas does not, therefore, always coincide in point of time with the minimum pressure.

By sealing the air inlet of the mine, while continuing to operate the fan, Koehler was able, by causing an artificial depression of 2.5 mm. of mercury inside the mine, to increase the average amount of gas in the upcast from 20.12 to 36.83 cu.m. per minute.

Note.—Abstract of an article in *Ann. des Mines*, Vol. XVI, No. 10, 1909.

\*Chief engineer, Société houillère de Liévin, Liévin, France.

## EXPERIMENTS IN FRANCE

Experiments by Chesneau in 1886 at one of the mines at Anzin, which normally yielded about 3356 cu.m. of gas per day, warranted the conclusion that only a very small proportion of this total could have come from the waste filling of the mine, and that in a mine affording a permanent and fairly regular flow of gas, sudden drops in atmospheric pressure caused an increased proportion of gas.

Finally, a note by F. Laur, in 1907, attributes the disasters at Reden, Liévin, Charleston and Fayetteville, directly to the period of depression preceding each explosion. We see thus that many engineers are agreed that barometric variations do influence the outflow of mine gas; a great difference of opinion does exist, however, as to the relative importance of the old workings and the new workings as to the yield of gas in a given mine.

## OTHER EXPERIMENTS

In making tests for myself I selected four upcast air shafts at Liévin for a series of experiments lasting for two months. At one of these, the percentage of gas was determined every hour, except on Sundays, and at the other three, every eight hours. The four shafts were selected because of the large area of worked-out ground tributary to each.

Shaft No. 13, of the Du Souiche du Levant mine, at which the hourly samples were taken, exhausted 8,008 cu.m. of air per second. The shaft was used solely as an upcast air shaft, and being quite independent of the downcast shaft and free from short circuits, it was found, after a number of tests, that the volume of air circulating in the mines was almost perfectly uniform; thereafter the experiment was confined entirely to the analysis of the air. The area circumscribed by the air current was 166,000 sq.m. Except for a small working area in the Alfred seam, 12 m. below, which was ventilated by the same air current, the other seams above and below the Du Souiche were untouched coal.

## TAKING THE SAMPLES

At No. 13 shaft, the hourly samples were taken by reliable men whose work was nearby; at the other three shafts the samples were taken by shift bosses. The method was to carry down glass bottles full of water and then empty them at the spot where it was desired to take the samples of air; the bottles were then

carefully corked and carried up-side down, with a little water remaining inside to assure against escape of the sample. As the air pressure at the bottom of the shaft, where the samples were secured, was greater than at the surface, leakage of air into the bottles while in transport, was not likely to occur.

At the beginning of the experiment, simultaneous samples were taken near the roof, near the middle, and at the floor of the gangway, but analysis showed that the three samples were identical in composition, owing, no doubt, to the energetic mixing of the air current at a velocity of 2 m. per second. Thereafter while each sample was being taken, the bottle was moved about in a zigzag fashion. The temperature of the upcast current was nearly constant, at 23 deg. Centigrade.

## METHOD OF ANALYSIS

The samples were sent, every 12 hours, to the company's central laboratory, where they were analyzed independently by two experienced chemists, using the Coquillion apparatus as modified by Le Chatelier; four of these devices were installed, and their accuracy was determined at frequent intervals by calibration on the same sample. The four readings never differed by an amount equivalent to more than 0.03 per cent. of methane. The determinations were also compared, at intervals, with others made on the Le Breton apparatus. To test the possible error introduced by varying proportions of carbon dioxide, a number of tests were made on gaseous mixtures containing 0.1, 0.5, 1.0, 5.0 and 50 per cent. of CO<sub>2</sub>; the Coquillion apparatus still registered the correct percentage of methane. It was also ascertained that fine coal dust, suspended in the sample of air, could not enter the apparatus and affect the results.

Barometric observations were made at the surface only, Koehler's experiments having proved this to be permissible, by a recording aneroid, which was compared daily with a mercury barometer hanging beside it. The results of the analyses and the barometric readings, from March 21 to May 10, 1907, were then tabulated and plotted on coordinate paper, in the form of the curves which are reproduced in the accompanying figures.

Fig. 1 represents the data secured at No. 13 Du Souiche shaft, and Figs. 2, 3 and 4 apply to the other three air passages at which samples were taken.

CONCLUSIONS

Inspection of the plotted curves warranted the following conclusions:

(1) Even slight variations in atmospheric pressure induce variations in the escape of firedamp; other things being equal, while atmospheric pressure remains constant, the liberation of firedamp is equally uniform.

(2) When atmospheric pressure increases, the escape of gas diminishes, and conversely.

(3) Maximum atmospheric pressure corresponds with minimum percentage of gas, and *vice versa*.

(4) The variations in percentage of gas may reach great importance; thus a fall from 770 to 740 mm. in the barometer increases the proportion of methane by 50 per cent.

(5) There is no exception to the gen-

thickness of the strata, the supporting power of the waste filling, the timbering, and other factors. The closure of the voids is never perfect, even after the surface has settled as much as it will. When shaft No. 4, at Bethune, was pumped out after its workings had been abandoned for 12 years, measurement of the water showed that the empty spaces still remaining constituted 30 per cent. of the original volume of the workings from which coal had been extracted.

When we began our experiments on the Du Souiche seam, a careful series of levelings on the surface gave us data on which we computed that the voids in the old workings, covering 166,000 sq.m., the average thickness of the seam being 1.5 m., amounted to 114,000 cu.m. However, on the assumption that the old workings are the only cause of variation

pure methane, ranges all the way from 3330 to 290,550 cu.m.; the larger values are found to correspond to the longest periods of time. The wide variation in the computed values for voids, and their divergence from the fairly accurate figure previously determined, led to the supposition that the voids were not filled with pure firedamp but with mixtures of gas and air arranged in order of density, those richest in gas occupy the voids at the highest level. A slight fall in barometric pressure would then affect only the mixtures, poor in gas, occupying the lower levels, while further drops in pressure would bring out successively the richer and lighter mixtures.

This explanation is not altogether satisfactory, and, as will be shown further on, we were unable to obtain from the old workings samples of air containing

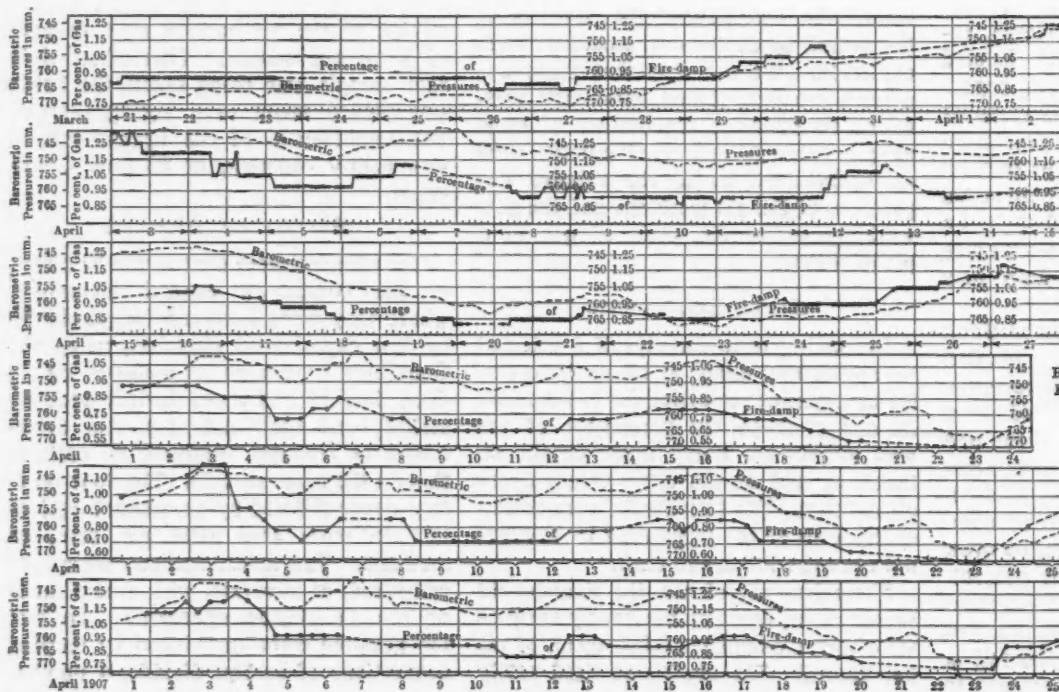


Fig. 1  
Shaft No. 13, Du Souiche  
Seam, Mar. 21, to Apr. 28, 1907.  
Volume of Air: 8 Cu. m. per Sec.

Fig. 2  
Return Air Current  
Bowette Sud a 345  
Volume of Air:  
8,838 Cu. m.

Fig. 3  
Return Air Current  
Bowette Levant  
a 345  
Volume of Air:  
3,610 Cu. m.

Fig. 4  
Du Souich Ba 430  
Return Air Current  
Voie de Fond No. 1  
Volume of Air:  
2,230 Cu. m.

DIAGRAMS SHOWING VARIATIONS IN ATMOSPHERIC PRESSURE AND COINCIDENT OUTFLOWS OF GAS IN MINES AT LIEVIN

eral rule of inverse ratio between variation in pressure and variation in percentage of gas.

DISCUSSION OF RESULTS

The first explanation of the phenomena that occurs to one is that the empty spaces in the old working places of the mine constitute a kind of reservoir for the firedamp, absorbing it when the atmospheric pressure is high, and liberating it again when the pressure falls. It is obvious that the old workings of a coal mine do contain numerous voids, in crevices, in rooms incompletely gobbed, and in the gob itself. If the settling of the surface followed closely after the exhaustion of the coal, the percentage of voids in the old workings would be smaller, but this settling is not complete, usually, depending upon the nature and

in the yield of mine gas, under fluctuating pressure, it should be possible to calculate the volume of the voids. Thus, let X represent the volume of pure gas accumulated at pressure P; t the percentage of gas in the return air current at the same pressure; t' the percentage at pressure P', which will assume to be less than P; V the volume of air exhausted in a unit of time; D the length of time during which the atmospheric pressure falls from P to P'; then

$$PX = P' (X + VD \frac{t' - t}{2})$$

If we apply this formula to a number of the periods covered by our investigation, in some of which the pressure was falling and in others rising, we find that the calculated volume of voids in the mine, assuming them to be filled with

more than a very small proportion of methane. We were thus led to conclude that the old workings are not the only nor even the most important cause of variation in the percentage of firedamp liberated by a given coal mine; we must look to the original source of the gas for a sufficient explanation.

SAMPLING THE AIR IN OLD WORKINGS

At this point, we made some experiments as to the character of the atmosphere contained in old workings. Samples were taken through pipes by aspiration. A 1-liter bottle having two necks was fitted with tubes and stop-cocks in such a way that, as the water in the bottle was emptied through one tube, a sample of atmosphere was drawn in through the other. Two inclined rooms were selected in the most gassy parts of



the mine; a pipe 5 m. long, and of 30 mm. diameter, was fastened longitudinally to the roof of each room, and the gob was piled up under and around it in the usual manner. The lower end of the pipe was left open, and was situated at about the center of the room filling; the upper end, closed with a plug, projected into an upper gangway. After three months, samples were drawn from the pipes, giving, in one case, a maximum of 0.46 per cent., and in the other, 0.75 per cent. of methane; the percentages of gas in the ventilating air currents at the same points were respectively 0.25 and 0.60 per cent.

In another part of the mine a considerable area of worked-out coal had been filled with packing, and the ventilation had been changed in such a way that firedamp accumulated and finally began to be noticeable in the gangway outside the pack wall. Samples taken through the wall at three points around this area gave 2.0, 2.4 and 2.7 per cent. of gas. These tests seem to indicate that while the exhalations from old workings, no matter how carefully packed, may contribute gas to the ventilating current of adjacent operations, they do so only to an unimportant degree. In all our tests, we found it impossible to secure from old workings samples of air rich in gas, even though our sampling pipes were located close to the roof and at one of the highest places in the mine.

#### SOURCES OF MINE GAS

The principal sources of firedamp in coal mines are: (a) The unbroken coal at the breasts of working places; (b) freshly broken coal; (c) rock strata adjacent to the coal seam. Our experiments included tests on the relative importance of each of these sources of contamination, since, as has been shown, the old workings alone do not seem capable of accounting for the known facts.

#### EXPERIMENTS AT WORKING FACES

The nature of the gas exhaled by massive, unbroken coal was studied at Liévin by Simon in 1893. He found that the gas present in the massive, unbroken seam is subjected to a pressure of 4 to 7 kg. per sq. cm.; that the permeability of the seams at Liévin was very slight, only 0.001 in solid, massive coal, and 0.04 in coal at the breast (the measure of permeability is the ratio between cubic meters of gas exhaled per square meter of surface per hour and the gas pressure in kilograms per square centimeter); and that the liberation of gas from the working face was therefore slow.

In 1907, a gangway going down the dip into absolutely virgin coal in the Leonard seam encountered a flow of gas of sufficient intensity to inject about 1 per cent. of methane into an air current of 1.5 cu. m. per sec. Into the upper part of this seam we drove bore holes, of 6 cm. diameter, to various depths. Into each hole

we inserted a 10-mm. copper tube, the inner end of which reached to within 20 cm. of the bottom of the hole; the space around the tube was then carefully closed with clay to within 1.2 m. of the bottom of the hole, a ring being soldered to the tube at that point to prevent the clay plug from going deeper. A test on one of these holes, 8 m. deep, gave the following data: Pressure, 0.75 kg., falling to 0.50 kg. two weeks later; volume of gas exhaled at the latter pressure, 40 liters per hour, with a free surface of 0.20 sq. m.; after allowing gas to flow freely for two hours, the pressure gage was attached again, and in 45 min. the pressure regained its original intensity.

Compared with the results obtained in 1893, it is seen that the pressures are decidedly lower, the flow of gas much more copious, and the speed with which the pressure regains its full intensity much more rapid than in the earlier investigation. Further tests with the same holes indicated a falling pressure but a flow of gas which did not diminish correspondingly, seeming to prove that the permeability of massive coal, in a seam so situated as to drain itself of gas, increases slowly at first, and then much more rapidly as soon as the drainage becomes well established.

#### GAS IN FRESHLY BROKEN COAL

By extracting, with great care, a sample of atmosphere from the center of a pile of freshly-broken coal weighing 3 or 4 tons, we obtained results showing a richness in gas exceeding the explosive proportion—16 per cent. in one case and 26 per cent. in another. This fact should be of great interest in those mines using explosives in the coal. It is apparent, therefore, that coal thrown into the gob, as well as the carbonaceous rocks in floor and roof, continue to evolve gas after the working face has passed on.

#### GAS DERIVED FROM ROCK STRATA

Gangways driven into massive coal frequently intercept gas-bearing fissures, but it is equally true that the floor and the roof of a seam undergoing active mining liberate important quantities of gas. It is also well known that the percentage of gas in the return air current tends to increase as the workings of a mine enlarge. One would suppose, however, that the amount of gas liberated by the working faces would remain nearly constant, since the length of the breasts and their rate of advance do not differ materially as the mine expands. (I am speaking, of course, of longwall methods.) As for the coal and carbonaceous rock left behind as filling, the gas that they contain is so rapidly dissipated, that their contaminating effect during succeeding periods must be practically uniform.

It is well known, furthermore, that a coal seam under operation evolves much

less freedom if an adjacent seam has previously been developed and worked, while its yield of gas, in similar circumstances likewise shows no inclination to increase as the mine broadens. These facts are well established, in my mind, by a long series of observations<sup>1</sup> on the proportion of gas in the return air currents of our mines, which include workings in six coal seams underlying one another within a total thickness of 92 m. These phenomena are obviously explained by the presence of fissures through the intervening rocks created by the settling that naturally accompanies the exhaustion of a coal seam.

By means of a number of bore holes from which we took samples of air, we ascertained that the floor and the roof of a coal seam contain gas which they gradually relinquish after the period of active work has passed. At a distance from the seam, however, the percentage of gas in the barren rocks becomes very minute, except as it may be transmitted there through fissures leading from other sources.

#### DISCUSSION OF BAROMETRIC INFLUENCE

As previously indicated in discussing the results obtained at No. 13 shaft, it seemed necessary to study the effect of barometric variation upon the original sources of the mine gas, in addition to its influence upon the atmosphere contained in the voids of the old workings. As to the gas evolved by the solid coal in working faces, we have never been able to discover that its volume showed any variation corresponding to fluctuations in pressure. A careful test of the air in the new gangway in the Leonard seam, referred to above, failed to prove any interrelation, as was, perhaps, to have been expected. Whatever the law connecting variation of gas pressure with distance from a free surface, the rate of exhalation must be governed by the pressure existing in the solid, virgin coal. This internal pressure is measured in kilograms, whence it is absurd to expect that a variation of a few millimeters in external pressure shall produce much effect on the outflow of gas from solid coal.

As for coal and carbonaceous rock in the mine filling, the gas which they contain is probably dissipated in a comparatively short time, and thereby does not greatly affect the subsequent fluctuations in the percentage of gas observed in the ventilating current.

We are thus forced to conclude that barometric changes affect mainly the quantity of gas liberated by the floor and roof of the seam under operation, whether this gas is contained in the rocks themselves or comes through fissures from adjacent seams.

The gaseous zone above and below

<sup>1</sup>These observations are given in detail in the original article, but are omitted here for lack of space.—EDITOR.

the seam under development retreats as work in the seam advances; as the coal is removed the roof settles and the floor tends to rise, causing fractures through which the gas of adjoining virgin seams enters the workings. A solid seam is comparatively impervious to the passage of gas, as our experiments indicate. The pressure that actuates a flow of gas through the fractured zone is, therefore, entirely independent of the original pressure existing in the neighboring seams in their undisturbed condition. The barometric variations, always of relatively small magnitude, are not, then, pitted against the pressure of kilograms, as it exists in solid seams, and are, therefore, able to influence the flow of gas from this fissured zone to the degree which we have observed.

As the drainage of gas from the fractured region becomes more complete, the pressure becomes more and more feeble, thus permitting the barometric variations to exert a more and more pronounced influence upon the outflow. Thus, in addition to the normal flow of gas under high pressure from the working face and from the newly formed fissures close to the working face, we can readily imagine an outpouring of gas through floor and roof, copious though under low pressure, the volume of which will be proportional to the area of the old workings of the mine. This, I believe, is the source of gas, most susceptible to barometric changes, that is responsible for the tremendous observed variations in the quantity of firedamp liberated by a given coal mine.

#### QUANTITY OF GAS DOES NOT DEPEND ENTIRELY ON FLUCTUATION IN PRESSURE

On this supposition, it is easy to interpret the results of our experiments in the Du Souiche seam. The quantity of liberated gas does not depend alone on the magnitude of the fluctuation in pressure, but also on the absolute barometric reading at each moment, becoming thereby proportional to the length of time elapsed between the two extreme pressures defining the fluctuation. On this ground, also, we can explain the disproportionate values found by computing the volume of voids in the old workings; neither are we compelled to assume that these voids are filled with pure methane, an assumption not borne out by our observations.

Examining the curves in Fig. 1, we see that when a period of constant pressure follows a fluctuation, the percentage of gas maintains the level it reached as a result of the fluctuation. A maximum or a minimum pressure lasting for several hours induces a minimum or a maximum percentage of gas lasting for the same length of time. It can not be said that to a given pressure will always correspond the same percent-

age of gas; this is because of the complication introduced by the expansion and contraction of the atmosphere in the old workings.

It is noticeable that after a barometric rise to a given pressure the percentage of gas is always smaller than after a drop to the same pressure. This can be understood on the supposition that during a period of high pressure part of the liberated gas finds its way into the crevices of the old workings, while during a period of low pressure the whole outflow passes at once into the ventilating current.

To the results of our observations on the Du Souiche seam, as stated earlier, I would add the following:

6 The variations in the outflow of gas, induced by fluctuations in atmospheric pressure, are due not only to voids in the old workings but to fissures in the roof and floor which permit the admission of gas from adjoining coal seams.

#### COUNTERACTING BAROMETRIC VARIATIONS

As a means of discounting the effect of fluctuations in pressure upon the outflow of gas in a mine, it has generally been suggested that the ventilating fan should be driven faster during periods of low pressure, but it is equally important that the speed should be reduced whenever the pressure is high. This is a delicate means of adjustment, especially if some form of electric motor, the speed of which is so easily regulated, be used to drive the fan. It should be remarked, however, that any attempt to attain complete uniformity of gas percentage in the air from a whole mine would require abnormal and impracticable regulation of the motor speed, but any mechanical device helping to increase the supply of air during periods of low pressure should be considered a step in advance.

#### USING HOODED VENTILATORS

In this connection it may be of interest to outline the use that may be made of hooded ventilators for utilizing the power of the winds produced by the very barometric changes that we are trying to circumvent. These hoods can be supplied to both downcast and upcast shaft, assisting the power of the mechanical ventilator by the amount of their combined effort. From data as to wind velocities, air densities, and other factors, collected in the vicinity of our mines, we have computed that a wind having a velocity greater by 10 m. per sec. than that of the current down the air shaft produces a motive force equivalent to 27 mm. of water. Our normal fan pressure during the summer is 45 mm. of water, for the exhaustion of 77 cu.m. per sec., which, in winter, becomes 25 mm. with an output of 102 cu.m. I strongly recommend the use of these movable hoods, wherever feasible, as an adjunct to the usual mechanical ventilators.

## Report on Bituminous Coal Miners

### WASHINGTON CORRESPONDENCE

The report of the Immigration Commission on immigrants in bituminous-coal mining, shows that, among the foreign-born miners, the Poles show the highest earning capacity, while the French and Mexicans make a poor showing when compared with other races; less than 3 per cent. of the French miners and less than 2 per cent. of the Mexican miners showed earnings greater than \$3.50 per day.

An interesting part of the report is found in the analyses of the method of securing men practised by coal companies in the Southwest. Originally men were transported directly from other coal-fields at the expense of the company, and later transportation was furnished and the cost was collected back from wages on the instalment plan. Later on, the immigrants were simply met in New York by agents of the Southwestern operators, who offered them employment in the mines. At the present time, sufficient labor comes of its own accord and men find employment through personal applications.

#### THE UNION IS A BENEFIT IN OKLAHOMA

In Oklahoma, practically all of the mines have been unionized, and the immigrant races have in general fallen into the union organization. The Immigrant Commission in reporting on this subject, say that the union system in the Southwest has been of benefit both to the miners and operators. The hours worked are practically an eight-hours' day, while employment is rather more regular than in other fields.

Wages are paid on a scale for mining which varies in the different districts, ranging from 72c. to 77.5c. per ton for pick mining. The men are paid twice a month, and a company store system prevails whereby men can secure supplies on credit between pay days. The commission found, however, that prices were reasonable and the goods were of fair quality. The only thing that the miners were compelled to buy at the company's store was explosives. Some tendency toward the segregation of different races was found to exist, and there was a disposition on the part of some groups to become property owners. Large households were more general with the Irish than any other race.

#### THE SOUTHERN BITUMINOUS FIELD

In the Southern bituminous field, the reports show that as regards earning capacity, the German, with an average annual earning of \$818 stood highest, while the south Italians, with only \$582, were lowest. The question of hours of labor is surveyed for the several States in-



cluded in the Southern district, and it appears that hours are shorter in the West Virginia fields than in the Alabama field. The Virginia coalfield is practical identical in conditions of work with West Virginia, but many classes of men work 10 hours a day, six days in the week. One peculiarity in the immigrants' labor situation in the South is found in the Southern convict leasing system of work. Criminals are leased for work in the mines and are employed by the company under specified conditions of payment to the State.

#### REASONS FOR EMPLOYING IMMIGRANTS IN WEST VIRGINIA

The large demand for the employment of immigrants in the West Virginia fields has been due to the tendency of American white miners to leave the field, while on the whole the native whites have been inefficient and the negroes have been irregular and unreliable in their work. American whites now employed in the Pocahontas and New River fields are chiefly of the better class and are employed in the higher and more responsible administrative positions. In West Virginia the immigrant miners made a rather good impression, having been found more industrious and regular than the native whites or negroes.

The percentage of literacy of persons native born of foreign father was much higher than that of persons native born of native father. The reduction of percentage of literacy for the native born was largely due to the presence of many negroes. Among the foreign-born class the Germans led in the degree of literacy. Small interest was taken in American institutions. The commissions's investigation of the Southern field shows a greater degree of general ignorance and a lower economic status than prevails in other bituminous-mining fields.

### The Colorado Coal Strike Situation

#### SPECIAL CORRESPONDENCE

State Labor Commissioner Brake, of Colorado, has sent letters to the coal operators of the Northern field, and to the officers of the United Mine Workers, urging them to appoint committees which shall meet jointly and compromise the strike. Unless this is done, it is stated that compulsory arbitration may be resorted to, according to the authority given the commissioner by the Seventeenth General Assembly.

On Aug. 30, the operators, at a meeting held in the offices of F. F. Struby, president of the Northern Coal and Coke Company, refused to arbitrate their differences with the 3000 striking miners, and sent a letter to Commissioner Brake,

stating in substance that "there is nothing to arbitrate." Northern lignite is now selling at \$5 per ton, and there are already fears of a coal famine in Denver this winter.

### Small Success in Utilizing Irish Peat Deposits

Small success has attended the recent efforts to utilize more extensively the peat beds of Ireland. Although peat has been for ages the fuel of the poorer classes in the remote districts of Ireland, no process has yet been discovered for converting it into a desirable and economical commercial fuel. Many schemes have been tried in Ireland in recent years and extensive and well-equipped plants have been erected in different parts of the country at enormous expense, in an effort to convert the peat into a profitable fuel for manufacturing purposes; so far all efforts have been disappointing.

It was thought at one time that by applying pressure to the product in its green and wet state and compressing it into a convenient shape, like briquets, it could be successfully used in place of coal, but in most cases this process has had to be abandoned. Numerous expensive plants are idle waiting for some enterprising company to take hold of them, and through some new process convert these bog lands into mines of wealth. Manufacturing paper out of peat was tried for a time, but this industry has also been abandoned. One-seventh of the area of Ireland consists of peat-bog lands.

### The Establishment of Additional Rescue Stations

#### WASHINGTON CORRESPONDENCE

The situation of three of the nine new rescue stations recommended for the coalfields of the country by the Secretary of the Interior as a means of reducing the number of deaths in coal mines, was determined by George Otis Smith, while acting director of the Bureau of Mines. The first will be at Birmingham, Ala.; the second at Huntington, W. Va., and the third at Wilkes-Barre, Penn. Other stations will be established throughout the country as soon as the plans are prepared and the best situations decided upon.

Each station will be in charge of a foreman, a man with practical mining experience, who has been a miner, a fire-boss, mine foreman, manager of a mine or inspector of mines. It will be his duty to train the miners from the coalfields within his district in rescue work. It is proposed that the miners who work in the nearby mines will, under the guidance of the foreman of the station, form a volun-

teer rescue corps, ready to respond at once to any emergency call within the district.

The principal equipment of the station will consist of eight oxygen helmets. An air tight room will be fitted up and filled with smoke. The miners who are sent to the station will practise with the oxygen helmets in this room until they are perfectly familiar with the apparatus. It is expected that it will take two weeks to thoroughly train a miner for this work. The men will be housed and fed at the station during the training period. When they return to their respective mines, it is expected that they will form rescue corps and have properly equipped stations of their own.

At a mine disaster, the foreman of a station will have charge of the rescue work. A mining engineer will be stationed in the district, whose duty it will be to examine the physical condition of the mines and have general supervision over the training in rescue work.

#### COLLIERY NOTES

The No. 2 colliery of the Kingston Coal Company, Kingston, Penn., during the month of August just closed, shipped 104,395 tons, thus exceeding by 11,000 tons, the former monthly anthracite region record of October, 1909, held by this colliery.

Alleging that injuries received at a colliery of the Lehigh & Wilkesbarre Coal Company, near Hazleton, Penn., was due to the neglect of a miner who was working without a certificate, a foreign miner asked for \$25,000 damages from the company. As a test case, this suit will be interesting.

The annual report of Chief Mine Inspector Roderick, of Pennsylvania, dwells upon the importance of educating the foreign miner in the proper use of the English language. All those interested in mining coal, now realize that the majority of mining accidents are due to ignorance and incompetent foreign miners, and that the dangerous deficiency can be largely overcome through the education of the foreigner. What we want to know, however, is just how to go about this work. Practical suggestions regarding the establishment of schools will be listened to with interest by all. If the mine owners do not solve this problem soon, the State Legislatures will be obliged to take the matter up and pass restrictive legislation. At the present moment, there seems to be no good reason why a miner, to be eligible for employment underground, should not show a certificate proving that he has an intelligent understanding of English. Some act of this sort would put it up to the operator and to the miner so strongly, that a satisfactory solution would be forthcoming immediately.

## NEW PUBLICATIONS

**DIE ENTSTEHUNG DER STEINKOHLE UND DER KAUSTOBIOLITHE UBERHAUPT.** (WIE DES TORFS, DER BRAUNKOHLE, DES PETROLEUMS USW.) Nach Vorlesungen, Gehalten auf der Kgl. Bergakademie und der Universität zu Berlin, by H. Potonié. 7m., 80 pfg., Gebrüder Borntraeger, Berlin.

**CHEMISTS' POCKET MANUAL**, by Richard K. Meade. \$3. Chemical Publishing Company, Easton, Penn.

A practical hand-book containing tables, formulas, calculations and analytical methods for the use of chemists and engineers. This volume presents in condensed form such information as is usually found distributed through many large volumes. Its conciseness and brevity should make it especially valuable for the busy man.

**MODERN ASSAYING: A CONCISE TREATISE DESCRIBING LATEST METHODS AND APPLIANCES.** By J. Reginald Smith. Edited by F. W. Braun. J. B. Lippincott Company, Philadelphia.

This volume is not intended as an exhaustive treatise on the subject. It is an assayers' handbook dealing with fire assays, volumetric methods and the Guess-Haultain electrolytic method for copper and lead. The author presents in a simple manner the methods of assaying precious metals, together with a description of many of the latest mechanical appliances used in the art.

**A MANUAL FOR ASSAYERS AND CHEMISTS.** By W. H. Seamon. \$2.50. John Wiley and Sons, New York.

The book is prepared especially for the young graduate engineer and chemist. It gives methods with which the author has had satisfactory results. The subject is divided into four parts: Metallic determinations, nonmetallic, miscellaneous and tables. The methods given are dealt with in a practical manner, leaving out theoretical discussion. At the close of the chapter on each element is a paragraph on its "uses and valuation." The last two chapters give much information on ore contracts, sampling and making settlements.

**PRACTICAL DATA FOR THE CYANIDE PLANT**, by Herbert A. Megraw. Illustrated, 93 pages, \$2. McGraw-Hill Book Company, New York.

A compilation of data on cyanide plant equipment and practice designed to assist the "man on shift" in understanding the basic principles of his operations. The chief types of crushing machines, of tanks used in sands and slimes treatment, and of slimes filters are mentioned and the methods of ore treatment and precipitation of solution explained. Some instructive information regarding prelim-

inary experiments on ores is given. Forty-eight pages are devoted to tables of data useful in cyaniding and in general engineering practice.

**AMERICAN PRODUCER GAS PRACTICE AND INDUSTRIAL GAS ENGINEERING**, by Nisbet Latta. \$6. D. Van Nostrand Company, New York.

Contents: Producer operation; cleaning the gas; works details; producer types; moving gases; solid fuels; physical properties of gases; chemical properties of gases; gas analyses; gas power; gas engines; industrial gas applications; furnaces and kilns; burning lime and cement; pre-heating air; Doherty combustion economizer; combustion in furnaces; heat; temperature, radiation and conduction; heat measurements: pyrometry and calorimetry; pipes, flues and chimneys; materials: fire clay, masonry, weights and rope; useful tables; oil fuel producer gas.

**THE ORE DEPOSITS OF NEW MEXICO**, by Waldemar Lindgren, Louis C. Graton and Charles H. Gordon. U. S. Geological Survey, Professional Paper 68, 1910. Washington.

This report is the first publication of the Survey that deals comprehensively with the geology and ore deposits of a single State or Territory. The accounts of the mining districts are necessarily brief but contain much detailed information, and the report not only provides a summary of the important facts concerning the ore deposits but includes discussions of the broad relations of the ores and of their origin. The work is likely to remain for many years a valuable reference book for all who are interested in the mineral resources of New Mexico.

**THE EARTHQUAKE OF 1872 IN THE OWENS VALLEY, CALIFORNIA.** By William H. Hobbs. Pamphlet reprint by author from proceedings of the Association of American Geographers, Chicago.

Professor Hobbs has, in this publication, interpreted the field data of Willard D. Johnson, of the U. S. Geological Survey, relating to the physical and geological changes resulting from the notable earthquake which occurred in 1872, in the Owens Valley region of California. He points out that the visible scarps clearly represent faults in the basement, for they extend without deviation of direction into the rock spurs of the adjacent Alabama hills and says that they certainly do not represent more than a small proportion of the faults within the basement. This condition he finds in parallel at Tonopah, Nev., as disclosed by the maps prepared by J. E. Spurr. Many pictures and maps are produced.

**ELECTRIC POWER PLANT ENGINEERING.** By J. Weingreen. \$5. McGraw-Hill Book Company.

The development of the electric industry has been so rapid in recent years that

it has been difficult to treat comprehensively of the various problems attending the generation and distribution of electrical energy. The present volume is intended to formulate as far as possible rules and regulations which may be used as guides in the various problems. It is assumed that the reader is familiar with the basic principles of electrical engineering, and with electrical machinery and instruments. Discussions of theory are therefore omitted and the higher mathematics eliminated as far as possible. The book has brought together a large amount of material which ought to be extremely useful to the engineer and contractor, and presents much information as to the latest and best methods of handling electric energy. It seems to be thoroughly practical. Moreover it does not assume that anything approaching perfection has been reached, and is careful to point out lines of possible future development. So many mining engineers have to do with the establishment and use of power plants, that the book should be a valuable aid to them.

**SUMMARY REPORT OF THE MINES BRANCH OF THE CANADIAN DEPARTMENT OF MINES FOR THE CALENDAR YEAR 1909.** Paper, illustrated, 181 pages, 10c. C. H. Parmelee, Kings' Printer, Ottawa.

This report gives statistics of the mineral production of Canada; those for 1909 already published in another form being subject to revision. A comprehensive review is presented of the work of the Mines Branch, which covered a wider field than usual. An account is given of the special investigations started in connection with the development of the government peat bog at Alfred, for demonstrating the practicability of the economic manufacture of air-dried peat; the demonstration at the fuel-testing station, at Ottawa, to show that peat and other low-grade fuels can be utilized for the production of power; and the coal tests at McGill University, the latter being completed. Considerable attention has been devoted to the collection of information in regard to mine accidents caused by explosives, showing that the larger number of fatalities in Canadian mines as compared with those of Great Britain is obviously due to the absence in the former case of protective legislation. As a result of this investigation remedial measures are now being prepared. Reports of field officers give the results of the season's work in investigating occurrences in iron ore, manganese, nickel and molybdenum in Ontario, Quebec and Nova Scotia; of the copper and sulphur mining industry in the province of Quebec; the gypsum industry in New Brunswick and Nova Scotia, and the coal-mining industry of Nova Scotia, together with the collection of additional data for a second edition of Fritz Cirkel's monograph on asbestos.



## i PERSONAL i

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

Wilbur E. Sanders is visiting New York.

Carl F. Dietz, of Dietz & Keedy, Boston, has returned from Europe.

Mark R. Lamb, of the Allis-Chalmers Company, Milwaukee, Wis., is in New York.

Charles Kirchoff, who has been abroad for several months, arrived in New York recently.

Allen H. Rogers left New York this week for Sonora and New Mexico to be absent about four weeks.

G. Harold Grant, of Victoria, B. C., was at the coal mines on Juan de Fuca strait, Washington, in August.

E. K. Soper has returned to Minneapolis, Minn., after several months spent on the iron ranges of Minnesota.

Hon. William Templeman, of Ottawa, minister of mines for Canada, is spending a few weeks in British Columbia.

H. F. Lefevre left New York last week on his way to Guatemala, where he expects to remain about two months.

Albert L. Waters, of Los Angeles, Cal., has gone to Tucson, Ariz., on professional business to remain several months.

R. G. Edwards Leckie, of Sudbury, Ont., has been examining mineral claims in Portland canal district, British Columbia.

E. H. Webster has resigned the management of La República mine, at Ocampo, Chihuahua, Mexico, effective Sept. 30 next.

John G. Worth has removed his office to the Equitable building, Denver, Colo. He is now in California, on professional business.

Francis A. Thomson, of Pullman, Wash., recently made several examinations in Sanders and Missoula counties, Montana.

E. Coppee Thurston has been examining mica deposits at Tete Jaune Cache, upper Fraser river, B. C., for a Minneapolis client.

Theodore Rudolph, of New York, has been appointed secretary and treasurer of the Sayre Mining and Manufacturing Company, Birmingham, Alabama.

John C. Brennon has retired from the firm of Carpenter, Brennon & Ryan, and has opened offices at 519 La Mutua, City of Mexico; also an office at Monterey.

S. H. Prunty, recently of San Luis Potosi, has bought the laboratory of William Collier at Guadalajara, Mexico. Mr. Collier will return to the United States.

H. L. Schleiff, of Berlin, Germany,

has just completed an examination of the tungsten deposits at Cedar Cañon, Deer Park and Loon Lake, in Stevens county, Washington.

Hugh D. Pallister, recently at the Case School of Applied Science, Cleveland, O., is now assistant in metallurgy in the School of Mines of the Pennsylvania State College.

Dr. George E. Ladd, president of the Oklahoma School of Mines and Metallurgy, has been in New York and Boston this week, selecting equipment for the new laboratories at Wilburton.

Charles von Brandis, of Durango, has been appointed general superintendent of mines for the Lucia Mining Company, at Gabriel, Durango, Mexico. A. Macfarlane, who formerly held the position, is now in Denver.

A. J. McMillan, for years managing director of the Le Roi Mining Company, Rossland, B. C., has been appointed liquidator by the shareholders, who have decided that the company shall go into voluntary liquidation.

D. C. Macdonald, of Berkley, Cal., superintendent of the Dominion Lode Development Company, which is developing a quartz mine on the divide between Dominion and Lombard creeks, Yukon Territory, is in San Francisco.

Horace V. Winchell, who has been spending some time in Sweden, attending the International Geological Congress at Stockholm and visiting Swedish iron mines, will sail from England for the United States early in October.

H. B. Maule, who has done much work for the Geological Survey of Great Britain and also in British East Africa, has been appointed director of the Geological Survey of Rhodesia, and has sailed from London to assume his new duties.

D. P. Roberts, chief electrical engineer of the city of London, Ont., has been appointed by the Government of British Columbia inspector of electrical energy for that province. This is a new office, created by the Provincial Legislature at its last session.

James McLean, vice-president of Phelps, Dodge & Co., has been chosen chairman of the Copper Producers' Association in place of Col. T. L. Livermore, resigned. Rudolph L. Agassiz, vice-president of the Calumet & Hecla, succeeds Colonel Livermore as a director of the association.

A. F. Allard, for some time engineer of construction in charge of the building of new coke plants for the H. C. Frick Coke Company, has been appointed engineer for the United States Steel Corporation, with headquarters at Gary, Ind. He will have charge of new coke plants at Gary and elsewhere in Indiana and Illinois.

## + OBITUARY +

James McCarthy, a mining engineer, well known in Alaska, was drowned Aug. 25, in McCarthy creek near Valdez.

Isaac L. Ellwood died at De Kalb, Ill., Sept. 11, aged 77 years. He was at one time prominent in the iron trade and was one of the early makers of barbed wire. He also took an active part in the establishment of tinsplate manufacture in Indiana.

William Harris died at Pachuca, Mexico, Sept. 6, aged 58 years. He was born in Cornwall, but had lived in Mexico for many years. He was for a long time with the Real del Monte, but for some years past had been with La Blanca Company.

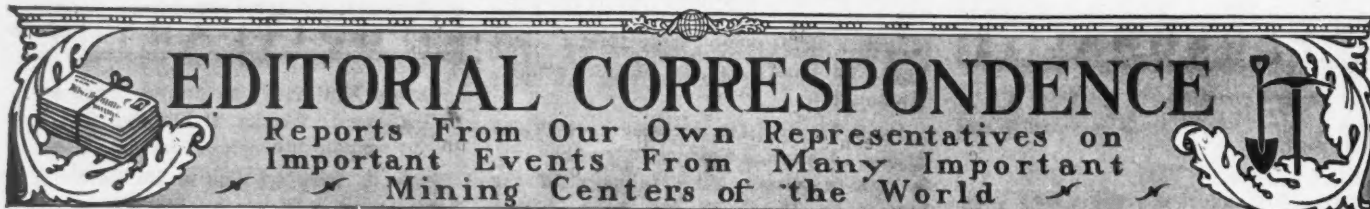
Theodore Giles Montague, a large stockholder in the Roane Iron Company, Chattanooga, Tenn., of which his brother, D. P. Montague, is vice-president, died Sept. 2, aged 74 years. He was connected prominently with banking, manufacturing and real estate interests in Chattanooga.

## SOCIETIES and TECHNICAL SCHOOLS

*American Miners of Pachuca*—At a meeting held at Pachuca, Sept. 6, it was decided to form an association including the American mining men of the district. C. W. Van Law and Walter McCann were appointed a committee to prepare the details and arrange for legal incorporation.

*Iron and Steel Institute of Great Britain*—The autumn meeting will be held at Buxton, England, Sept. 26-30. The following papers will be presented:

1. "Electric Steel Refining." D. F. Campbell, London.
2. "The Hanyang Iron and Steel Works." G. Chamier, Hankow, China.
3. "Manganese in Cast Iron and the Volume Changes during Cooling." H. I. Coe, Birmingham.
4. "Sulphurous Acid as a Metallographic Etching Medium." E. Colver-Glauert, Berlin, and S. Hilpert, Charlottenburg, Germany.
5. "The Theory of Hardening Carbon Steels." C. A. Edwards, Manchester.
6. "The Influence of Silicon on Pure Cast Iron." A. Hague and T. Turner, Birmingham.
7. "The Preparation of Magnetic Oxides of Iron from Aqueous Solutions." S. Hilpert, Charlottenburg, Germany.
8. "The Manufacture of Rolled H-beams." G. E. Moore, Loughborough.
9. "The Utilization of Electric Power in the Iron and Steel Industry." J. Elink Schuurman, Baden, Switzerland.
10. "The Briquetting of Iron Ores." C. de Schwarz, Liège, Belgium.
11. "Some Experiments on Fatigue of Metals." J. H. Smith, Belfast, Ireland.



## EDITORIAL CORRESPONDENCE

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

### San Francisco

Sept. 10—Sacramento and Stockton, the largest two of the interior cities of the State, situated on the navigable portions of the Sacramento and San Joaquin rivers respectively, were in the early days of mining in California, headquarters for outfitting for the mountain mining camps. When railroads were built this class of trade became small and both cities were more interested in the agricultural productions of the Sacramento and San Joaquin valleys and have since prospered greatly. Of late their citizens have gone into mining to considerable extent and numbers of mining companies are controlled by them. Large quantities of mining supplies are purchased in both cities and they are again on the lookout for miner's trade. And not only that but one of them at least is looking out for mining investors also. The Stockton Chamber of Commerce has set a good example and adopted an original plan to protect the name of the city from manipulators of "wild-cat" mining and oil company schemes. With the idea of keeping the public informed and prevent swindles, the chamber has appointed a standing committee of three members, consisting of one mining engineer and two bankers who will, on application, investigate the character of any mining proposition generally, and report on it to the chamber. The cost of the investigation must be borne by the applicants. The men who pass through the city on the way to the southern mines, often stop to make inquiries about properties, especially men from the Eastern States. As the Mother Lode counties are tributary to Stockton most inquiries relate to them and the necessary information is within easy reach. The plan is to bring the city into closer touch with neighboring mining communities.

Unless the "winter rains" set in early this fall a serious water shortage is imminent in the foothill and mountain counties where most of the gold mines are. Already a number of mining properties have had to close down and others have had to hang up part of their stamps at the mills. The hope now is that water will be available to at least keep up enough power so that mine pumping may continue without interruption. The big storage reservoirs of many of the power and ditch companies are unusually low for this season, and the rain must be depended on to refill them.

The lowest rate for years in the oil market now prevails in this State—30c.

per bbl. in the field. The heaviest purchaser announces that it will not pay beyond that price. This is on account of the excess production in Kern county. The price had been up to 50c., and above 40c. for some time but even this could not be sustained. Before the present heavy output began to affect the market, 63c. per barrel was given for fuel oil and it was expected that this rate would be raised. There are eight gushers now flowing in the Midway field, four of them being wonderfully large ones. Many hundreds of thousands of barrels of oil are being stored. The great Lakeview gusher is flowing about 17,000 bbl. daily. The American Oilfields well is yielding from 30,000 to 40,000 bbl. daily. The Consolidated Oil Company's well in the Midway field, which is 2000 ft. deep, is capable of throwing 3000 bbl. an hour, but is under control because the owners put on the proper appliances before the great flow was struck and can therefore now handle it at will.

The new employer's liability law passed by the last legislature was strongly opposed by the mine owners and managers, but without avail, since the influence of the labor unions was stronger than theirs. A decision has been just handed down by the Supreme court which shows what is to be expected when a damage suit is instituted under the new law. An employee of the Northern Power Company was injured while stringing wires, being ordered by the foreman to climb a tree to fasten a wire, when another tree fell upon and injured him. He was denied damages by the lower court and this has been upheld by the State Supreme court. In rendering the last decision, however, the court quoted the section of the civil code then in force, but intimated that under the new law the decision would have been the opposite.

### Denver

Sept. 10—The Denver mint has now begun, and it is stated will continue for some time, to turn out \$20 gold pieces at the rate of \$200,000 per day. On August, \$865,000 in \$10 gold pieces, and \$57,000 in 25-cent silver pieces, were coined, but work has been stopped on these and the whole force put on the double eagles. The increased call for gold for export is given as the reason.

A report comes from Cripple Creek that on the Little May claim, of the El Paso Consolidated property, a strike of extraordinarily high-grade ore has been

made, and it is further stated that samples across the vein yield \$1500 per ton in gold. This mine is at the contact of a vertical plug of phonolite with the Pike's Peak granite of Beacon hill.

The El Paso company's crosscut under the El Paso shaft, at the tunnel level, to connect with the churn-drill hole, is completed, and an uprise to connect with the shaft commenced. The distance between the two is 295 ft., and it is expected that water will be running through the deep drainage tunnel in about a month. It is not true, as stated, that the tunnel is already lowering the water in many of the mines.

### Butte

Sept. 12—At a conference of the United Mine Workers, being held in Billings, it has been decided to demand an increase of 5.55 per cent. in wages and an 8-hour day. This is considered by the coal-mine operators as equivalent to a 15 per cent. increase in the scale and will probably cause a determined resistance on their part. President James Pearson, of the operators' organization, in speaking of the action of the conference, states: "We have heard all along, that the miners would make no such demand and had hoped this was true. We simply cannot and will not accede to it, and on this point we are all agreed. The association is now paying the highest scale in the country. It is \$1 a day higher than in the East for the same class of labor and higher than is paid in Wyoming and Canada, both of which are competitive fields. It is up to these places to raise their scale before we should be asked to do so. The scale in Montana is higher for the reason that the basis has been the rate paid for metal mining and even now we are paying 25c. per day more than is paid in the metal mines. Not only are we paying a considerably higher scale, but the outlook for business is not at all flattering at present. We have never yet taken a stand against the miners, and had hoped we would not have to do so in this instance; but we simply cannot, in the face of existing conditions, agree to any further increase in the scale. Unofficial reports have from time to time been given out by delegates to the Mine Workers convention to the effect that they did not expect any demand for an increase in the scale, but it is possible that they were either not informed or had reference to demands other than those provided for by the Indianapolis convention."



## Salt Lake City

Sept. 10—New orebodies have recently been encountered in the Utah Apex making out along the limestone bedding from the Dana fissure. The reports which have appeared in the East to the effect that the Dana fissure was the main source of mineralization, but that until recently no ore had been found in the fissure itself, are incorrect in that ore has been mined from this fissure for six or eight months. The fissure has furnished a good quality of milling ore, containing some first class, and is mined for three sets or more in width. The ore found on the fourth level along the bedding carries from 20 to 24 per cent. lead, 11 to 34 oz. silver, and from 4 to 8.5 per cent. copper. This has been followed on the strike about 50 ft. A raise 90 ft. above the third level has cut ore where the continuation of the bedded body was looked for. There is approximately 500 ft. between the two points which has not been opened. Whether the ore is continuous, or whether these are two separate orebodies making from the Dana fissure is not yet known. The recently found bedded deposits are of interest as promising to open up new bodies of silver-lead ore of good grade and size in this section of Bingham. Beside the first-class shipped direct the Utah Apex is milling 180 tons of ore daily in its mill at the entrance of the Parvenue tunnel, and is earning from \$12,000 to \$18,000 a month. During August 5500 tons were milled. It is proposed to increase the capacity during the coming year.

The mill of the South Utah Mines and Smelters, at Newhouse, Beaver county, was placed in commission Sept. 2. During the last year the plant was thoroughly overhauled and practically rebuilt under the direction of A. J. Bejtles. Its normal capacity was raised from 800 to 1000 tons a day. From the experience gained with the old mill, it is thought that the changes will increase the saving, which was formerly 55 to 63 per cent., to between 75 and 80 per cent., and result in more economical operations generally. The mine is in condition to provide the necessary tonnage. Concentrates amounting to 100 tons a day are to be shipped to the International smeltery. A better freight rate than heretofore has been obtained from the San Pedro, Los Angeles & Salt Lake road. The limbering up of the machinery is progressing, and the mill will be brought up to capacity as soon as possible. There are 100 men at work in the mine and mill.

The Bingham & Garfield Railway Company, Aug. 29, filed a mortgage deed of trust with the county recorder. The deed is in favor of the Guaranty Trust Company of New York, to secure a bond issue of \$2,500,000 to provide for the construction and equipment of its line be-

tween Bingham and Garfield. The Utah Copper Company is named as surety. Work on the railroad is progressing. Between 30 and 40 per cent of the grading has been completed. It will be necessary to drive three tunnels, and work on these has been started. The road will run from Carr Fork along the north side of the cañon, and will be a little over 17 miles long. The maximum grade will be  $2\frac{1}{2}$  per cent.

## Cobalt

Sept. 10—The new road from the Keely mine to Silver Center, in South Lorrain has recently been completed, and it is now possible to make ore shipments. The first shipment this summer is being sent out from the Wettlaufer property, where there are two or three cars in the ore house. The new substation of the Mines Power Company will shortly be finished and then the mines will be able to operate by electric power. A very noticeable improvement has recently taken place in several of the properties. Good ore has been discovered on the Frontier, and a crosscut is being run from the bottom of the shaft to open up the main vein. Many other important discoveries have been made on other properties and there is considerable activity prevailing.

A. A. Cole, engineer of the Railway Commission, has just returned from Gowganda, and reports conditions to be very promising. Good ore has been discovered on the 120-ft. level of the Miller Lake-O'Brien mine, and the property gives every indication of becoming a producer. Several other claims are also showing up well, and the shipments next winter will probably exceed those of last season.

## Toronto

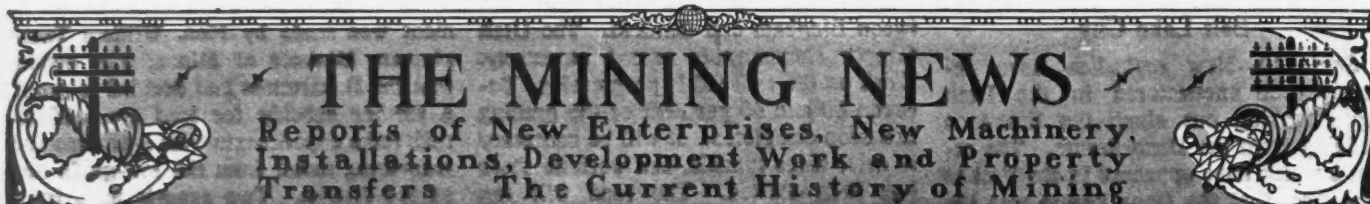
Sept. 11—Sir Wilfrid Laurier, Premier of Canada, and his party, comprising several members of the Government, who have been touring through the West were at Lethbridge, Alta., on Sept. 1, and visited two coal mines operated by the Alberta Railway and Irrigation company. Strong representations were made to them by coal operators in favor of reciprocal free trade with the United States in order to enable them to obtain a market for their product. There are in all seven mines in the district, having a capacity of 1600 tons per day, the output being domestic coal, which sells at the mines for \$3.85 per ton, but owing to high freight rates and tariffs the price in Montana and Winnipeg is \$8 per ton. With free trade the market in the United States would be greatly extended and large coal deposits now undeveloped for lack of a market, would be opened up.

At Nelson, B. C., during the course of the Premier's trip, an important announce-

ment was made by Hon. William Templeman, Minister of Mines, who stated that the Department had decided to grant a further subsidy for lead ore, and to undertake experiments with a process for recovering metal from the low-grade ore of the district. Two experts have been engaged to conduct official experiments at the Nelson smeltery.

## Rossland, B. C.

Sept. 6—Acting on the advice of the company's consulting engineer, W. A. Carlyle, of London, the shareholders of the Le Roi company will not spend more money in exploring for ore, but have decided the company shall go into voluntary liquidation. Mr. Carlyle reports that during the last ten years a large amount of exploration has been consistently done, including much diamond drilling, of which 27,000 ft. have been bored since June, 1906, and of this 15,000 ft. within the last 12 months. He says, further, the last of the known pay ore is being stoped out and realized upon. To effectively explore for more ore at least \$500,000 would have to be provided, but with the knowledge of the mine now possessed after the extensive exploratory work done during the last 12 months, he cannot hold out hope that there is a prospect of success even if the large expenditure of money it would require were to be made. The company has valuable assets, free and unencumbered by mortgage, and has no debenture issue. Its debts, outside of current expenses, total about \$55,000, against which there is cash on hand and money due for ore and products shipped, together approximately \$40,000. A statement published two years ago showed that from February, 1889, to September, 1908, there had been taken from the Le Roi mine 1,445,246 tons of ore, containing 689,057 oz. gold, 1,038,906 oz. silver and 41,600,740 lb. copper, together of a value of \$20,406,627, or an average of \$14.12 per ton. The Le Roi Mining Company, Ltd., was organized in London, June 7, 1898, under the laws of Great Britain, with capitalization £1,000,000, shares £5 par, fully issued and fully paid. Only £50,000 working capital was provided, but as on Nov. 7, 1899, a dividend of 5 shillings a share was paid, it has had actually no cash capital from the shareholders for development or equipment purposes. Two dividends were paid in 1906, one shilling and 6 pence in March, and two shillings in November. Prior to sale by Spokane, Wash., owners to the British-America Corporation, London, in Jan., 1898, the Le Roi paid its American shareholders \$995,000 in dividends. Under British ownership much money had been spent in expensive machinery equipment, sinking the 5-compartment main shaft 1700 ft., and purchase of the smelting works at Northport, Washington.



# THE MINING NEWS

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

## Alaska

Throughout the Fairbanks district operators are complaining of a shortage of the supply of water and mining operations are seriously hampered, some mines being closed down, while others are working single shifts or with reduced crews. On No. 6, below Dome creek, where in other seasons there was a sluice head flowing, there is scarcely enough water to supply the boiler.

The Scrafford arrastre, at the junction of Skoogey gulch and Twin creek, which has been milling ore from the Center Star lead, has been closed down while new and heavier bearings are being installed.

*Unik*—This placer property is being examined by J. J. Martin, representative of the Chicago Exploration Company. A wagon road is being built.

*Red Wing*—This mine in the Ketchikan district is being examined by Seattle parties, and if conditions are favorable, development will continue.

*Seal Bay*—P. Heaney has made a small test shipment from this property. The tunnel is in 1600 feet.

*Nome Gold Gravel*—This company will build another dredge this season for use on Cripple creek. E. R. Jordan is manager.

*Quartz Creek*—Edmund Smith and George Treat are planning to install a hydraulic plant on their claims next season.

## Alabama

The Sloss-Sheffield Steel and Iron Company is repairing and improving three blast furnaces and expect to blow in one of the Birmingham city furnaces within the next three weeks.

## Arizona

### GILA COUNTY

*National Mining Exploration*—The station on the 778-ft. level of the Williams shaft is complete. There are two gangs of men at work on this level at present and two drifts are being run.

*Warrior*—Development is continuing in the western portion of the workings on the 330-ft. level drifting westward on the footwall side of the ore-bearing trough.

### PIMA COUNTY

*Imperial*—The smelting plant produced 400,000 lb. in August before closing. Development has been continued, both in the underground workings at the main Imperial property and in the porphyry ground, where efforts are being made to

prove up a large tonnage for steam-shovel operations. Imperial entered the producing ranks in 1904 and has yielded about 40,000,000 lb. of copper and approximately 400,000 oz. of silver.

## California

### CALAVERAS COUNTY

*Waterman Gold Mining Company*—This company has been organized by John Ross and others to work the Centennial and Fairfax mines, at Angels. An old prospect shaft has been cleaned and good ore found within 50 ft. of the surface. The vein is 15 ft. wide.

### COLUSA COUNTY

*Ruby King*—This property, in the northern part of the county, was originally worked for copper. It has been found that there is a vein of cinnabar, which will be worked. Dr. A. M. McCollum is president and A. C. Kaufman, secretary.

### FRESNO COUNTY

*Fresno Copper Company, Ltd.*—This company, owning mines and a smeltery west of Clovis, has paid off one mortgage and has assumed another under a trust deed, reducing its indebtedness by about \$15,000. The Wellman-Seaver-Morgan Company, of Ohio, has released a mortgage of 1907 against the copper company for \$55,000 and the copper company last month gave a trust deed to the California Title Insurance and Trust Company for \$40,000.

*Davis Flat*—This company operating a quartz mine at Davis Flat has decided to put up a 5-stamp mill. R. E. Stevens and A. R. Steinwand, of Selma, are interested.

### KERN COUNTY

*Ramey*—The 12 claims located some years ago by J. E. Ramey, in Hamilton district 20 miles east of Caliente, have been sold to a Duluth company which has commenced operations and will soon put up a 10-stamp mill. Mr. Ramey will represent the company.

*Black Hawk*—This group, three miles southeast of Randsburg, is now being operated by Byrne, Kuffel & Noyser, and a 5-stamp mill is being run steadily.

### MARIPOSA COUNTY

*Evans*—From this mine near Bagby, McMaster, Leperron & Buckley, have taken \$4000 from a pocket.

*Mount Gaines*—This mine at Hornitos, now closed owing to legal tangles, is ex-

pected to start shortly under new management.

*American Eagle*—This group, in Quartzburg district, near Exchequer, has been purchased by J. E. Meyer, of Los Angeles. The principal vein is nearly 50 ft. wide at the surface. The old tunnel will be now extended and a new one driven. Electrical power is assured for a milling plant. B. R. Binns is in charge.

### MONO COUNTY

*Casa Diablo*—New orebodies are being opened up in depth in this mine. The shaft will be deepened and the main tunnel extended, and a crosscut tunnel run. Immediate construction projected is a 100-ton tube mill and an agitating tank for treatment of concentrates and tailings. The address of the mine is Bishop.

*Gray Butte*—Operations have been resumed on this property west of Benton and Superintendent Austin is driving a long tunnel to tap the vein.

### NEVADA COUNTY

*Black Bear*—The high-grade ore recently mined has been milled. As soon as the dimensions of the pay shoot are determined, a mill will be built by Manager C. L. Wilson.

*Red Ledge*—This company has been organized to work the Red Ledge mine at Washington. Clyde M. Cole and R. F. and T. B. Williamson are among the incorporators.

*Consolidated St. Gothard*—This company is sinking the shaft of the Delhi mine 200 ft. and the mill has been hung up until stoping begins.

*Round Mountain*—Albert Rickard and Elmer Hitchcock, who are opening a claim at this place, have found gravel on bedrock.

*Oakman*—At this property, Washington, Frank Dillon, manager, a new compressor has been installed and the tunnels will be equipped with machine drills.

*Fairview*—The 20-stamp mill at this mine, Washington, will be ready to start in two weeks. It will be operated by water power. John C. Nilon is superintendent.

*Birchville*—A fire at this mine, Graniteville, has destroyed the mill, hoisting works, and all the buildings.

*Delhi*—The chlorination plant at this mine will be overhauled and started running on accumulated concentrates. James H. English is in charge of the plant.



## PLACER COUNTY

In the recent fires on the Forest Hill divide the sawmill, shaft house and machinery of the Hidden Treasure drift mine were destroyed; loss, \$20,000. The fire is supposed to have been incendiary. It extended to the adjoining forests, menacing Damascus, Red Point and Acacia. The buildings of the Macedon mine at Whisky Hill were also burned. Federal troops were called out to fight these fires which is the first time they have been called upon to perform such service outside the Yosemite National Park.

*Dardanelles*—At this Forest Hill divide drift mine, a 300-ft. tunnel will be run.

## Colorado

## CLEAR CREEK AND GILPIN COUNTIES

James Beshear, after whom Camp Beshear is named, is reported to have just opened up at a depth of 18 ft. a body of smelting ore one foot wide, a mill test of which returned \$110 per ton in gold. Great excitement prevails.

## LAKE COUNTY—LEADVILLE

*Ibex*—During the past week, Cofield and Kyle, leasing on this mine, took out 116 lb. of gold ore which yielded 92 lb. troy of pure gold. A specimen weighing 13 lb. avoirdupois, when run down, is said to have yielded 10½ lb. troy of gold.

*New Monarch*—Guides for a cage are being installed in the shaft of this Little Ella Hill mine, while prospecting still continues on the east extension of the Silent Friend vein recently opened up in the lower levels.

## TELLER COUNTY—CRIPPLE CREEK

*Cresson*—The August production of gold ore was approximately 3250 tons, of an average of \$20 per ton.

*Isabella*—The August production of this property was 1232 tons, of an average of about \$25 per ton. It was produced entirely by lessees.

*Ajax*—During August, this Battle mountain property produced 52 cars of gold ore, the average being about \$20 per ton.

*Lexington*—At the 350-ft. level of the main Lexington shaft, on the Clara D. claim, Lessee Ivor Weston has opened a new vein 4 ft. in width, a trial shipment from which gave returns of \$32.50 per ton.

*American Eagles*—Lessee Jones is said to have opened a new vein 8 ft. in width at the breast of his drift at the 700 level, assaying \$20 a ton.

*El Paso Consolidated*—Oscar Fogleman, lessee, has opened a new shoot of ore, said to be 4 ft. wide, of an average grade of \$40 per ton.

*Granite*—The retimbering of the Gold Coin shaft having been completed, many leases are being granted, and as soon as the Granite lower levels have been un-

watered it is expected that the production will reach 1000 tons per month.

*Dolly Varden*—This mine, under lease to T. A. Colburn, of Denver, is being unwatered, with two pumps going, and will be actively worked again.

## SAN JUAN DISTRICT

*Tomboy*—Returns for August: Crushed 10,000 tons, yielding bullion, \$38,500; concentrates shipped, \$34,500; expenses, \$48,000; profit, \$25,000.

## Indiana

## KNOX COUNTY

As soon as titles are obtained, a new coalfield will be opened and several mines will be in operation before winter. The lands comprise between 2000 and 2500 acres and have been optioned to J. W. Sherwood & Co., of Terre Haute.

*Hoosier Mining Company*—This company, at Vincennes, has been incorporated to mine fluorspar, lead and zinc. The directors are J. L. Biddle, G. H. Cramer and W. H. Whitaker.

*Worth-Huskey Coal Company*—This Illinois company has brought suit against the Freeman Coal Company, operating at Bicknell, to compel the defendant to carry out the terms of a contract by which the Indiana company was to furnish the Illinois company with its entire output, and to enjoin the Indiana company from selling to any other company. It is asserted that the contract was to continue until April, 1911, but that Aug. 30 the officers of the Indiana company demanded a change that would mean an increase in price, and said that unless this was acceded to the mine would be closed to make improvements. It is contended that these improvements are not necessary.

## SULLIVAN COUNTY

Two coal-mining companies of Illinois were admitted to Indiana during the past week. Both will do business in Sullivan county. The Averill Coal Mining Company, of Chicago, capital \$125,000, will invest \$25,000 in lands and mines with offices in Hymera; Edward G. Lewis, State agent in charge, and C. A. Beckett, president. The Worth-Huskey Coal Company, of Chicago, will invest \$20,000 in coal mining. The company has offices at 820 State Life building, Indianapolis; Thomas C. Evans is State agent; William P. Worth, of Chicago, president.

## Maine

Jasper Wyman, of Millbridge, and others have secured an option on Katahdin Iron Works properties in Piscataquis county, at \$250,000 and have employed Chester A. Gilbert, of South Bethlehem, Penn., to examine the ore beds. Should Mr. Gilbert's reports warrant it, Senator Wyman and his associates propose to resume the operations that were abandoned 25 years ago. The ore is an iron sulphide.

## Michigan

## COPPER

*Victoria*—The company continues developing good ground at the bottom, or 22nd level of its shaft. About 1600 ft. of drifting has been done at this point and 800 ft. west of the shaft a rise has been put to 70 ft. with good rock throughout. The new shaft east of this is down 450 ft., where a plat is being cut for the third level. Copper ground has appeared from time to time and a drill core taken from 700 ft. was well mineralized.

*Algoma*—The company has put its steam plant into commission and a pump has been installed to take care of the water which interfered with sinking. The shaft is down 50 ft. with copper ore throughout. The drill sinking to determine the pitch of the formation is down 400 ft., but has not encountered anything.

*South Lake*—No. 5 drill sinking to further determine the character and trend of the amygdaloid formation exposed in Nos. 3 and 4 drill holes has entered the vein after passing through 275 ft. of overburden and it is estimated that it will encounter the first of the series at 500 feet.

*Lake*—This company's shaft is being sunk close to the eighth level and at the seventh level a crosscut is being driven to cut the lode. Openings in the levels above continue showing good ground. Nine drills are in operation at the present time and as soon as the enlarged compressor capacity is ready, a more aggressive policy will be pursued.

*Clark*—The United States Smelting, Refining and Mining Company holds the option on this property, near Copper Harbor, Keweenaw county, where diamond drilling was started a short time ago.

*Island Copper Company*—Thomas F. Cole will endeavor to open up the copper property on Isle Royale, 70 miles north of the Michigan peninsula in Lake Superior. Mr. Cole and his assistants came into possession of this property several years ago. It possesses 84,000 acres. A portion of the property, in which there is a conglomerate lode, will be mapped preparatory to diamond drilling.

## Minnesota

Shipments of iron ore from the Cuyuna range will be sent forward over the new Soo line this fall. The initial movement will consist of 50,000 tons from the Kennedy mine of the Rogers-Brown company. The ore will come to Duluth over the new Soo line and will be taken to Ashland for Lake shipment. As soon as the Soo's ore docks at Superior are completed, the ore will be loaded into holds there. Three additional mines will go on the shipping list next year. The prospective producers are the Armour, Interstate and Section 17, operated by the Rogers-Brown company. The shipments

of ore next year are estimated at 1,000,000 tons. About 50,000 tons of ore is on the dump at the Kennedy mine.

### Montana

#### BUTTE DISTRICT

*East Butte*—The plant at the company's lime quarry, at Lime Spur, Mont., was destroyed by fire Aug. 31, the damage being estimated at \$10,000. The quarry has been furnishing lime for the smeltery and since there is a considerable supply of lime now on hand no immediate inconvenience will result.

#### FERGUS COUNTY

*Barnes-King*—Work on the property was resumed Sept. 5. George McGee has resigned as superintendent and J. L. Bright will be in charge temporarily. Efforts will be devoted to the opening of new orebodies with enough actual mining to pay expenses. About 25 men will be employed.

#### JEFFERSON COUNTY

*Boston & Alta*—The Butte Machinery Company has brought suit against this company for \$2900 for machinery, and the claims have been attached.

#### MADISON COUNTY

Surveyors and miners under the direction of W. E. Watson have recently located 4000 acres of placer claims along what is believed to have been the original channel of Alder gulch. The theory upon which this party is working is that the deposits of gold in the vicinity of Alder gulch came originally from the bed of the old creek. An eruption is supposed to have destroyed the formation of the old creek channel and covered it with a lava capping. A mining engineer from the placer fields of Oroville, Cal., has given his opinion that the formation is identical with that of certain California placers which have produced many millions.

### Nevada

#### CHURCHILL COUNTY

*Nevada-Wonder*—A contract has been closed with the Mill and Smelter Engineering Company of New York for a modern 100-ton all-slime cyanide plant. The ore carries gold and silver in quantity.

#### ESMERALDA COUNTY

*Goldfield Annex*—Lateral work has been commenced at 1025 ft. One crosscut is being driven southwesterly in an attempt to pick up one of the rich shoots of the Consolidated Clermont workings which are only 600 ft. distant.

*Goldfield Consolidated*—Construction is rapidly being completed. The new concrete storehouse at the mill is ready for use and the transformer house is nearing completion. Steel is arriving for the new refinery and will be put up as rapidly as possible. At the mines the

new electrical distributing station, the assay office and other work is progressing more slowly.

*Nevada-Eagle*—The first shipment of ore has just been hauled to the Western Ore Purchasing Company. This ground, three miles west of any other producing property, has been under development for four years and the indications are now favorable.

#### NYE COUNTY

Tonopah ore shipments for the week ended Sept. 4 are: Tonopah, 3150 tons; Tonopah-Belmont, 1700; Montana-Tonopah, 968; Tonopah Extension, 840; Mac-Namara, 200; West End, 500; Midway, 50; total, 7408 tons.

*Montana-Tonopah*—Two new orebodies have been encountered on the 465-ft. level, one east of the shaft and the other in the footwall branch of the Triangle vein, west of the shaft.

*Tonopah-Belmont*—The shaft which is now widened to within 45 ft. of the surface should be completed and equipped by Oct. 15. The steel gallows frame is under way.

*Tonopah*—Mill report for the week shows 97 out of 100 stamps dropping constantly; 3470 tons crushed; average extraction, 93 per cent.; bullion shipments, \$78,000.

*Johnnie*—The present 800-ft. shaft will be sunk to 1200 ft., while a new shaft, 3000 ft. south, is planned.

*Montgomery-Shoshone*—The company is said to be operating at a total cost of \$3.80 per ton, this amount being almost equally divided between mining and milling expense.

#### WHITE PINE COUNTY

*Cumberland-Ely*—The temporary injunction issued Aug. 26 by Justice H. C. Peabody, of the Maine Supreme Court, restraining the taking over of the Cumberland-Ely Copper Company by the Nevada Consolidated Copper Company, has been vacated. The transfer of the Cumberland-Ely property to the Nevada Consolidated is in progress.

*Nevada Consolidated*—The company is reported to be getting the Ruth mine in shape for production, so that a percentage of "warm" ore from underground workings will be available during the winter when the cold, wet ore from the surface workings in the steam-shovel pit is apt to cause trouble and delay by freezing in the ore cars.

*Giroux*—The company is planning to start the crosscut from the 1200-ft. level of the new shaft toward the Alpha workings. Cement foundations for the pumps at the 1200-ft. station are being put in. Structural steel workers are expected daily and on their arrival the power plant and other surface buildings will go up rapidly.

### New York

*Peru Steel Ore Company*—The company has sold its ore lands north of Ausable river to Witherbee, Sherman and Company, of Port Henry. The property will be operated.

### Oregon

#### CURRY COUNTY

*Idaho Blacksand Gold Saving Company*—The company has begun the construction of its mill and buildings at Gold Beach.

#### JOSEPHINE COUNTY

Haldsworth & Co. have installed a suction dredge on Rogue river in the Argo diggings. This is an experiment, and if it proves successful a number of machines will be put in operation. The Rogue River Dredging Company is also installing a large bucket dredge below Galice on the property recently owned by Harry Lewis, on Rogue river.

*Almeda*—The new machinery at this mine is installed, and with the completion of the motor-truck road now being built from Leland to the mine, this property will be in good condition.

#### LANE COUNTY

Lewis Hartley has completed the installation of his one-stamp mill in Salior's gulch, in Bohemia.

*West Coal Mines Company*—Dr. Herbert E. Smith, of New Haven, Conn., after having made an inspection of the mining properties of this company in the Bohemia district, returned East. The inspection of the property was in the interest of the Wheeler estate and, after Dr. Smith's report on the conditions, a decision will be arrived at as to what will be done in the future.

*Mayflower*—This mine, the property of the Kelso Mining and Milling Company, is making a good showing. During the summer large quantities of ore have been put onto the dump, and the stamp mill, which has been shut down on account of the low water, will resume.

*Review*—A shoot of ore 200 ft. in length and from 3 to 8 ft. wide was recently discovered at this claim. The Review adjoins the Grizzley.

*Blue Bird*—A car of machinery has been taken to this property. In the consignment was a stamp battery and ore crusher. Activity is shown in the mines near Blue river.

### Pennsylvania

#### ANTHRACITE COAL

*Philadelphia & Reading Coal and Iron Company*—The statement for July, the first month of the fiscal year, shows gross earnings, \$1,499,664; expenses, \$1,707,847; deficit, \$208,210. As compared with July, 1909, there was a decrease of \$97,431 in gross earnings, and an increase of \$193,971 in the deficit.



## South Dakota

**Hidden Fortune**—The property was to have been sold Sept. 1 for taxes aggregating some \$27,000, but an extension of 30 days was granted by the court, the receiver's bill of about \$10,000 having been settled.

**Golden Crest**—The affairs of this company, at Galena, have been aired in the courts during the past month. The suit of the Stearns-Rogers Manufacturing Company to compel payment of \$1250 balance due on the construction of the 40-stamp mill was decided in favor of the plaintiff. F. W. Bird, one of the largest stockholders, instituted a mandamus proceedings against R. Baillie, president, to compel him to permit an examination of the books, and an order was made by the court to allow such inspection.

**Homestake**—The tunnels of the hydroelectric project in Spearfish cañon have been completed with the exception of a few hundred feet. The work of lining the ditches and tunnels with cement remains to be done. The Westinghouse company has secured the contract for the electrical equipment, which will be driven by Pelton wheels and which is expected to furnish a minimum of 4500 horsepower.

## Tennessee

Two hundred citizens of the State of Georgia filed a bill in chancery court at Benton, Polk county, against the Tennessee Copper Company seeking to enjoin the company from operating its plant and asking for damages by reason of the alleged destruction of timber and crops by smoke and fumes. Chancellor McConnell issued an order citing the defendant company to appear the first Monday in October.

## Utah

## BOX ELDER COUNTY

**Salt Lake Copper**—Repairs on the tramway have been completed, and shipments of iron ore to the United States Smelting and Refining Company will be resumed.

## DAVIS COUNTY

**Burro**—This property in Mill Creek cañon east of Bountiful has shipped its first car. Development is by tunnel.

## GRAND COUNTY

**Wilson Mesa**—Work is being done on this placer ground, some parts of which are said to carry \$1.23 per cu.yd. A "giant" has been installed. A cleanup recently is reported to have given \$1800.

## IRON COUNTY

**Gold Springs**—The crosscut on the 300-ft. level of the Jennie mine has encountered the vein, which shows a width of 15 ft. The ore carries more gold than on the upper levels.

## JUAB COUNTY

**North Tintic-Iron Blossom**—This company has filed articles of incorporation. The capital is \$100,000 in shares of 10c. each. The holdings consist of 11 claims in the north end of the district. James Morgan is president.

**Provo**—Work will be started shortly on this property in East Tintic, by leasers. The Eureka Leasing Company, which did some work here, encountered ore but not in paying quantity.

**Black Diamond**—This quartz mine between Johnsville and Gibsonville is now being worked again by Eastern capital under supervision of W. E. Holdie, president of the Crescent Hill company.

**Yankee Consolidated**—A contract for sinking the shaft 400 ft. was given to Sam Scott and Ralph Kellogg. Work was started Aug. 13, from a depth of 905 ft. While this work is being done, development will be carried on by the company on the 300-ft. level. Six sets of leasers are operating in the old workings, and making wages, or better. The new electric hoist is running smoothly.

**Daly-Judge**—The work of unwatering the shaft from the 1500- to the 1600-ft. level was started Aug. 14, and the 1600 station has been reached. Work of cleaning the station and mucking out the drift has been under way, and it is expected that the ore exposed when the miners were driven out by water several years ago will soon be reached. The mill is being driven with the new electrical equipment.

**Chief Consolidated**—Excavating for the new shaft house has been completed, and foundations for the hoisting machinery are being laid. The structural steel is expected shortly. A well is being sunk on property obtained from the Crusader group, and when water is encountered it will be pumped to the mine.

**Black Jack**—A contract for 200 ft. of drifting on the 1000-ft. level has been given. The work will be done in search of ore opened in the Oponongo.

**Bullion Beck**—Development on the west dip deposit continues to produce good ore. Two cars from the 300-, 400- and 500-ft. levels have been mined.

**Dragon Iron**—The shaft is down 650 ft., and is being continued. The output is from 20 to 30 cars per week.

**Victoria**—The capital has been increased from 250,000 to 700,000 shares, of which present stockholders are to receive two shares in exchange for each share of original stock. There will be 200,000 shares held in the treasury.

**Iron Blossom**—Work on the 500-ft. level of the No. 1, or South shaft has opened the gold-copper orebody for several hundred feet. In places the ore is 30 ft. in width. Drifting for this ore is being done on the 600 level.

**Crown Point**—Grading for the new buildings is in progress. Work will be started at once on the new shaft 1300 ft. from shaft No. 2 of the Colorado mine. A road has been built to the property, and a pipe line will be run from the Colorado to furnish air.

**Governor**—Ore in the Iron Blossom is nearing this company's ground. Development through the Black Jack workings has been stopped, but will be continued from the Iron Blossom side, when this company's drifts reach the Governor lines.

**Colorado**—New ore is being opened on the 300-ft. level, and is being followed south toward Sioux ground. There is still considerable undeveloped territory in this neighborhood.

**King William**—This property, which adjoins the Eagle & Blue Bell, Centennial Eureka and Grand Central, has been financed by C. H. Griffin, Samuel Newhouse and associates, who have taken over a block of treasury stock. The ground will be developed from the 1000-ft. level of the Eagle & Blue Bell, which has been extended 200 ft. into King William territory. This level corresponds to the 1900-ft. level of the King William. New air pipe, rails and ties are being put in, and drifting will be started. Work will also be done from the 500-ft. level of the Eagle & Blue Bell.

**Sioux Consolidated**—A monthly report, issued Aug. 10, shows that 46 cars were settled for during July, giving returns of \$25,527. Twenty-eight cars shipped up to Aug. 10 netted \$21,520. The grade has been improving.

**Vulcan**—A lease and bond has been taken on this property, at Fish Springs, by J. P. Nelson, of Salt Lake City. The ground adjoins the Utah mine and is on the same mineral zone. Supplies have been ordered, and work of cleaning the workings will be started Oct. 1. Silver-lead ore has been produced above the 200-ft. level.

**Emma**—This property, which adjoins the Vulcan, has been taken under lease and bond by E. J. McCune. It has produced silver-lead ore. Work will be started soon.

## SALT LAKE COUNTY

**Columbus Extension**—Six feet of ore is exposed in a fissure in quartzite near the face of the 4000-ft. tunnel. The limestone contact has not been reached. A raise has been driven on the ore, and preparations for shipping are being made.

**South Columbus**—At a special meeting, the merger with the Alta-Hecla was agreed to. The merger will be known as the South Hecla.

**Ohio Copper**—According to eastern advices, the reported sale of \$1,000,000 worth of bonds has not been effected. The bonds are understood to have been

placed with foreign bankers, who agree to market them, but do not guarantee the sale.

**Yosemite**—This property was recently drained by a drift from the Mascot tunnel. Work will be started from the inclined shaft, which has reached the 800-ft. level. A new hoist and compressor will be installed.

**Columbus Consolidated**—The ore developed on the 400-ft. level has been cut on the 300, and work has begun in search of it on the 200. Twenty teams are hauling to Murray.

#### TOOELE COUNTY

**Bullion Coalition**—Shipments from the body of lead-silver ore on the 600-ft. level are reported to bring around \$20 a ton. The Honerine tunnel is being continued, and is 1700 ft. vertically below the surface at the face.

**Cliff**—About 70 tons of ore daily were mined during August. The lower tunnel is in about 3000 ft., and is approaching the ore zone, which it will cut at 1500 ft. depth.

#### UTAH COUNTY

**Mountain Dell**—Between two and four feet of ore has been opened in the west drift on the 300-ft. level. Shipments are being made.

**Mineral Flat Extension**—On account of the good showing, additional men are being added. It is proposed to build cabins, and take in supplies.

**Sara**—Progress is being made on the tunnel driven from American Fork cañon to cut a vein showing lead and silver on the outcrop.

#### Washington

**Tacoma Smeltery**—Extensive improvements costing about \$150,000 are to be added to this plant.

#### FERRY COUNTY

**Chimacum**—Operations on this property, owned by the Michigan Mining Company, are being pushed, under the direction of Herman Camerer, of Rosalia. The tunnel is in about 320 ft. The company has also bought the Quin claims.

**North Star**—New machinery will be installed at this mine, of which J. E. Pickereil is manager.

**Copper King**—Work has been started on this property by L. Larson, the owner.

**New Republic**—The cyanide plant, which will have a capacity of 100 tons a day, is about half completed.

**Insurgent**—Regular shipments are being made and work on sinking the shaft is continuing.

**Knob Hill and Mud Lake**—These claims have been leased to Robert Maboy, J. W. Floyd, L. W. Anderson and others. A corporation will be formed, and development undertaken.

#### STEVENS COUNTY

Forest fires have done an untold amount of damage to the mines in this vicinity, destroying buildings and machinery.

**Grouse Creek Copper**—Work is being done at this property in the hope of finding the vein under Grouse creek. The mine is owned by Montana people.

#### Canada

##### BRITISH COLUMBIA

**Kootenay Silver-Lead**—The recently organized Kootenay Silver-Lead Mines, Ltd., has commenced work at the Highland mine and concentrating mill, Ainsworth, H. Shell, of Denver, is manager, with about 30 men in mine and mill. Silver-lead ore and concentrates are being shipped to the Consolidated smeltery at Trail.

**Perry Creek**—This hydraulic company is working between 20 and 30 men on its placer gold claims on Perry creek, East Kootenay. A steam shovel is used to lift gravel into the sluices.

**Iron Mask**—Retimbering and straightening the 600-ft. shaft of the Iron Mask mine, Kamloops, is in progress. When this is completed mining will be resumed.

**Hosmer**—Exploration of the coal measures on the south side of the creek has been commenced. Output of coal from mines off main tunnel is now 700 tons daily, about half of which is made into coke for the Trail smeltery.

**Cliff**—This property near Rosland is being developed under the supervision of W. Y. Williams.

**Aurora**—The showing at this mine at Moyie is encouraging. Excavation has been started on the concentrator.

**Whitewater**—The work of getting the plant running at this mine has been hindered by lack of railway facilities, the Great Northern having lost several bridges in the forest fires.

**Nickel Plate**—The new machinery at this mine is installed and will soon be running, 150 men are employed.

**Fife**—It is reported that operations at this mine at Fife will be increased. The ore is gold-copper.

**Lucky Jim**—Work has been started on new buildings to replace the ones destroyed by fire. Work will be continued on No. 5 tunnel, and an adit to be called No. 6 will be started.

**Pueblo**—The first shipment of 4000 tons of ore has been made from this mine, 12 miles from White Horse. W. D. Greenough has charge.

#### ONTARIO

Shipments of ore from Cobalt for the week ended Sept. 2 were: Buffalo, 59,500 lb.; Chambers-Ferland, 64,000; Coniagas, 103,880; Crown Reserve, 64,000;

Hudson Bay, 57,100; Kerr Lake, 181,075; McKinley-Darragh, 65,050; Nipissing, 379,390; Right of Way, 57,600; Temiskaming, 141,000; total, 1,172,635 pounds.

**Badger**—Two new veins have been discovered on the surface in the Keewatin formation at this Cobalt mine. During the summer 6000 ft. of trenching and stripping has been done with promising results.

**Nova Scotia**—Very rich ore, reported to run 10,000 oz. in silver to the ton, is being taken out of the vein at the fifth level of this Cobalt property. The strip on which the vein is located is claimed by the Peterson Lake Company, and the ownership is now the subject of litigation.

**Rochester**—A vein showing good silver content has been uncovered on the surface of a property adjoining this mine at Cobalt, about 100 ft. from the Rochester shaft. It is supposed to be the vein which disappeared from the shaft at 50 ft. two years ago. Drifting in the direction of the vein will be started at once.

**Temiskaming**—A statement for the month of August shows the product from the mine 171,968 oz.; from mill 80,000—total, 251,968 oz.; net value, \$125,984—total cost of operation, \$22,014, leaving balance of \$103,969.

**Gates**—This Gowganda property has taken out a carload of rich ore by team to be shipped by steamer on Elk lake.

**Moose Mountain**—As a result of a visit of inspection recently made to this iron property by Pres. John W. Gates, D. D. Mann and others interested, the directors have authorized the expenditure of additional capital sufficient to increase the output of concentrated ore from the present production of 400 tons daily to 1000 tons. The ore finds a market at Cleveland, Ohio.

**Mikado**—This mine, in the Kenora district, Western Ontario, has been unwatered and stoping and development are going actively forward on the upper levels. Some rich ore and a large body of low-grade occurs on the 180-ft. level and it is estimated that there is enough ore of milling quality to keep the 20-stamp mill running for two years. A gold brick, valued at \$1200, has been produced from sweepings of dirt encountered in the course of repairs to the mill. Twenty-six men are employed.

**Dome Mines**—A party, including Ambrose Monell, Capt. J. R. DeLamar, Charles L. Dennison, Captain Lawson, Tom Jones and W. S. Edwards, are making an examination of the Porcupine district. They are members of the syndicate that purchased from Wilson & Edwards, the Wilson-Dome property at Porcupine. There are over 100 men at work on the Dome mines. A compressor, two diamond drills and a small mill are in operation.



## YUKON TERRITORY

Twenty thousand dollars worth of gold dust and nuggets was landed in Dawson the first of September from the Upper Stewart country.

*Canadian Klondike*—Construction of the No. 2 dredge for this company has started. It will have buckets with a capacity of 15 cu. ft. each.

## Mexico

## CHIHUAHUA

The Mina Vieja tramway, at Santa Eulalia, has been inoperative since Sept. 1, on account of the breaking of a main cable. As a result the American Smelting and Refining Company's Chihuahua smeltery has curtailed operations, as the bulk of the lime-fluxing ore came from this Santa Eulalia property. The tramway is expected to be in operation about Sept. 20.

*Calera*—This zinc mill, at San Isidro, was closed down indefinitely Sept. 1. The reason given is the disadvantages of marketing its zinc concentrates on account of low prices and the tariff on its importation into the United States.

*Gibraltar*—The company is installing an aerial tram from its Naica mine to Concho station. On its completion ore shipments will be greatly increased.

*Rosario*—At this property in the Guadalupe y Calvo district, operated by the West Mexican Mines Company, a 400-ton cyanide plant is being built. There is said to be available sufficient \$2 ore for the operation of the plant for over two years.

## DURANGO

*Lustre*—The Pittsburg stockholders are asked to participate in a reorganization of the company.

## GUANAJUATO

*Oro Grande*—This company is handling about 300 tons daily in the reduction plant purchased from the Guanajuato Amalgamated. The ore is from the Jesus Maria mine, one of the Amalgamated properties, and from the dumps at the old La Luz mines. French engineers will soon reach Guanajuato to examine the Oro Grande properties for French capitalists, who are considering a large stock investment.

*Guanajuato Reduction and Mines*—The reduction works are handling from 20,000 to 22,000 tons monthly. Mine fillings, as well as dump ore, are being treated. A profit more than sufficient to pay the bond interest is being earned.

*San Gregorio*—The railroad connecting the properties with Marfil will be taken up and the material and equipment sold. The benefits fail to justify the cost of operation. The San Gregorio property is being worked on a limited but profitable

scale by *buscones*. It is controlled by the Dwight Furness interests, and the erection of a 20-stamp mill and cyanide plant is planned. San Gregorio ore, taken out a few years ago, averaged 800 grams silver and 19 grams gold per ton.

*Mineral Development*—A station has been cut at 600 m. in the Neuva Luz shaft, and work is in progress on the crosscut projected to open the "mother" lode of the Guanajuato district, 500 ft. below the deepest present working. The company has collected a subsidy of 15,000 pesos from the Federal government for the last 100 m. of the shaft.

*Carmen*—A parallel vein, averaging 25 ft. in width, has been opened in this property. The ore is of good milling grade.

*Cubo Mining and Milling*—An aerial tramway is now delivering ore from the Cubo properties to the Peregrina mill. The contract calls for a maximum of 200 tons daily, but present deliveries do not approach that tonnage.

*Guanajuato Power and Electric*—The transmission line to San Luis Potosi has been completed to San Felipe, and power will be furnished the Compañía Minera Providencia San Juan de la Luz. Current will be transmitted to San Luis Potosi before the end of 1910. The Towne smeltery there has contracted for power.

## JALISCO

*Espada*—This company, formerly known as the Vick Mining and Milling Company, has made arrangements to mill at the Virginia & Mexico plant in the Hostotipaquillo district. An aerial tramway will be built and deliveries started about March, 1911. The company owns the old Espada, Deseada and San Jose mines and adjoining virgin ground.

*Virginia & Mexico*—The reduction plant is idle, pending mine developments. A satisfactory extraction is difficult with the manganese ores now available. The affairs of the company are being reorganized by the men principally interested.

*Magistral-Ameca*—The Elmore flotation process has not yet proven the success that was anticipated. Additional Wilfley slime tables have been ordered. The plant is running at about half capacity.

*Cinco Minas*—The new company has encountered several rich stringers of ore leading from the old San Nicolas bonanza which has given high assays, specimens running as high as 60 per cent. silver, but the general average is about 8 kg. These stringers have been as wide as 6 ft. and yield three 30-ton cars per month. They might be called small bonanzas as there has been taken about ten tons of 50-kg. ore from one of them. H. E. Crawford is manager.

## HIDALGO

*La Union*—This hacienda has resumed after a stoppage caused by lack of power.

The capacity of the plant has been increased to 200 tons daily.

## MEXICO

*Mexico Mines*—Returns for August are: Crushed 11,369 tons, yielding bullion, \$130,460; working expenses, \$42,670; expenditure on development, \$10,400; profit, \$77,390.

*El Oro*—Returns for August: Crushed 30,870 tons (mill No. 2), yielding bullion, \$205,820; working expenses, \$91,330; expenditure on development, \$23,000; profit, \$91,490; profit on railway, \$4000.

## SONORA

*Greene-Cananea*—Following the policy of curtailment, the company has reduced its production by 1,000,000 lb. per month. It has discontinued much development and has blown out two of its battery of furnaces, so that at the present time it is producing only 50 tons of blister copper per month.

## ZACATECAS

*Zacatecas Mining and Metallurgical Company*—The cyanide plant is nearing completion and will be ready for operation within 60 days. The company owns the San Cristobal and Zacatecas gold groups, and a 30-stamp mill, in connection with which there is amalgamating and concentrating equipment.

## Africa

## RHODESIA

Gold output in July was 46,367 oz., being 4649 oz. less than in June. For the seven months ended July 31 the total was 353,957 oz. in 1909, and 363,672 oz., or \$7,510,900 in 1910; an increase of 9715 oz. The production of other metals for the seven months included 133,738 oz. silver, 37 tons copper and 444 tons lead. The chrome ore reported is 27,455 tons; asbestos, 151 tons. Coal production was 94,235 tons in 1909, and 101,308 in 1910; an increase of 7073 tons.

## WEST AFRICA

Gold production in Ashanti and the gold coast in July was 15,564 oz., or 1630 oz. less than in June. For the seven months ended July 31 the total was 148,672 oz. bullion in 1909, and 177,671 oz. in 1910, a decrease of 31,000 oz. The bullion reported this year was equal to \$2,316,946, or 112,072 oz. fine gold.

## Asia

## KOREA

*Oriental*—The August cleanup was \$126,400.

## New Zealand

Gold output in August is reported at 43,873 oz. bullion, an increase of 4220 oz. over August, 1909. The bullion reported this year was equal to \$832,750 or 40,288 oz. fine gold. The silver output for the month was 202,620 oz., an increase of 95,718 oz. over last year.

# THE MARKETS

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

## Coal Trade Review

*New York, Sept. 14*—In the East the coal trade is showing more activity and advancing prices, and matters are looking better than for two or three months past.

In the West interest continues to center on the various wage settlements; notes on which are given below.

The trade situation in the West is really a serious one, even now that most of the mines are at work. Current production has been barely sufficient for daily needs, and there are practically none of the winter stocks laid in yet. Usually at this time of year large users of coal have at least part of their stock in their sheds, but this year they are empty. There is a heavy deficit in supply to be made up, and it will be hard to do this before winter begins to interfere with transportation. Even with some important districts idle, there have been some complaints of car shortage; and these are sure to be increased as production grows larger. The coming three months are going to give coal miners and distributors plenty of trouble.

**Strike Conditions**—Notable progress has been made in the settlement of the various strikes. In the Southwest the operators have ratified the compromise agreement. The miners hold their convention tomorrow—Sept. 15—and there seems to be no doubt that they will ratify also.

In Wyoming a new contract has been completed and will be ratified in a few days.

The main point is the Illinois settlement, which accepts the general increase of 3c. for the State, with 5c. for the Franklin-Williamson district; and 5.55 per cent. on day wages. There are some concessions to the operators, including a limitation of shot-firing cost. An extended statement will be found on another page.

The unsettled strikes are now in Colorado and in the Irwin district of Pennsylvania.

### COAL TRAFFIC NOTES

Coal tonnage originating on the lines of the Southern railway, six months ended June 30: Tennessee district, 608,714; Alabama district, 1,513,320; total, 2,122,034 short tons, an increase of 364,581 tons over last year.

Anthracite shipments by Lake from Buffalo, season to Sept. 1, were 1,840,605 tons in 1909, and 2,392,080 in 1910; an increase of 551,475 tons.

Shipments over the Virginian railway in West Virginia in July were 105,589 tons of coal and 3462 tons coke.

Coal receipts at Boston, eight months ended Aug. 31, reported by Chamber of Commerce, in long tons:

	1909.	1910.	Changes.
Anthracite.....	1,103,518	1,155,944	I. 52,426
Bituminous.....	2,303,662	2,732,655	I. 428,993
Total domestic....	3,407,180	3,888,599	I. 481,419
Foreign.....	167,454	199,764	I. 32,310
Total.....	3,574,634	4,088,363	I. 513,729

The foreign coal is almost all from Nova Scotia mines.

Coal passing through Sault Ste. Marie canal, season to Sept. 1, short tons:

	1909.	1910.	Changes.
Anthracite.....	798,545	1,060,259	I. 261,714
Bituminous.....	4,802,168	7,297,788	I. 2,495,620
Total.....	5,600,713	8,358,047	I. 2,757,334

The total increase this year was 49.2 per cent.

Anthracite shipments in August were 4,996,044 long tons, being 793,985 tons more than in July, and 797,771 tons more than in August, 1909. For the eight months ended Aug. 31 the shipments were, in long tons:

	1909.	1910.	Changes.
Reading.....	7,561,471	7,869,543	I. 308,072
Lehigh Valley...	6,654,551	7,418,876	I. 764,325
N. J. Central.....	5,071,927	5,477,069	I. 405,142
Lackawanna.....	6,210,121	6,355,422	I. 145,301
Del. & Hudson....	4,205,400	4,208,930	I. 3,530
Pennsylvania....	3,719,715	3,911,052	I. 191,337
Erie.....	4,929,627	4,943,323	I. 13,696
N. Y., Ont. & West.	1,817,956	1,828,636	I. 10,680
Total.....	40,170,768	42,012,851	I. 1,842,083

All the companies showed increases, the Lehigh Valley having the largest gain and the Central Railroad of New Jersey the next. The total gain this year was 4.6 per cent.

## New York

*Sept. 14*—Demand is showing up pretty well, both for prepared and steam sizes. Some of the collieries are having trouble on account of short water supply.

Schedule prices for large sizes are \$4.75 for broken and \$5 for egg, stove and chestnut, f.o.b. New York harbor. For steam sizes, current quotations are: Pea, \$2.95@3.25; buckwheat, \$2.15@2.50; No. 2 buckwheat, or rice, \$1.65@2; barley, \$1.35@1.50; all according to quality, f.o.b. New York harbor.

### BITUMINOUS

Business is looking better than for some time. Sales increase rather slowly, but there is a better feeling and more disposition to take coal. Prices are improving, gas coal selling at prices which realize \$1@1.05 at mines for run-of-mine and 65@70c. for slack. Good

steam coals bring 10 or 20c. more than they did two weeks ago—\$2.50@3, according to quality, f.o.b. New York harbor.

Transportation is generally good, but there is complaint about car supply on some lines. At a number of collieries in central Pennsylvania the operations have been hindered by short water supply, resulting from the long drought. The same cause has produced some trouble on the railroads.

In the coastwise market vessels are plenty and rates low. For large vessels from Philadelphia quotations are: Boston, Salem and Portland, 55c.; Portsmouth, 60c.; Lynn, Newburyport and Bath, 65c.; Bangor, 75c.; Gardner, 85c. From New York harbor small boats get 50@55c. to Boston and Portland; 30@40c. to Providence and the Sound.

## Birmingham

*Sept. 12*—The demand for coal in Alabama warrants a full operation of all mines. The production of coal is larger at present than it has ever been before. Additional orders are coming in and car shortage is being felt in more than one direction. Better prices are being obtained. While reports come that labor troubles in other sections are being settled, there is still a demand for Alabama coal coming in from some of the large railroad systems. The tonnage being handled to Mobile, New Orleans, Pensacola and other southern ports is large. There is a better demand for coke, and production is being increased.

## Chicago

*Sept. 12*—The buying of Indiana bituminous coal for storage piles of steam-making plants has eased somewhat with newspaper announcements of the end of the labor dispute in Illinois and the general expectation that supplies from the mines of this State will soon be obtainable. Current needs, however, are large and the demand for domestic sales is setting in from both city and country retailers. Eastern coals are in better demand, generally, and no oversupply exists of any kind of coal. Steam coals quite generally are being sold in small lots, for quick delivery, in view of the expectation of supplies from Illinois. Indiana coals bring \$2.50@2.65 for lump, \$2.30@2.50 for run-of-mine and \$2.30@2.40 for screenings, the strong demand for the last-named size continuing unchecked. Smokeless is in large and steady demand at \$3.30 for run-of-mine and \$3.80 for lump, the September increases in price



having lessened the demand only slightly if at all. Hocking is in strong demand at \$3.25. Youghiogheny is selling well at \$3.22 for ¾-in., and Pittsburg No. 8 of the same size at \$2.80.

The anthracite market lags, indicating a heavy rush when the demand caused by cold weather sets in.

**Cleveland**

Sept. 12—Trade is active, both for steam and domestic coals. Cars are beginning to be scarce and coal is not coming in as fast as it is wanted, so that most dealers are behind on orders.

Middle district coal, f.o.b. Cleveland, is \$2.15 for 1¼-in., \$1.90 for ¾-in., \$1.80 for run-of-mine and \$1.65@1.75 for slack. No. 8 and Cambridge districts, about 5c. higher. Pocahontas is scarce, owing to slow arrivals, and brings \$3.25 for lump and \$2.60 for run-of-mine, f.o.b. Cleveland.

**Indianapolis**

Sept. 12—Indiana mines are running full capacity and still unable to keep up with orders. Local dealers say they are having trouble in getting coal. However, the operators deny that there is a shortage of steam coal at Indiana manufacturing points, asserting that the manufacturers, almost without exception, have yearly contracts that must be lived up to. The shortage in domestic coal, they say, is caused by the effort to get out steam coal. The report for August showed more than 17,000 men steadily at work in the bituminous mines in the State, which is 2000 more than were ever before employed at one time. This total does not include the block coalfield of Clay county. About 1000 miners from Illinois are now working in the Indiana mines.

The entire week of Sept. 12-17 will be given to mine rescue lectures and demonstrations that will be given by the Urbana, Ill., rescue experts at all the mining centers of this State. James Epperson, State mine inspector, will accompany the experts on their lecturing tour.

**Pittsburg**

Sept. 13—The settlement of the Illinois strike is held not to affect the local market materially. The Westmoreland county strike continues to drag along. Demand for coal from the Pittsburg district has improved, particularly for the Lake trade, and there is somewhat of a rush to get coal through. However, this is probably partly due to the expectation that ore shipments will come to an early close, and it is necessary to get the coal movement over sooner than usual. There is less free coal than there was, and prices have firmed up further, so that the extreme cutting is probably not more than 2½c. under the circular prices. We continue to quote: Mine-run and nut, \$1.20 @1.22½; ¾-inch., \$1.30@1.32½; do-

mestic 1¼-in. lump, \$1.45@1.47½; slack, 75@82½c. per ton.

**Connellsville Coke**—The market has been entirely bare of features, sales being of negligible amount, while offerings are light and prices nominally unchanged. Shipments are fully as good as they were in August, and there are few requests for suspensions, such requests being a feature early in August. We continue to quote standard grades of Connellsville coke per net ton: Prompt furnace, \$1.60@1.65; contract furnace (nominal) \$1.75@1.85; prompt foundry, \$2.10@2.25; contract foundry, \$2.25@2.50 all at ovens.

The *Courier* reports the production in the week ending Sept. 3 at 342,775 tons, a decrease of 19,000 tons, and shipments at 3750 cars to Pittsburg, 5420 cars to points west and 882 cars to points east, a total of 10,052 cars.

**St. Louis**

Sept. 12—The event of the week in the coal trade has been the signing up of the Carterville and Springfield district to go to work. It will take several weeks before any tonnage of any importance is produced in the Carterville district. The mines in that district are in bad shape owing to the engineers' strike. The office force and owners of the mines have had to fire their boilers and run the pumps for the last three months. They found it exceedingly hard to do this, much less to get ahead with any repair work. None of the mines have in any of the new safety appliances required by law and it will take some time to install these.

Nearly all of the companies report that they are all sold up for the first two weeks' run. There are a few companies which refuse to sell anything ahead as they hope to receive a premium on spot coal when they have it, which they no doubt will. When the miners and operators were in session the market was a little slow awaiting the decision; however, since the announcement was made that work would be resumed the market has improved. This seems to be a rather singular fact yet buyers realize that there would not be sufficient tonnage produced to have any effect on the market and the demand seems to be very much better all around. There is no doubt but what the market will maintain itself for the next 60 days, in fact a brisk market is anticipated for the entire winter.

Dealer trade is very good and since the announcement that Carterville settled up floods of inquiries and orders have been received.

**Anthracite**—The market is in good shape. Both the supply and demand are good and a large tonnage is moving. Railroads seem to be giving prompt service. Demand is evenly balanced and prices are being maintained.

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

	Mine.	St. Louis.
Illinois, Standard:		
6-in. lump and egg.....	\$2.00	\$2.52
2-in. lump.....	1.85	1.37
Mine-run.....	1.65	1.17
Screenings.....	1.10	1.62
Trenton:		
6-in. lump and egg.....	2.50	3.02
3-in. nut.....	2.00	2.52
Staunton or Mt. Olive:		
6-in. lump.....	2.25	2.77
2-in. nut.....	2.00	2.52
Mine-run.....	1.70	2.22
Screenings.....	1.20	1.72
Carterville:		
6-in. lump or egg.....	2.00	2.67
3-in. nut.....	1.75	2.42
Mine-run.....	1.50	2.17
Screenings.....	1.30	1.97
Pocahontas and New River:		
Lump or egg.....	1.90	4.40
Mine-run.....	1.25	3.75
Pennsylvania Anthracite:		
Nut, stove or egg.....		6.95
Grate.....		6.70
Coke:		
Connellsville foundry.....		5.40
Gas house.....		4.90
Smelting.....		4.15

East St. Louis prices on soft coal are 20c. less than the St. Louis quotations.

**San Francisco**

Sept. 7—An unusual incident in the coal trade is the arrival of a steamer here with a cargo of coal from Ching-wangtao, China. This is a trial shipment, and is to be followed by others if the experiment is successful.

**FOREIGN COAL TRADE**

**British Coal Trade**—Exports of fuel from Great Britain, with coal sent abroad for use of steamships in foreign trade, seven months ended July 31, long tons:

	1909.	1910.	Changes
Coal.....	39,080,190	35,281,787	D. 796,403
Coke.....	619,234	478,918	D. 140,316
Briquets.....	858,171	910,994	I. 52,823
Total exports.....	37,557,595	36,671,699	D. 885,896
Steamer coal.....	11,288,941	11,016,691	D. 272,250
Total.....	48,846,536	47,688,390	D. 1,158,146

Imports of coal were only 2358 tons in 1909, and 21,921 this year.

**Belgian Coal Trade**—Imports and exports of fuel in Belgium, half-year ended June 30, metric tons:

	Imports.	Exports.	Excess.
Coal.....	3,025,509	2,318,050	Imp. 707,459
Coke.....	259,043	516,755	Exp. 257,712
Briquets.....	128,185	258,772	Exp. 130,587
Total.....	3,412,737	3,093,577	Imp. 319,160
Total, 1909....	3,010,306	3,225,989	Exp. 215,683

Imports are chiefly from Germany and Great Britain; exports to France and Holland.

**Welsh Coal Prices**—Messrs. Hull, Blyth & Co., London and Cardiff, report current prices of Welsh coal as follows, on Sept. 3: Best Welsh steam, \$3.96; seconds, \$3.78; thirds, \$3.60; dry coals, \$3.60; best Monmouthshire, \$3.54; seconds, \$3.42; best steam smalls, \$2.04; seconds, \$1.80. All prices are per long ton, f.o.b. shipping port, cash in 30 days, less 2½ per cent. discount.

## IRON-TRADE-REVIEW

*New York, Sept. 14*—While no important change has taken place in the iron and steel markets, the better tone is still observed. New business has been moderate but steady. The Steel Corporation statement for Sept. 1 shows a decrease in orders on the books, but there are good reasons for this, as noted on another page.

Pig-iron orders continue to come in, but do not run beyond the present year. Makers are not inclined to take contracts for 1911 business at present prices, and buyers will not pay more, believing that there is no reason to do so. One cause for this feeling is found in the unused and unsold stocks. A estimate on good authority gives these at 1,900,000 tons, of which 400,000 tons are held by the steel companies and 1,500,000 by merchant furnaces; about 600,000 tons of the latter being in the South. Until these are worked off, higher prices do not look reasonable.

In finished material, jobbers' orders for wire and wire products are good. Many small orders for structural steel continue to be a feature of the market, and make up a good aggregate. A large order is noted for steel pipe for an Oklahoma oil-pipe line. Railroad orders have been confined to some bridge work. There is quite a falling off in some classes of sheets which are used in automobile manufacture. On the whole the improvements are greater than the losses.

*Pig Iron Production*—The returns of the blast furnaces on Sept. 1, as collected by the *Iron Age*, show on that date 243 coke and anthracite furnaces in blast, having a total daily capacity of 66,500 tons; a decrease of 1900 tons from Aug. 1. Making allowance for the charcoal furnaces, the total production of pig iron in August was 2,106,000 tons. The total for the eight months ended Aug. 31 was 19,295,100 tons.

*Steel Corporation Orders*—Unfilled orders on the books of the United States Steel Corporation on Sept. 1 were 3,537,128 tons; which compares with 3,970,931 tons on Aug. 1 and 4,257,794 tons on July 1. Previous to July unfilled orders were only reported quarterly.

### Baltimore

*Sept. 12*—Imports for the week included 483 tons manganese ore from Rotterdam; 21,800 tons iron ore from Cuba.

### Birmingham

*Sept. 12*—Steady selling of iron in small lots, with several sales of larger proportions, a fair reduction of stocks on hand and some lively inquiry give the pig-iron market in Southern territory a better aspect. The sales already made in September aggregate well and there is

a constant reduction of the iron on hand.

The quotations are \$11@11.50 per ton for No. 2 foundry, though the furnace companies say nothing of iron under \$11.50 per ton. Some large interests are said to have purchased 6000 tons of low-grade iron in a block this month at \$11. Furnace companies in this territory are not anxious to make bookings for next year's delivery. It is estimated that at the rate of reduction during the past four weeks there should not be much more than 100,000 tons of pig iron on the yards in Alabama.

### Chicago

*Sept. 12*—Actual sales of pig iron were disappointing, in the last week, to the optimists concerned in the local iron market, but the number of inquiries continues large, showing that many concerns having need of large tonnage for last-quarter and first-quarter business are watching the market closely and preparing to jump into the rising tide as soon as it shall clearly appear to be moving. That it will move soon is the confidently expressed belief of leading men in the selling ranks. Meanwhile, the prices of iron for actual deliveries remain as last week \$11@11.50 Birmingham, or \$15.35@15.85 Chicago for Southern No. 2, and \$16.50@17 for Northern No. 2, with Lake Superior charcoal iron at \$18.50@19. The total volume of business now being done constantly is larger than the average individual sale of a carload to 600 or 700 tons might seem to indicate, for the number of these small sales is large.

Among both buyers and sellers of pig iron the feeling seems to exist that the market cannot show depression in the near future, considering the reduced output and the continued large needs of the Chicago district. Furnace interests in general are holding out for higher prices on 1911 business than melters will pay and so the business done is almost wholly in last-quarter deliveries.

The market for iron and steel products is becoming more active generally, structural materials showing a considerably increased demand.

Coke is steady and in good supply at \$4.85 for the best Connellsville.

### Cleveland

*Iron Ore*—After all the talk of slow shipments the total movement of ore in August was nearly up to that in July, and the season shows a total increase of 6,240,000 tons.

*Pig Iron*—Some good inquiries are about for foundry and basic. Business looks more promising. The number of small orders for short deliveries is increasing. Quotations remain \$15.90 for bessemer; \$14.50@14.75 for No. 2 foundry; \$14 for forge; all Cleveland

delivery. About \$18.50 is asked for Lake Superior charcoal iron.

*Finished Materials*—Three or four good contracts have been placed for structural steel. Prices are steadier, except for plates, which are rather irregular.

### Philadelphia

*Sept. 14*—Reports from furnace agents and brokers show a light week's business in actual sales but a renewal of inquiry from consumers. Offers have gone to some Southern makers. Recent Southern quotations show a difference in favor of Southern iron. This means a shading in Pennsylvania irons if the business is to be held. Southern No. 2 foundry is offered at \$15.25; Northern \$16; Southern forge, \$14.50; Northern, \$15; basic \$15 per ton.

*Steel Billets*—Deliveries on old contracts are practically completed and only small orders for quick delivery were sent to mills.

*Bars*—Much of this week's business came from orders from country stores. Inquiries from direct consumers are more frequent and in some cases for remote delivery.

*Sheets*—The weakness is discouraging. The forward buying usual at this season is absent.

*Pipes and Tubes*—Large purchases for pipe iron have been closed and work on new orders begins early in October. Merchant pipe has weakened under a lessened demand. Tubes are strong at latest discounts.

*Plates*—Absence of car building orders continues to exert a weakening influence on plates. No further efforts are being made to invite business at stated rates.

*Structural Material*—Local offices report but little inquiry out of the ordinary run.

*Scrap*—Dealers are not seeking to fill their yards or to control accumulations in scrap-producing shops. Very little business is being done.

### Pittsburg

*Sept. 13*—The decrease in the Steel Corporation's unfilled orders in August of 433,803 tons, reflected conditions in the steel trade. The Corporation's shipments were at the rate of a little less than 1,000,000 tons a month, so that orders received were less than 60 per cent. of shipments.

The past week has seen a slight increase in the improvement which has been noted since the closing days of August. There is better specifying and better new buying, the latter being almost wholly for early delivery. Stocks of buyers are evidently at a low ebb. There is no inclination to buy beyond immediate requirements, inasmuch as there is no prospect of higher prices. The present level of prices of finished steel



is held by individual action of producers, and the accident of price competition may develop at any time in a given line, so that the immediate prospect is for buying closely regulated to actual requirements.

**Pig Iron**—The local pig-iron market has become very quiet again. There is a fair run of small orders for foundry iron for early delivery. Prices are not notably changed, being as follows, Valley furnaces, 90c. higher delivered Pittsburg: Bessemer, \$15; basic, \$13.75@14; No. 2 foundry, \$14; forge, \$13.35; malleable, \$14.50 per ton.

**Steel**—Specifications on contracts are somewhat larger, but new buying continues light. It is possible that on odd lots held by brokers prices might be shaded a trifle, but on the whole the market continues firm as follows, f.o.b. maker's mill, Pittsburg or Youngstown: Bessemer billets, \$24.50; sheet bars, \$25.50; open-hearth billets, \$26; sheet bars, \$26.50; forging billets, \$29.50; rods, \$28 per ton.

**Ferromanganese**—The market has shown slightly more activity. British operators are holding prices a little firmer, and we quote prompt 25c. higher, at \$39.50, Baltimore, freight to Pittsburg being \$1.95 per ton.

**Sheets**—There has been somewhat sharper competition in sheets, resulting in black and galvanized being shaded about \$1 a ton more than formerly, and blue annealed about \$2 more, making concessions from nominal prices \$5 on black, \$6 on galvanized and \$3 on blue annealed, nominal prices being 2.40c. for black, 3.50c. for galvanized, 1.75c. for blue annealed, \$1.70 for painted corrugated roofing and \$3 for galvanized corrugated roofing. The demand in point of tonnage is fairly large, but the market suffers from an excess of producing capacity.

**Bar-iron Settlement**—The bimonthly settlement of wages in the iron mills controlled by the Amalgamated Association discloses an average realized price on shipments of base sizes of bar iron from the selected mills in July and August of 1.4655c., against 1.46375c. for May and June, thus continuing the puddling rate at \$6.12½ and finishing rates as formerly. The Sons of Vulcan have not closed a puddling scale yet. They demand, from the manufacturers who signed their scale last year, a rate substantially 25c. per ton for puddling above the Amalgamated scale already settled. The bar-iron market is quotable at 1.45@1.50c., Pittsburg.

**St. Louis**

Sept. 12—The iron market is still slow, though the general feeling is more optimistic. No. 2 foundry is moving a little more freely and inquiries are coming in very well. Melters are still buying closely and nearly all the orders are for delivery during this season. Very few have ven-

ured into the first quarter of next year as yet. In fact practically no first-quarter iron has been sold; it is understood that producers are not selling for next season's delivery unless they obtain better prices than the present market.

**FOREIGN IRON TRADE**

**United States Foreign Trade**—Exports and imports of iron and steel in the United States for the seven months ended July 31 are valued as below by the Bureau of Statistics of the Department of Commerce and Labor:

	1909.	1910.	Changes.
Exports.....	\$86,819,465	\$112,519,587	I. \$25,700,122
Imports.....	15,597,923	24,285,898	I. 8,687,975

Excess, exp. \$71,221,542 \$88,233,689 I. \$17,012,147  
The leading items of imports and exports were, in long tons:

	Exports		Imports	
	1909.	1910.	1909.	1910.
Pig iron.....	31,782	59,213	76,800	139,918
Scrap.....	21,329	12,929	2,252	60,389
Billets, blooms, etc.	74,810	7,657	9,084	27,595
Bars.....	46,611	69,728	8,564	25,528
Rails.....	139,567	219,200	.....	.....
Sheets and plates..	91,912	153,022	2,024	4,073
Structural steel....	53,706	89,042	.....	.....
Wire-rods.....	9,391	14,626	6,968	12,698
Wire.....	90,268	97,082	.....	.....
Nails and spikes..	27,217	34,761	.....	.....
Tinplates.....	5,597	7,056	34,971	47,010
Pipe and fittings..	84,169	88,560	.....	.....

Imports of wire not reported in quantities; values were \$580,331 in 1909, and \$898,432 this year. Imports of rails and structural steel not reported this year.

**United States Iron Ore Movement**—Imports and exports of iron ore in the United States seven months ended July 31, long tons:

	1909.	1910.	Changes.
Imports.....	744,863	1,508,076	I. 763,213
Exports.....	233,009	329,996	I. 96,987

Of the imports this year 851,330 tons were from Cuba, 325,327 from Spain, 122,280 from Sweden and 89,289 from Canada.

Imports of manganese ore for the seven months were 107,965 tons in 1909, and 131,434 in 1910; increase, 23,469 tons.

**British Iron-ore Trade**—Imports of iron ore into Great Britain, seven months ended July 31 were 3,507,927 tons in 1909, and 4,393,653 in 1910; increase, 885,726 tons. Of the imports this year 3,126,804 tons were from Spain.

**METAL MARKETS**

**New York, Sept. 14**—The metal markets do not show any marked change. Slight improvement is noted in some lines, while in others matters are about stationary.

Our index number for the metals, calculated on the approximate production and sales of pig iron, copper, tin, lead, zinc and aluminum, was 127 for the month of January; 124 for February; 118 for March; 118 for April; 113 for May; 107 for June; 112 for July; 113 for August.

**Gold, Silver and Platinum**

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
<b>Gold:</b>			
July 1910..	\$ 828,451	\$10,282,649	Imp. \$ 9,454,198
" 1909..	16,661,782	3,269,886	Exp. 13,391,896
Year 1910..	50,345,182	29,671,180	" 20,674,002
" 1909..	80,496,119	23,405,478	" 57,090,641
<b>Silver:</b>			
July 1910..	5,124,471	3,794,888	Exp. 1,329,583
" 1909..	5,049,366	3,916,117	" 1,133,249
Year 1910..	32,178,689	25,696,408	" 6,482,281
" 1909..	34,409,082	26,788,145	" 7,620,887

Exports from the port of New York, week ended Sept. 10: Gold, \$28,400; silver, \$914,163, chiefly to London and Paris. Imports: Gold, \$53,431; silver, \$286,800, from South America, Mexico and the West Indies.

Exports of silver from London to the East from Jan. 1 to Sept. 1, reported by Messrs. Pixley & Abell:

	1909.	1910.	Changes.
India.....	£4,305,700	£4,197,500	D. £ 108,200
China.....	1,555,200	1,113,500	D. 441,700
Straits.....	82,800	.....	D. 82,800
Total.....	£5,943,700	£5,311,000	D. £ 632,700

India Council bills brought an average of 16.03d. per rupee in London.

Estimated stocks of silver in India on Sept. 1 amounted to 19,400 bars, or £2,300,000—equal to about 10,440,000 oz. This is an increase of about 44 per cent. over Sept. 1 of last year.

**Gold**—Prices on the open market in London continue at 77s. 9d. per oz. for bars and 76s. 5½d. per oz. for American coin. Some more gold was taken in New York for Canada. The receipt of \$500,000 gold from Mexico is also noted.

**Platinum**—The market remains quiet, and prices are unchanged at \$33 per oz. for refined platinum and \$37.50@38 per oz. for hard metal.

Our Russian correspondent writes under date of Sept. 1 that the market has a strong tendency, but without material change in prices. Crude metal, 83 per cent. platinum, is quoted at Ekaterinburg at 7.50 rubles per zolotnik—\$28.20 per oz. This is still above St. Petersburg quotations for the same grade, which are 27,500@28,000 rubles per pood—average \$27.20 per oz. Reports are current in St. Petersburg that a syndicate has been organized at Brussels, Belgium, to control the entire Russian production.

SILVER AND STERLING EXCHANGE

Sept.	8	9	10	11	12	14
New York....	52½	53½	53	52½	53	53½
London ..	24½	24½	24½	24½	24½	24½
Sterling Ex. .	4.8595	4.8595	4.8600	4.8605	4.8610	4.8625

New York quotations, cents per ounce troy, fine silver; London, pence per ounce, sterling silver, 0.925 fine.

**Silver**—The tone of the market has improved lately owing to three causes: The apparent ability of the India operators to carry and finance the large amounts of bullion they have been credited with holding; the favorable crop outlook, and the disposition of China to buy.

Copper, Tin, Lead and Zinc

NEW YORK							
Sept.	Copper.		Tin.	Lead.		Zinc.	
	Lake, Cts. per lb.	Electrolytic, Cts. per lb.	Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.	New York, Cts. per lb.	St. Louis, Cts. per lb.
8	12½ @12¾	12.40 @12.50	35½	4.40	4.27 @4.32	5.45 @5.47	5.30 @5.32
9	12½ @12¾	12.40 @12.50	35.40	4.40	4.27 @4.32	5.47 @5.50	5.32 @5.35
10	12½ @12¾	12.35 @12.45	35.40	4.40	4.27 @4.32	5.47 @5.52	5.32 @5.37
11	12½ @12¾	12.35 @12.45	35½	4.40	4.27 @4.32	5.52 @5.55	5.37 @5.40
12	12½ @12¾	12.35 @12.45	34¾	4.40	4.27 @4.32	5.52 @5.57	5.37 @5.42
14	12½ @12¾	12.35 @12.45	34¾	4.40	4.27 @4.32	5.55 @5.60	5.40 @5.45

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.

LONDON							
Sept.	Copper.		Tin.		Lead.		Zinc, Ordinaries.
	Spot.	3 Mos.	Spot.	3 Mos.	Span-ish.	Eng-lish.	
8	55½	56½	163½	158½	12¼	.....	22½
9	55½	56½	162	158½	12¼	.....	22½
10	.....	.....	.....	.....	.....	.....	.....
12	55½	56½	162	159½	12¼	.....	22½
13	55½	55½	159½	157½	12¼	.....	23
14	55½	55½	158	157½	12¼	12½	23

The above table gives the closing quotations on London Metal Exchange. All prices are in pounds sterling per ton of 2240 lb. Copper quotations are for standard copper.

**Copper**—The market has been quiet during the last week. Manufacturers are busy and consumption, both here and abroad is good, but for the moment there is not much buying. In the absence of demand some producers have offered electrolytic at 12½c. delivered, usual terms, corresponding to about 12.45c., cash, New York, but such business as has been done has been below that figure. This does not imply a weakening of the market so much as a desire to make the metal move. Buyers seem to be skeptical respecting curtailment of production and are strengthened in their opinion by the refinery statistics for August, but the producers know that curtailment is really going on and feel sure that as soon as buyers become convinced of this they will be more anxious to contract for supplies, wherefore there is an undertone of strength in the market. At the close Lake copper is quoted at 12½@12¾c., electrolytic copper in cakes, wirebars and ingots at 12.35@12.45c. Casting copper is quoted nominally at 12¼@12¾c. for the week.

Copper sheets are 18@19c. base for

large lots. Full extras are charged, and higher prices for small quantities. Copper wire is 14c. base, carload lots at mill.

The standard market in London has been dull and featureless, and closes at £55 3s. 9d. for spot, and £55 17s. 6d. for three months.

Refined and manufactured sorts we quote: English tough, £57 10s.; best selected, £59@£59 10s.; strong sheets, £67@£68 per ton.

Exports of copper from New York for the week were 5861 long tons. Our special correspondent gives the exports from Baltimore for the week at 143 tons.

Imports of copper in Germany, seven months ended July 31 were 100,150 metric tons; exports, 5058; net imports, 95,092 tons, an increase of 4923 tons over last year.

**Tin**—The corner in spot tin in London seems to have collapsed. Quotations receded almost £9 from the highest point as far as spot tin is concerned, while three-months tin declined to the extent of £2 5s. only. It has been suggested in the trade that the heavy shipments from the East and the coming Banka sale are the causes of this collapse.

The domestic market has remained indifferent toward the advance of spot tin in London. An important feature of the present situation is the larger use to which tin not produced in the Straits Settlement is being put. Consumers who have heretofore never used anything but Straits tin have been forced, through the enormous premiums exacted for that metal, to use so called impure tin in their works, with the result that they have found its quality quite satisfactory and are probably going to continue its use at the large reduction in price at which it can usually be obtained. This may have quite a bearing on the future consumption of Straits tin in this country. The market in London closes at £158 for spot, and £157 7s. 6d. for three months. September delivery in New York is quoted at about 34¾ cents.

Messrs. Robertson & Bense reports receipts of Bolivian tin concentrates at Hamburg, Germany, in August at 626 metric tons.

Visible stocks of tin reported on Sept. 1, including tin afloat, were: London, 12,400; Holland, 2195; United States, excluding Pacific ports, 3348; total, 17,943 long tons. This is an increase of 510 tons over Aug. 1, but a decrease of 1239 tons from Sept. 1 last year.

**Lead**—The market is without special feature, and quotations are unchanged at 4.40c. New York, and 4.27½@4.32½c. St. Louis.

The London market is firm at the last prices, £12 10s. for Spanish lead, and £12 12s. 6d. for English lead.

**Spelter**—The market continues strong and advancing and a good business has

been done from day to day at higher figures. Stocks in the hands of producers appear to be low; also in the hands of consumers; while consumption is good. The outlook is for still further improvement in the price for this metal. The market closes at 5.40@5.45c. St. Louis, and 5.55@5.60c. New York.

The foreign market is firm and the closing quotation for good ordinaries is cabled at £23, and £23 5s. for specials.

Base price of zinc sheets is \$7.50 per 100 lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

Imports and exports of spelter and zinc products in Germany, seven months ended July 31, metric tons:

	Imports		Exports	
	1909.	1910.	1909.	1910.
Spelter.....	22,208	21,850	42,316	44,579
Zinc scrap.....	1,502	942	3,502	3,681
Zinc sheets.....	55	104	10,251	11,792
Zinc dust.....	483	815	2,050	1,719
Zinc oxide, etc.....	4,148	4,647	14,969	18,871

Imports of zinc ores were 111,570 tons in 1909 and 138,555 in 1910; exports were 26,581 tons in 1909, and 31,213 this year.

Other Metals

**Aluminum**—The market remains quiet and a little depressed. Quotations are unchanged, at 21½@22c. per lb. for No. 1 ingots, New York delivery.

**Antimony**—The market remains dull, with only a retail business being done. Prices are nominally unchanged at 8¼@8¾c. per lb. for Cookson's; 7¾@8c. for U. S., and 7¼@7¾c. for outside brands.

**Quicksilver**—Business is improving and the market has a firmer tone than for some time. Prices are unchanged, however. New York quotations are \$46 per flask of 75 lb. for large lots; \$47@48 for jobbing orders. San Francisco, \$45.50 for domestic orders and \$2 less for export. The London price is £8 12s. 6d. per flask, with £8 6d. 3d. quoted by second hands.

**Magnesium**—The price of pure metal is \$1.50 per lb. for 100-lb. lots, f.o.b. New York.

Zinc and Lead Ore Markets

**Joplin, Mo., Sept. 10**—The highest price paid for zinc-sulphide ore was \$46 per ton, on a base price of \$43.50 per ton of 60 per cent. zinc. The highest base price was \$44, two different bins selling at this figure. Zinc silicate sold on a base of \$20@24 per ton of 40 per cent. zinc. The average price, all grades of zinc was \$39.66. Lead ore sold generally at \$56, with some of the buyers trying to cut the price at the end of the week. The average price, all grades of lead, was \$55.24 per ton. The base price of zinc ore shows an increase of 50c. over the previous week but the general market was \$1 or \$2 higher and very little ore sold under a \$42 base.



SHIPMENTS, WEEK ENDED SEPT. 10.

	Zinc, lb.	Lead lb.	Value.
Webb City-Carterville	4,064,750	687,690	\$102,236
Joplin	1,800,290	190,880	43,065
Alba-Neck	1,004,260	.....	22,093
Galena	912,610	57,310	20,233
Jackson	687,530	3,480	13,840
Miami	400,480	248,300	12,094
Duenweg	539,290	12,110	10,110
Oronogo	56,860	298,090	9,510
Spurgeon	364,350	39,570	6,597
Carthage	254,660	.....	5,347
Badger	240,560	.....	4,931
Carl Junction	178,470	.....	3,836
Cave Springs	123,440	3,200	2,612
Granby	131,690	1,000	1,977
Aurora	169,250	.....	1,777
Quapaw	61,720	.....	987
Sarcoie	66,610	.....	699
Totals	11,056,890	1,541,630	\$261,874

37 weeks.....409,722,900 59,666,570 \$9,565,740  
 Zinc value, the week, \$219,293; 37 weeks, \$8,033,318  
 Lead value, the week, 42,581; 37 weeks, 1,532,422

MONTHLY AVERAGE PRICES.

Month.	ZINC ORE.				LEAD ORE.	
	Base Price.		All Ores.		All Ores.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	\$41.25	\$47.31	\$38.46	\$45.16	\$52.17	\$56.99
February	36.94	40.69	34.37	39.47	50.50	53.64
March	37.40	43.60	34.71	39.71	50.82	51.26
April	38.63	41.09	37.01	39.33	55.63	49.72
May	40.06	40.19	37.42	37.51	56.59	48.16
June	44.15	40.20	40.35	37.83	57.52	48.80
July	43.06	39.63	41.11	36.80	53.74	48.59
August	48.25	40.13	44.54	37.32	57.60	49.75
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.

Platteville, Wis., Sept. 10—The base price paid this week for zinc ore was \$42 @ 42.50 per ton; no premium price reported. The base price paid for 80 per cent. lead ore was \$51.50 @ 52 per ton.

SHIPMENTS, WEEK ENDED SEPT. 10.

Camps.	Zinc ore, lb.	Lead ore, lb.	Sulphur ore, lb.
Galena	802,160	.....	67,000
Mineral Point	598,000	.....	.....
Platteville	508,270	.....	406,900
Cuba City	402,570	259,450	513,300
Benton	285,520	.....	40,000
Highland	252,200	.....	.....
Harker	217,710	.....	.....
Livingston	136,164	.....	.....
Linden	63,790	.....	.....
Montfort	.....	65,580	.....
Hazel Green	.....	47,300	.....
Shullsburg	.....	87,000	.....
Total	3,256,348	459,360	1,027,200
Year to date	65,397,345	6,764,219	17,728,230

Shipped during the week to separating plants, 3,058,520 lb. zinc concentrates.

**CHEMICALS**

New York, Sept. 14—There is just about buying enough in the general market to keep prices steady. On the whole, business is improving.

Copper Sulphate—The market is easy and prices unchanged. Quotations are \$4 per 100 lb. for carloads or over, and \$4.25 per 100 lb. for smaller orders.

Arsenic—The market is a little more active and prices are slightly better, \$2.30

@2.37½ per 100 lb. being quoted for white arsenic. The rise is rather in sympathy with the general market.

Nitrate of Soda—Business in this article is steady. Spot can be had at 2.10c. per lb., while 2.15c. is asked for futures.

Imports and Exports—Imports and exports of chemicals and raw materials in the United States, seven months ended July 31:

	Imports.	Exports.	Excess.
Bleach, lb.....	53,204,538	496 I.	53,204,842
Bleach, 1909....	49,618,496	13,964 I.	49,604,532
Potash salts, lb.....	325,586,721	1,996,766 I.	323,589,955
Potash salts, '09	217,668,404	1,858,086 I.	215,810,318
Soda salts, lb.....	18,478,484	289,823 I.	18,188,661
Soda salts, 1909	8,918,989	394,465 I.	8,524,524
Acetate lime, lb.....	40,145,326	40,145,326 E.	.....
Acetate, 1909.....	47,433,731 E.	.....	47,433,731
Nit. of soda, tons	327,331	4,088 I.	323,243
Nitrate, 1909....	216,613	5,509 I.	211,104
Phosphates, tons	10,277	591,626 E.	581,349
Phosphates, '09	6,077	633,613 E.	627,536
Sulphur, tons.....	17,226	22,320 E.	5,094
Sulphur, 1909....	18,427	13,166 I.	5,261
Pyrites, tons.....	450,122	..... I.	450,122
Pyrites, 1909....	399,810	..... I.	399,810
Magnesite, lb.....	156,525,136	2,703,822 I.	152,821,314
Magnesite, 1909	.....	.....	.....

Exports include reexports of foreign material. Figures for magnesite not reported prior to July 1, 1909. Estimating sulphur contents of pyrites, the total imports of sulphur in 1910 were 197,275 tons.

Imports of potash salts into Russia during 1909 amounted to 40,482 tons; of superphosphates, 85,428; ground slag, 109,080; Chilean saltpeter, 17,460 tons. These figures represent increases of from 25 to 80 per cent. over the importations of the previous year.

Petroleum

The oil production of Oklahoma in August is reported by the Oil and Gas Journal at 4,549,718 bbl.; deliveries, 4,385,827 bbl.; stocks, Sept. 1 were 53,773,926 bbl. Most of the pipe-line companies are paying 40c. for oil of 30 deg. gravity and over.

New wells completed in southeast Texas in August were 38 oil and 1 gas; in Louisiana, 3 oil wells.

**MINING STOCKS**

New York, Sept. 14—Beginning very quietly, there has been some improvement, both in the volume of business and in quotations. The market has been stronger and shows a better tone, though it is still largely professional, and the public is not taking much interest.

An important incident of the week was the sale of a large block of Rock Island stock to Phelps, Dodge & Co., who will hold it.

A sale of Homestake, of South Dakota, is reported, 100 shares at \$85 per share.

On the Curb, business also improved. There was a good deal of trading in copper shares, British Columbia, Chino and Ray Central leading, and showing advanced prices. In the Nevada stocks, Jumbo and Tonopah Extension met a good demand. Cobalt stocks were

stronger, with some good sales, especially of Cobalt Central.

Boston, Sept. 13—Sentiment is changing on copper shares and it is reflected by hardening prices and more activity in leading issues. This feeling has been extended to some issues, notably the Calumet & Hecla subsidiaries, in which Superior Copper and Isle Royale are the most notable. As showing what a narrow market there was during July it is cited that the most active stock was North Butte with only 49,444 shares. Lake Copper was second, with 32,929 shares. In no other mining stock did the total for the month reach 15,000 shares.

COPPER PRODUCTION REPORTS.  
Copper contents of blister copper, in pounds.

Company.	June.	July.	August.
Arizona, Ltd.....	2,802,000	2,910,000	2,620,000
Balaklala.....	1,226,000	1,100,000	.....
Boleo (Mexico)....	2,115,314	2,272,600	2,039,520
Copper Queen.....	10,219,687	10,730,372	9,426,763
Calumet & Ariz....	2,490,000	2,705,000	.....
Cananea (Mexico)..	4,280,000	4,500,000	3,526,000
Detroit.....	2,017,000	1,800,000	2,100,000
Imperial.....	800,000	800,000	400,000
Nevada Con.....	6,186,832	6,896,429	5,800,000
Old Dominion.....	2,092,000	2,000,000	2,693,000
Shannon.....	1,528,000	2,207,000	1,546,000
Superior & Pitts....	2,245,000	2,224,000	.....
Utah Copper Co....	8,358,496	8,677,000	.....
Butte District.....	23,750,000	23,750,000	23,750,000
Lake Superior.....	18,000,000	19,000,000	18,800,000
Total production.	88,130,329	90,804,411	.....
Imports, bars, etc..	20,817,978	17,714,034	.....
Imp. in ore & matte	5,579,618	6,637,836	.....
Total.....	114,527,915	115,156,281	.....

Butte district and Lake Superior figures are estimated; others are reports received from companies. Imports duplicate production of Cananea, and that part of Copper Queen production which comes from Nacozari. Boleo copper does not come to American refiners. Utah Copper report includes the output of the Boston mill.

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries Domestic.	Deliveries for Export.
IX, 1909.....	118,023,139	52,105,955	50,077,777
X.....	124,657,709	66,359,617	56,261,238
XI.....	121,618,369	66,857,873	55,266,595
XII.....	117,828,685	69,519,501	59,546,570
Year.....	1,405,408,056	705,051,591	680,942,620
I, 1910.....	116,547,287	78,158,387	81,691,672
II.....	112,712,493	66,618,322	37,369,518
III.....	120,067,467	62,944,818	40,585,767
IV.....	117,477,639	67,985,951	31,332,434
V.....	123,242,476	59,305,222	45,495,400
VI.....	127,219,188	53,363,196	65,895,948
VII.....	118,370,003	56,708,175	59,407,167
VIII.....	127,803,618	67,731,271	61,831,780

VISIBLE STOCKS.

	United States.	Europe.	Total.
IX, 1909.....	135,196,930	197,993,600	333,190,530
X.....	151,472,772	210,224,000	361,696,772
XI.....	153,509,626	222,566,400	376,076,026
XII.....	153,008,527	236,857,600	389,866,127
I, 1910.....	141,766,111	244,204,800	385,970,911
II.....	98,463,339	248,236,800	346,700,139
III.....	107,187,992	254,150,400	361,338,392
IV.....	123,824,874	249,625,600	373,450,474
V.....	141,984,159	246,870,400	388,854,559
VI.....	160,425,973	239,142,400	399,568,373
VII.....	168,386,017	232,892,800	401,278,817
VIII.....	170,640,678	222,320,000	392,960,678
IX.....	168,881,245	218,444,800	387,326,045

Figures are in pounds of fine copper. U. S. production includes all copper refined in this country, both from domestic and imported material. Visible stocks are those reported on the first day of each month, as brought over from the preceding month.

Algomah mining shares have been taken from the Curb and put on the unlisted sheet of the Stock Exchange. Isle Royale's strength is based on bullish utterances and belief that the long search for the Baltic lode has at last met with success. Today's market for coppers was the strongest and broadest for many months and hopes for its continuation are almost unanimous.

Trading on the Curb has been of fair volume with steady to firm prices with some few exceptions. National Exploration almost reached the disappearing price. The company is without funds and has a \$100,000 note due Sept. 24, held by President Amster, of the Arizona Commercial company, on which foreclosure is expected. Old Dominion mining trust receipts have reappeared on the Curb with sales around \$2 per share.

Assessments

Company.	Delinq.	Sale.	Amt
American, Ida.	Sept. 22	Oct. 15	\$0.002
Bullion, Nev.	Aug. 11	Sept. 12	0.05
Challenge, Nev.	Sept. 7	Sept. 28	0.10
Davis-Daly, Mont.	Sept. 20	0.50	
Ely Con., Nev.	Oct. 10	0.05	
Exchequer, Nev.	Sept. 14	Oct. 4	0.05
Hancock Con., Mich.	An. Oct.	3.00	
Hypothek, Ida.	Sept. 12	Oct. 8	0.005
Little Butte, Ida.	Sept. 15	Oct. 13	0.002
Live Oak, Ariz.	Oct. 1	3.00	
Potosi G. & S. Min., Nev.	Sept. 6	Sept. 28	0.10
Raven, Mich.	Aug. 15	0.10	
Rhode Island, Ida.	Sept. 14	Oct. 14	0.001
Savage, Nev.	Sept. 21	Oct. 13	0.10
Scorpion, Nev.	Aug. 11	Sept. 6	0.02
Scottish Chief, Utah.	Aug. 10	Sept. 20	0.01
Seg. Belcher & Midas Con., N.	Sept. 6	Sept. 27	0.05
Tintic Central, Utah.	Aug. 10	0.004	
Union, Nev.	Sept. 19	Oct. 19	0.10
Utah, Nev.	Sept. 6	Sept. 27	0.05
Winona, Mich.	Aug. 9	1.00	
Yellow Jacket, Nev.	Sept. 15	Oct. 20	0.15

Monthly Average Prices of Metals  
SILVER

Month.	New York.		London.	
	1909.	1910.	1909.	1910.
January	51.750	52.375	23.843	24.154
February	51.472	51.534	23.706	23.794
March	50.468	51.454	23.227	23.690
April	51.428	53.221	23.708	24.483
May	52.905	53.870	24.343	24.797
June	52.538	53.462	24.166	24.651
July	51.043	54.150	23.519	25.034
August	51.125	52.912	23.588	24.428
September	51.440	53.743	23.743	24.428
October	50.923	53.502	23.502	24.428
November	50.703	53.351	23.351	24.428
December	52.226	54.030	24.030	24.428
Total	51.502	53.706	23.706	24.428

New York, cents per fine ounce; London, pence per standard ounce.

COPPER.

	NEW YORK.				London.	
	Electrolytic		Lake.		1909.	1910.
	1909.	1910.	1909.	1910.		
January	13.893	13.820	14.280	13.870	61.198	60.923
February	12.949	13.832	13.295	13.719	57.688	59.388
March	12.387	13.255	12.826	13.586	56.231	59.214
April	12.561	13.733	12.931	13.091	57.363	57.238
May	12.893	13.550	13.238	12.885	59.338	56.313
June	13.214	12.404	13.548	12.798	59.627	55.310
July	12.880	12.215	13.363	12.570	58.556	54.194
August	13.007	12.490	13.296	12.715	59.393	55.738
September	12.870	13.210	13.030	12.715	59.021	55.738
October	12.700	13.030	13.030	12.715	57.551	55.738
November	13.125	13.354	13.354	12.715	58.917	55.738
December	13.298	13.647	13.647	12.715	59.906	55.738
Year	12.982	13.335	13.335	12.715	58.732	55.738

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling per long ton, standard copper.

TIN AT NEW YORK

Month.	1909.	1910.	Month.	1909.	1910.
January	28.060	32.700	July	29.125	32.695
February	28.290	32.920	August	29.966	33.972
March	28.727	32.463	September	30.293	32.913
April	29.445	32.976	October	30.475	32.913
May	29.225	33.125	November	30.859	32.913
June	29.322	32.769	December	29.725	32.913
			Av. Year.	29.725	32.913

Prices are in cents per pound.

LEAD

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	4.175	4.700	4.025	4.582	13.113	13.650
February	4.018	4.613	3.868	4.445	13.313	13.328
March	3.986	4.459	3.835	4.307	13.438	13.063
April	4.168	4.376	4.051	4.225	13.297	12.641
May	4.287	4.315	4.214	4.164	13.225	12.550
June	4.350	4.343	4.291	4.207	13.031	12.688
July	4.321	4.404	4.188	4.291	12.563	12.531
August	4.363	4.400	4.227	4.290	12.475	12.513
September	4.342	4.215	4.215	4.215	12.781	12.781
October	4.341	4.215	4.215	4.215	13.175	13.175
November	4.370	4.252	4.252	4.252	13.047	13.047
December	4.560	4.459	4.459	4.459	13.125	13.125
Year	4.273	4.153	4.153	4.153	13.049	13.049

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

SPELTER

Month.	New York.		St. Louis.		London.	
	1909.	1910.	1909.	1910.	1909.	1910.
January	5.141	6.101	4.991	5.951	21.425	23.350
February	4.889	5.569	4.739	5.419	21.562	23.188
March	4.757	5.637	4.607	5.487	21.438	23.031
April	4.965	5.439	4.815	5.289	21.531	22.469
May	5.124	5.191	4.974	5.041	21.975	22.100
June	5.402	5.128	5.252	4.978	22.000	22.219
July	5.402	5.152	5.252	5.002	21.969	22.406
August	5.729	5.279	5.129	5.129	22.125	22.800
September	5.796	5.646	5.646	5.646	22.906	22.906
October	6.199	6.043	6.043	6.043	23.200	23.200
November	6.381	6.231	6.231	6.231	23.188	23.188
December	6.249	6.099	6.099	6.099	23.094	23.094
Year	5.503	5.352	5.352	5.352	22.201	22.201

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

PRICES OF PIG IRON AT PITTSBURG.

	Bessemer.		Basic.		No. 2 Foundry.	
	1909.	1910.	1909.	1910.	1909.	1910.
	January	\$17.18	\$19.90	\$16.40	\$17.96	\$16.26
February	16.73	18.96	16.09	17.21	15.90	17.38
March	16.40	18.58	15.84	16.93	15.62	17.00
April	15.79	18.28	15.05	16.84	15.06	16.75
May	15.77	17.10	15.02	15.94	15.08	16.18
June	16.13	16.52	15.84	15.60	15.63	15.53
July	16.40	16.40	15.90	15.40	15.96	15.40
August	17.16	16.09	16.17	14.89	16.20	15.16
September	18.44	16.80	16.80	16.80	17.03	16.80
October	19.75	17.84	17.84	17.84	18.02	17.84
November	19.90	18.37	18.37	18.37	18.09	18.09
December	19.90	18.16	18.16	18.16	17.90	17.90
Year	\$17.46	\$16.46	\$16.46	\$16.46	\$16.40	\$16.40

STOCK QUOTATIONS

COLO. SPRINGS Sept. 13			SALT LAKE Sept. 13		
Name of Comp.	Bid.		Name of Comp.	Cig.	
Acacia	.05		Carisa	.15	
Cripple Cr'k Con.	.02		Colorado Mining	.38	
C. K. & N.	.16		Columbus Con.	.58	
Doctor Jack Pot.	.10		Daly Judge	4.30	
Elkton Con.	.73		Grand Central	1.00	
El Paso	.81		Iron Blossom	.80	
Fannie Rawlins	1.05		Little Bell	1.10	
Findlay	.08		Little Chief	.22	
Gold Dollar	1.14		Lower Mammoth	.12	
Gold Sovereign	1.03		Mason Valley	7.40	
Isabella	.18		Maj. Mines	.53	
Jennie Semple	.10		May Day	.05	
Lexington	.01		Nevada Hills	2.15	
Moon Anchor	.03		New York	.13	
Old Gold	.04		Prince Con.	.51	
Mary McKinney	1.53		Red Warrior	6.00	
Pharmacist	.02		Silver King Coal'n	1.90	
Portland	1.15		Sioux Con.	23	
Windicator	.90		Uncle Sam	.18	
Work	.04		Victoria	1.07	

SAN FRANCISCO. Sept. 13.

Name of Comp.	Cig.	Name of Comp.	Bid.
<b>COMSTOCK STOCKS</b>			
Alta	.10	<b>MISC. NEVADA</b>	
Belcher	.69	Belmont	4.10
Best & Belcher	.49	Daisy	.02
Caledonia	.40	Jim Butler	.29
Challenge Con.	.24	MacNamara	.29
Chollar	.16	Midway	.22
Confidence	.70	North Star	.07
Con. Cal. & Va.	1.32	West End Con.	.02
Crown Point	.80	Atlanta	.12
Gould & Curry	.19	Booth	.10
Hale & Norcross	.20	C.O.D. Con.	.16
Mexican	1.22	Columbia Mt.	.04
Occidental	.40	Comb. Frac.	.41
Ophir	1.32	Great Bend	.03
Overman	.59	Jumbo Extension	.44
Potosi	.40	Oro	.06
Savage	.17	Red Hill	.04
Sierra Nevada	.22	Sandstorm	.04
Union Con.	.39	Silver Pick	.06
Yellow Jacket	.67	St. Ives	.11
		Tramps Con.	.04

N. Y. EXCH. Sept. 13

Name of Comp.	Cig.	Name of Comp.	Cig.
Amalgamated	64%	Adventure	6
Am. Agri. Chem.	44%	Allonez	41
Am. Sm. & Ref. com	68%	Am. Zinc	6
Am. Sm. & Ref. pf.	103%	Arcadian	125
Anaconda	39%	Arizona Com	5%
Bethlehem Steel pf	57%	Atlantic	17
Col. & Hock. C. & I.	3%	Boston Con.	6
Federal M. & S.	156	Bonanza	118
Coldfield Con.	8%	Boston & Corbin	5%
Great Nor. ore ctf.	56	Butte & Balak	59
Homestake	187%	Calumet & Ariz.	5%
Nat'l Lead com.	52%	Calumet & Hecla	550
National Lead, pf.	104	Centennial	16
Nev. Consol.	20%	Con. Mercur.	6
Pittsburg Coal.	17	Copper Range	66%
Republic Is. com.	91%	Daly-West	5%
Republic I & S, pf.	94%	East Butte	7%
Sloss Sheffield com.	57	Franklin	10%
Sloss Sheffield, pf.	110%	Granby	32
Tennessee Copper	27%	Hancock	20%
Utah Copper	47	Helvetia	2
U. S. Steel com.	69%	Indiana	17%
U. S. Steel, pf.	116%	Isle Royale	22%
Va. Car. Chem.	59	Keweenaw	3%
		Lake	35%
		La Salle	10
		Mass.	7
		Michigan	4
		Mohawk	47%
		Nevada	20%
		North Butte	29
		North Lake	9%
		Oldway	5%
		Old Dominion	36
		Osceola	125