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In the accompanying table we summarize the production of the more important minerals and metals in the United States in 1909 so far as it has been possible to collect the statistics at so early a date. The figures for copper, lead and spelter are based on reports received directly from the producers, who have communicated their actual output during the first 11 months of the year, together with their estimates of probable production in December; in many cases the estimates are for only the last few days of December. The other statistics are based chiefly on the reports of producers, State mine inspectors, and special correspondents.

It will be observed that in some cases there are differences between the statistics given by the various contributors to this number and our editorial statistics. This is because the articles of our outside contributors were necessarily written and put into type before our own statistics were available, which in some cases was not until Jan. 5, 1910, and consequently the statistics of our contributors are generally estimates. This explanation will account for discrepancies, though the reason will be so obvious to our readers that an explanation is hardly required.

We thank the producers of metals and minerals for their courteous coöperation by promptly and fully furnishing us with statements of their production in 1909 and we thank the many other persons who have aided in the preparation of this number.

The metal industries revived in 1909 from the depression that began in 1907. About the middle of 1909 the demand for copper, lead, spelter and iron began to be buoyant. Except in the case of spelter, which was influenced by special conditions, prices ruled during 1909 at a little below what are commonly considered to be the normal averages. This was obviously due to the marketing of the accumulated stocks with which the year began, and also the greatly increased current production. In copper, lead and spelter the highest previous records of production were greatly exceeded. Indeed, the gain in the statistics of these metals is but little short of marvelous.

In spite of this result it was the common talk during 1909 that the mining industry was slack. The sellers of mining machinery and supplies complained generally respecting unsatisfactory business. Yet the developed mines were producing more than ever before and much new construction was going on. The complaint arose, we think, because less than ordinarily was done toward the development of new mines. The reason for this was obviously that times had not yet become propitious for the financing of new enterprises calling for men, machinery and supplies. However, toward the end of 1909 there was a noteworthy improvement in this particular, as was evidenced by the introduction of a large number of new concerns upon the stock exchanges and open markets and an increased display of interest on the part of the public.

MINERAL AND METAL PRODUCTION OF THE UNITED STATES.

PRELIMINARY STATISTICS, SUBJECT TO REVISION.

Product.	Customary Measure.	1908. Quantity.	1908. Value. Total.	1908. Value. Per Unit.	1909. Quantity.	1909. Value. Total.	1909. Value. Per Unit.	Changes in Quantity
NON-METALLIC:								
Coal, bituminous	Short ton	337,929,632	$387,678,972	$1.14	360,076,905	$414,448,517	$1.15	I. 22,147,273
Coal, anthracite	Short ton	80,329,578	159,122,961	1.98	77,099,336	153,757,678	1.99	D. 3,230,242
Iron ore	Long ton	33,789,987	60,821,976	1.80	53,033,873	954,609,714	1.80	I. 19,243,886
Limestone flux	Long ton	9,563,158	4,720,485	0.47	14,070,000	7,316,400	0.52	I. 4,506,842
Petroleum	Barrel (*b*)	184,711,413	136,347,831	0.74	180,717,696	133,864,299	0.74	D. 3,993,717
METALLIC:								
Copper	Pound	948,196,490	127,438,536	13.424c	1,098,287,425	146,456,628	13.335c	I. 150,090,935
Iron, pig	Long ton	15,936,018	267,540,378	16.80	25,711,846	437,101,382	17.00	I. 9,775,828
Lead	Short ton	318,876	26,785,584	84.00	374,579	32,011,521	85.46	I. 55,703
Quicksilver	Flask (*d*)	17,969	805,690	44.90	20,000	926,000	46.30	I. 2,031
Zinc (*e*)	Short ton	210,511	19,897,500	94.52	267,069	29,660,683	111.06	I. 56,558

(*b*) Barrels of 42 gal. (*d*) Flasks of 75 lb. (*e*) Includes zinc from foreign ore.

Contents

Metal Markets

New York, Jan. 5—The metal markets in the first week of the year are not specially active, but prices are generally firm.

Gold, Silver and Platinum

UNITED STATES GOLD AND SILVER MOVEMENT

Metal.	Exports.	Imports.	Excess.
Gold:			
Nov. 1909..	$15,649,281	$ 3,863,637	Exp. $11,785,644
" 1908..	2,967,795	2,909,883	" 57,912
Year 1909..	122,301,517	42,003,194	" 80,298,323
" 1908..	73,857,749	45,123,561	" 28,732,188
Silver:			
Nov. 1909..	4,951,483	4,691,807	Exp. 259,676
" 1908..	3,951,987	3,275,609	" 676,378
Year 1909..	52,294,314	41,981,036	" 10,313,338
" 1908..	47,111,382	37,814,676	" 9,296,706

Exports from the port of New York, week ended Dec. 29: Gold, $260,200, principally to Panama; silver, $743,525, to London and Paris. Imports: Gold, $202,993; silver, $202,625, from Australia, South America and Mexico.

Gold—Prices on the open market in London have remained at 77s. 9d. per oz. for bars and 76s. 5d. per oz. for American coin.

Platinum—Quotations for refined platinum are unchanged, at $29.50 per oz. For hard metal there is an advance, $36 per oz. being asked.

Silver—The market continues steady with good demand. Silver is being disposed of and distributed as produced. There are no special stocks held on this side, though we understand the accumulations in China have been large owing to the trade imports being much less than the exports. The large difference of £9,000,000 in them readily accounts for the great stock of sycee in Shanghai.

SILVER AND STERLING EXCHANGE

Dec.-Jan.	30	31	1	3	4	5
New York ...	52 3/8	52 3/8	.....	52 1/2	52 5/8	52 5/8
London..	24 1/4	24 1/4	24 1/4	24 3/16	24 1/4	24 1/4
Sterling Ex..	4.8705	4.8695	.....	4.8675	4.8670	4.8695

New York quotations, cents per ounce troy, fine silver; London, pence per ounce sterling silver, 0.925 fine.

Exports of silver from London to the East, Jan. 1 to Dec. 23, as reported by Messrs. Pixley & Abell:

	1908.	1909.	Changes.
India.....	£ 9,147,390	£6,567,600	D. £2,579,790
China.....	641,400	1,930,000	I. 1,288,600
Straits.....	164,885	114,600	D. 50,285
Total..	£ 9,953,675	£8,612,200	D. £1,341,475

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

Copper, Tin, Lead and Zinc

Dec.-Jan.	Copper. Lake, Cts. per lb.	Copper. Electrolytic, Cts. per lb.	Copper. London, £ per ton.	Tin. Cts. per lb.	Lead. New York, Cts. per lb.	Lead. St. Louis, Cts. per lb.	Zinc. St. Louis, Cts. per lb.
30	13 3/4 @14	13 1/2 @13 5/8	61 1/2	33 3/4	4.70	4.60 @4.65	6.05 @6.07 1/2
31	13 7/8 @14	13 1/2 @13 3/4	61 3/4	33 3/4	4.70	4.60 @4.65	6.05 @6.07 1/2
1	.....	.....	....	....	....	.....	.....
3	13 7/8 @14	13 5/8 @13 3/4	62	33 3/8	4.70	4.60 @4.62 1/2	6.05 @6.07 1/2
4	13 7/8 @14	13 5/8 @13 3/4	61 15/16	32 1/2	4.70	4.60 @4 62 1/2	6.05 @6.07 1/2
5	13 7/8 @14	13 5/8 @13 3/4	61 9/16	33 1/4	4.70	4.60 @4.62 1/2	6.05 @6.07 1/2

London quotations are per long ton (2240 lb.) standard copper. The New York quotations for electrolytic copper are for cakes, ingots and wirebars, and represent the bulk of the transactions made with consumers, basis New York, cash. The prices of casting copper and of electrolytic cathodes are usually 0.125c. below that of electrolytic. The quotations for lead represent wholesale transactions in the open market. The quotations on spelter are for ordinary Western brands; special brands command a premium.

Copper—There has been a good demand, particularly from the home trade, and considerable business has been done at advancing prices. The manufacturers are very busy and are booking much new business. At the close, Lake copper is quoted at 13⅞@14c., and electrolytic copper in cakes, wirebars and ingots at 13⅝@13¾c. Casting copper is quoted nominally at 13⅜@13½ cents.

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

The market for standard copper in London has been firm. It advanced on Monday to £62. On Tuesday, under considerable sales by speculative holders who wanted to realize, it declined to £61 2s. 6d. and closed on Wednesday at £61 11s. 3d. for spot £62 10s. for 3 months.

Refined and manufactured sorts we quote: English tough, £65; best selected, £65@£65 10s.; strong sheets, £75@£76 per ton.

Tin—When the unfavorable statistical position of tin, showing increased shipments from the Straits, smaller deliveries for consumption in the United States and an increase in the visible supplies of about 900 tons for December, became known at the beginning of this month, the London market declined sharply. The decline made further progress on Jan. 4, when the low point of £148 5s. for spot and £149 12s. 6d. for three months was reached. After this severe decline, a reaction was due, and at the close the market is cabled as firm at £151 7s. 6d. for spot and £152 15s. for three months.

Interest in this market is still lacking, and the little business which took place was for retail lots only. The lowest point reached on Jan. 4 was 32½c. while the close is quoted at about 33¼ cents.

Lead—There is a good business doing from day to day at about last prices, 4.60@4.62½c. St. Louis, and 4.70c. New York.

The London market is strong and advancing, and Spanish lead is now quoted at £13 13s. 9d. and English lead at £13 16s. 3d. per ton.

Spelter—The market remains quiet. Galvanizers are busy but are well covered with raw material. Prices are unchanged at 6.05@6.07½c. St. Louis, and 6.20@6.22½c. New York.

New York quotations for spelter, Dec. 30 to Jan. 5, inclusive, were 6.20@6.22½ cents.

Base price of sheet zinc is now 8c. per lb., f.o.b. La Salle-Peru, Ill., less 8 per cent. discount.

The London market is unchanged at £23 2s. 6d. for good ordinaries, and £23, 7s. 6d. for specials.

Antimony—The market is quiet. Cookson's is quoted at 8½c. per lb.; Hallett's, 8@8⅛c.; U. S., 7⅞@8c.; with 7⅝@7¾c. named for outside brands.

Aluminum—The price of aluminum is unchanged at 20@23c. per lb. for ingots. The higher price is that asked by the American producer.

Quicksilver—In New York the quotation is $52.50 per flask of 75 lb. for large lots; for small lots 72@75c. per lb. is asked by jobbers. The San Francisco quotation is $50.50@51.50 per flask for domestic orders, and $2 less for export. The London price is £9 15s. per flask, with £9 17s. 6d. asked by jobbers.

Gold, Silver and Platinum in 1909

Review and Statements of the Production of the Three Precious Metals. Conditions Which Influenced Their Commercial Movements and Values

WORLD'S GOLD PRODUCTION $457,567,280

The different gold-producing countries of the world in 1909 not only kept up the great output of recent years, but again increased it in a marked degree. The return from the gold mines was greater than had ever before been recorded in a single year. Gold mining was successfully prosecuted in many countries and most of them increased their returns, by the opening of new mines, by the intensive working of old ones or by closer recovery of metal from the ores—in some cases by a conjunction of all three methods. The total results are summarized in the accompanying table.

GOLD PRODUCTION OF THE WORLD.
IN DOLLARS.

Country.	1908.	1909.
Transvaal	$145,819,016	$151,900,000
United States	94,560,000	96,500,000
Australia	73,314,671	71,980,780
Russia	30,944,561	34,160,000
Mexico	24,518,548	26,000,000
Rhodesia	12,276,394	12 605,000
British India	10,424,067	10,566,500
Canada	9,559,274	10,750,000
China, Japan and Korea	10,618,850	11,000,000
West Africa	5,773,544	4,625,000
Madagascar	1,136,850	2,480,000
Other countries	24,488,752	25,000,00
Total	$443,434,527	$457,567,280

The total increase in the world's production in 1909, as compared with 1908, was $14,122,753, or 3.2 per cent. The larger gains came from the Transvaal, Russia and Mexico. Australia alone of the prominent producing countries showed a decreased output.

The figures for 1908 include the corrected official returns. For 1909 for nearly all the prominent countries—as the Transvaal, Australasia, Rhodesia and India—we have the official returns for 11 months, from which it is possible to estimate the month of December very closely. From Mexico and Russia there are partial returns, and from several other countries information showing the general course of production. In all cases where estimates are required they have been made on a conservative basis, so that we believe the revisions later will increase rather than diminish the total given.

The second table gives the total gold production of the world for 20 years past, during which period it has increased nearly fourfold.

This shows an almost continuous growth, with only a setback during the years of the Boer war when the Transvaal production was cut off almost entirely. The year showing the greatest increase over the preceding one was 1898, when gold from Alaska and the Yukon first came out in large amounts.

GOLD PRODUCTION OF THE WORLD FOR TWENTY YEARS.

1890....	$118,848,700	1900....	$258,829,703
1891....	130,650,000	1901....	260 877,429
1892....	146,292,600	1902....	298,812,493
1893....	158,437,551	1903....	329,475,401
1894....	182,509,283	1904....	349,088,293
1895....	198,995,741	1905....	378,411,054
1896....	211 242,081	1906....	405,551,022
1897....	237,833,984	1907....	411,294,458
1898....	287,327,833	1908....	443,434,527
1899....	311,505,947	1909....	457,567,280

Production in the United States

From State reports and other information we have estimated an increase of a little less than $2,000,000 in the gold production of the United States during 1909. Owing to some delay in collecting the statistics the preliminary estimates of the United States Mint, which are usually completed in the first week of the New Year, are not yet in shape. We hope to receive and publish them next week.

The Commercial Movement of Gold and Silver

BY FREDERICK HOBART

The continued great production of gold again brings up the question as to the disposition made of the supplies which the mines of the world have furnished. It is a question which gives rise to endless discussion, and probably will never be susceptible of exact determination, since there are elements in the problem for which no exact figures can ever be obtained. There is no room, at least in this review, to enter into the discussion.

Commercial Movement of Gold

The additions made to the world's visible stocks of gold in 1909 were, as nearly as can be ascertained, between 65 and 75 per cent. of the total production; that is, not far from $300,000,000. This includes gold actually coined and passing into circulation, and gold appearing either as coin or bullion in the bank and Government reserves which form the basis of circulation and credit. The uncertain elements in the disposition of the gold mined are the quantities used in the arts, for which no definite figures are attainable; the quantities directly hoarded or concealed; and the quantities needed to replace gold lost. These loses arise from actual destruction, as by fire or wreck; from concealment in private boards; from actual disappearance in the many minor forms which are constantly recurring and always escape record.

Large as was the increased monetary stock provided it seemed hardly sufficient to meet the commercial demand, and there were at times during the year calls for gold from the important financial centers which could not be promptly supplied. European markets had the call, and took gold from the United States instead of sending it there as in some previous years. That the new supplies of gold helped the general improvement in business there can be no doubt. That the betterment in conditions ran ahead of the increase in those supplies is another refutation of the theories of those who believe that the production of gold is the sole or the chief factor in commercial prosperity.

Gold Movement in the United States

The gold movement in the United States for the 11 months ended Nov. 30 was as follows:

	1907.	1908.	1909.
Exports	$54,211,240	$73,857,749	$122,301,517
Imports	98,949,557	45,123,561	42,003,194
Excess	I. $44,738,317	E. $28,734,188	E. $ 80,298,323

In 1907 the United States drew gold from abroad to an amount equal to nearly half its own production. In 1908 the movement was reversed, and the net exports of gold were about 30 per cent. of the home production. In 1909 the outward movement not only continued, but increased, and the net exports were over 80 per cent. of the gold produced. This reversal of the gold movement was due to a variety of causes. The merchandise exports from the United States in 1909 were rather below those of 1908, and considerably less than those of 1907;

on the other hand, the imports this year increased enormously, being the largest on record for many years. During 1909 there was a strong demand for gold from nearly all the great European banks. Loans made in this country were called in and accommodations were withdrawn. High rates of interest were established by the Bank of England for several months of the year, and its example was followed by the Bank of France and to a greater extent by the Bank of Germany. The rates for money all over Europe were so high as to make it difficult for New York to secure accommodations abroad, and there was less foreign money in use here either in the shape of loans or of speculative accounts in 1909, than for several years.

Much of the gold exported from this country did not go to Europe directly, but was sent to South America on European account. The amount of gold shipped to South America in this way in 1909 was about $62,000,000, five-sixths of it going to Argentina and the rest to Brazil.

Japan took $23,354,000 gold from this country in 1909, against practically nothing in 1908. This movement was mainly in the later months of the year, and its cause is not altogether clear. It was a material contribution to the outward movement. Canada, on the other hand, took less gold than in 1908.

Gold Movement in Great Britain

The movement of gold in Great Britain for the 11 months ended Nov. 30 was as follows:

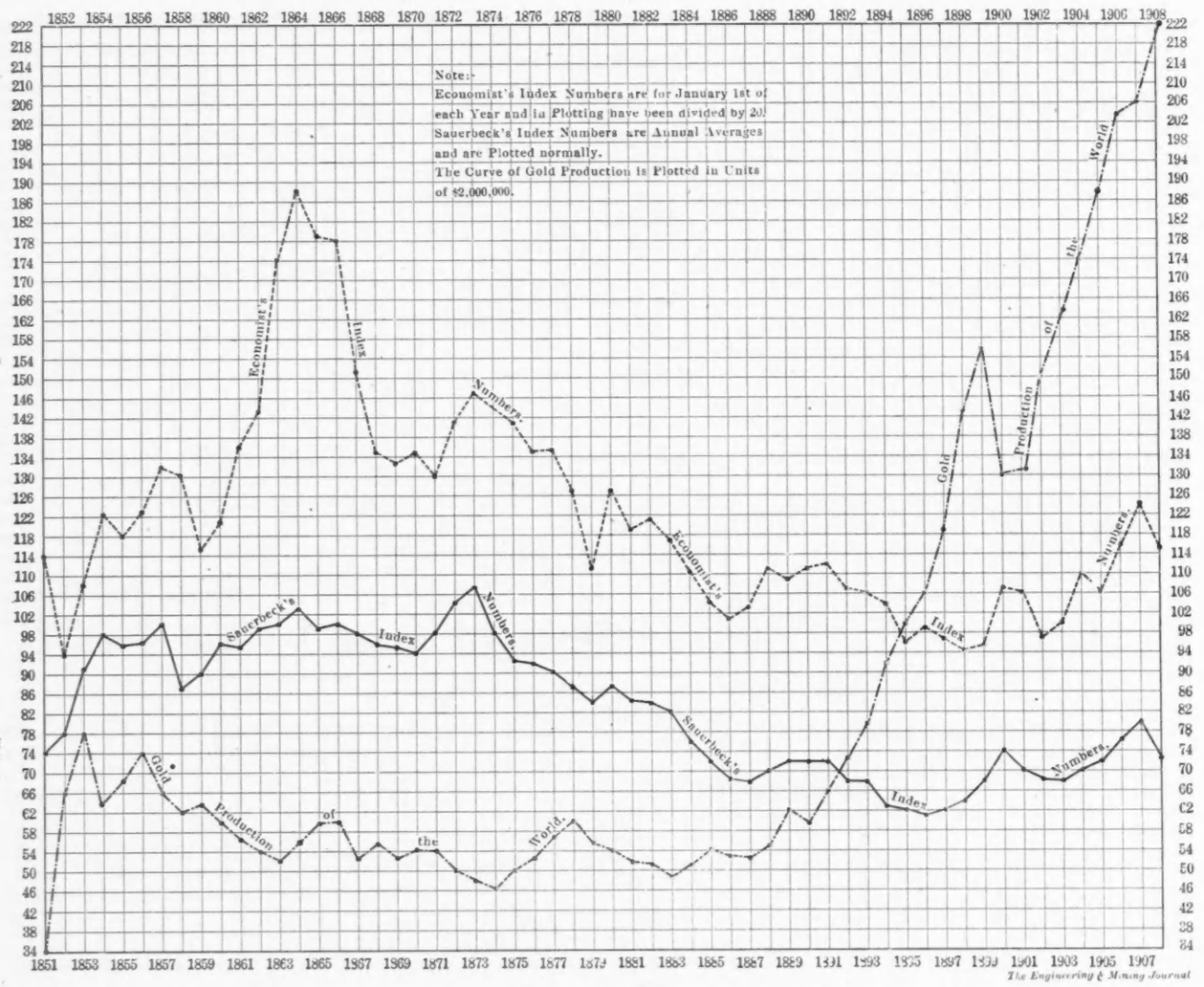
	1908.	1909.	Changes.
Imports....	£41,539,849	£48,870,125	I. £7,330,276
Exports.....	45,197,929	43,101,383	D. 2,096,546
Excess..E.	£ 3,658,080	I. £ 5,768,742	.....

The excess of imports in 1908 was a very unusual condition, and was mainly due to the large demands from France, which is usually a creditor in the London market, and which in that year called in its balances to a large extent. In 1909 the gold was, in turn, attracted to London by the strong demand for money there and the consequent high rates of interest prevailing. Of the imports in 1909 the United States contributed only £2,950,388; but it relieved the Bank of England of the necessity of supplying large amounts for South America.

Gold Movement in France

The gold movement in France for the 10 months ended Oct. 30 was as follows:

	1908.	1909.	Changes.
Imports..	F.789,825,000	F.356,668,000	D.F.433,157,000
Exports..	18,447,000	127,679,000	I. 109,232,000
Excess..	F.771,378,000	F.228,989,000	D.F.542,389,000



Production of Gold and Commodity Prices

The Bank of France in 1909 discontinued the persistent accumulation of gold which had marked its policy for a year previously. Apparently its reserves had reached a total which was deemed sufficient to provide for any possible economic or political contingency. Last year it ceased to reach after all available supplies of gold, and moreover it parted with considerable amounts for loans or investments abroad. At several times during the year it helped the London and Berlin markets when they were in need. France is the great creditor

nation of Europe and can always secure gold when it is needed. Although assistance was given to European money markets, it is reported that French bankers declined more than once to aid the speculative position in New York, although tempting offers were made.

Bank Gold Holdings

The gold reserves of the great banks of Europe were reported as follows in the closing weeks of 1908 and 1909. It must be understood that these sums practically represent the banking reserves of the respective nations, the custom being for them to hold the gold owned by private bankers, as well as their own. In the table the amounts are reduced to dollars:

	1908.	1909.
Bank of England	$153,662,010	$167,160,405
Bank of France	697,645,445	701,397,400
Imp. Bank of Germany	191,965,000	187,395,500
Austro-Hungarian Bank	245,730,000	284,070,000
Bank of Russia	607,255,000	704,450,000
Netherlands Bank	42,089,000	50,405,000
Belgian National	21,413,335	21,233,335
Bank of Italy	187,335,000	192,400,000
Bank of Spain	79,030,000	80,570,000
Swedish National	21,195,000	22,340,000
Norwegian	8,280,000	8,885,000
Switzerland	23,535,000	24,920,000
Total	$2,279,134,790	$2,445,226,640

The Bank of Spain, alone of all the European banks, carries a large silver reserve, which amounted to $153,910,000 at the end of 1909. The Bank of France reported $175,202,800 in silver coin, but that amount is small in comparison with its gold. The Bank of Russia includes in its statement gold bills on foreign banks, and to that extent there is a duplication, the amount of which cannot be ascertained. The Bank of Russia also acts as agent for the Imperial Treasury, which to some extent explains the large amount of its gold reserve.

The total increase during the year in these visible stocks of gold during the year was $166,091,850, or about 40 per cent. of the production of the year. It may therefore be accepted that at least that proportion of the gold output became an addition to the world's money supply as a basis for currency circulation, most of these bank reserves being used in that way. In addition to this there must have been a considerable amount used as an addition to gold coin in circulation.

The specie holdings of the New York banks declined during the year from $279,129,400 to $251,390,400, a loss of $27,739,000. These holdings include silver coin as well as gold. The United States Treasury holds about $1,200,000,000 in gold coin and bullion. Of this over $1,000,000,000 is locked up, being held against outstanding gold certificates in circulation, or as the statutory reserve against outstanding United States notes, or greenbacks, as they are popularly called.

The Commercial Movement of Silver

The commercial movement of silver in 1909, while not differing greatly in volume, was again represented by rather lower values, owing to the lower range of prices which prevailed. There was, however, little variation in these prices during the year, the market having been steady, though at a low level.

The movement of silver in the United States for the 11 months ended Nov. 30 was as follows:

	1908.	1909.	Changes.
Exports	$47,111,382	$52,294,344	I. $5,182,962
Imports	37,814,676	41,981,006	I. 4,166,330
Excess,E.	$9,296,706	$10,313,338	I. $1,016,632

At the average prices of the year the net exports represented approximately 17,586,000 oz. in 1908, and 20,034,400 oz. in 1909; so that there was an actual increase in quantities of 2,448,400 oz. By far the larger part of the exports went to London, the central market where the buying of silver for the East is done In 1909 there were also considerable shipments of silver to Paris, partly on purchases for the French Mint, and partly on account of increased buying for use in the arts. Direct exports to the East are still comparatively small, the total sent from San Francisco to China having been only a little over $4,000,000 in value. The East is always conservative and prefers to buy its silver in London, no matter where the supplies may come from originally.

The imports of silver are chiefly in ores, base bullion and matte brought to this country to be refined. Mexico is the principal source of these imports, but considerable quantities come from South America, Central America and other countries.

Silver Movement in Great Britain

The silver movement in Great Britain for the 11 months ended Nov. 30 was valued as below:

	1908.	1909.	Changes.
Exports	£11,804,119	£11,557,834	D. £ 246,285
Imports	9,588,542	10,814,404	I. 1,225,862
Excess, Ex.	£ 2,215,577	£ 743,430	D. £1,472,147

Of the imports of silver in 1909 a total of £9,124,510 was credited to the United States. A special statement of the exports to the East, as reported by Pixley & Abell, of London, brings the figures up to Dec. 16, only two weeks from the close of the year. The figures are as follows:

	1908.	1909.	Changes.
India	£8,412,390	£6,521,400	D. £1,890,990
China	641,400	1,885,000	I. 1,243,600
Straits	164,885	114,600	D. 50,285
Total	£9,218,675	£8,521,000	D. £ 697,675

The values given represent, at the average prices of the year, 90,668,000 oz. in 1908, and 86,200,000 oz. in 1909; a decrease of 4,468,000 oz., or 4.9 per cent. in quantities, against a decrease of 7.6 per cent. in values.

India, it appears from this statement, took less silver in 1909 than in 1908. The deficiency was partly made up by a large increase in Chinese buying. It also appeared that the stocks which were reported to have been accumulated in India at the close of 1908 were largely absorbed in 1909. The Indian government was not a heavy buyer in London during the year, its volume of coined silver requiring only moderate additions. At the same time there were lighter shipments of silver from Australia to India, owing to the reduced production from the Broken Hill mines.

Price of Silver

The following table shows the range of prices by months in New York and London for two years:

SILVER

Month.	New York.		London.	
	1908.	1909.	1908.	1909.
January	55.678	51.750	25.738	23.834
February	56.000	51.472	25.855	23.706
March	55.365	50.468	25.570	23.227
April	55.505	51.428	25.133	23.708
May	52.795	52.905	24.377	24.343
June	53.663	52.538	24.760	24.166
July	53.115	51.043	24.514	23.519
August	51.683	51.125	23.858	23.588
September	51.720	51.449	23.877	23.743
October	51.431	50.923	23.725	23.502
November	49.647	50.703	22.933	23.351
December	48.766	52.226	22.493	24.030
Total	52.864	51.503	24.402	23.726

New York, cents per fine ounce; London, pence per standard ounce.

The average yearly quotation of silver in New York for 10 years past has been as follows in cents per fine ounce:

1900	61.330	1905	60.352
1901	58.950	1906	66.791
1902	52.160	1907	65.327
1903	52.570	1908	52.864
1904	57.221	1909	51.503

The average price in 1909 was lower than that for any one of the preceding years. It was 1.361c. below that for 1908, and 0.657c. below the previous low level reached in 1902. It was 15.288c. less than the high point of 1906.

The monthly averages show a fair recovery in January from the extremely low prices of November and December, 1908. There were no great variations until an advance came which covered the months of April and May, but was followed by a reaction in June. Thenceforward there was little change, the lowest average being reached in November. In December there was an upward reaction, and the year closed with a promise of better prices.

The smaller purchases for India were the weak point in the market. In that country there was for the greater part of the year comparatively little surplus to pay for the silver, which is, as it has been for centuries, the chief investment for the savings of the people. Late in the year came the promise of good crops and larger exports, and the distribution

of silver increased accordingly. In the latter part of the year China was the sustaining force in the market. The Chinese banks bought largely and must at times have held large stocks; but they were absorbed or held, as they were not returned upon the market.

Other Conditions

Buying of silver for coinage purposes was not heavy. The United States Mint took little silver. Only the usual purchases by France and other nations in the Latin Monetary Union were reported. The demand for silver for use in the arts showed an increase with the returning prosperity in business. Supplies of the metal were about the same as in 1908, the decrease in Australia being made up by the larger output of Canada and Mexico.

Platinum in 1909

The production of platinum in the United States in 1909, so far as can now be ascertained, was about the same as in 1908, when a total of 510 oz. was reported. Most of this was obtained through the mint, where a certain quantity is recovered every year as a by-product in the refining of gold and silver bullion, mainly from California. A much smaller quantity is saved in treating the nickel-copper mattes brought here from the Sudbury district in Ontario to be refined.

Imports into the United States in 1909 increased largely over those for the previous year. For the 11 months ended Nov. 30 they were 105,340 oz., while those for the full year 1908 were only 49,168 oz. The total for the year 1909 was probably about 115,000 oz. A large part of these imports is crude metal, which is refined here. Most of the imports are Russian platinum, usually received here from Paris, where the control of the Russian industry rests. During the latter part of the year there was a considerable increase in the receipts from Colombia. Two dredges are now at work on the placers in that country, it is reported, with successful results.

Platinum in Russia

The production of platinum in Russia in 1909, taking the actual returns for 11 months and estimating the output for December, was 350 poods, equal to 184,240 oz., or 5730.55 kg., of crude metal, containing 83 per cent. platinum. This is an increase of 50 poods, or 16.7 per cent., over 1908. The gain was made chiefly in the later months of 1909 the activity in mining being stimulated by the larger demand for the metal and the higher prices realized for it.

The concentration of the industry made much progress during the year and the Russian platinum business is now almost completely syndicated. During the year an agreement was completed, the parties to which are the Société Anonyme d'Industrie du Platine, of Paris; Count P. P. Shouvaloff's Sons and the Estate of Prince Demidoff. The terms of the agreement are such that the Société du Platine controls the production and sale of more than 300 poods, or 85 per cent. of the total production.

This excited much feeling among the smaller producers, which found expression in the newspapers. As a result the government appointed a special commission to inquire into the conditions of the industry. After a number of sessions this commission made a report recommending: (1) That the export of crude platinum from Russia be prohibited; (2) That all platinum mined should be delivered to the government and refined in a plant to be built for the purpose either by the government or by a company specially licensed for the purpose; (3) That the National Bank be authorized to make loans or advances to miners on the metal. These measures were recommended as aids to the smaller producers to enable them to continue at work.

The Markets

New York—The year opened with a light trade, dealers asking $23.50@24.50 per oz. for refined metal and this condition, with an unchanged quotation, held until the middle of March. A slight drop brought the current price down a little and $23@24 per oz. was quoted until the middle of May. A reduction to $23@23.50 was reported early in June, and 50c more was dropped in July, the price being $22.50@23, which held for a month. In August the market was disturbed by some holders of small stocks, who found it necessary to realize, and refined platinum could be had at $21@22.50 per oz., the higher price being that asked by the large refiners. About the end of August demand began to improve; sales were larger and the small holders who had been offering at low prices were generally cleaned out. On Aug. 28 an advance to $23@24.50 was recorded. Thereafter there was a steady advance, $24@24.50 being quoted on Sept. 4; $25.50, Sept. 18; $26 on Oct. 2; $27 on Oct. 9; $27.75 on Oct. 23, and $28.50 on Oct. 30. An unusually large fall trade developed, especially with jewelers, who took considerable quantities in anticipation of the holiday season. About the middle of November there was an advance to $29.50 per oz., and this held until the end of the year.

Hard metal, which is an alloy of platinum and iridium, had special advances on account of a scarcity of iridium and its consequent high price. During the first half of the year the difference in price between refined platinum and hard metal was $2.50 per oz.; in July this was increased to $3.75, and in December to $5.50. The dealers' quotation for hard platinum was $35@35.50 per oz., at the close of the year.

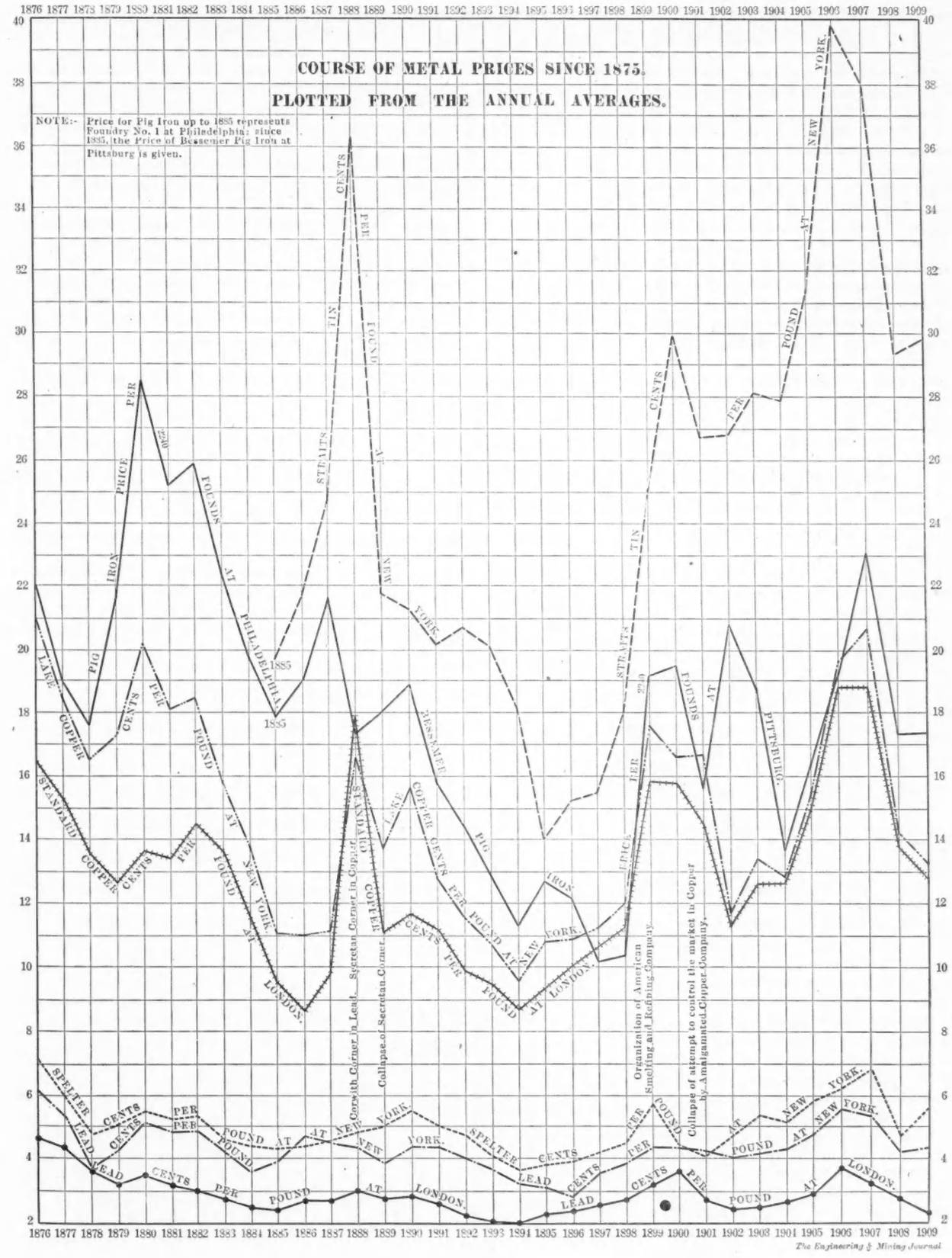
Russian Markets.—The prices of crude platinum in Russia fluctuated widely during the year. In Ekaterinburg, which is a primary market in which the smaller miners offer their production, the price in January was 5 rubles per zolotnik for crude metal, 83 per cent. platinum. This held until the end of March when a gradual fall began, the lowest price—4.25 rubles per zolotnik—being reached in June. Recovery from this point was slow for two months, but in September 5.25 rubles was reached; in November 6 rubles and at the close of the year 6.25 rubles. The large producers and the middlemen who buy small lots usually sell their metal in St. Petersburg. The opening price there was 20,550 rubles per pood; the quotation declined until June, when the lowest point of the year was reached, at 18,000 rubles per pood. An advance began in August which carried the quotations to 22,500 rubles in October; 24,000 rubles in November, and 24,500 rubles at the end of the year.

The accompanying table gives average monthly prices of refined platinum in New York and of crude metal in the Russian markets. The Russian prices in the table are reduced to their equivalents in American money per ounce troy.

AVERAGE PRICES OF PLATINUM.
In Dollars per Ounce Troy.

	New York, Refined Platinum.	Russia, Crude Metal—83 Per Cent. Platinum.	
		St. Petersburg.	Ekaterinburg.
January	$24.10	$20.14	$18.80
February	24.00	19.80	18.89
March	23.75	19.09	18.85
April	23.50	18.13	17.48
May	23.25	18.13	17.86
June	22.75	17.64	16.58
July	22.43	17.64	16.73
August	22.65	19.83	19.27
September	25.31	20.64	19.74
October	27.75	21.85	21.53
November	29.50	23.52	22.56
December	29.50	23.77	23.03
Average for the year.	$24.87	$20.02	$19.26

Average Yearly Prices of the Metals



The Copper Production of North America

The Production of the United States was 1,098,000,000 Pounds; of Mexico, 126,000,000 Pounds; of Canada, 48,000,000 Pounds

REFINED PRODUCT 1,410,000,000 POUNDS

The production of refined copper in the United States in 1909 was in round numbers 1,410,000,000 lb. against 1,153,000,000 lb. in 1908. The increase was in reality a little larger than is shown by these figures, because in the total for 1908 is included all the copper resmelted from junk, which it is not yet possible to figure for 1909. For both years these figures represent the total production of American refineries, which draw supplies of raw material, not only from the United States, Canada and Mexico, but also from many foreign countries. This raw material is partly ore and matte and partly blister copper, the production of Cerro de Pasco being the chief supply of the latter obtained from countries outside of North America.

Estimating the domestic deliveries of refined copper in December at 70,000,000 lb., the total for the year was 704,070,892, against 488,500,000 in 1908, 538,000,000 in 1907 and 668,600,000 in 1906. The productions and deliveries by months are given in an accompanying table. Regarding the domestic deliveries in 1909 by quarters, it appears that in the first three months the average was about 48,000,000 lb.; in the second, about 56,400,000; in the third, about 62,400,000; and in the fourth, 67,700,000. Consumption in 1909 probably did not increase to the amount indicated by the deliveries, inasmuch as manufacturers are supposed to have added to the stocks in their yards toward the end of the year, but there is little doubt that the actual domestic consumption in 1909 was fully 660,000,000 lb.

The statistics show clearly to what extent the American consumption of copper revived in 1909 and dispel the idea expressed during the year that the copper business was lagging behind the industrial improvement in general. Toward the end of 1909 the brass, sheet and tube mills went on over-time in order to keep up with their orders, and business in the lighter sort of wire, such as are required for telephone extensions, was good. It was only for the heavy wire, required for trolley and power transmission purposes, that demand was sluggish, the reason being obviously because the times had not yet become wholly propitious for the financing of new enterprises. However, at the very end of the year the demand for this kind of wire also showed a noteworthy improvement. The demand for copper in Germany improved materially in 1909, and in France business became fair. It was only in Great Britain that the demand continued sluggish.

PRODUCTION OF COPPER BY STATES.

State.	1908.	1909.
Alaska	4,394,887	4,474,203
Arizona	290,167,795	291,075,846
California	36,890,353	53,048,094
Colorado	13,896,689	10,408,823
Idaho	8,749,559	8,168,267
Michigan	222,267,444	227,019,646
Montana	252,558,330	315,090,341
Nevada	12,174,269	50,820,000
New Mexico	8,523,652	7,001,136
Utah	70,978,952	105,349,740
Wyoming	2,384,356	100,000
South and East (*a*)	20 822,368	21,524,333
Other states (*b*)	4,387,836	4 206,999
Total	948,196,490	1,098,287,425

(*a*) Includes Vermont, New Hampshire, Pennsylvania, Virginia, North Carolina, Alabama and Tennessee. (*b*) Includes Washington, Oregon, South Dakota, Texas, Missouri, and the production of the lead desilverizers and others which it is impossible to distribute according to place of origin.

CONSUMPTION OF COPPER.

	1908.	1909.
Stock Jan. 1	120,000,000	122,357,266
Imports of refined	nil	nil
Production	1,152,895,019	1,410,116,663
Total supply	1,272,747,890	1,532,473,929
Exports	661,876,127	680,285,945
Remaining in U.S.	610,871,763	852,187,984
Stock Dec. 31	122,357,266	148,117,092
Delivered for consumption	488,514,497	704,070,892

STATISTICS OF COPPER.

Month.	United States Product'n.	Deliveries, Domestic.	Deliveries for Export.
I	112,135,200	51,862,624	38,499,797
II	103,700,817	43,578,118	30,968,496
III	117,058,661	48,871,964	59,191,043
IV	113,574,292	47,546,010	65,110,111
V	118,356,146	61,163,325	70,542,753
VI	116,567,493	60,591,116	70,966,457
VII	118,277,603	75,520,083	75,018,974
VIII	120,597,234	59,614,207	48,382,704
IX	118,023,139	52,105,955	50,077,777
X	124,657,709	66,359,617	56,261,238
XI	121,618,369	66,857,873	55,266,595
XII	125,550,000	70,000,000	60,000,000
Totals	1,410,116,663	704,070,892	680,285,945

	Visible Stocks.		
	United States.	Europe.	Total.
I	122,357,266	124,716,480	247,073,746
II	144,130,045	118,574,400	262,704,445
III	173,284,248	117,140,800	290,425,048
IV	182,279,902	115,024,000	297,303,902
V	183,198,073	114,050,320	297,248,393
VI	169,848,141	127,352,960	297,201,101
VII	154,858,061	150,928,960	305,787,021
VIII	122,596,607	171,492,160	294,088,767
IX	135,196,930	197,993,600	333,190,530
X	151,472,772	210,224,000	361,696,772
XI	153,509,626	222,566,400	376,076,026
XII	153,003,527	236,857,600	389,861,127
I	148,553,527	244,004,800	392,758,327

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. The statistics for December are estimated.

During 1909 there was a good deal of complaint respecting the "low price for copper," yet the average for the year is not much below that of the last 20 years, or much below the figure upon which conservative engineers and industrialists base their calculations for a long way ahead. The new copper mining enterprises that are brought out with the countenance of competent and conservative engineering advice are seldom based upon a price for copper higher than 13½c. It is well known that the bulk of the North American production of copper yields a handsome profit on the basis of 13c. Otherwise, why should production have increased so hugely in 1909?

The really marvelous thing is that during 1908 and 1909 the price for copper has held so steadily at 13c. This has resulted primarily from the cheapness of money, which has made it easy to finance the accumulation, carried in the hope that absorption would not be long delayed, and, of course, the present concentration of the copper selling business in comparatively few strong hands has aided. This has kept the market free from any pressure that might have reduced the price to 10c. or less, as happened in former times, and by naturally restricting the unprofitable output brought production and consumption into equilibrium. So far as productive conditions are concerned there is no reason, so far as we can see, why copper should not be offered at as low a figure as at any time in the past. The exhaustion of some of the rich and cheaply worked mines of former times and the drawbacks of having to work many deposits at increased depth are fully offset by improvements in mining and metallurgy and the discovery of new mines.

Along toward the end of 1909, the widely discussed plan for consolidation of important interests played a prominent part in the copper market. The purpose of this plan was declared to be to improve the price for copper by curtailment of output. Incidentally, it was inferred that its purpose was also to put in a more marketable form various securities that the public would be more interested in buying on a basis of 15c. for copper. This would be, of course, more or less a repetition of the organization of Amalgamated in 1899. Probably the new consolidation would not include any larger proportion of the output than Amalgamated did at that time. The umbrella became too heavy for Amalgamated to hold, and without doubt the situation would

become unmanageable to the new combination when such prospective producers as Miami, Ray Consolidated and others will enter the market a few years hence. However, this would be for the public to find out. The Standard Oil decision gave the scheme a rude check. Also the difficulty of reconciling many discordant interests was very great. Consequently, it was decided to effect consolidation in groups, and afterward undertake to bring the groups together. We think, however, that the psychologic time for bringing out the consolidation was missed, and that now it is likely to be defeated by the weight of criticism. The public is now better informed as to the principles of mining valuation than it used to be, and it is less easy to lead investors into gambles in excessively inflated securities.

It is difficult to forecast the probabilities of the copper market in 1910, although at the moment the sentiment is highly optimistic. Artificial measures, such as the consolidation project above referred to, or the curtailment of production by common consent, may have an important bearing upon the market. Stringency in the money market may be at any time an important factor, compeling lower prices for a while, stimulating consumption. However, the time will inevitably come when consumption will again exceed production. The demands of the world grow, and the increase by decades is apt to be steady, although in one, two, or three years there may be no increase at all. Such a failure must subsequently be made up. Undoubtedly the world will sooner or later take up the slack of 1908 and 1909.

We do not seem to be threatened by any dearth of copper. The determination that the low-grade porphyry deposits of Utah and Nevada can be exploited profitably marked the beginning of a new era in copper production and mines of this class are now being rapidly developed in Arizona and New Mexico. It is unbelievable that such deposits are confined to the United States. On the contrary, it is highly probable that similar deposits will be discovered and exploited in Mexico, Chile and other foreign countries, perhaps even in Europe. Indeed, we know of such prospecting, promising well, that has already been inaugurated. It is possible that in admiring the pre-eminence that North America has held in copper production we have underestimated the possibilities of the rest of the world. Among the new copper districts clearly in view, it is expected that Copper River will produce a little in 1910 and largely in 1911 when the railway will be completed. Not much is known respecting the resources of this district, except the Bonanza mine but the occurrence of copper is wide-spread, the surface ores are rich and smelting facilities already exist at Tacoma. Katanga is also expected to begin production by the end of 1910 and a great deal of copper is known to exist there. However, both Copper River and Katanga are being developed under adverse natural conditions and their copper will not be produced at anywhere near so low a cost as has been advertised.

Review of Copper Mining in the United States

Alaska.—Production in 1909 was about the same as in 1908. The entire product was finally smelted at Tacoma, a portion being first treated at the Tyee works and thence shipped to Tacoma as matte.

Arizona—Production in 1909 was about the same as in 1908. There were no new producers of blister, but two companies are planning to instal converters. Miami and Ray Consolidated are building large concentrating mills.

California.—The increased operations by Mammoth and the steady operation by Balaklala added largely to the production of California, which is doubtless destined to make further gains in the near future. Mountain made only a small output in 1909 but has ore reserves enabling it to increase largely when it gets ready.

Colorado.—Production appears to have been somewhat less than in 1908.

Idaho.—Production appears to have been about the same as in 1908. The Snowstorm mine, in the Coeur d'Alene, continued to be the chief producer. All of the copper ore of Idaho is shipped to other States for smelting, a little being exported to British Columbia.

Michigan—Production increased considerably over 1908. It could readily have been increased further, but Calumet & Hecla restricted its production of refined metal, adding to its accumulation of "mineral." There were several new producers but none of particular importance except Superior, although some others, especially Lake, promise to figure prominently in the near future.

Montana.—In this State there was a large increase in production and it regained its former place as the premier. The Washoe and Great Falls works were run at practically full capacity throughout the year, except in December when the switchmen's strike interfered.

Nevada.—As the Steptoe Valley works approached completion their production swelled and the result was a huge increase for the State. At the rate of the last quarter Nevada Consolidated alone would produce 70,000,000 lb. in 1910. Steptoe Valley now has four reverberatory furnaces, and a fifth to be completed in January.

New Mexico.—Production appears to have been a little less than in 1908. Development of the old Santa Rita mines, now called Chino, will doubtless add largely to the production of this Territory, but hardly before the end of 1911.

Utah.—The huge increase in the production of this State was due chiefly to Utah Copper Company. The prospect is for progressive increases for several years to come. The United States Smelting Company expects soon to resume copper production. The Tooele smeltery will go into operation in 1910, taking the Highland Boy ore that now goes to Garfield. In December the Ohio Copper Company started the first section of its mill and began shipping to Garfield. The mills of the Utah Copper Company and Boston Consolidated are to be nearly doubled.

Wyoming.—Production in 1909 was insignificant, the Penn-Wyoming having been idle. Plans are on foot to operate again in 1910.

South and East.—Production was about the same as in 1908, coming chiefly from Tennessee. The output of Virginia became insignificant, but some copper was produced in Pennsylvania, Vermont and New Hampshire.

The Copper Statistics for 1909

The statistics of production in North America in 1908 and 1909 herewith presented are based upon reports from all of the producers and represent the Michigan production, plus the fine-copper content of blister copper and the copper content of the very small quantity of matte exported.

The distribution of the production of the United States among the several States and Territories as made at the present time is only approximately correct. Indeed there is some uncertainty as to the distribution between the United States and Mexico, but error in this particular cannot be more than a fraction of 1 per cent., one way or the other.

The total production of refined copper in the United States in 1909 was about 1,410,000,000 lb. The production of Lake copper was 227,019,646 lb.; of, blister copper, in North America, 1,065,615,990. The amount of pig copper imported from foreign countries other than Canada and Mexico was 126,000,000 lb. Consequently the supply of blister copper to the American refineries was 1,191,615,990 lb. Estimating that 1 per cent. of the blister copper was recovered as bluestone, the total available from this source was 1,181,000,000 lb. in round numbers, and adding to this the 227,000,000 lb. of Lake copper the grand total is 1,408,000,000, which is a close check of the refinery statistics.

Texada island has shown more satisfactory recent development in copper mining than any other section of the British Columbia coast district. The Canadian geological survey has had a field party on the island two seasons.

Copper Production of North America

The copper production of North America is summarized as follows:

Country.	1908.	1909.
United States	948,196,490	1,098,287,425
Mexico	89,576,464	125,982,688
Canada	53,725,213	48,067,710
Cuba	6,538,047	6,002,000
Totals	1,098,036,214	1,278,339,823

All of the Cuban ore was shipped to the United States for smelting.

Copper Production of Canada

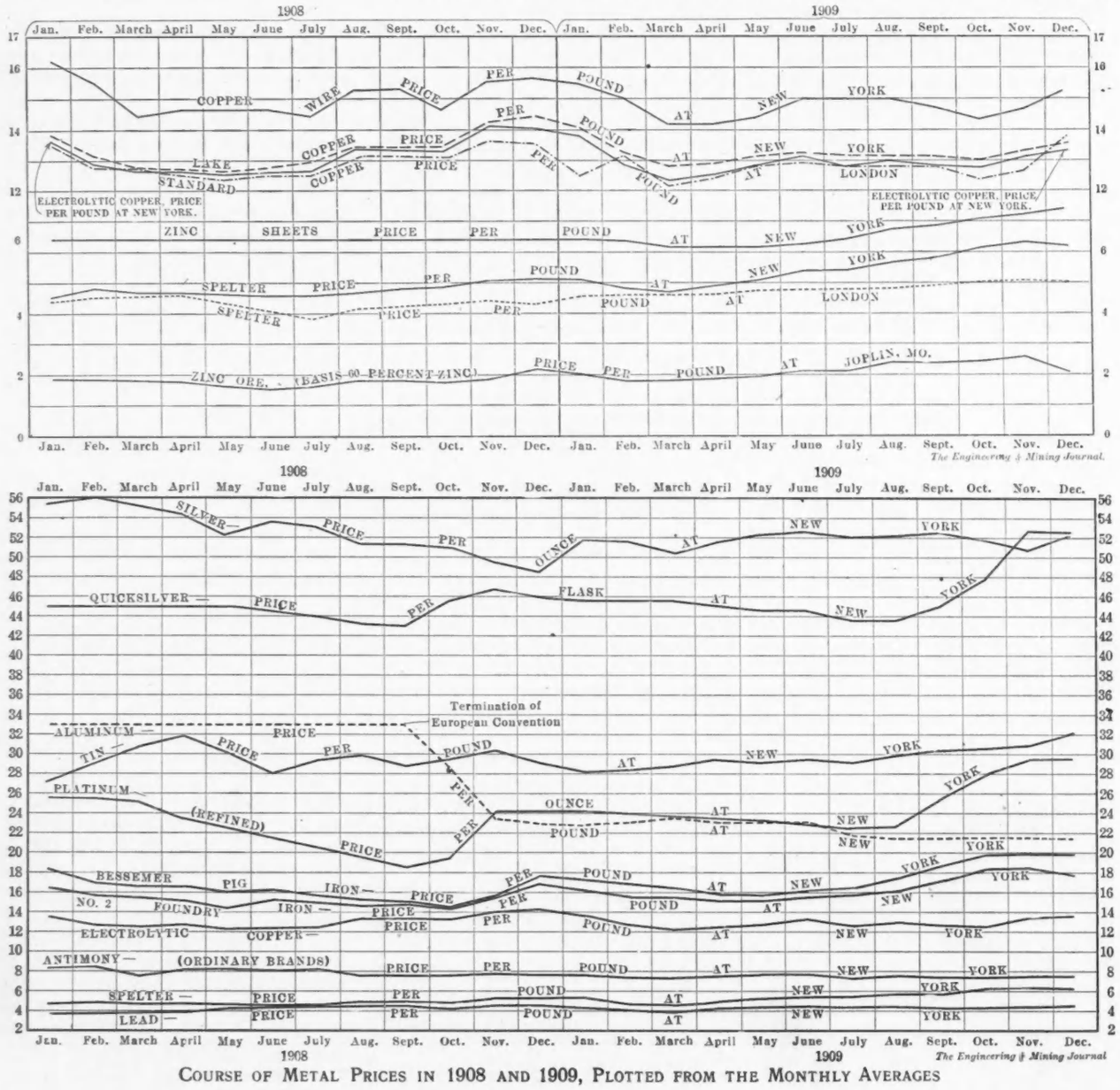
The production of copper in Canada in 1909 was 48,067,710 lb., against 53,725,213 lb. in 1908. As heretofore the Boundary district of British Columbia and the Sudbury district of Ontario were the largest producers. The British Columbia and Granby companies were the only ones producing blister copper. The remainder of the Canadian production was exported as ore and matte, chiefly the latter, the bulk of this material being sent to the United States for smelting.

Copper Production of Mexico

The copper production of Mexico in 1909 was 125,982,688 lb., against 89,576,464 lb. in 1908. The producers of blister in Mexico were Cananea, Aguascalientes, Torreon and Boleo. All of these made increased outputs in 1909. A great deal of Mexican ore was also smelted at Douglas, Ariz., and at other works in the United States. The largest part of the increase in Mexican production in 1909 was due to Cananea. Teziutlan continued to keep its new smeltery out of operation.

The Copper Market in 1909

The dawn of 1909 brought with it a very hopeful feeling for the future of the copper market, which, however, was doomed to an early disappointment. A retrospective analysis of the conditions would, however, tend to show that the developments as they took place were altogether logical. The opening up of the large low-grade orebodies of Ely, Nev. and Bingham, Utah, had been progressing during the previous two years and the mines had just about reached the producing stage, fulfilling in the course of the year all promises of the large production held out by the promoters. Consumption the world over did not increase fast enough to absorb the additional output, but with occasional irregularities and stimulated both by the general revival of business and the low price of the metal, the progress has been toward a steady en-



COURSE OF METAL PRICES IN 1908 AND 1909, PLOTTED FROM THE MONTHLY AVERAGES

largement. In the meantime, however, stocks of copper have largely increased, particularly in Europe, where most of the visible supply is carried at the present time. On Dec. 31, 1908, stocks there in public warehouses amounted to 55,677 long tons, while on Nov. 30, 1909, they had increased to 105,743 long tons. Due to the figures compiled by the Copper Producers Association, which was formed early in 1909, an exact record is again being kept from month to month of the statistical position of the domestic market. According to the figures of the Producers Association, the stocks in this country, which had amounted on Jan. 1 to 122,357,266 lb., showed an enlargement

COPPER

	NEW YORK.				LONDON.	
	Electrolytic		Lake.			
	1908.	1909.	1908.	1909.	1908.	1909.
January...	13.726	13.893	13.901	14.280	62.386	57.688
February..	12.905	12.949	13.098	13.295	58.786	61.198
March.....	12.704	12.387	12.875	12.826	58.761	56.231
April	12.743	12.561	12.928	12.93[illegible]	58.331	57.363
May.....	12.598	12.893	12.788	13.238	57.387	59.338
June.....	12.675	13.214	12.877	13.548	57.842	59.627
July.....	12.702	12.880	12.933	13.363	57.989	58.556
August....	13.462	13.007	13.639	13.296	60.500	59.393
September	13.388	12.870	13.600	13.210	60.338	59.021
October...	13.354	12.700	13.646	13.030	60.139	57.551
November.	14.130	13.125	14.386	13.354	63.417	58.917
December.	14.111	13.298	14.411	13.647	62.943	59.906
Year.....	13.208	12.982	13.424	13.335	59.902	58.732

New York, cents per pound. Electrolytic is for cakes, ingots or wirebars. London, pounds sterling, per long ton, standard copper.

by the end of November to 153,509,626 lb. There is not likely to be a marked change in the figures, either here or in Europe, when the statistics for the whole year will have become available.

Throughout 1909, the market was in a very sensitive condition being always under the influence of the speculative market in London, which, in turn, takes its cue in a large measure from the share markets. A great deal has been said to deprecate the influence which the London standard market has been exercising on the business in the refined metal. It is, however, but reasonable to conclude that through the standard market it has been made possible to distribute among many the burden of carrying the large stock, which, had it been left in few hands, might have brought about market conditions most unpleasant to contemplate. Even as matters are, the position in London would not have been as sound as turned out to be the case—everything considered—had it not been for a lively speculative interest which made itself manifest in this country, where formerly speculation in the copper metal had not been indulged in on a large scale. Speculators the world over show a singular confidence in their position, and though the figure of the visible supply of copper on hand in public warehouses in Europe is very formidable, the danger of the stock to the market is not very great as long as the prospects for the future continue encouraging. So far as the stock in this country is concerned, it represents only a little more than a month's production.

Two episodes in the last quarter of the year gave a great deal of special interest to the copper situation. Firstly, the long contemplated copper merger had gradually arrived at a point where it began to assume tangible form. It is not necessary to refer here to the details of the plans which were entertained by the leading producers and which have since been deferred due to the Standard Oil decision. Secondly, as the year drew to a close, it became evident that the only chance of early improvement lies in a reduction in the output, and reports that many important mining companies throughout the country would curtail their production were widely circulated, although it is doubted whether they will really do so. On the other hand, consumption is making satisfactory progress. While during the high pressure of the early months of 1907 the actual consumption might have been in excess of

AVERAGE MONTHLY PRICES OF COPPER MANUFACTURES.

(In Cents per Pound).

	1908.		1909.	
	Copper Wire.	Sheet Copper.	Copper Wire.	Sheet Copper.
Jan.....	16.375	20.000	15.650	20.000
Feb.....	15.6875	19.75	15.0625	18.675
Mar.....	14.500	18.00	14.3125	17.30
Apr.....	14.750	18.00	14.250	16.50
May.....	14.750	18.00	14.500	16.70
June.....	14.750	18.00	15.000	17.00
July.....	14.500	17.75	15.000	17.50
Aug.....	15.200	18.70	15.000	17.50
Sept.....	15.250	19.00	14.750	17.50
Oct.....	14.8125	19.00	14.500	17.50
Nov.....	15.600	19.80	14.937	18.00
Dec.....	15.750	20.00	15.250	18.50
Year...	15.160	18.833	14.851	17.72

the current requirements, the highest figures have certainly now been exceeded, compared with any extended period of time, and this in spite of the fact that the wire business is still far below both previous records and the capacity of the manufacturers.

In the early days of January, electrolytic copper was quoted at 14¼@14⅜, and this turned out to have been the highest price of the year. Later on in the month, the publication of exaggerated estimates of accumulated stock on this side led to the liquidation in the London market of large speculative accounts which had been carried for several months. This caused a break in the market for standard copper, and thereafter the decline was rapid both at London and New York. By the last of the month, the price of electrolytic copper had receded to 13⅜.

Throughout February, the copper market was dull and sagging. Sales were unusually small because manufacturers had overbought themselves in previous months. Prices continued to decline rapidly, until, during the last week of February, a basis of 12⅜c. was reached, which at last interested European buyers and in the last four days of the month some fairly large sales for export were consummated. The activity continued until March and an attempt was made to raise prices, which, however, failed, as manufacturers would not be led into buying largely upon a rising market. The improvement in general business, however, began to make itself felt, and at the low prices reached the market showed a great deal of resistance.

While prices did not improve very much in April, business was in good volume and the market held its own throughout the month at 12½@12⅝c.

During May, demand from consumers improved very much, being stimulated by a revival in business and a rampant bull movement in the London market emanating largely from this side. In the New York market there was a steady advance in the price during May, and at the close electrolytic was quoted at 13⅛@13⅜c.

The activity that characterized the end of May extended into the early part of June and an outburst in speculative buying in all the European markets carried prices further upward, a basis of 13½c. for electrolytic being reached. About the middle of the month, speculative selling led to a decline and later on the market became deluged with offerings from this source which precipitated a decline to 13 cents.

In July the market receded somewhat further, but when prices had declined to 12¾c. a large buying movement developed, and July closed with the market in a better condition at 12⅞ cents.

Not much business was done until Aug. 10, when the publication of the American statistics, showing a decrease of about 32,000,000 lb. in the visible supply on this side, was followed by excited buying from European sources and a considerable business from domestic manufacturers, which caused prices to advance to 13@13¼c. for electrolytic. Later on the conviction became general that the deliveries in July were swelled by speculative purchases on the part of some of the largest consumers, who had decided to carry heavier stocks, so that the statistics were not really so good as they looked. Consumers, having supplied themselves liberally, became disposed to await developments, while the selling agencies, who still had an abundant supply, became once more pressing in their competition and made concessions which carried the market again downward to 13 cents.

Early in September, the market was considerably disturbed by some large sales of metal from second hands, and a further depressing influence was the producers' statistics, which showed an increase of 12,600,000 lb. in stocks during August. However, the market showed a great deal of resistance, due to the realization that consumption had reached a very high

level. At the close of the month, the market had not lost much ground, sales taking place at 12¾@13 cents.

The chief feature in October was the stiffening in the money market, which compelled some speculators to liquidate, while foreign bankers, in consequence, sought to discourage speculation in copper. The decline in the standard quotations compelled New York sellers to reduce their prices to nearly 12½c. When this level was reached, a better demand set in which carried prices up to 12⅝@12¾c. during the closing days of the month. The improvement was helped by the project of a copper consolidation, which inspired a speculative movement at the beginning of November. In the second week, this movement gained force and had the natural effect of drawing in manufacturers who were frightened into covering their requirements for a long time ahead. The volume of business up to Nov. 20 was on a larger scale than perhaps at any other time during the year, prices rising to 13⅝c. Then came the Standard Oil decision, which caused buyers to hold aloof waiting to see how far this would affect the plans for the consolidation. The speculative market took this decision more seriously, and under a heavy wave of liquidation prices in London gave way sharply. Electrolytic, as usual, followed, and the market at the end of the month was weak at 13@13¼ cents.

Developments during the last month of 1909 showed that the market is weathering the disturbing factors which have beset it. Consumption of copper both in Europe and in this country appears to have increased greatly. The outlook for still larger requirements the world over is good. The tone was steady throughout December, and the market closed with an upward tendency at 13⅝@13¾ cents.

Copper in Arizona in 1909

BY JAMES DOUGLAS *

The most notable feature of Arizona's copper mining during 1909 was in the direction of the development of deposits of low-grade ores in porphyry and schists. The greatest activity has been in the Globe district. The country between Pinal creek, which runs through the town of Globe, and the Pinal mountains, which are 20 miles south of Globe, is more or less impregnated with copper, and it is within that district that the most vigorous operations are now being conducted. Some of the properties which are to be worked by large public corporations have been small producers for a number of years, but nowhere have they been prospected in depth, and it is the deeper ores which under corporate management will unquestionably tell largely upon Arizona's future production.

Development of New Properties

The most prominent of the new properties is the Miami, which is being opened under the management of J. Parke Channing. The concentrating mill was designed and is being erected under the supervision of H. Kenyon Burch. It should, therefore, be an improvement upon the successful mills which have been built under his direction for the Detroit Copper Mining Company and the Montezuma Copper Company.

Adjacent to the Miami, the Inspiration and Black Copper are being opened up, and the Live Oak, Warrior and Eureka (renamed the Cordova since consolidation with the Globe Consolidated), all promise to become more prolific producers in the future than they have been in the past. The Cactus company is another new company which is appealing to the public for support. Its mines are about four miles west of the Miami. The Gibson Copper Company is still producing, and mines are being opened in the neighborhood of Bloody Tanks, a district historically interesting in that the first furnaces put up by the Old Dominion company in 1881 were erected there to treat the ores of the Chicago and New York.

To the north of Pinal creek, where are the properties of the Old Dominion and United Globe mines, the Arizona Commercial Company has passed from the passive stage of a mere ore producer into the active stage of a smelting enterprise, and is turning out at the start about 25 tons of 50 per cent. matte per day. Other companies working on the northern extension of the more or less developed Globe veins are the Superior & Boston and the Cordova, which has absorbed the Globe Consolidated.

Another district which is appealing to the public for support is what is known as Mineral creek, south of the Pinal mountains. The Ray mine has been more or less actively worked for the last 24 years, and has passed through various reorganizations. The last is the Ray Consolidated. Another company in the same neighborhood is the Ray Central. The Gila Consolidated is a third candidate appealing for public help. All these companies are capitalized at very high figures, and are developing enormous quantities of ore with churn and diamond drills. If their expectations are realized, the quantity of copper they will turn out will certainly supply all the world will require.

The only other new district in the Southwest in which the same quality of ores is being explored is in the Burro mountains in New Mexico, a short distance east of the Arizona line. The old Comanche mine, now consolidated with a neighboring concern as the Savannah, has been mining these low-grade ores for several years with indifferent success; but more extensive operations were conducted by the Burro Mountain and Chemung companies on an adjacent group of claims. Although the Burro Mountain company has treated the ores, necessarily extracted, in a small mill, neither of these companies has reached the point where it can confidently predict the cost of making copper.

On the testimony of churn drills and diamond drills we are measuring ore by the millions and millions of tons, and estimating its value to the tenth of a per cent, and counting the costs and the profits on prophetic anticipations of what mills will do and what prices will be. It is a wild game in which the public is generally the pawn and the players stand small danger of losing. In no case have active operations proceeded far enough to raise the value of these properties out of the speculative into the realized class.

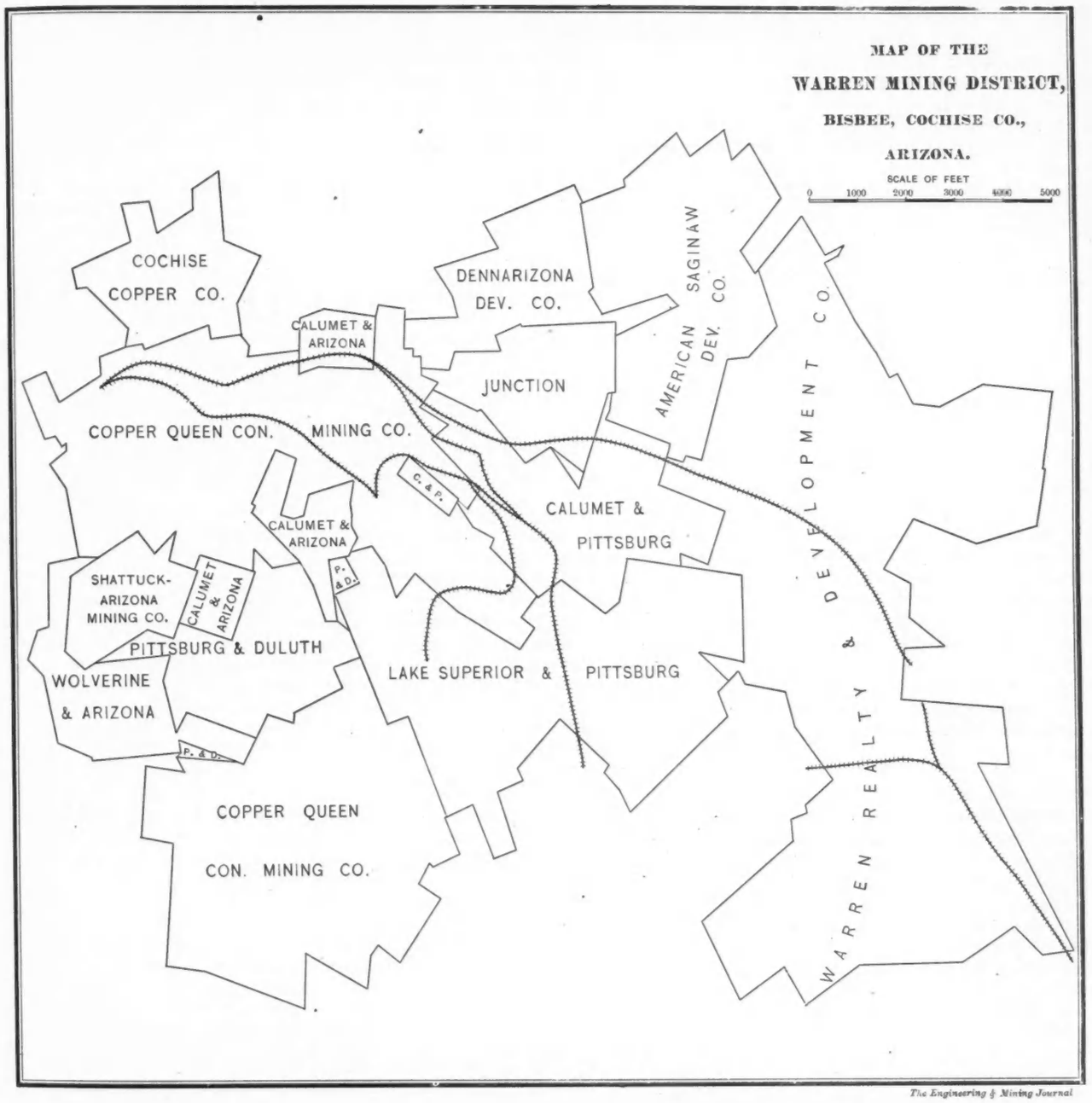
Working the Low-grade Deposits

One inducement to capitalists to undertake the exploitation of these deposits has been the success of the Clifton companies in working profitably ores of 3 per cent. and under, though they do not carry precious metals in profitable quantities. In this respect they are at a disadvantage with the porphyry mines of Utah, Nevada and British Columbia. But the present position of the Clifton mines was earned by many years of financial trial and was gradually attained by experience as the grade of the ore dropped from 10 or 15 per cent. to its present level. The new undertakings start with even leaner ores than Clifton, but with the information derived from their neighbors' operations, and with the additional advantage of perfect knowledge of the great advance made within recent years in mining and metallurgy. The reduction in the cost of mining through the introduction of the caving and slicing systems, has, where conditions are favorable, cut in two the expense of underground mining; and the steam shovel, applied to opencast work,

*President, Phelps, Dodge & Co., 99 John street, New York.

has reduced such mining to the level of railroad grading. Mineral, therefore, which could not have been classed as ore 20 years ago is today worked to a profit. And the ore when extracted can be handled with ever decreasing cost, both mechanically through the concentrating mill, and metallurgically through the smelting works. It is therefore presumptuous to pretend to define what is the minimum grade which under certain favorable circumsances can be profitably treated. Nevertheless another factor enters into the question of what is a profitable ore, besides the cost of turning it into metal and marketing it and that is the price that is going to be realized for the metal. If there is any relation between production and consumption in controlling price, unlimited production must mean limited price. When, therefore, these new concerns talk lightly of building mills of 5000 and 6000 tons daily capacity instead of 1000 or 2000, they must have some assurance of a buoyant market, which will put the red metal to new uses.

These courageous projects cannot, however, be expected to notably increase Arizona's production during the coming year. The mills are not yet erected, nor the mines sufficiently opened to furnish with ore the mills of such large contemplated output.



THE 1909 PRODUCTION

The production of Arizona in 1909 was approximately the same as it was in 1908, say, 291,000,000 lb. As Butte has with but slight interruption been active throughout the year, Montana may be expected to again take the lead by a small excess. The copper statistics of Arizona are liable to be confused if the product of the Copper Queen smelting works at Douglas is credited wholly to the Territory. The copper smelted at the Copper Queen works during 1909 may be roughly distributed as follows:

	Lb.
Copper Queen ores	75,821,566
Custom (domestic)	7,704,997
Moctezuma Copper Company	23,936,000

The output of the Copper Queen mines during 1909 was 75,821,566 lb., as compared with 76,125,162 lb. in 1908, and 61,701,862 lb. in 1907. The Calumet & Arizona works at Douglas smelted ap-

proximately 52,142,664 lb., of which 27,793,322 lb. are credited to the Calumet & Arizona and 24,349,332 lb. to the Superior & Pittsburgh. Some ore, however, has recently reached these works from the property of the Calumet & Arizona at Courtland. The other producing company of that district, the Great Western, is shipping its ore to El Paso. Shipments from this source have only recently commenced, and have reached about 10,000 tons. The developments at Courtland do not yet warrant the anticipation that this new district will become a prolific producer.

Clifton's output was approximately 74,059,948 lb. as against 74,596,897 lb. in 1908, and that of the Old Dominion furnaces in Globe was approximately 35,027,576 lb. as against 37,840,587 lb. in 1908. The quantity of custom ore which was shipped to the smeltery at Globe fell off after the absorption of the properties which yielded it by the large corporation recently formed and which is reserving the resources for more economical treatment.

The only other smelting establishment which has been in blast is the Imperial, its furnaces turning out approximately 11,000,000 lb. of copper during 1909. The company states that it proposes to enlarge the plant during the coming year.

Developments in Sonora

It is not contemplated to increase any other of the smelting plants during 1910, but the success attained in Cananea in reverberatory smelting with the use of oil as fuel has suggested very radical alteration in those establishments which have to treat large quantities of concentrates and retreat large quantities of flue dust.

The two neighboring districts in northern Sonora which have been closely allied with Arizona enterprises, Cananea and Nacozari, have been active. At Cananea good management has brought the cost of copper within profitable bounds, and Nacozari has increased its output, and continues to ship its concentrates to the Copper Queen furnaces at Douglas. The Transvaal company has not resumed production.

The Indiana-Sonora property, which used to ship its crude ores to Douglas for reduction, was absorbed by the Greene-Cananea company.

Forecast for 1910

The forecast for the coming year is that all the companies will maintain their present production. Some can easily exceed it, but it would be injudicious in the present state of the market to do so. But there is no reason to suppose that any will cut down their production beyond the present limits. Changes if made in the furnace plants, will be in the direction of improved methods, not of increased capacity.

Lake Superior Copper District

BY C. L. C. FICHTEL *

The most important event of 1909 in the Lake Superior copper district was the passing of the Bigelow properties to the control of the Calumet & Hecla. After prolonged litigation between the two factions, regarding the voting of a block of Osceola stock acquired by the Calumet & Hecla company, a compromise was effected whereby the Calumet & Hecla took over the entire group, marking the retirement of A. S. Bigelow from the Lake Superior district. The locating of what was believed to be the extension of the Baltic lode on lands north of Portage lake will undoubtedly prove of material benefit to the district and the continuation of the remarkable richness of the Lake lode may mean the opening of mines in Ontonagon county. These have heretofore been disappointing. The producing mines maintained about a normal output and a large amount of drilling and other exploratory work was carried on by the newer companies.

Keweenaw County

The Keweenaw Copper Company suspended work on the Medora lode after an extensive mill run which showed the rock did not carry copper in commercial quantities. The West fissure vein that gave such promise when opened at the 11th level did not continue with depth and after drifting upon it for considerable distance at the 13th level it was deemed advisable to discontinue all work on this portion of the tract. Diamond drilling exposed the Calumet conglomerate and Osceola amygdaloid lodes but the cores showed them somewhat shattered. A shaft was sunk about 100 ft. on the Kearsarge lode with encouraging results.

Shortly after the passing of the Tamarack company to the control of the Calumet & Hecla, work was suspended at the Cliff property for financial reasons and at a special meeting of the stockholders it was decided to sell this tract to a new company formed for the purpose of proving these lands.

The Ojibway company sank both of its shafts to the 1250-ft. level where they were temporarily bottomed, until the ground down to that point shall be fully opened. Drifting to connect the two shafts was started from the 500-, 650- and 800-ft. levels, with an average grade of stamp rock at all points; with the exception of the drift south from No. 1 shaft at the 800-ft. level which, due to a fault, passed out of the copper-bearing formation. This property will be in position to start producing early in 1910. The Seneca sank its shaft to a depth of about 500 ft. and exposed the lode at two levels by means of crosscuts. The first level was established at a depth of 200 ft. and showed the lode badly shattered and carrying little copper. At the second level the lode was recently cut and, while not opened to any extent, is more uniform than at the upper level. This property is well located and should develop into a paying mine.

The Gratiot company sank its northern, or No. 1 shaft, down to the 12th level and extended the lateral opening from all the intervening levels, the lode opened by this shaft being well charged with copper. No. 2 shaft was sunk below the 11th level, with drifts extending from the 9th, 10th and 11th levels. This shaft did not open so good a grade of ground as No. 1 but a much better showing was noted below the 9th level. This property secured railway facilities and will become an early producer. A stock pile aggregating about 14,000 tons was accumulated during the opening of the two shafts.

The five producing shafts of the Mohawk company were sunk deeper with drifts extending both ways from the various levels. Regular production averaging about 2500 tons daily was maintained. A new shaft, No. 6, was started to open the southern portion of the tract; it was put down about 200 ft. in the footwall. Lateral openings were not started but the drifts south of No. 5 shaft, which were extended beyond the line of this shaft, showed a high state of mineralization.

The two new shafts of the Ahmeek were sunk to a depth of about 400 ft. They were provided with concrete collars and a power equipment installed capable of taking them below the depth at which the lode will be cut, estimated to be about 1250 ft. Production from the two producing shafts was increased to about 1700 tons daily which was stamped by the Franklin and Tamarack mills. The stamp mill which was under construction throughout the year was nearly

*Electrical department, Calumet & Hecla Mining Company, Calumet, Mich.

completed and will have two heads ready to go into commission about Feb. 15, 1910. No. 2 shaft of the Allouez company reached the lode, was turned to conform to the pitch of the formation and sunk about 250 ft. on the lode, which was well mineralized. F. W. Ridley was appointed superintendent.

HOUGHTON COUNTY

Wolverine maintained about regular production and opened up large tracts of reserve ground. At the stamp mill, a Jackson sand-conveying system was installed to take care of the tailings. The two Centennial shafts were sunk deeper, No. 2 shaft reaching a depth where the northern drifts began to come into the rich Wolverine mineral zone. At the stamp mill, owned jointly by the Wolverine and Allouez companies, the additional equipment was practically completed and will go into commission early in 1910. The Mayflower company resumed exploratory work in making a diamond-drill cross-section of its tract. This property has been idle since exploration stopped early in 1905.

Work on the conglomerate lode of the Calumet & Hecla Mining Company was normal with about the same results as during 1908. At the 74th level of No. 10 shaft the drift south opened a streak of exceptional ground which, however, did not continue for any distance. On the Osceola amygdaloid lode all the shafts were sunk deeper, openings extended and the surface equipment improved, all to take care of the gradual increase in the rock tonnage. (It is planned that the ultimate capacity of the five producing shafts on this lode will be about 10,000 tons of rock daily.) On the Kearsarge lode one shaft, No. 21, continued to operate, showing average results. An electric-hoisting plant was installed underground to handle the rock from the slope shaft that is operating on the tract of land north of the Tamarack Jr. property. The large regrinding plant at the stamp mill was completed. Henry Fisher was appointed superintendent of the mills, succeeding H. W. Cake, deceased. This company also continued its exploratory work on the None Such property in Ontonagon county.

A number of tests were made at the Calumet & Hecla's mills on rock taken from the various properties now under its control. As an outcome, preparations were about completed for the transfer of rock. All conglomerate rock from the Tamarack and Osceola properties will be stamped at these mills and the rock from the Osceola lode on the Calumet & Hecla property will be treated at the Tamarack and Osceola mills. No. 1 shaft of the Tamarack was equipped with two large steam pumps and handled all the mine water.

The Osceola company increased production during 1909 and is in as fine condition as at any time in its history. No. 4 shaft on the North Kearsarge tract began to produce on a limited scale and in a short time will become a large factor in the mine's production. Details were completed for the equipping of the shaft houses, shops, etc., with electric power. The Laurium property came under the management of the Calumet & Hecla and operations were started during the summer. The shaft was put down to a depth of about 200 ft. and showed a well mineralized lode. The surface equipment was completed and is of such size as to take the property through the development stage.

Operations at the No. 2 shaft on the Caldwell tract were suspended by the La Salle, underground conditions not being sufficiently encouraging to warrant further work. No. 1 shaft was sunk to about 1000 ft. with the bottom openings coming into better ground. At the Tecumseh tract a new shaft (No. 2) was started and put down over 200 ft. with results about equal to those shown in the No. 1 shaft at the same depth. No. 1 shaft reached the 17th level. A mill test will be made during the coming year, the rock in all probability going to the Allouez-Centennial mills.

The Oneca company changed management, John D. Cuddihy of Calumet, Mich., being elected president. Exploratory work in the form of drilling was resumed. A copper-bearing lode, thought to be the same formation that is shown in the shaft sunk a few years age, was exposed in one of the drill cores at a depth of about 400 ft. A complete cross-section of the tract will be made by two drilling outfits with a view of opening what is believed to be the northern extension of the Baltic lode. A new company known as the New Arcadian Mining Company was organized to take over all the effects of the old company. Drilling operations were started and some encouraging cores taken.

The New Baltic Exploration Company was formed and exploratory work started to investigate what is believed to be the Baltic lode on lands north of Portage lake. The formation outcropped on these lands and in trenching encouraging copper rock was exposed. A drill core recently showed the lode to be about 70 ft. wide, and for 7 ft. very rich.

During 1909 the Franklin company took over the Rhode Island. It suspended all work on the conglomerate lode and directed its attention to opening the Pewabic. This lode was opened down to the 27th level by means of crosscuts; the drifts from the 23rd level down showed a fine grade of stamp rock. A number of drifts were extended into the Rhode Island tract with the same results. No. 9 or Pontiac shaft of the Quincy, was sunk for considerable distance with good results. Several air blasts occurred during the year but without material injury to the property. At the stamp mills, all the heads were equipped with the enlarged cylinders and their operation proved entirely satisfactory. The wash depth was enlarged to take care of the additional tonnage brought about by this change.

The Hancock No. 2 shaft reached the No. 3 lode at a depth of 2040 ft. and found it well charged with copper. A winze from the 13th level of No. 1 shaft was put down to the 17th level and a raise driven from the same point to the 11th. The drifts on this lode from the various levels were in good ground. No. 2 shaft continued sinking to cut the Pewabic lode which is estimated to be about 1500 ft. deeper. A mill site on the shores of Portage lake was purchased and a railroad spur put into No. 2 shaft. Nearly all the permanent surface equipment was installed and the property is on the verge of entering the producing list. Exploratory work was begun on Section 12, which adjoins the Isle Royale. Drill cores taken showed an amygdaloid formation carrying some copper.

The Isle Royale Company, under the management of the Calumet & Hecla, was operated on a conservative plan attention being given to the productive portion of the lode, sinking being suspended, with the result that a much smaller rock tonnage was handled with about the same copper yield and a corresponding decrease in cost of production. The shaft on section 11, sinking to open the Baltic lode, reached a depth of about 700 ft. and three levels were opened, but without encountering any copper worth considering.

The Superior company began production, the rock being stamped at the Atlantic mill. The lode showed an average of about 28 lb. refined copper to the ton of rock. No. 1 shaft was sunk below the 12th level and the lode opened further at all the levels. Sinking was resumed at No. 2 shaft. Atlantic continued its search for the Baltic lode at its Section 16 shaft without any permanent results. The shaft was put down to the 27th level and drifts and crosscuts driven at various points to expose the surrounding ground. St. Mary's Mineral Land Company abandoned all work on the Challenge tract after extensive exploratory work in the form of drilling and shaft sinking which gave unsatisfactory results.

The option on the Globe tract held by the Copper Range Consolidated was surrendered after a thorough investigation of the formation at a depth of 1000 ft. The option on the land in sections 7 and 8 was also released after a large amount of drill work had been done. The Champion and Baltic maintained about normal production while a much better showing was noted in the lower levels of the Trimountain, especially so below the 14th level of No. 4 shaft. The Copper Range railroad, which is owned by this

company, paid its initial dividend of $4 per share. A large amount of reconstruction work was done on this road and it was well equipped in all departments.

ONTONAGON COUNTY

The Elm River company began crosscutting from the 200-ft. level of its exploratory shaft to make a complete cross-section of its land. One copper-bearing formation was cut but did not carry enough copper to warrant further exploitation. The Wyandot cut a number of lodes with the crosscut it is driving from the 700-ft. level of its shaft, but they only held out for a short distance. A very promising lode was recently encountered and drifting started.

Mining operations were centered at No. 4 shaft on the Winona property. This shaft was opened below the 14th level with a betterment in the formation showing in the lower workings. Operations at No. 3 shaft were temporarily suspended; on account of the large amount of ground opened in this shaft it was decided not to do any more work there until stamping began. Work on the new stamp mill which is owned jointly by this and the King Philip company progressed satisfactorily. It will be completed during the coming summer. The two shafts of the King Philip, opened on the Winona lode, revealed a good grade of rock in the lower levels and when the mill is ready to go into commission this property will be in position to maintain regular shipments.

The remarkable showing at the Lake property was maintained with depth. The shaft was put down to the 6th level and the lode opened at the levels above was of exceptionally high grade. Two mill tests, made at the Franklin mill with the rock taken from across the face of the formation at the 3rd and 5th levels, showed a mineral yield of 80 and 82 lb. to the ton. The construction of a temporary shaft house was commenced and when completed regular shipments will be maintained. Just above the 6th level the shaft encountered another copper-bearing lode on the foot-wall side about 90 ft. from the main lode. Diamond drilling was carried on for the location of a second shaft.

The results of the Lake property influenced the adjoining lands and North lake put down a number of drill holes and, while copper was shown in some of them, a definite location for a shaft was not decided upon. The Indiana company resumed exploratory work. The Aztec was taken over by the new South Lake company and drilling operations started to reveal the Lake lode. The Mass company discovered the existence of a new lode lying about 120 ft. south of the Evergreen lode. This was accomplished by driving a crosscut from the 17th level of the A shaft. This lode was exposed in four other points by crosscutting from the 13th and 15th levels. Drifting at these points was started and the lode opened for considerable distance and, while it did not continue as rich as at the point first opened, it gave promise of proving a valuable asset to the company.

Operations were suspended on the main lode of the Michigan and a small amount of development work was done on the new lode that was opened on the Bee tract. Diamond drilling was also performed to cut the new Mass lode, and the lodes exposed at the Adventure. The Adventure started a new vertical shaft to open the three lodes that were exposed in drill work. The shaft was sunk to a depth of nearly 400 ft. and furnished with a surface plant capable of handling operations to a depth of 2000 ft. It is calculated that the first of these lodes will be reached at a depth of about 950 ft. The Victoria carried on development work during the early part of 1909 in hopes of opening more uniform copper rock. At the 22nd level an encouraging streak was encountered and the company was able to about meet current running expenses.

Changes in Acid Process at the Tennessee Copper Company

At the acid works of the Tennessee Copper Company at Copperhill, Tenn., the year 1909 witnessed developments in the sulphuric acid process as applied to waste blast-furnace gases, which have placed the industry finally on a firm financial and technical footing. Too much credit cannot be given to the men who had the courage of their convictions and embarked on this enterprise in the face of difficulties impossible to foresee.

As originally designed, the plant was intended to use 10 of the 12 tall chambers as front chambers in which the complete chemical reaction was supposed to occur[1]. A year was spent in efforts to work out this theory and it was found to be unsuited to the existing conditions. A change was therefore made early in 1909, connecting the chambers in series, as is customary at most acid plants. The one-chamber idea being abandoned, certain important changes in the details, such as flue areas, nitrating arrangements, etc., were also made, with the result that steady improvement was shown throughout the year, although the grade of gas was poorer than during 1908. This improvement is best indicated by the statement that the production of 60 deg. acid in 1909 was more than double that of 1908, and the make for December, 1909, was over three times the average monthly make for 1908. The plant, which more than doubles the chamber space of the old, will be described in a later issue of the JOURNAL.

Owing to the necessity for economy in ground space the new chambers will be as high or higher than the old, i.e., 70 ft. or more. Experience gained at this plant has not indicated any advantage in the tall type of chamber other than the saving of ground space, although no especial disadvantage can be attributed to it. Chambers of such proportions have been in successful operation for several years, as for instance at Baltimore where chambers 16x22x34 ft. high are seen, at Pittsburg where sets of chambers 20x20x21 ft. high have been running for many years, and near North Norfolk where chambers 17½x19x30 ft. high are used. It is expected that the new plant at Copperhill will be completed and in full operation early in the summer of 1910.

[1]ENG. & MIN. JOURN., Sept. 4, 1909.

Molybdenum

Practically no molybdenum ore was produced in the United States in 1909. About 25 tons of molybdenite was imported. The demand for molybdenum products is increasing again, but very slowly.

Chromite

The only deposits of chromic iron ore now being utilized in the United States are in California. Some hundreds of deposits are known in the State in the Coast range both north and south of San Francisco, a number of which have been worked in the past but are now idle. The production is only from 200 to 400 tons yearly, mainly from Shasta county, though small lots are mined in Alameda county from some of the old deposits there. The ore is sold at from $17 to $20 per ton. Most of the California ore is of too low grade to meet the requirements of the market.

A good deal of mining for chrome has been carried on in Alameda county from time to time but most of the known deposits are now idle. In Del Norte county are quite extensive deposits, formerly worked, but distance from suitable means of transportation keeps these mines closed. Test lots of copper ore are being shipped from that section, and if results are satisfactory the copper mines will be worked on a large scale. At that time the chrome deposits will undoubtedly be reopened. None of the Fresno county deposits are being worked, nor are those in Placer, San Luis Obispo, Sacramento, Sonoma or Tehama counties.

The importations of chrome iron into this country vary from 30,000 to 40,000 tons yearly.

The Production of Lead and Spelter in 1909

Statistics of Production and Price—Imports and Exports—A Review of Mining Conditions in Missouri, Oklahoma, Wisconsin—The Markets

LEAD, 374,579; SPELTER, 267,069 TONS

The production of lead in the United States in 1909 increased largely, the total of the refined product exceeding the highest figure previously on record. The separation of the total product according to origin, domestic and foreign, cannot be made precisely at this time, but the refined lead of domestic origin in 1909 appears to have been about 374,000 tons, against about 319,000 tons in 1908. In both of these figures the production of antimonial lead is included. There was a large increase in the lead production of Missouri, and also in that of Utah and the Cœur d'Alenes.

PRODUCTION OF REFINED LEAD.

(In Tons of 2000 Lb.)

Class.	1908.	1909.
1. Desilverized	174,650	214,516
2. Antimonial	13,109	12,715
3. Southeast Missouri	113,103	126,916
4. Southwest Missouri	18,014	20,432
Total domestic	318,876	374,579
Total foreign	94,992	86,524
Grand total	413,868	461,103

(1) Does not include the lead chiefly of Missouri origin, which is desilverized by one smelter in Illinois and is here entered under Class 3. (2) The production of antimonial lead which used to be divided according to domestic and foreign, in 1908 and 1909, has been wholly entered under domestic. (3) Includes two smelters in Illinois, which use chiefly ore from southeastern Missouri. (4) Includes one smelter in Kansas, which uses ore chiefly from southwestern Missouri.

IMPORTS AND EXPORTS OF LEAD.

(For First 11 Months of the Year.)

(In Tons of 2000 Lb.)

	1908.	1909.
Imports:		
In ore and base bullion	97,120	100,967
Pigs, bars and old	2,753	3,238
Exports:		
In ore and bullion	68,424	82,852

The consumption of lead increased largely, business in white lead and oxides, which amounts to about 40 per cent. of the total, having been especially good. This caused the stocks in the hands of the refiners, rather large at the beginning of 1909, gradually to disappear, and at the end of the year there was probably scarcely more than an ordinary working surplus on hand.

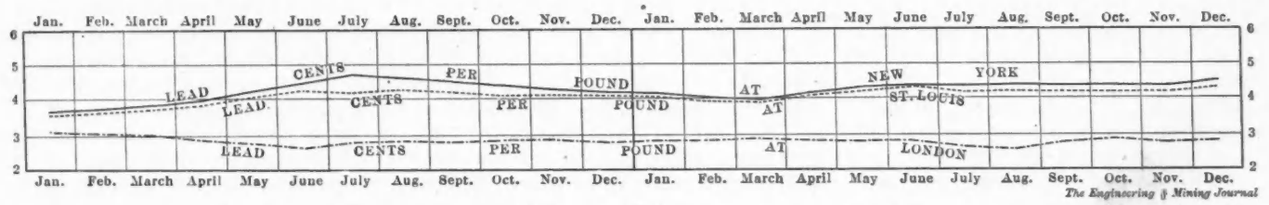
The Payne law made no change in the tariff on lead in ore and base bullion, but an alteration in the section as to smelting in bond deprived the refiners of the "exempt lead" which formerly was a valuable perquisite. For the cancellation of bonds, the refiner is now obliged to deliver the lead actually produced, whereas, formerly he had to deliver only 90 per cent. of the base bullion imported, although he normally recovered 96 per cent. Consequently, he obtained the difference free of duty.

The Lead Market

The general business revival which followed after the so called "Taft boom" extended only a few days into the year 1909, and lead, like all other metals, was affected by the reaction which followed during the latter part of January and lasted until well into spring. After selling early in January at 4.20c. New York, prices receded and the decline was not checked until the market had dropped below 4c. During the month of March, the demand for the Spring requirements of the lead-consuming trades began to make itself felt and prices began to harden. A buying movement set in, in which all interests participated, and in consequence the price was carried up to 4.35c. New York late in May. From that time on the market displayed a strong undertone, the consumption for all purposes being on a very satisfactory scale. The requirements for lead-covered cables, which had been at a low ebb since the panic of 1907, at last began to make an impression upon the stocks carried over from that period. It was due to their existence and slow distribution that the improvement in prices did not make headway more quickly. As the year drew to a close, this burden was reduced to a normal point. On the other hand, the demand from all sources improved at a rapid rate, and under the impetus of a large business, prices during December advanced quickly to 4.70c. New York, at which figure the market closed firm and active.

White Lead in 1909

The consumption of paints during 1909 showed an increase over 1908 fully commensurate with the growth of the country, and enough to indicate a revival of building operations in many sections where little new work was completed during 1908. The lead pigments enjoyed a full share of the increased demand, the beneficial effects of the agitation for paint legislation still being apparent in the growing use of pure white lead and linseed oil to the exclusion of their substitutes. Although but few new State laws were adopted the agitation over this subject increased. The substitution of full net weights for gross weights or partial tare, was made complete in 1909 on pure lead in oil, and with its attendant advance in the price of small packages was accepted by the trade and consumers without creating any such serious protest as was predicted by the opponents of the "full weights and measures legislation" which led up to this change. The use of steel for packages of 100 lb. and under, was considerably extended during 1909, and promises to displace wood entirely, although the latter will continue to be used for the larger packages.



COURSE OF LEAD PRICES IN 1908 AND 1909, PLOTTED FROM THE MONTHLY AVERAGES

LEAD

Month.	New York.		St. Louis	London.	
	1908.	1909.	1909.	1908.	1909.
January	3.691	4.175	4.025	14.469	13.113
February	3.725	4.018	3.868	14.250	13.313
March	3.838	3.986	3.835	13.975	13.438
April	3.993	4.168	4.051	13.469	13.297
May	4.253	4.287	4.214	12.938	13.225
June	4.466	4.350	4.291	12.600	13.031
July	4.744	4.321	4.188	13.000	12.563
August	4.580	4.363	4.227	13.375	12.475
September	4.515	4.342	4.215	13.125	12.781
October	4.351	4.341	4.215	13.375	13.175
November	4.330	4.370	4.252	13.538	13.047
December	4.213	4.560	4.459	13.166	13.125
Year	4.200	4.273	4.153	13.439	13.049

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

Lead Carbonate

There was no change in the card price for lead in oil from Dec. 10, 1908, until Dec. 6, 1909, the nominal quotation be-

ing 6½@6¾c. per lb. for packages of 100 lb. or over. Active competition among corroders caused more or less irregularity in the actual price, however, so that a considerable portion of the year's business was probably done at a concession of about $5 per ton from these prices in spite of the fact that at no time was there any excessive supply in the hands of corroders. Owing to the high cost of linseed oil, lead in oil was advanced on Dec. 6 to 6¾@7c. per lb. for 100-lb. packages and over, and with a subsequent advance on pig lead there is some prospect at the close of a further rise in prices of all products before the spring trade opens.

Dry white lead was nominally 5⅜c. to large consumers, but with the bulk of the sales to carload buyers at 5¼c., a price that was really established by the large contracts entered into in the latter part of 1908, and which covered a good share of the consuming demand for 1909. The same course was followed this year, and a large tonnage placed for 1910 delivery at 5¼c., with an advance in the nominal quotation to 5½@5⅝c. per lb. on Dec. 6. There was but little addition to the corroding capacity of the country during 1909, but 1910 will probably show a 10-per cent. increase.

The fact that in revising the tariff Congress reduced the duty on white lead to 2½c., without changing the rate on pig lead, leaves the margin of protection against foreign lead in oil so narrow that, unless metallic lead were to advance abroad with a consequent rise in the products, corroders here would be unable to advance their prices much beyond the present limit, without opening the door to possible competition from abroad. At the present time English lead in oil could probably be laid down here, duty paid, at 6½c. per pound.

Lead Oxides

While the consumption of lead oxides was in excess of that of 1908 by reason of an increased demand for red lead for structural iron and steel work, and for litharge from the glass, rubber and other large consuming industries, prices were irregular and unprofitable to producers. Red lead sold as low as 6c. to carload buyers and litharge at 5½c., and even these figures were shaded early in the fall to work off stock which accumulated during the summer. At the close, however, there was a disposition to get back to a more reasonable basis, and the nominal advance on white lead extended also to the oxides, with special concessions to the largest buyers much narrower than they were some months earlier. In a large way red lead was quoted at the end of 1909 at 6¼@6½c., and litharge at 5¾ and 6c. per pound.

Southeast Missouri Lead District

BY H. A. WHEELER *

The Southeast Missouri lead district enjoyed a highly prosperous year in 1909, as there were no labor troubles, wages were reasonable, the price of lead was fair, and the output was by far the largest in its history. The production has been steadily growing for the last 40 years and each year has usually shown a marked advance over its predecessor, but in 1909 the increase was unusually large as it exceeded the banner record of 1908 by about 23 per cent. The estimated output of the district in 1909 was 128,000 tons of pig lead with an approximate value of $11,000,000, which not only breaks the local records, but probably gives southeastern Missouri the world's record, as a district. The only other output that exceeds it is that of Spain, but that is derived from several different provinces or states. When the production of the Joplin district in southwestern Missouri (where about 30,000 tons of lead per year are recovered as a by-product in working the zinc ores) is added, the Missouri production slightly exceeds the Spanish, and gives Missouri the world's lead record.

Missouri has been the largest lead producer in the United States since 1905, when it passed Idaho. The development of the Cœur d'Alene district enabled Idaho in 1897 to take the lead from Colorado, which had been the leading producer for many years, especially during the palmy days of the Leadville mines. The lead produced by the mines west of Kansas is a by-product in working the silver ores, whereas the Missouri mines are solely lead producers. It is also noteworthy that the large lead-producing camps that have been opened up in the far West during the last 40 years have seldom maintained their importance for more than 15 to 20 years, including Leadville and Aspen in Colorado, Frisco in Utah, Eureka in Nevada, and Wood River and the Cœur d'Alene in Idaho. The Southeast Missouri district, on the contrary, has been a continuous lead producer for two centuries. Up to 1825 the production was very small, yet it was by no means unimportant in a country that was scarcely settled and where the principal use of the lead was for bullets. The output from 1825 to 1869 increased materially but not uniformly, usually ranging from 2000 to 5000 tons annually, and was about 3500 tons in 1869, when the total output of the United States was 17,000 tons. Up to this time the lead was produced from innumerable shallow diggings by a host of small leasers who worked on a royalty basis.

Disseminated Deposits

The year 1869 was the most eventful in the history of this district, as it marks the introduction of the diamond drill by which the deeper disseminated deposits were discovered. As the first mills erected to treat the disseminated ore had a daily capacity of only about 100 tons, the growth was not rapid and there was none too much confidence in this new class of deposits, especially as they required so much capital. A marked impetus to the output was given in 1883, when the struggling St. Joe company lost its mill by fire. This proved to be the dating point of the success of this company, for the burned mill was replaced by a 500-ton mill, which at that time was not only the largest in the district, but, outside of the Lake Superior copper mills, was probably the largest in the United States. This large mill brought out the very important facts that the disseminated, low-grade orebodies were not only large and reliable, but that they were also highly profitable.

As the merits of the disseminated ores slowly became known, other operators were attracted and the district enjoyed a quiet but substantial growth, in which the boomer was conspicuous by his absence. It was opened up and developed by Eastern capital, and St. Louis has never had more than a minor interest in the district, which recent sales have further reduced. Although only 60 miles distant, it is far better known and appreciated in Wall street, and probably 90 per cent. of the St. Louis business men are not even aware of its existence. Yet last year it was the most important lead-producing district in the world.

The productive portion of the Southeast Missouri district is a belt about 75 miles long that includes the counties of Franklin, Jefferson, Washington, St. Francois and Madison. The heavy production of 1909 was derived from the deep, low-grade, disseminated deposits that occur in a basin in St. Francois

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county, 15 miles long by 7 miles wide, in which the principal towns are Bonne Terre, Flat River and Leadwood. Another basin of much less importance occurs in Madison county, about six by five miles in area, of which Fredericktown is the center. St. Francois county is preëminently the giant, as last year it produced over 95 per cent. of the output, while Madison county produced about 4 and the remainder of the district, from the shallow diggings, produced less than 1 per cent.

That disseminated ore will be found to a greater or less extent underlying the shallow lead beyond the present productive zones, there is scarcely any doubt, and it is well to remember that the disseminated belt produced lead from its shallow deposits for 100 to 150 years before the deep underlying ores were discovered. It is also interesting to note that the early work in the disseminated mines was confined to shallow depths, 50 to 200 ft.; later, deposits were worked at 300 to 400 ft.; still later at 500; and one of the most recent shafts is over 700 ft. deep. In Washington county a still greater range in depth is likely to be found, as one body has been worked at a depth of 200 ft., and deposits in the western part of the county are likely to be 800 to 1200 ft. deep.

Diamond Drill Prospecting

Prospecting for new orebodies with the diamond drill was carried on to only a moderate extent in 1909, and was entirely confined to the operating companies. Most of the drilling was done to develop the extensions of the working orebodies; little virgin land was drilled and few options were taken. While the large outputs resulted in lower working costs and larger profits, they also necessitated much more vigorous drilling than was required in the past. To secure the economy of big mills having a capacity of from 2000 to 3000 tons daily, they must be worked up to their capacity and that means an insatiable demand for ore that is going to exhaust the present orebodies at a rate hitherto unknown. The recent rapid rate of growth of the huge piles of tailings at the large mills is an ocular warning of the importance of more rapidly opening up new ground.

The Penicaut, Elizabeth, Manhattan and Bogy companies still remained in the drilling stage of development and did nothing in 1909. It is more likely that they will be absorbed by some of the present operators than developed into new producers.

An interesting problem in forestry was taken up by the St. Joseph company in trying to utilize some of its extensive holdings, which now exceed 20,000 acres. The company tried farming and cattle-raising, but these did not prove a financial success as the soil is very poor. While the mines do not require timbering, the company's 60-mile railroad is a large consumer of ties and lumber, and it also builds from 25 to 75 houses annually to provide for the increasing corps of employees. A professional forester was retained, and under his advice an effort is being made to stimulate the growth of the valuable trees and to remove the black jack and other low-grade or valueless trees and shrubbery. Natural reforestation takes place promptly throughout the lead belt when the original oak timber is cut off, but the black jack and scrub oaks that have replaced the white, post and other oaks are of little value except for fire-wood. Should this experiment prove a success it will be helpful to all the large companies in the district.

St. Joseph Lead Company

For the first time in its long, successful career the St. Joseph Lead Company took second place, as its output in 1909 was exceeded by that of the Federal Lead Company. While the Federal company attained in 10 years what required over 40 years' effort by the pioneer company, the latter never enjoyed the benefits of its younger rival in receiving large blocks of new capital and absorbing several producing mines. The growth of the St. Joseph company to its present great size, with its numerous valuable mines, large surface plants and 60 miles of well-built railroad, was paid for out of the profits, and no new capital has been put into the company since its formation in 1864.

The St. Joseph company maintained its usual large production in 1909, and its vitality is illustrated by the fact that the greater portion of the ore for the No. 1 mill was obtained from the original mine at Bonne Terre that underlies the mill and which was opened in 1865. The No. 1 mill was built as a 500-ton mill, but has since been enlarged and improved until it now has a capacity of 1500 tons. The ore from the old mine is all raised through the No. 1 shaft at the mill, to which it is brought by a compressed-air haulage system. This permitted the closing down of shafts Nos. 2, 3, 4, 5 and 6, which are now used only for ventilation.

Ore is also shipped over the company's railroad, in 50-ton, steel, drop-bottom cars to the No. 1 mill from the No. 7 or Hill shaft, two miles distant; from the No. 8 or Crawley shaft at Flat River, eight miles distant; and from the No. 10 or Gumbo shaft, 11 miles distant.

The No. 2 mill at Leadwood, built in 1904 with a daily capacity of 1500 tons, is supplied by shafts in the Upper Big River district, viz., the No. 11 or Hunt shaft, the No. 12 or Hoffman shaft and the No. 14, which are all in the town of Leadwood. Both mills were kept in full operation throughout 1909 and the concentrates shipped to the smeltery at Herculaneum, 30 miles north of Bonne Terre on the Mississippi river. The smeltery is equipped with five, large, mechanically fed shaft furnaces and a battery of five Savelsberg pots or roasting furnaces, besides the refinery and matte roasters. It is the intention to greatly enlarge the pot plant for roasting the concentrates, after which the 20 Freiberg or hand-roasting furnaces at Leadwood will be closed down.

The gas-power plant at Bonne Terre was increased by adding a 30-drill, Snow type, gas-driven air compressor which will supersede the Norwalk compound, condensing, steam-driven compressors.

A new shaft, No. 15, was sunk on the southern part of the Crawley tract at Flat River and equipped with an electric hoist. As soon as the enlarged power plant of the Doe Run company at Flat River can furnish power, this shaft will begin shipping ore to the Bonne Terre mill and thus make the ninth producer out of a total of 15 shafts.

Doe Run and Desloge Companies

The Doe Run Lead Company, closely affiliated with the St. Joe Lead Company, had a prosperous year and materially increased its output. The new 2000-ton concentrator (No. 3) at Flat River started in March, and was successfully operated on ore from the Mitchell shaft and part of the output of the Flat River shafts. It is a thoroughly modern plant that is divided into four units housed in a steel building with concrete floors. It was designed by O. M. Bilharz, the manager of the company. The old or No. 1 mill at Doe Run, of 1500 tons capacity, and the No. 2, or old remodeled Columbia mill, of 600 tons capacity, were also operated, and the three mills were run on the output of six shafts.

The No. 6 shaft at Elvins, on the right of way of the Missouri Southern railroad, after lying idle for several years, was completed and equipped with an electric hoisting plant. A new shaft (No. 9) is being sunk on the property purchased from the Union Lead Company, two miles east of Flat River, where the diamond drill disclosed an attractive orebody. It is near the shaft of the old Donnelly company, where seams of quite pure siegenite, the double sulphide of nickel and cobalt, were found an inch or two in thickness. Nickel and cobalt may become a valuable by-product of this new shaft.

The power plant at Central was increased by a new unit, so that it now consists of four Snow gas engines that directly drive 600-kw. Westinghouse alternating-current generators that produce a 6600-volt current. The gas is furnished by four Loomis-Pettibone down-draft gas producers that are run on southern Illinois bituminous coal.

The Desloge Lead Company completed its new or No. 6 shaft near Leadwood and made regular ore shipments about

four miles to the mill over a spur of the Desloge railroad. It is equipped with a crushing department having four rock breakers. This is the deepest producing shaft in the district, 550 ft. to the sump, and within three miles of the Washington county line, or beyond the "deadline" of what was formerly considered the western boundary of the disseminated-lead belt. The Hoffman shaft of the St. Joe company is nearer the Washington county line by about half a mile, yet this is recognized, after having been operated for six years, as being one of the strongest and richest orebodies ever opened in southeast Missouri.

The 1000-ton mill at the town of Desloge is also receiving ore from the No. 3 shaft near the mill and from the No. 4 shaft on Big river, about one mile west of the mill. The No. 2 shaft, at the southern end of the property, was not operated. In the smelting department, the blast furnace and hand roasters were not operated, but three Flintshire or air furnaces were run steadily. As they could smelt only a small portion of the concentrates, the surplus was shipped to the Federal smeltery at Alton, Ill.

The National Lead Company maintained its usual output. It was not burdened with any important new construction work although a small brick hospital is now being erected for its employees. Its 1500-ton mill was supplied from four shafts and the concentrates were shipped to its large smeltery at Collinsville, Illinois.

Federal Lead Company

Although the Federal Lead Company, at Flat River, is the youngest of the St. Francois county producers, it has grown so rapidly and been developed so energetically that it was by far the largest producer in the district in 1909. It started in 1900 with a small acreage and one shaft—the No. 1 or Blue Jay—where an 800-ton mill was erected the following year on highly original lines. No jigs were employed in this mill, the ore being crushed to 3 mm. and treated on Bartlett tables. Another shaft, the No. 2, or Graveyard, was sunk in 1902 on Flat river, and the mill remodeled for coarse crushing (9 mm.) and the Bartlett tables being replaced by Harz jigs.

In 1903 the Derby property and the Irondale Lead Company were acquired. In 1905 the adjoining property of the Central Lead Company was purchased. In 1906 the erection of a modern 3000-ton mill (No. 3) and power house was started on the Central property, and a new shaft, No. 8, was commenced on the 40-acre Central tract at Elvins. In 1907 two shafts, Nos. 8 and 9, were started in the recently acquired land of the Missouri Leadfields Company, which had a large acreage south of Flat River. In 1908 a new shaft, No. 11, was sunk on the extension of the Rogers orebody, and the new mill was remodeled by substituting Hancock for Harz jigs.

The year 1909 found the Federal Lead Company with its construction and readjustment work at last finished, including repeated changes in the local manager, and more attention was given to production and reduction in costs. The year was more than satisfactory, and the output showed an unprecedented growth. In fact, the lead production is today not only the largest in the district, but is probably the largest in the United States, if not in the world.

Other Mines

The Madison county mines, at the southern end of the disseminated-lead belt, all suffered from the great disadvantage of having much smaller orebodies than occur in St. Francois county. They therefore have smaller plants, and none of them reached an output as large as 3000 tons of lead in 1909. As a compensation, however, they have little or no water to contend with and the orebodies are shallow or occur at 40 to 300 ft. in depth, as against 300 to 700 ft. in St. Francois county. None of the companies operate smelting plants and the concentrates were sold in the St. Louis market. They all cluster around Fredericktown, on the Iron Mountain Railroad, and are close or adjacent to the granite and porphyry hills that characterize this portion of the Ozark uplift.

The oldest lead mine in the United States, the Mine la Motte, has been producing since 1720, and had a quiet, uneventful year in 1909. The construction work of the present owners ceased with the completion of a 500-ton mill in 1908, and 1909 was devoted to production and the development of new orebodies. Part of the company's large acreage was leased on a royalty basis to two operating companies, each of which operated its own mill. The individual leaser has always been an important factor here, as the shallowness of the deposits, 20 to 120 ft., and the freedom from water have enabled the small leasers to produce considerable lead which is milled in the company's mill on a tonnage basis.

The North American Lead Company has for some time been a copper, nickel and cobalt producer, and the lead that is recovered as a by-product is a minor factor. A large body of mixed sulphides, in which pyrite greatly predominated, was worked during the year from which the main output was ingot copper, metallic nickel and cobalt oxide. The electrolytic process was employed in the separation of these metals. The galena or lead by-product is recovered in the mill on the jigs, before the "sulphides" are sent to the large smelting plant that adjoins the mill. The output is derived from one shaft, and is milled in a concentrator of about 500 tons daily capacity.

The Madison Lead and Land Company, formerly known as the Catherine, went into the hands of a receiver last summer, after successfully weathering the panic of 1907. This is one of the few instances of failure in this district and seems to be due to a complex of troubles, among which it is said that the company stoped over its line into the adjoining property. The present company made extensive improvements since it purchased the property from the Catherine Lead Company, and added a second mill of 500 tons capacity, which is situated at No. 2 shaft. This, with the No. 1 mill on the Little St. Francois river, gave a total daily milling capacity of 750 tons, but as no new shafts were added there were only two shafts to furnish such a heavy tonnage—a severe strain on the orebodies of Madison county. As the company possesses a considerable acreage and as the mines, which are dry and shallow, have been operated less than 10 years, the property will probably be acquired by stronger interests and worked on a larger scale.

Spelter

The production of spelter in 1909 exceeded the highest figure previously on record. The deliveries for consumption increased even more than the production, inasmuch as there were larger imports of foreign spelter than is usually the case, and there was a diminution of stocks in the hands of the smelters. The demand for consumption, especially in the brass and galvanizing trades, was excellent. The business in sheet zinc improved

PRODUCTION OF SPELTER.
(In Tons of 2000 Lb.)

State.	1908.	1909.
Colorado	3,079	6,115
Illinois	50,244	75,271
Kansas	99,136	104,012
Missouri	10,196	8,478
Oklahoma	14,867	28,821
South and East	32,989	44,372
Total	210,511	267,069

DELIVERIES INTO CONSUMPTION.
(In Tons of 2000 Lb.)

	1908.	1909.
Stock January 1	32,883	25,000
Production	210,511	267,069
Imports	811	11,000
Total supply	244,275	303,069
Exports	2,640	2,440
Stock, December 31	25,000	12,000
Deliveries	216,635	288,629

materially, but not perhaps to as large an extent as in the other branches.

During the first half of 1909 the zinc industry was greatly disturbed by the fight over the tariff question, which was finally won by the producers of ore. Under the new tariff zinc ore (formerly free of duty) is subject to a graduated schedule, rising to 1c. per lb. on the zinc content of ore assaying 30 per cent. zinc. The zinc smelters are not interested in ore of any lower grade than that, and consequently in their case the maximum rate of duty is of general application.

The imposition of this duty coming contemporaneously with a buoyant feeling

in nearly all lines of business and an improved demand for spelter led to an advance in price to a high level, which indeed made it possible to resume the importation of Mexican ore in spite of the duty.

Previous to the enactment of the new tariff many of the smelters imported large quantities of ore and also stocked up from domestic sources, so that while the quotational margin for 1909 does not show well the rise in the price for the metal was highly profitable to some of the smelters. The zinc smelting industry, however, has been by no means a bed of roses for all hands. The immediate effect of the rise in spelter was to stimulate developments to the west of the Rocky mountains and there is every prospect of a greatly increased supply of ore from that region. In particular it seems as if the zinc mines of Butte, Mont., would become of great importance. Shipments from Butte in 1909 were considerable and the construction of two large mills, now in progress, will greatly increase the supply in the near future. The Butte ore assays about 24 per cent. zinc and can readily be concentrated to 50 per cent., with but little iron, and occurring in large bodies which can be mined and milled at $4 @ 4.50 per ton, with a $7 freight rate on the concentrate, the mines can produce profitably on a basis of 5c. spelter, or less. The very low freight rates quoted by the railways, considering the long haul, promote the development of zinc mines in the far West. During 1909 a considerable tonnage of calamine was shipped from the new mines in southwestern Nevada, which was hauled to Kansas smelteries at $8 per ton. This ore assayed about 45 per cent. zinc. There was also an increased production of zinc ore in Arizona. Colorado and Utah produced about as usual. The Magdalena district of New Mexico is still checked by milling difficulties.

In the East there was an increased production in Wisconsin and Oklahoma. The ore deposits of the latter State appear to be of importance, but development is retarded by the absurdly extortionate demands of the owners of the land and the lack of expert knowledge and efficient means to mill the peculiarly complex ore. One drawback hangs upon the other. So long as greedy land or lease-owners exact an outrageous scale of royalty, the big companies that are able to solve the mining and milling difficulties will not go into the district. Thus not only does the whole industry suffer, but also the present policy is contrary to the best interests of this district.

Anyway, the result of 1909 has made it clear that the shortage of zinc ore in this country is not so pronounced as we thought during the pessimistic days of depression following the panic. The demand for a tariff on foreign ore was pressed at a period when spelter was low along with other metals, with which it would certainly have appreciated upon the revival in business. The tariff doubtless contributed to a jacking up of the price to an inordinate level, but as new supplies of ore are developed we are likely to see a recession to what would have been the normal level without any tariff. The latter will, however, excite local irritations, as for example to those smelters who are short of gas and miss the Mexican calamine that does not require roasting.

The gas question is in fact becoming very serious in Kansas, and the smelters at Iola will consider themselves lucky if they get through this winter. There is still an abundant supply of gas in Oklahoma, and we shall look for a gradual transference of a part of the smelting industry from Kansas to that State, which is already indicated by the statistics. The occurrence of zinc ore and natural gas in such proximity as in Oklahoma emphasizes the shortsightedness that prevents both resources from being utilized to the best advantage.

The Spelter Market

At the opening of 1909 the market ruled above 5c. St. Louis. Under the influence of the unfavorable conditions developing at that time in the iron and steel industry, prices began to weaken and declined continuously until 4.60c. St. Louis was reached late in February. This low figure attracted buying by both consumers and speculators, and in consequence a steadier tone prevailed during March. Moreover, the smelters were reluctant to enter orders, due to the fact that ore prices had not yielded in proportion to the decline in the refined metal. The strength of the ore market was in a measure due to the sentimental influence created by the efforts of the Joplin miners to shut out Mexican and British Columbia ore, by causing a prohibitive duty to be placed on zinc ore in the Payne tariff bill. This factor made itself felt more strongly as time passed, and combined with the revival in business in general, and in the iron and steel industry in particular, caused prices to harden, and under large transactions the market moved upward by leaps and bounds in April, May and June until 5.30c. St. Louis was realized toward the end of the last named month. At about this time it became known that the leading buyers had purchased large lots of foreign spelter, ostensibly for drawback purposes, the quantities being estimated at from 8000 to 10,000 tons. This news created at first considerable consternation, bringing about recessions early in July, but the influence wore off as the month advanced, being overshadowed by the developments in Washington, where it became clearer from day to day that the mining interests would win their fight for a duty on zinc ore, which had been fixed at 1c. per lb. of zinc contained on such grades as are available for the manufacture of spelter. This expectation was realized at the final passage of the bill early in August.

While the return of prosperity began to be reflected in an expanding consumption of spelter for all purposes, the output of the metal continued restricted, as necessarily considerable time must elapse until the quantities formerly supplied from Mexico could be replaced by an increased output in this country.

SPELTER

Month.	New York.		St. Louis.		London.	
	1908.	1909.	1908.	1909.	1908.	1909.
January	4.518	5.141	4.363	4.991	20.563	21.225
February	4.788	4.889	4.638	4.739	20.875	21.563
March	4.665	4.757	4.527	4.607	21.075	21.438
April	4.645	4.965	4.495	4.815	21.344	21.531
May	4.608	5.124	4.458	4.974	19.906	21.975
June	4.543	5.402	4.393	5.252	19.000	22.000
July	4.485	5.402	4.338	5.252	19.031	21.969
August	4.702	5.729	4.556	5.579	19.350	22.125
September	4.769	5.796	4.619	5.646	19.563	22.906
October	4.801	6.199	4.651	6.043	19.750	23.200
November	5.059	6.381	4.909	6.231	20.875	23.188
December	5.137	6.249	4.987	6.099	20.625	23.094
Year	4.726	5.503	4.578	5.352	20.163	22.185

New York and St. Louis, cents per pound. London, pounds sterling per long ton.

MONTHLY AVERAGE PRICES OF SPELTER AND SHEET ZINC.

(In Cents per Pound.)

Month.	1908.		1909.	
	(a) Spelter.	(b) Sheet Zinc.	(a) Spelter.	(b) Sheet Zinc.
January	4.518	6.44	5.141	6.44
February	4.788	6.44	4.889	6.44
March	4.665	6.44	4.757	6.21
April	4.645	6.44	4.965	6.21
May	4.608	6.44	5.124	6.21
June	4.543	6.44	5.402	6.325
July	4.485	6.44	5.402	6.44
August	4.702	6.44	5.729	6.808
September	4.769	6.44	5.796	6.90
October	4.801	6.44	6.199	7.187
November	5.059	6.44	6.381	7.36
December	5.137	6.44	6.249	7.36
Year	4.726	6.44	5.503	6.657

(a) At New York. (b) At Lasalle-Peru, Illinois.

Everything had, therefore, shaped itself toward laying the foundation for a strong advance in the market, and the forward movement was resumed with great vigor during August. The influx of orders became so heavy that, in addition to the current consumption, the bulk of the stock which had been carried over from the previous year was gradually absorbed during September, October and November. In October, the price—for the first time since the panic of 1907—crossed 6c. St. Louis, and the advance did not stop until 6¼c. St. Louis was reached toward the end of that month. The market remained active and firm around this level throughout November.

Necessarily, such high prices attracted a great deal of attention to deposits of zinc ore throughout the country. Mines which had been shut down for several years, owing to the low price of spelter, are now again in a position to operate profitably, and work is progressing rapidly toward putting them into shape to produce. An entirely new source of supply is promised from Montana. Even now shipments from there amount to approximately 1500 tons a month, and a large increase will take place as soon as the Butte & Superior Copper Company begins shipments from its mill now in the course of construction. At the relative parity of the foreign and domestic markets, imports of ore from Mexico have become feasible, in spite of the duty. It is, therefore, evident that no scarcity of raw material need be feared so long as the price of spelter rules at a reasonable level. A realization of this situation brought about freer offerings of the metal during the last month of 1909 at slight recessions in the price.

The prospects for the zinc industry continue bright, in view of the unprecedentedly large consumption on the one hand, while on the other, a material increase in the output cannot be expected since the present idle smelting capacity is in those gasfields where the supply of gas is becoming exhausted, as is evidenced by the necessity of the installation of pumping plants at some of the important smelting works at Iola and Gas in Kansas. The year closes with spelter at 6@6.05c. St. Louis, and 6.15@6.20c. New York.

Zinc and Lead in the Joplin District

BY JESSE A ZOOK

During 1909 the shipment was increased 37,825 tons of zinc and 5342 tons of lead concentrate, the increment of values aggregating $3,577,100, compared with 1908.

The Course of Prices

With prices at the beginning of the year fair, a weakening spelter market sent zinc ore down $5.50 per ton within six weeks. The lowest point of the year was in February, when for three weeks the highest price was $40 and the average as low as $33 per ton the second week of the month. With the upward turn of spelter in May zinc ore and metal advanced steadily to the end of the year. The average increase in zinc prices for the year was $6.72 per ton, the extreme variation in the market ranging from $40 in February to $55 at the year end.

TABLE II. SIXTEEN YEARS' PRODUCTION OF JOPLIN DISTRICT.

	Zinc Tons.	Lead, Tons.	Total Value.
1909	296,453	43,875	$14,573,077
1908	258,628	38,533	10,995,977
1907	286,538	42,065	15,419,827
1906	278,930	39,189	15,128,175
1905	252,435	31,679	13,302,800
1904	267,240	34,362	11,487,350
1903	234,773	28,656	9,471,395
1902	262,545	31,625	9,430,890
1901	258,306	35,177	7,971,651
1900	248,446	29,132	7,992,105
1899	255,088	23,888	10,715,307
1898	234,455	26,687	7,119,867
1897	177,976	30,105	4,726,302
1896	155,333	27,721	3,857,355
1895	144,487	31,294	3,775,929
1894	147,310	32,190	3,535,736
Totals	3,758,943	526,178	$149,503,743

Table I gives the comparative sales of zinc and lead ore for 11 months of 1909 and the same period of 1908 from each camp, each county and State and the Joplin district totals. Table II gives the district totals for each of 16 years. Table III gives the highest and average price paid each month of 1900 for zinc and lead per ton of 2000 lb. Table IV gives the high and average price for each of 11 years.

TABLE I. PRODUCTION OF ZINC AND LEAD IN THE JOPLIN DISTRICT.

	Zinc Ore (Short Tons).				Lead Ore (Short Tons).			
	1909.	1908.	Inc.	Dec.	1909.	1908.	Inc.	Dec.
Webb City–Carterville	90,888	70,460	20,428	....	19,350	16,890	2,460	....
Joplin	45,833	51,727	.....	5,894	6,221	6,278	....	57
Duenweg	15,405	11,939	3,466	....	2,394	1,840	554	....
Alba-Neck	10,480	11,968	.....	1,488	155	86	69	....
Prosperity	10,394	7,691	2,703	....	2,887	2,182	705	....
Oronogo	7,407	8,506	.....	1,099	842	410	432	....
Carthage	6,486	3,893	2,593	....	8	3	5	....
Sarcoxie	4,142	2,123	2,019	....	.....	.....	....	....
Zincite	3,561	2,064	1,497	....	73	83	....	10
Cave Springs	1,677	945	732	....	10	6	4	....
Carl Junction	1,501	1,386	115	....	28	65	....	37
Reeds	.....	82	.....	82	.....	.....	....	....
Jasper County	197,774	172,784	24,990	....	31,968	27,843	4,125	....
Granby	13,060	10,599	2,461	....	321	831	....	510
Spurgeon	8,005	6,863	1,142	....	1,891	1,479	412	....
Jackson	1,421	.....	1,421	....	181	.....	181	....
Saginaw	1,227	.....	1,227	....	130	.....	130	....
Wentworth	288	597	.....	309	.....	.....	....	....
Seneca	23	18	5	....	50	76	....	26
Newton County	24,024	18,077	5,947	....	2,573	2,386	187	....
Aurora	11,420	8,406	3,014	....	333	204	129	....
Stott City	573	159	414	....	.....	.....	....	....
Lawrence County	11,993	8,565	3,428	....	333	204	129	....
Dade County	61	.....	61	....	.....	.....	....	....
Barry County	18	.....	18	....	.....	.....	....	....
Green County	.....	19	.....	19	41	59	....	18
Kansas.								
Galena	16,260	16,576	.....	316	1,772	2,807	....	1,035
Badger	7,669	9,633	.....	1,964	145	509	....	364
Playter	.....	220	.....	220	.....	36	....	36
Cherokee County	23,929	26,429	.....	2,500	1,917	3,352	....	1,435
Oklahoma.								
Miami	10,312	5,870	4,442	....	3,561	1,254	2,307	....
Quapaw	4,599	3,149	1,450	....	277	44	233	....
Peoria	242	288	.....	46	.....	.....	....	....
Ottawa County	15,153	9,307	5,846	....	3,838	1,298	2,540	....
Murray County	16	.....	16	....	.....	.....	....	....
Missouri	233,870	199,445	34,402	....	34,915	30,492	4,423	....
Kansas	23,929	26,429	.....	2,500	1,917	3,352	....	1,435
Oklahoma	15,169	9,307	5,862	....	3,838	1,298	2,540	....
Joplin District	272,968	235,181	37,787	....	40,670	35,142	5,528	....

Prospect and Development Work

The steadily advancing level of prices inspired a campaign of prospecting and development work that grew in interest to the end of the year. The greater results from development work came to the

sheet-ore area, yet there were other points that marked a greater percentage of increase. The renewal of operations at Saginaw and Jackson, together with the large increase in the output of Spurgeon, all of which are in the Joplin area, and represent a portion of the Joplin development, do not show in favor of Joplin, however, as they are in Newton county. Development of the work contiguous to Joplin in Jasper county, near Carl Junction, where eight additional mills are planned, and in Galena, Kan., will culminate in results another year.

TABLE III. ZINC-LEAD PRICES PER TON, 1909.

	Zinc.		Lead.	
	High.	Average.	High.	Average.
January	$46.00	$38.48	$54.50	$51.74
February	40.50	34.46	53.00	50.54
March	41.50	34.77	53.50	50.46
April	43.00	35.99	58.00	54.71
May	46.00	37.82	59.00	56.61
June	47.50	40.00	60.00	57.92
July	48.00	41.28	57.00	54.19
August	54.50	44.56	60.50	57.61
September	52.50	44.78	58.00	56.32
October	54.00	46.04	58.00	55.26
November	55.00	48.29	58.00	53.98
December	55.00	48.43	54.00	53.23
This year	55.00	41.08	60.50	54.56
Last year	47.00	34.36	66.00	54.66
Increase	8.00	6.72	....	....
Decrease	....	....	5.50	0.10

A New Field

The shipment from Murray county, Oklahoma, comes from the vicinity of Davis. Murray is the southern county of the old Chickasaw nation, separated from Texas by Red river, and almost centrally situated from east to west of the State. This ore is a zinc silicate of fair grade. But one shipment has been reported made.

Developing Lower Levels

In 1899 the possibilities of lower ore levels was first made public by the publication of the Crossman drill chart, which stated that 34 per cent. of holes drilled 250 ft. deep found ore; that 75 per cent. of holes drilled 500 ft. found 40 to 60 ft. of ore; that 50 per cent. of holes drilled to 600 ft. found 40 to 60 ft. of ore; that 50 per cent. of holes drilled to 1100 ft. found 25 ft. of ore on that level; that one hole drilled to 2500 ft. found chert and limestone.

TABLE IV. PRICES FOR ELEVEN YEARS.

	Zinc Ore.		Lead Ore.	
	High.	Average	High.	Average.
1909	$55.00	$41.08	$60.50	$54.56
1908	47.00	34.36	66.00	54.66
1907	53.50	43.68	88.50	68.90
1906	54.00	43.30	87.00	77.78
1905	60.00	44.88	80.00	62.12
1904	53.00	35.92	62.00	54.80
1903	42.00	33.72	60.50	54.12
1902	42.00	30.33	50.00	46.10
1901	34.00	24.21	47.50	45.99
1900	38.50	26.50	56.50	48.32
1899	55.00	36.61	55.00	51.34

An effort to develop ore on the 300- and 400-ft. levels was made at Aurora a few years ago, but falling ore prices stopped production. It was demonstrated that these levels could then be mined only at a cost of $45 per ton of concentrate.

This year a company at Cave Springs, Mo., near the State line of Kansas, by an incline shaft driven at an angle of 45 deg. a length of 444 ft., developed a sheet formation in Grand Falls chert from 180 ft. to the 220-ft. level, and from 222 ft. to the 290-ft. level found ore disseminated in shaly limestone. Two miles west in Galena, Kan., a similar ore occurrence was found by drill, and two miles north of this it is just now being developed by shaft. The three form a triangular area two miles each way, and are geologically predicative of a continuation of one ore occurrence.

In addition to the above, recent drillings near Quapaw, Oklahoma, also near Joplin, Webb City, Carterville, Hornet, Granby, Aurora and Springfield in Missouri, corroborate the Crossman drill chart in the existence of an extensive ore area in the Kinderhook rock, underlying the Grand Falls chert, which has a very perceptible dip northward.

The ore occurrence in shaly limestone, below the Grand Falls chert, carries with it a problem in concentration at variance to the ore occurrence in chert, requiring a solution before the ore of this level can be marketed at a profit.

Miami District, Oklahoma

The mines of the Miami district of Oklahoma are at Hattonville, 2½ miles north of Miami. The ground that has been prospected and partially developed covers an area ½ mile wide and about two miles long. The development work so far accomplished shows that the ore deposit extends along a line approximately north 20 deg. west. According to the local operators, the ore occurs in a series of parallel "runs" 50 to 80 ft. wide which pitch slightly toward the north. The present workings range from 100 to 175 ft. in depth, while farther north a number of drill holes are reported to have encountered ore at a greater depth. The surface of the country is a flat open prairie with no rock outcrop near the mines. The ore was accidentally discovered while drilling a well for domestic purposes.

A geological section from the surface down consists of approximately 25 ft. of soil and clay, 50 to 60 ft. of shale and soapstone, 8 to 10 ft. of oil-bearing limestone which is usually the cap rock. Beneath this is a stratum 6 to 20 ft. thick containing both lead and zinc in a cherty oil-bearing limestone. The bedrock beneath this consists of a thin stratum of chert. At present all the mining is carried on in the ore-bearing formation above the chert bedrock, and in many instances the ore is found to extend up to and slightly into the soapstone roof. With this roof it is necessary to drive narrow drifts and use more or less timber, leaving large pillars, thus adding to the expense of mining. In a few instances ore has been found below the chert bed. Only the richest deposits are being taken out, and these are mined in anything but a systematic manner, as is the case in most mining districts in their early history.

The district is well equipped with mills, there being 18 or 20 complete and ready for operation. The operating mills are the Emma-Gordon, Queen City-Joplin, Old Chief, Okmulgee, Chatham Oil and Gas, Turkey Fat, King Jack and New State. In addition to this there are two tailings plants in operation and a third one now under construction. The above mills have a capacity of 50 to 200 tons each, while the Emma-Gordon is a 400-ton mill. These are all rated on Joplin ore. However, the character of the ore here is such that most of the mills are operated on about half the rated capacity, and even then the losses are high. Among some of the dozen idle mills are a number of new ones that have only recently been completed, while others have been run a short time, and for one reason or another have not been found profitable. In many cases the mills are built before the ground is thoroughly proven and developed and by the time the mill is ready for operation, operating funds are depleted and work must cease or wait until the mill and land can be leased to someone else.

Royalties

The high royalty in this district works a severe hardship on the operators, and if it were not for the fact that the ore is exceedingly rich it would be almost impossible for any mill to pay dividends. The owner of the land receives 5 per cent. royalty. This is paid by a Royalty company, which sub-leases the property to the prospector for 15 to 20 per cent. The Prospector does a little work

on the land and in turn leases it to a milling company for 25 to 30 per cent. In one or two cases the company putting up the mill has sub-leased the entire plant for 35 per cent., with the understanding that the operator keeps up the mill and leaves it in good condition at the expiration of the lease. In some cases a bonus of $2000 or $3000 with a royalty of 27½ per cent. is paid by the operator who has to make an additional outlay of $5000 to $15,000 for a mill, depending upon the scale he proposes to work.

A number of the tailings dumps have been leased at 30 to 50 per cent. of the gross output. At this price the lessee builds his own mill. The high royalty on the tailings is largely the fault of the man who proposes to work them. The dirt being rich, it looks as if money would be easily made in working it over, and in his enthusiasm the operator in some cases has actually offered to pay this high rate, asking no questions.

An attempt is being made to reduce the royalties. Some prospectors refuse to lease from the Royalty company, and are endeavoring to obtain their leases direct from the fee owner. By doing this, at least one royalty of 10 to 15 per cent. can be cut out entirely. Some of the old leases that have been forfeited from one cause or another are now being sub-let on a closer margin.

State Taxes

The State taxes imposed on mining companies in Oklahoma are also quite high. One half of one per cent is charged on the gross output of the mine; this has to be paid even though the mine be running at a loss. In addition to this there is a tax on the net profits, as well as the regular tax on the assessed valuation of the property.

Milling Practice

The same type of mill that is used in the Joplin district has been installed at Miami. In fact a large number of the mills that have been built are ones that have been moved direct from the Joplin field. While this type of mill may be the best one available at the present time for treating these ores, there is a good field for some other type of mill. The character of the ore is such that these mills do not recover to exceed 50 per cent. of the metallic content. The tailings losses are exceedingly high. This is due largely to the fact that the ore carries a notable percentage of petroleum and bitumen. The hydrocarbons make the ore more or less sticky and there is a tendency to clog the jig beds. A portion of the oil floats off and carries fine blende with it. A large percentage of the ore is finely disseminated and to recover it will require fine crushing.

The present practice is to crush the ore to ¼ inch size, run it over a roughing jig; the spigot product goes to a finishing jig. The tailings from the roughing jig are disposed of as waste, while those from the finishing jig are recrushed and passed over a sand jig. The majority of the mills have one or two Wilfley, or other make of tables, upon which the slimes are treated. In some cases no tables are used.

The ore as it comes from the mine contains three parts blende to one of galena, with a high percentage of marcasite. It is hard to obtain a finished product that contains over 50 to 52 per cent. zinc. The iron content of the concentrate is high, and as a result the highest prices are not obtained.

Zinc Mining in Wisconsin in 1909

BY J. E. KENNEDY

The output of zinc ore of the Wisconsin district closely approximated 75,000 tons in 1909. This exceeded the highest previous production, that of 1908, by about 30 per cent., but on account of the better metal prices and the higher grade of concentrate delivered, the production of 1909 is easily 40 per cent. greater in value. During the first four months of the year the weekly production of crude concentrate was 1000 to 1200 tons; it steadily increased during the summer months and exceeded 2000 tons at the close of the year.

The year opened with the base price of 60 per cent. zinc ore at $40 per ton. During January it advanced to $43. A reaction came in February, when the base price declined to $37@38 and remained at these figures until the middle of April. From that time it worked back and forth until the $50 mark was reached the last week in August. Competition among ore buyers in the Joplin district, rather than a healthy advance in the spelter market, caused the high base at this time and it immediately eased off again to $48. Following the rise in spelter the base price went to $50 again in October. The highest premium price reported during the year was $53 per ton. The best base price was $51 per ton, recorded during November and December.

Eleven roasters were in almost continuous operation during 1909, including three of the Mineral Point Zinc Company and two of the Joplin Separator Works. By the process of roasting, green concentrates assaying from 17 to 40 per cent. zinc were converted into a product containing from 55 to 63 per cent. zinc. A loss exceeding 10 per cent. of the zinc content was sustained, however, together with a shrinkage of 30 to 50 per cent. in the gross weight of raw concentrate, the sulphur content going off in fumes and the residual iron going to the dump pile. The electrostatic separator, at Platteville, saved the iron pyrite as a byproduct. Since Nov. 6 the shipment of zinc ore from this district was based on ore sent to smelteries, either from the mines direct, or from the three separating plants at Platteville, Galena and Mineral Point, the grade varying from 40 per cent. for the raw sulphide to 63 per cent. roasted. Formerly all zinc ore shipped to the Mineral Point Zinc Company's separating plant at Mineral Point was classified as "ore to smelteries." About 5000 tons of carbonate-zinc ore were included in the year's output.

Production by Camps

In respect to production, Platteville, Benton, Hazel Green, Mifflin, Highland, Cuba City, Linden, Rewey, Galena, Livingston, Shullsburg, Mineral Point, Montfort, Dodgeville and Potosi stood in the order of importance named. One hundred mining companies contributed to the year's shipment. Of this number 75 were equipped with modern milling plants.

Eight new concentrators were constructed and 11 second-hand mills were moved to new properties. Rich deposits of zinc were opened up at New Diggings, an old lead camp lying between Benton and Shullsburg, which is new territory for zinc mining. A central power plant, at Galena, which will furnish electric motive power to mines between Platteville and Galena, is nearing completion.

The Mineral Point Zinc Company bought additional mineral land at Highland, Benton and Hazel Green. The Kennedy mine was purchased early in October for $250,000. The Wisconsin Zinc Company acquired control of the property of the Benton Development Company, including the Pittsburg-Benton and Drumm mines; also the land of the LaFayette Land and Mining Company, comprising 1900 acres of mineral land lying between Benton and Shullsburg. The Frontier Mining Company bought the Dark Horse mine, at Linden, for $25,000, and developed and equipped the Hoosier mine on the Graham land, south of Hazel Green. A substantial gain in dividend payments by producing properties invited new capital into the field, and a number of abandoned mines were again placed in the producing list.

Iron and Steel Industry in 1909

A Year Beginning with Halting Recovery from Depression and Ending with Production at an Unprecedented Rate and a Very Large Demand

PIG IRON PRODUCTION, 25,712,000 TONS

As the record of 1908 was one of deep depression at the beginning, with only slow and halting steps toward recovery in the later part of the year, that of 1909 began rather unfavorably. The determined adherence of the leading interests to the policy of maintaining prices seemed to have discouraged those who believed that the financial condition of the country had so far improved that money was ready for investment in construction of all kinds, if only proper encouragement could be given by the cheapening of material. Their view, which experience once more showed to be the only correct one, finally prevailed. The halting and confusion of the early months of the year fast gave way to activity on every side. Production increased by leaps and bounds, and the year closes with blast furnaces and steel mills operating at a rate unprecedented in the history of the trade, and with preparations for increasing their capacity.

Iron and Steel Production

BY FREDERICK HOBART

As the production of iron and steel in 1908 was sharply contracted from that of the previous two years, so the output of 1909 showed an equally rapid rebound, and the year took its place among those of greatest activity. That the larger part of this work was crowded into a comparatively short time—less than two-thirds of the year—illustrates the great capacity of the plants which have been built up in this country, and the intensified activity in operating them which was shown in the latter part part of the year. The same story extends through all branches of the trade.

Iron Ore Production

The production of iron ore at the opening of 1909 was at a low level, and the estimates of the requirements for the year were not encouraging. It was not until work was well started for the season that it became apparent that these estimates were mistaken. It became necessary to call in all the reserves of labor and machinery and to extend operations in every direction in order to meet the demand. The Lake Superior region in particular was urged to the limit, and responded well, especially from the Mesabi range in Minnesota. The value of the exploration and development work done in 1907 and 1908 became apparent, and the monthly shipments in the latter part of the season were greater than any before known.

	1908.	1909.	Changes.
Lake Superior....	26,014,987	42,533,873	I. 16,518,886
Southern States...	5,900,000	7,350,000	I. 1,450,000
Other States.....	1,875,000	3,150,000	I. 1,275,000
Total prod.....	33,789,987	53,033,873	I. 19,243,886
Add imports.....	776,896	1,650,000	I. 873,104
Total supply	34,566,883	54,683,873	I. 20,116,990
Deduct exports. ..	309,099	465,000	I. 155,901
App. consumpt'n	34,257,784	54,218,873	I. 19,961,089

The estimated production of iron ore for 1909 is given herewith, in long tons, in comparison with that for 1908.

In the imports and exports the month of December is estimated. For the 11 months ended Nov. 30 the completed statement of imports gives a total of 1,473,812 tons; of which 809,935 tons came from Cuba; 209,376 tons from Canada and Newfoundland; and 411,522 tons from Europe, chiefly Spain and Norway. A large increase is expected to come from Cuba in 1910, and contracts have been for supplies for Eastern furnaces from Norway, Russia and Spain.

The Southern iron-ore mines were, like those of the Lake Superior region, in a condition to respond to a call for increased production. In the East there was a good deal of work done in extending old mines and in reopening deposits formerly worked. The Lake Champlain and Adirondack regions in New York had much work of this kind done. The Wharton group and other mines in New Jersey were actively worked.

In the general statement above, no account is made of stocks on hand, for the reason that accurate figures are not attainable for what may be called the invisible stocks; that is, those in furnace yards. It is probable that there was no great difference. At the opening of the year furnaces were not disposed to carry large stocks; at its close they were hardly able to get the ore as fast as they needed it.

The consumption of iron ore per ton of pig iron made appears to be increasing, owing to the use of lower-grade ores. Last year it was about 2.11 tons.

Lake Superior Iron Ores—The statistics of Lake Superior shipments are very closely kept, through the enterprise of the Cleveland *Iron Trade Review*. It is possible to give definite figures, especially as water shipments close early in December. The only estimate required this year is of the rail shipments, part of which are made during the winter. The shipments of Lake ore, by ports, were as follows, for three years past, in long tons; with the rail shipments added for 1907 and 1908, and an estimate of them for 1909:

Port.	1907.	1908.	1909.
Escanaba.....	5,761,988	3,351,502	5,748,042
Marquette.....	3,013,826	1,487,487	2,909,578
Ashland.....	3,437,672	2,513,670	3,834,286
Superior.....	7,440,386	3,564,030	9,181,132
Duluth.....	13,445,977	8,808,168	6,540,505
Two Harbors.....	8,188,906	5,702,237	13,470,503
Total water.....	41,288,755	25,427,094	41,684,005
Rail.....	956,315	587,893	850,000
Total.....	42,245,070	26,014,987	42,534,005

The distribution by ranges in 1908 is not yet complete. Escanaba and Marquette are the shipping ports for the Marquette and the Menominee ranges; Ashland for the Gogebic. Two Harbors takes the ore from the Vermillion range and a part of the Mesabi; while the docks at Superior and Duluth are supplied entirely from the Mesabi range. The rail shipments come from all ranges; they go to Zenith furnace at Duluth, to the furnaces at Marquette, Gladstone, St. Ignace and other points in Michigan and Wisconsin.

The season shipments to furnaces from Lake Erie ports, to which about 80 per cent. of the Lake ore goes, and from which it is distributed, were as follows:

	1908.	1909.
Ore on docks, May 1	5,480,300	8,441,533
Receipts for the season	20,414,491	33,672,825
Total	25,894,791	42,114,358
Shipments to furnaces	17,453,258	33,148,569
Stocks on docks, Dec. 1.....	8,441,533	8,965,789

Shipments to furnaces in the season of 1909 increased by 15,695,311 tons over

1908. The stocks on docks Dec. 1 increased 524,256 tons. These stocks would have been less, if the railroads had been able to transport the ore faster.

The distribution of the season's receipts and of the stocks on the docks Dec. 1 among the several ports is shown in the accompanying table.

About 80 per cent. of the Lake ore goes to the Lake Erie pots for distribution to the consuming furnaces. The remaining 20 per cent. goes chiefly to Chicago and vicinity for the furnaces of the Illinois Steel Company and others, and lately for the great new furnaces of the Indiana Steel Company at Gary.

The prices of Lake Superior ore to buyers for the season of 1909 were, f.o.b. Lake Erie ports: Old Range bessemers, $4.50; Mesabi bessemers, $4.25; Old Range nonbessemers, $3.70; Mesabi bessemers, $3.50. The base guarantee was 55 per cent. iron for bessemer ore, and 51.5 per cent. for nonbessemer ore. All the larger steel companies own their mines, and to them, of course, the price of their ore is practically the cost of mining and transporting it.

Ports.	Receipts.			Stocks		
	1907.	1908.	1909.	1907.	1908	1909.
Toledo	1,314,140	680,553	1,374,224	518,645	590,925	332,456
Sandusky	83,043	.....	11,088	44,546	36,079	39,557
Huron	971,430	213,377	243,082	415,730	458,158	477,333
Lorain	2,621,025	2,286,388	2,796,856	366,271	426,274	407,129
Cleveland	6,495,998	4,240,816	6 051,342	1,281,335	1,458,592	1,547,142
Fairport	2,437,649	1 518,961	1,734,277	523,981	835,821	867 640
Ashtabula	7,521,859	3,012,064	8,056,941	2,056,820	2,293,531	2,594,359
Conneaut	5,875,937	4,798,631	7,007,834	1 090,774	1,296,675	1,411,002
Erie	2,294,239	828,602	1,235,057	652,219	730,530	788,046
Buffalo	5,580,438	2,835,099	5,002,235	435,407	315,148	501,125
Detroit	.....	.....	159,889	.....	.....	.....
Total	35,195,758	20,414,491	33,672,825	7,385.728	8 441,533	8,965.789

Lake ores in recent years have supplied the raw material for from 75 to 80 per cent. of the pig iron made; and in 1909 there was no material change in this proportion.

Manganese Ore—Imports of manganese ore into the United States for the 11 months ended Nov. 30 were 170,662 tons in 1908, and 199,222 tons in 1909; an increase of 28,560 tons. The quantity of manganese ore mined in the United States is comparatively small.

Limestone Flux—The quantity of limestone and dolomite used in 1909 as flux in making pig iron is estimated at 14,070,000 long tons.

Pig-iron Production

The second half of 1908 showed a substantial gain over the first, but it was only sufficient to bring the total for the year up to 15,936,018 tons, the smallest recorded since 1901. For the first half of 1909 there was a further gain of about 2,000,000 tons, or about on the level of 1905. The second half, however, brought an advance of 3,700,000 tons over the first half, and the total for the half year was unprecedented in the history of the trade. In 1907 the blast furnaces turned out close to 26,000,000 tons; the production of the second half of 1909 was at the rate of close upon 30,000,000 tons a year. This was made possible by the fact that during the time of depression preparations for greater output had not been suspended, and when the demand came everything was ready to meet it.

The following table shows the production by half years for three years past. For the first half of 1909 the figures are those collected and published by the American Iron and Steel Association—as are the totals for 1907 and 1908; for the second half they are estimated on the basis of the monthly reports of the capacity of the active furnaces. The figures are, in long tons:

	1907.	1908.	1909.
First half	13,478,044	6,918,004	11,022,346
Second half	12,303,317	9,018,014	14,689,500
Total	25,781,361	15,936,018	25,711,846

The total increase of 1909 over 1908 was 61.3 per cent. The production for 1909 was very close to that of 1907 by the estimate; so close that it is quite possible that the final official figures may make it quite equal, if not a little greater. The difference, however, cannot be more than a few thousand tons.

Assuming that the division of the iron according to the uses for which it was intended was substantially the same as in the first half, for which we have official figures, we find that this analysis of the production will compare with that of 1908 as follows:

	1908.	1909.	Changes.
Foundry and forge	4,307,734	6,866,274	I. 2,558,540
Bessemer	7,216,976	10,357,290	I. 3,140,314
Basic	4,010,144	7,892,318	I. 3,882,174
Charcoal	249,146	391,732	I. 142,586
Spiegel and ferro.	152,018	204,232	I. 52,214
Total	15,936,018	25,711,846	I. 9,775,828

It is probable that the final figures may show some changes in this table, especially in foundry and basic iron. When the revival in iron production began it was manifest chiefly in the stacks owned by the large steel companies making iron for their use. Later the merchant furnaces began to gain, and in November and December the increase was almost wholly from those furnaces. The demand for basic pig was especially active and pressing.

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

1900	13,789,242	1905	22,992,380
1901	15,878,354	1906	25,307,391
1902	17,821,307	1907	25,781,381
1903	18,009,259	1908	15,936,018
1904	16,497,003	1909	25,711,846

No two years in the past 10—or for 20 years before that—show such wide differences as 1908 and 1909. A change of nearly 10,000,000 tons in a year is so great as to be almost startling. In past years the recovery from depression has been much more gradual.

The approximate consumption of pig iron in the United States in 1909 was, in long tons:

Production	25,711,846
Imports, Dec., estimated	181,000
Total	25,892,846
Exports, Dec., estimated	66,000
Consumption	25,826,846

This shows the approximate consumption of pig iron during the year to have been 643 lb. per capita.

Production of Steel

No figures are available for the production of steel for any part of the year. The only approximation that can be made is an estimate based on the output of pig iron. It is probable that the total steel made was: Bessemer, 10,750,000 tons; open-hearth, 12,500,000; other, 150,000; a total of 23,400,000 tons; an increase of 9,393,000 tons over 1908, and a gain of about 100,000 tons over 1907. The revival in production and demand was manifested earlier and more strongly in steel products than in foundry products and wrought iron. The demand for steel, in fact, was greater throughout the year. There is no doubt that there was an increase in the proportion of open-hearth steel, owing to the opening of the Gary works and the substitution of open-hearth furnaces for bessemer converters in some important plants.

For finished material no accurate figures are available. The business of the year in structural steel was very large; but there was a strong demand also for bars and plates. The railroads placed large orders for new cars, but the rail business was not large. Heavy orders for rails were for 1910 delivery. The business in wire, nails and the minor materials of construction was large. The full figures for finished material in 1909 will be well up to those for 1907; possibly exceeding them in some lines.

The United States Steel Corporation

The Steel Corporation continued to be the most important factor, producing about 60 per cent. of the total output of finished material. Its managers were forced to give way in their chosen policy of limited output and high prices, but they did so in a way which preserved their influence in the trade. The earnings of the Corporation showed an increase of between 40 and 50 per cent. over those of 1908. For the nine months ended with September, for which reports

have been made, the total net earnings were $90,508,666, and the surplus after meeting all fixed charges was $51,427,605. The net earnings increased from $22,921,268 in the first quarter to $38,246,907 in the third quarter, and the surplus from $11,873,106 to $23,543,067. In the June quarter the dividends on the common stock were increased from 0.5 to 0.75 per cent. quarterly, and for the September quarter there was a further increase to 1 per cent.

The earnings for the fourth quarter of the year, not yet reported, will probably bring the total net earnings for the year 1909 up to about $135,000,000 and the surplus to $80,000,000. In the September quarter the appropriation of money for new construction was resumed, after a suspension of nearly two years; the sum of $10,000,000 being set aside for that purpose. The unfilled orders on the books on Sept. 30 reached a total of 4,796,833 tons, an increase of more than 1,000,000 tons over the first of the year.

Changes and Consolidations

Changes among iron and steel companies were comparatively few; and no consolidations of great importance were made. There was at one time talk of a consolidation of several of the larger independent companies, but this was rumor only, and nothing resulted. The Bethlehem Steel Corporation extended its operations in this country and its mining interests in Cuba, and absorbed some of its subsidiary companies. Near the close of the year the Rogers-Brown Iron Company was organized, taking in the Buffalo & Susquehanna Iron Company and some allied interests.

New Works and Extensions

Probably the most important event of the year was the progress made on the extensive works of the United States Steel Corporation at Gary, Ind. Several of the blast furnaces and some units of the steel plant are now in operation, and rapid progress is being made with the rest. Important improvements have been in progress at the steel works of the Tennessee Coal, Iron and Railroad Company at Ensley, Ala. These will enlarge the capacity of the works, and it is intended to handle there all the Steel Corporation business in the South. The Jones & Laughlin Steel Company resumed work on its new plant at Allequippa, Penn., and has the blast furnaces there now in operation. The new mills of the Bethlehem Steel Company, near Bethlehem, Penn., are nearing completion.

Technical Progress

The progress of the open-hearth steel production is marked, though no very great changes occurred in 1909. Both the Gary and Ensley plants are open-hearth steel works, and no new bessemer converters are being installed. Further investigations of the quality and properties of steel were in progress, but with no announced results.

The electric furnace continues to make progress, especially in the manufacture of steel. The Steel Corporation has installed two electric furnaces of large capacity, one at the Joliet works of the Illinois Steel Company and the other at the wire works at Worcester, Mass.

The Gary dry-air blast has made progress both in the United States and abroad. Mr. Gary has supplemented it by devices intended to secure uniformity of temperature in the blast, and consequently of the weight of air delivered to a furnace.

Labor Conditions

With two exceptions the year 1909 was measurably free from labor troubles in the iron and steel trades. A strike at the works of the Pressed Steel Car Company at McKees Rocks, Penn., was the cause of much trouble and a great deal of violence; but it was local in its causes and effects and did not extend further.

In June, according to custom, the Amalgamated Association of Iron, Steel and Tin Workers presented a new scale to the manufacturers. This association is one of the oldest labor unions in the country and its members are in the bar, sheet and tinplate mills. After some discussion and amendment the scales were adopted by the Republic Iron and Steel Company and by the independent manufacturers. The American Sheet and Tin Plate Company, however, refused to sign any agreement, announcing its intention of operating all its plants on the open-shop plan. This resulted in the closing of several of the mills which had been union works. The company was able to go on with its nonunion works, and to reopen some of the former union mills, so that its operations were not seriously affected. The cause of the Amalgamated Association was taken up at the annual convention of the American Federation of Labor, and a formal declaration of hostility to the United States Steel Corporation was the result. No actual steps have been taken, but the Federation has begun the collection of a large reserve fund, to be used when opportunity for a strike is presented.

Imports and Exports

The values of the imports of iron and steel and of machinery in the United States for the 11 months ended Nov. 30 are reported as follows:

	1908.	1909.	Changes.
Imports	$ 18,247,908	$ 27,628,188	I. $9,380,280
Exports	138,881,373	142,605,148	I. 3,723,775

The increase in imports was 51.4 per cent.; it was largely in pig iron, in steel scrap and in billets, ingots and blooms. The increase in exports was 2 per cent.; in quantities it was greater than in value, owing to a generally lower level of declared values. The increase was pretty well distributed, taking in rails, bars, plates, wire and billets. The increase in billets was chiefly due to a large contract for tinplate bars for Welsh works, taken early in the year.

A marked feature of the imports was a large increase in structural steel, most of which was brought in on the Pacific Coast. Deliveries of foreign steel are made there by water, at a low freight rate, while the high rail rates from the East offset the duty charged. San Francisco especially has been using large quantities of structural steel in the rebuilding of the city, and constructors have found it to their advantage to take English, German and Belgian steel, rather than that from the East. There is also a strong local feeling involved on account of the refusal of the railroads to reduce rates on this class of material.

The tariff bill passed in August cut down the duties on pig iron, steel rails and a few other articles. Outside of these it did not make material changes. The reductions were not sufficient to induce any imports on a considerable scale. The imports of structural steel above referred to were the result of special and local causes, and the effect of tariff changes so far has been moderate. The exports did not increase to any great extent, although efforts were made to push them in the earlier part of the year. As business began to improve abroad, it increased still more rapidly here, and there was comparatively little surplus for export. The result serves to emphasize the remarks on foreign trade which were made in the review for the year 1908. The exports for 1909 included a large quantity of material for the Panama canal.

Iron Production in Belgium and Sweden

In 1909 Belgium showed the greatest relative increase in production of any European country. For the 10 months ended Oct. 31 the total pig iron made was 1,322,490 metric tons, an increase of 334,920 tons over 1908. The foreign trade showed an increase of about 10 per cent. for the period.

Sweden—The production of iron and steel in Sweden for the six months ended June 30 was: Pig iron, 285,900 metric tons; wrought iron, 61,200 tons; bessemer-steel ingots, 40,900; open-hearth ingots, 458,100; total steel, 499,000 tons. The production was decreased by the general strike and by light demand. Exports were 176,200 tons, chief items being 54,800 tons pig iron, 20,000 tons blooms and billets, 14,400 tons wire-rods, 65,100 tons bars.

The Iron and Steel Markets in 1909

A Strongly Marked Recovery in Demand and Later in Prices, Following the Adoption of an Open Market Policy by Producers

REPORTS FROM VARIOUS CENTERS

The general course of the markets during 1909 was a new vindication of the old law of supply and demand. The halting and hesitation manifest at the opening of the year disappeared as soon as the large producers abandoned their untenable position, gaye up their policy of maintaining prices and permitted the market to take its course. From that time on business increased with almost unprecedented rapidity; and as a natural consequence of increasing demand prices crept up gradually until they reached almost the level from which they had dropped. These gradual advances came naturally as the result of improved demand and did not check or limit the volume of trade.

The tariff discussion in the summer did not seriously affect the market. As soon as it became apparent that final settlement rested with the Senate, the situation was generally discounted. The final outcome—a spectacular reduction in the duties on pig iron, steel rails and few other items, and a practical maintenance of other rates—was generally anticipated, and had little effect on the market when the Payne-Aldrich bill finally became a law in August.

The rail question, which caused so much discussion in 1908, ended by a compromise which was generally accepted with little publicity. The rail mills quietly agreed to conform to the stricter specifications of the railroads, and maintained the price of $28 per ton. There was an increased demand for open-hearth rails.

The course of the markets is well told in the letters which follow from our special correspondents. These include Pittsburg and Birmingham, the chief primary markets; Chicago, which is typical of the Western territory; and the local markets on the seaboard.

The Pittsburg Iron and Steel Markets

BY B. E. V. LUTY

Seldom has a year in the iron trade exhibited such fluctutations in prices as occurred in 1909. The complete cycle was run, prices declining and then advancing. So much pomp and circumstance surrounded the maintenance of finished steel prices in 1908 after the panic of October, 1907, so violent was the break upon the abandonment of the price maintenance policy, and so quietly and gradualy did prices steal upwards in the second half of the year, that it requires a careful scrutiny of the opening and closing prices of the year to divest the mind of the impression that the net result of the year was a general and material lowering in the level of values.

As a matter of fact the absolute minimum price of merchant steel bars at the close of the year was $1 a ton higher than the nominal or official price at the opening, while plates and shapes showed an apparent reduction of $1 a ton. The nominal or official prices on bars, plates and shapes at the opening of the year were not generally observed, there having been shading on practically all important business, so that the net result of the year was an average advance in these three important products. Wire products suffered reductions of $8 per ton of 2000 lb. in plain wire, $7 in nails and $10 in barb wire, the subsequent advances amounting to $5 on each line, leaving an average net decline of about $3. Tinplates declined 25c. per box and recovered 20c.; black sheets made up all but $1 a ton of their loss, while galvanized sheets made up their entire loss. Standard steel rails suffered no fluctuation in the year.

Steel pipe alone of all finished steel products suffered a material net reduction. The reduction was five points or about $9.50 per ton of 2000 lbs., while the only advance was one point.

Unlike finished steel products, pig iron had found low points in 1908, the desultory attempts early in the year to maintain prices having been abandoned. An ill-advised marking up of prices in November and December, 1908, made the opening prices of 1909 higher than they should have been, considering the general situation, but even with such artificiality in the opening prices the closing prices of the year showed gains all along the line. Comparing the average quotations in December with those in January gains were shown in pig iron, f.o.b. Valley furnaces, of $2.72 in bessemer, $1.50 in basic, $1.62 in foundry and $2 in gray forge.

The February Price Break.—At a conference of officials of the United States Steel Corporation with representatives of a few important independent producers on the afternoon of Feb. 18, it was decided to abandon all concerted effort to maintain prices on finished steel products, with the single exception of standard rails. An exception was not made of rails without due deliberation; the abandonment of price maintenance was considered from the two standpoints of the ability or inability to hold prices, and the prospects of increased business at reductions. In the case of rails the number of producers was so small that the question of ability to maintain prices was relatively unimportant, and the decision rested upon the prospects of business. A hasty canvass of the railroads showed that no large business could be expected to follow a reduction; hence rails were excluded from the open market declaration.

The public utterances of officials of the United States Steel Corporation at the time of the break sought to convey the impression that it was brought about almost wholly by the cutting of some of the independents, but there is good reason to believe that this was the excuse rather than the reason. The Steel Corporation, however, was not wholly responsible for the taking of this oblique view. Several prominent independent interests had grown tired of the price maintenance game for a variety of reasons, but that they selected to urge upon the Steel Corporation was that certain smaller independents were cutting into their trade.

The outcome of the price break was a general resumption of activity following more closely than even the most sanguine anticipated. The immediate effect of the open market declaration was to suspend shipments on the great bulk of contracts on books, pending a readjustment of prices. In only a few particular instances did the mills attempt to hold customers to their contracts. Bar, plate and shape contracts were soon adjusted to a new level, although ultimately sales

were made at a still lower level. The curve of pig iron production, which trended continually upward from June, 1909, through February, 1909, dropped sharply in March and again in April, chiefly on account of the suspension of shipments on contracts.

After April the trend of production was sharply upward, and in the latter part of September, just six months after the break, the production of pig iron in the United States reached the rate of 28,000,000 tons annually which had been touched in October, 1907, the panic month. The entire dip in the curve of production extended over a period just short of two years. In quantity, it extended from a rate of 28,000,000 tons in October, 1907, the record to that time, to a rate less than 13,000,000 tons in January, 1908, the lowest since January, 1904. In December, 1909, a rate of approximately 32,000,000 tons was reached.

If the resumption of activity was due to the break in prices the move was thoroughly efficacious; if it was not due to that cause, if the resumption was marked to come in any event, it constituted a serious arraignment of the judgment of those who held prices for 15 months, only to desert the cause when the fruit was ripe. The former assumption sems to be the true one.

The Course of Steel Prices.—Standard rails, as noted, commanded unchanged prices during the year. The $28 rail price was first made in the spring of 1901, as the United States Steel Corporation was being formed, and has not been changed since.

Plates and shapes had been 1.70c. in 1907; June 9, 1908, the official price was reduced to 1.60c. At times in 1908 there was extensive shading, down to 1.40c. or lower, and the 1.60c. official price was probably being better held at the opening of 1909 than were the respective prices of 1.70c. and 1.60c. during much of the preceding year. Following the open market declaration, plates and shapes dropped, Feb. 19 and 20, to 1.30c., and existing contracts were largely adjusted to that basis. During parts of March and April they sold openly at 1.20c., but 1.10c. was done in special cases.

Steel bars had been 1.60c. in 1907, and were reduced to 1.40c. June 1, 1908, opening 1909 with that price fairly well held. The first break was to 1.20c., but in parts of March and April sales were freely made at 1.10c., and 1.05c. was done in special cases.

In the latter part of April plates, shapes and bars firmed up, closing the month at 1.15c. for bars and 1.30c. for plates and shapes. Bars soon gained $1 a ton upon plates and shapes, and thereafter there was a steadily advancing market on the three products, closing the year with bars at 1.45c. and plates and shapes at 1.55c., with $1 a ton more asked in some cases, particularly on deliveries more than three months ahead.

Merchant steel pipe opened the year at a nominal price of 80 per cent. off list, which with the customary concession to large jobbers made the actual inside price 81 and 5. There had been a two-point reduction from the 1907 price on June 9, 1908. March 1 the National Tube Company promulgated new prices, carrying a reduction of five points, or about $9.50 per net ton. Oct. 1 a one-point advance was made.

Sheets opened the year at 2.45c. for black and 3.50c. for galvanized, 28 gage. The first reduction was Feb. 24, making black sheets 2.20c. and galvanized 3.25c. In the next four months these prices were cut, at times, to about 2.10c. and 3.15c. In July and August the market firmed up, closing August with 2.20c. on black and 3.25c. on galvanized sheets. Sept. 28 and advance of $2 a ton was made, making black sheets 2.30c. and galvanized 3.35c. Nov. 12 prices were advanced to 2.40 for black and 3.50c. for galvanized, the spread between black and galvanized sheets being increased 5c. per 100 lb., which only partly made up for the advance in spelter.

Tinplates were reduced from $3.65 to $3.40 per box for 100-lb. cokes on March 15, and were advanced Sept. 28 and Nov. 12, 10c. each time, making the closing price $3.60 per box.

A peculiar condition confronted the wire trade when the open market declaration was made, as the jobbers had laid in large stocks for the spring trade. At first a general reduction appeared inevitable, but the threat of a large reduction served to hold the wavering producers fairly well in line. There was some cutting, particularly in April, but a general reduction was postponed until May 1, when jobbers had fairly well worked off their stocks and were ready to place additional orders. On that date prices were reduced from $1.95 per keg to $1.60 on wire nails, from 1.80c. to 1.40c. on plain wire, from 2.40c. to 1.90c. on galvanized barb wire and from 2.10c. to 1.60c. on painted barb wire, $7, $8 and $10 per net ton respectively. New business came with a rush, and May 15 prices were marked up $2 a ton. July 24 another $2 advance occurred, and Dec. 12 $1 was added, leaving prices $2, $3 and $5 respectively below the opening.

Pig Iron.—The course of pig iron prices is shown in the accompanying table, which is made up from daily prices, averaged each month. Prices at the opening of the year were inflated, as there had been a sharp advance in November and December of the preceding year, based upon insufficient grounds. Had it not been for this inflation the pig iron market might have passed through the period of readjustment in finished steel prices with but little decline. As it was, pig iron prices declined sharply, reaching a minimum early in May of about $14.50, Valley, for bessemer and $13.85@13.90, Valley, for No. 2 foundry and basic, Pittsburg prices being 90c. higher. Thereafter the market advanced steadily.

The most striking feature of the local market was the heavy buying of bessemer iron by independent steel works, the Republic Iron and Steel Company, Youngstown Sheet and Tube Company, Jones & Laughlin Steel Company, Cambria Steel Company and Lackawanna Steel Company. In ordinary conditions these companies are practically self-sustaining in pig iron, but when under pressure they take outside iron. The five companies bought a total of more than 400,000 tons of bessemer iron, chiefly from Valley furnaces, the purchases beginning with 10,000 tons by the Republic May 20, at $14.50, Valley. The heaviest buying was in September and October.

New Construction.—The Carnegie Steel Company completed Nos. 5 and 6 of the Duquesne blast furnaces, ground having been broken Dec. 1, 1906. The Jones & Laughlin Steel Company blew in No. 1 of the three Aliquippa furnaces upon which construction work started in 1907. When the other two Aliquippa furnaces are

AVERAGE PRICES AT PITTSBURG, 1909.

	Pig Iron.				Steel.					Nails.	
	Bessemer.	No. 2 Foundry.	Gray Forge.	Ferro-Mang.	Bessemer Billets.	Rails.	Black Sheets No. 28.	Tank Plate.	Steel Bars.	Wire per Keg.	Cut per Keg.
	$	$	$	$	$	$	c.	c.	c.	$	$
January	17.18	16.28	15.15	45.95	25.00	28.00	2.45	1.60	1.40	1.95	1.90
February	16.73	15.90	15.15	45.45	25.00	28.00	2.39	1.50	1.33	1.95	1.90
March	16.40	15.62	14.82	43.85	23.00	28.00	2.20	1.30	1.20	1.90	1.80
April	15.79	15.06	14.56	43.45	23.00	28.00	2.20	1.28	1.13	1.95	1.70
May	15.77	15.08	14.40	42.45	23.00	28.00	2.15	1.25	1.19	1.65	1.70
June	16.13	15.63	14.82	42.85	23.00	28.00	2.10	1.25	1.20	1.70	1.70
July	16.40	15.96	15.05	43.35	23.50	28.00	2.15	1.33	1.25	1.72	1.71
August	17.16	16.20	15.45	42.95	24.16	28.00	2.15	1.40	1.33	1.80	1.75
September	18.44	17.03	16.34	44.45	25.00	28.00	2.22	1.45	1.37	1.80	1.75
October	19.75	18.02	17.02	45.00	26.00	28.00	2.30	1.50	1.40	1.80	1.77
November	19.90	18.09	17.22	46.35	27.15	28.00	2.36	1.54	1.45	1.80	1.80
December	19.90	17.90	17.15	46.95	27.20	28.00	2.40	1.55	1.45	1.83	1.80
Year	17.46	16.40	15.59	44.42	24.58	28.00	2.26	1.41	1.31	1.82	1.77
Year 1908	17.23	16.28	15.28	46.38	26.25	28.00	2.50	1.64	1.48	1.99	1.83

completed the immediate Pittsburg district, covering Allegheny county, the Monongahela river up to Donora and the Ohio valley down to Aliquippa and Midland, will have a pig iron capacity of fully 8,000,000 tons per annum. Summing up the new furnaces blown in since Jan. 1, 1905, and including Duquesne and Aliquippa, the increase in the immediate Pittsburg district covers 12 furnaces, with a total annual rating of between 1,900,000 and 2,000,000 tons per annum. In the order of their completion these are: Two Donora of the Carnegie Steel Company; McKeesport of the National Tube Company; Midland of the Midland Steel Company; two Carrie of the Carnegie Steel Company; McKeesport of the National Tube Company; two Duquesnes of the Carnegie Steel Company, and three Aliquippa of the Jones & Laughlin Steel Company.

In November ground was broken for four additional open-hearth furnaces at the Homestead steel works of the Carnegie Steel Company.

The Forged Steel Wheel Company, a subsidiary of the Standard Steel Car Company, began the erection at Butler, Penn., 40 miles north of Pittsburg, of an open-hearth plant to comprise six 50-ton furnaces, to be completed by April 1, 1910. The primary function of the plant will be to furnish blanks for forged steel wheels. Later the plant may be enlarged to make plates.

The Seaboard Iron Market

SPECIAL CORRESPONDENCE

The course of the seaboard iron markets is determined chiefly by New York and Philadelphia. New York is the distributing point for a large territory in New York State and New England; Philadelphia not only has its own special territory, but is near to a large producing district in Eastern Pennsylvania, of which it is the chief outlet.

There are two distinct demands in the seaboard territory; the one being found in the direct consumers, who buy for immediate use, and the other in the manufacturers who buy raw iron and steel to make up into machinery and other finished forms. The seaboard territory is more a foundry than a steel making region, and the market there is for foundry rather than steel-making pig, and for steel in finished forms. The exception to this is that the Philadelphia market takes a large quantity of steel billets and basic pig.

The seaboard markets followed the course of the general market rather closely. In almost all lines the year opened with dull trade and rather light buying. This continued until after the 1908 policy of maintaining prices was abandoned and an open market declared. From that time on business improved rapidly; there was sharp buying in all lines, while foundry and machine shop work increased in all quarters. Buying continued active, almost without intermission, until the latter part of November, when matters began to quiet down, and December was rather a slow month. This was taken, however, as rather an indication of the usual end-of-the-year lull, than as any threat of a coming depression.

Pig iron had been the only open market in 1908 and at the beginning of 1909 had reached rather low levels. These were emphasized in the early months of the year and about the lowest points were reached in February and March. From that time on the quotations began to work up, until in December No. 2X foundry was quoted in Philadelphia at $19 @ 19.50; forge at $18, and basic at $18.50 @ 19. Southern iron sold well during the year, No. 2 Alabama foundry being for the most part about on a parity with Northern of the same grade. In November and December the market for Southern was disturbed by offerings of considerable quantities of speculative iron, which had been bought from furnaces earlier in the year, and held for an advance. Storage charges and interest forced out most of this iron, and it was sold at 50c. or 75c. below the price of $15, Birmingham, for No. 2 foundry which the furnaces were trying to maintain. For this reason chiefly Southern foundry closed the year at about 50c. per ton below the parity of Northern.

The only active market in finished material in 1908 had been structural steel. The open market did not so much affect this branch when it was declared in 1909, for the reason that much business had been done for months at quietly shaded prices. Structural business continued active throughout the year, and it is estimated that contracts calling for nearly 2,000,000 tons were placed in seaboard cities during the year. Other branches of the trade were active also after the break; bars, sheets, plates and wire all selling freely for consumption and manufacture. The sales of nails, bars and other material for building of the smaller class started up and rapidly developed into a very active trade. It was evident that large amounts of money were being put into small as well as large construction.

Railroad and terminal improvements and municipal work in and around New York, Philadelphia and Boston absorbed great quantities of material. Contracts for this work are generally made with the large mills directly, and do not appear on the local markets.

The Alabama Pig Iron Market

BY L. W. FRIEDMAN

With the production almost at the top notch, the quotations firm around a high figure, a general reverse of conditions that existed at the beginning of the twelve-months, the year 1909 is looked back upon as a good one for the Alabama pig iron manufacturers, in the face of what was expected and dreaded. The authoritative figures give the State credit for 1,708,068 tons of pig iron during 1909 while the year went out with but little of this iron in the furnace yards belonging to the producers. The quotations were anything but high for the first part of the year, and the make was kept down. When change for the better came on and the demand improved better quotations followed. Pig iron that in 1907 (to September) brought above $24 and $25 per ton spot, was to be purchased during 1909 as low as $11 and even $10.65 per ton, No. 2 foundry, in Alabama; some brokers and speculators took advantage of this condition and purchased. The demand became very slack and the furnace companies curtailed the production and in June the low water mark was reached in output, the Alabama total being under 100,000 tons for the month.

Before the summer was over in Alabama the manufacturers saw prosperity ahead and attention was given to preparation for iron making. The quotations

began taking on advances 50c. and then $1 per ton.

The improving demand in the fall advanced quotations to $15, and even $15.25 per ton, No. 2 foundry, was seen before the close of the year. While some of the furnaces sold in large quantities when the quotations were down at $11 per ton, the opinion evidently being that it would be better to sell and keep the furnaces in blast than to carry the iron or shut down, still, there was some profit at these prices.

The figures of the output tell the story of the year's pig iron transactions in Alabama: January, 148,404 tons; February, 134,909; March, 144,873; April, 139,493; May, 113,524; June, 99,355; July, 104,775; August, 137,363; September, 151,803; October, 176,266; November, 182,303; December (estimated), 175,000; total, 1,708,068 tons.

Several of the Alabama furnace companies had foresight, and as a consequence there was much work done in the way of rehabilitating, improving, enlarging and practically rebuilding furnaces in the State. During the year the reorganization of the Southern Steel Company, the large independent corporation, took place and the Southern Steel and Iron Company was formed. The new company undertook and accomplished the rehabilitation of furnaces and other properties including the steel plant near Gadsden, and also constructed a large steel rod and wire mill which will be placed in commission early in 1910. The Tennessee Coal, Iron and Railroad Company began a series of improvements and betterments of the present properties and outlined further extensive developments. Additions to the extensive property holdings of the company have been made and preparations are underway to enlarge them further. To provide an outlet for the various products, other subsidiary corporations are to establish themselves in the Birmingham district. The Sloss-Sheffield Steel and Iron Company, the Woodward Iron Company, the Republic Iron and Steel Company, the Birmingham Coal and Iron Company, the Central Coal and Iron Company, the Woodstock Iron Company, the Williamson Iron Company and others in the South, Alabama in particular, had furnaces repaired.

Additions and improvements have been made to the cast-iron pipe plants, the soil pipe plants, the foundries, machine shops and other works.

The steel production during the year was satisfactory. The plant of the Tennessee company at Ensley was in operation through the year, with the exception of a few weeks. Besides a large production of steel rails, some of the steel was worked up into other shapes, especially structural steel.

The Chicago Iron Market

BY E. MORRISON

In its first half the year 1909 was disappointing in nearly all lines of the iron and steel trade, but the second half showed boom conditions for finished products and a much better sale of pig iron. Opening in depression, January saw hardly any buying of pig iron, a carload to 100 tons being the average melter's purchase for the immediate needs of his light business. Finished materials had hardly any sale, except railroad supplies. Foundries continued to need very little iron throughout February and by March prices of both Northern and Southern had weakened to their lowest records for the year—$16.50 for Northern No. 2 and $15.35 for Southern No. 2 ($11 Birmingham).

The cut in prices of iron and steel products, in February had the effect of stimulating sales of these products almost immediately, but the wave of increased buying did not reach the pig iron market until several months later. Tariff revision influenced many if not most users of both pig iron and iron and steel materials toward delay in making purchases, even after it became apparent that the country had thoroughly recovered from its financial troubles and had regained its consumptive power. The greatest buyers of the year, the railroads, did not begin placing their very heavy orders until the latter part of April; early in that month the agricultural implement manufacturers, feeling sure of a prosperous year, placed heavy orders for bars and other materials, while the total tonnage of pig iron sales shot suddenly upward, with the feeling that the "bottom of the market" had been reached. It had been, and the spurt raised prices slightly on Southern, with the result that another period of inactivity for pig iron began. The average melter was not yet ready to buy liberally.

The railroads, once started, came into the market rapidly for long-delayed purchases. By the middle of July rails, bars, plates and structural shapes were selling more heavily than at any period since 1907. Building projects of all kinds went forward in confidence; shops generally put on full forces of workmen and prices of iron and steel materials rose again. The purchase of about 55,000 tons of pig iron by the agricultural implement makers, in July, strengthened greatly both Northern and Southern pig iron and the strong condition for the rest of the year.

In the spring of 1909 the average sale of pig iron was of a small amount, with early delivery. The summer saw active buying for the last half and by August some melters were asking contracts to cover the first half of 1910. Furnace agents were reluctant to sell so far ahead at current prices, being confident of a rising market, and prices of both Northern and Southern iron naturally rose, with Northern furnaces well sold up for the rest of the year. Northern, by September, reached $18.50 and a month later it went to $19 minimum for No. 2, at which figure it stayed for the rest of the year. Southern's low quotations on No. 2 were $16.85 in July, $17.85 in August, $18.35 in September and $19.35 in October, remaining firm at the last named quotation until November, when some Southern iron was sold at 50c. less.

Highest and lowest prices in the 1909 market, compared with similar prices in the previous year are given in the table.

	1908.		1909.	
	Highest.	Lowest.	Highest.	Lowest.
Lake Superior charcoal	$24.00	$19.50	$20.00	$19.50
Northern No. 2 foundry	18.50	16.50	19.50	16.50
Southern No. 2 foundry	17.85	15.35	19.85	15.35
Bar Iron	1.65c.	1.50c.	1.60c.	1.30c.
*Structural Material	1.78c.	1.88c.	1.78c.	1.40c.

*Beams and channels, 3 in. to 15 in., and angles, 3 in. to 6 x ¼ in. or heavier.

The months of November and December saw a quiet market for pig iron, but with every indication that a heavy purchasing power would be manifested as soon as foundries could be brought into full operating capacity, molders being scarce. Local furnaces were all in blast and Northern iron remained very firm. Little quick delivery iron was sold. Inquiries indicated that large contracts would be placed, with the imaginary dividing line of the New Year once passed. Considerable business was done in December in resale Southern iron.

Lake Superior charcoal iron sold well throughout the year at uniform quotations of $19.50@20 per ton.

Quicksilver in the United States in 1909

BY H. W. TURNER *

The world's price for quicksilver is practically fixed in London by the Rothschilds, who control the product of the most important mine, the Almaden of Spain. The higher domestic prices in 1909 were due to a protective tariff of $5.25 per flask. The New York price is usually a little higher than the San Francisco price, and the export price about $2 less than that for domestic consumption.

The total production of the United States in 1909 was about 20,000 flasks as against 18,000 in 1908. Two of the old producing mines of California closed down within the last two years, and two others, the Great Western of Lake county and the Napa Consolidated of Napa county, are making their final cleanups; while still another, formerly a very important property, is working very low-grade ore. No new deposits of much importance were developed in California, although some promising prospects may prove to be valuable. Quicksilver mines are therefore likely to be profitable as a result of diminishing production and consequently better prices.

California

In Lake county, California, the furnace of the Helen mine produced a large amount of soot, which is now being retorted and may amount to 800 flasks. The Chicago, just east of the Helen, found considerable ore, but no pay shoots as yet. The Wall Street, adjoining the Chicago, ran one D-retort during part of the year on ore from that mine. In Sonoma county the Culver-Baer, formerly known as the Oakland, has a good body of ore. In Napa county, a retort is said to be in operation at the Etna mine in Pope valley and considerable ore is blocked out. In Santa Clara county, according to Arthur Feust, the New Almaden furnace is treating 0.2 to 0.3 per cent. ore. In San Benito county the New Idria held its own and was the largest producer in the State. In Modoc county a discovery of cinnabar was reported in the Willow Creek district, near Goose lake.

Nevada

The Davis & Workman property is situated about three miles northeast of Berlin, Nye county. The ore is found chiefly in rhyolite near limestone, and to some extent in the limestone. It is sorted up to a 6 per cent. grade and roasted in nine D-retorts, 8 ft. long and 2 ft. wide. These retorts treat about 5½ tons daily. The retorts are kept at a cherry-red heat and the excess sulphur gives little trouble, being absorbed by the lime in the ore. The total production for 1909 was about 2000 flasks. The mercury is present as cinnabar, metacinnabarite and calomel. Much of the ore was obtained from an open cut.

Some new discoveries of cinnabar were made east of Goldfield and between Berlin and Austin. Their extent has not yet been determined.

Texas.

The condition of the quicksilver industry in Texas was recently reviewed by William B. Phillips.[1] There are seven furnaces in the Terlingua district, of which one of the Marfa & Mariposa and that of the Chisos Mining Company were in operation. The two furnaces of the Marfa & Mariposa Company are called 10-ton furnaces although they treat 12 tons per day each. The Chisos company operated for several years with D-retorts, but in 1908 built a 20-ton Scott furnace which was in commission in 1909, and in consequence the company treated a lower grade of ore, as was also done in 1908 in the Tignor furnace.

There are two main geological horizons in the district that contain mercury deposits: The Lower Cretaceous (Edwards limestone) and the Upper Cretaceous (Eagle Ford shale). The ores of these two formations differ to some extent. The ores in the Edwards limestone contain considerable yellow ore and native mercury, the yellow ore being oxychloride of mercury. Nevertheless the ordinary ore is cinnabar with calcite, gypsum, and sometimes pyrite, and traces of bitumen.

The ores of the Eagle Ford shales, which are bituminous, contain much hydrocarbon, and when formerly treated in retorts yielded considerable oil and illuminating gas. Phillips records the discovery of oxychlorides of mercury in the Eagle Ford shales, six miles east of California hill. Previously all the ore found in these bituminous shales was cinnabar.

Thus far much the larger part of the production has come from deposits in the Edwards limestone, but the Chisos mine is now finding ore in depth and its future looks promising. The main shaft of the Chisos is now down 500 ft., and preparations are being made to sink a larger shaft to the 1000-ft. level.

The growing scarcity of wood fuel would be alarming (the district is 90 miles from the railroad and hence the use of oil fuel is not practicable) were it not that there are beds of lignite in Brewster county, not far from the quicksilver mines. This coal is suitable for making producer gas, and Phillips is of the opinion that producer gas can be used in quicksilver furnaces. As a matter of fact, it has already been used in quicksilver reduction by W. B. Dennis at Blackbutte, Oregon. The use of gas should moreover greatly reduce the quantity of soot in the condensors, which is much to be desired. Phillips estimated the total cost of producing mercury in the Terlingua district at $25 per flask of 75 lb. The total production of the Terlingua district to date is given as 40,000 flasks.

In 1905, the legislature of Texas passed a law which practically stopped prospecting on the State lands. The prospector was required to make application for the land wanted, after which the land commissioner fixed the price. Thus if a lucky prospector stumbled on a rich find the commissioner could put on such a price as would prevent a profitable operation. The law of 1909, however, fixes the upper limit at $25 per acre.

AVERAGE MONTHLY PRICE OF QUICKSILVER.
(Per Flask of 75 Lb.)

	1908.			1909.		
		San Francisco.			San Francisco.	
	New York.	Domestic.	Export.	New York.	Domestic.	Export.
January	$45.00	$45.00	$43.50	$45.50	$45.30	$43.30
February	45.00	45.00	43.50	45.50	45.50	43.50
March	45.00	45.00	43.50	45.50	44.75	42.75
April	45.00	45.00	43.50	45.00	44.25	42.25
May	45.00	44.50	43.00	44.50	44.00	42.00
June	44.25	44.00	42.50	44.50	44.00	42.00
July	44.00	43.50	42.00	43.75	43.44	41.44
August	43.30	42.70	41.30	43.75	42.95	40.95
September	42.87	42.25	40.50	45.00	43.50	41.50
October	46.25	43.50	41.62	47.00	45.90	43.90
November	46.60	44.50	42.50	52.50	50.75	48.75
December	45.75	45.12	43.12	52.50	51.00	49.00
Year	$44.84	$44.17	$42.54	$46.30	45.45	43.45

*Geologist and Mining Engineer, San Francisco, Cal.

[1]Eng. & Min. Journ., Nov. 20, 1909.

Mining in the United States During 1909

Development of Porphyry Copper Properties Continued; Zinc Mining Stimulated by Higher Prices; Homestake Mine Closed by Labor Troubles

REVIEW OF 1909 BY STATES

Throughout the United States, the industry of mining may be said to have enjoyed a prosperous year in 1909, having gradually followed the revival of all branches of business since the late period of financial depression. While mining will, no doubt, always offer an enticing field for the flotations of unscrupulous promoters, yet 1909 saw distinct steps taken toward diminishing this evil. Large companies and small are beginning to adopt a policy of frankness to their stockholders which cannot fail to place the industry on a higher plane as a field for investment.

In Nevada there was an increase in actual metal output, three companies, the Nevada Consolidated, the Goldfield Consolidated, and the Tonopah Mining Company, standing out preëminently in the production of copper, gold and silver, respectively. The great Homestake property in South Dakota closed on account of threatened labor troubles.

Alaska

BY WILLIAM M. BREWER *

The following estimates of the value of the mineral output of Alaska in 1909 have been announced in the press bulletin of the U. S. Geological Survey: "The total mineral production is estimated at $20,200,000 practically the same as that of 1908, which was $20,139,272. The estimated value of the gold output of 1909 was $19,460,000; that of 1908 was $19,292,818. The copper production of 1909 was approximately 4,000,000 lb., valued at about $520,000; that of 1908 was 4,585,362 lb., valued at $602,267. Probably the output of none of the other mineral products, including silver, coal, marble and gypsum, differed greatly from that of 1908, when the total value was $244,189.

"From 1880, when mining first began in Alaska, to the close of 1909, the total value of the mineral production was, in round numbers, $168,000,000. Of this amount the gold mines contributed about $161,000,000; the commercial value of the silver output was about $1,200,000, and the copper production about $4,700,000. The remainder is represented by the value of the output of coal, gypsum, tin, and marble."

With regard to the production of copper, I am convinced that 4,000,000 lb. is too low an estimate because the "Big Bonanza" mine on Latouche island alone produced approximately 1,250,000 lb., and late in the autumn the Ellamar or Gladhaugh mine resumed shipments. This, with other smaller consignments from Prince William sound, would bring the total from that section up to approximately 1,600,000 lb., leaving only 2,400,000 lb. to be credited to the mines on Prince of Wales island, where the Mount Andrew, Jumbo and It mines were regular shippers and where in addition there were some irregular shippers.

*Mining engineer, Victoria, B. C.

Because of the great extent of the territory and the long distance intervening between the various districts, as well as for the convenience of those sufficiently interested to refer to a map while considering the following review of the mining industry for 1909, I have divided the territory into seven geographical subdivisions as follows: Prince of Wales island; Juneau; Prince William sound; Kenai peninsula; Copper river; Yukon basin, and Seward peninsula.

Prince of Wales Island District

The distributing center for the Prince of Wales Island district is Ketchikan, the most southeasterly port of call in Alaskan territory. While some discoveries of gold-bearing quartz and copper-sulphide ore have been made on Revillagigedo island, on the westerly side of which Ketchikan is situated, all of the most important are situated on Prince of Wales island and are confined so far to four separate districts: On and in the vicinity of Kasaan peninsula, around Moira sound, and McLean's arm on the east side of the island, and near the head of Hetta inlet on the west side of the island.

During 1909 there were three mines that were regular shippers of copper-gold ore, viz., the Mount Andrew and It mines, situated on Kasaan peninsula, and the Jumbo on Hetta inlet. It is interesting to note that the ore from the Mount Andrew mine, on account of its heavy excess of iron needed to flux the silicious ores offered, is smelted at a much lower rate for treatment than probably any other copper ore in the United States. The iron content of this ore is rarely below 35 per cent., and sometimes as high as 53 per cent., with copper ranging around 4 per cent. wet assay.

It is also encouraging to other owners of magnetite orebodies carrying small amounts of copper to know that in recent work at a depth of 150 ft. below any former work the ore contains more copper but much less iron indicating that the magnetite is only a surface deposit.

The Goodro property on Kasaan peninsula, was developed and equipped during last spring and summer and commenced shipping copper-gold ore in October. The It mine has the distinction of having shipped regularly the highest grade copper-gold ore ever produced from Prince of Wales island. The Rush & Brown property, on Karta bay at the head of the Kasaan peninsula, made some shipments of ore carrying a considerable excess of iron but low in copper, and it is expected that during 1910 this mine which was a regular shipper in 1906-07 will resume operations. The Niblack mine on Moira sound has been idle since the ligitation over it was settled and the lease canceled.

Development work was done during 1909 on several other copper properties, and especially on some locations in the vicinity of McLean's, near the southeast end of Prince of Wales island, where several promising discoveries were made in 1908.

On the southeast portion of Gravina island, which is situated between Prince of Wales and Revillagigedo islands, the Victor Mining Company worked continuously during the year driving a crosscut tunnel near the beach. This tunnel will prospect the ground at a depth of about 2000 ft. by driving about 1100 ft. into the mountain.

On the west coast of Prince of Wales island the Tyee Copper Company, of Victoria, B. C., used diamond drills to prospect a group of claims carrying copper ore. On the properties that carry gold-bearing quartz and on the Moonshine, the only galena prospect so far discovered on Prince of Wales island, more work was done in 1909 than during 1908, with a

view to bringing these into the ranks of producers during 1910. The low price of copper was chiefly responsible for the lack of activity around such properties as the Niblack on Moira sound and the Mamie and Stevenstown on Kasaan peninsula, all of which have been shippers in the past.

The great need in this district, as well as all over Alaska, is capital judiciously and systematically handled to develop promising prospects; and in addition to capital there is need of judgment on the part of owners of prospects in placing on them a reasonable purchase price.

Juneau District

The Alaska-Treadwell group, Alaska-Perseverance, Eagle River and Chicagoff Island mines worked steadily and produced nearly $3,400,000, the entire estimated poduction of gold from lode mining during the year credited to Alaska by the U. S. Geological Survey. This, the oldest gold-producing district in Alaska, has produced upward of $40,000,000 since 1880, and nearly all from lode mines.

The sale of the Ebner property to a new company that proposes to work it on a big scale instead of with merely a 15-stamp mill as in the past, together with the proposed reopening of the Jualin mine by Ex-Governor Hoggat and the expected settlement of the protracted litigation over the Kensington mines at Berner's bay, promise a materially increased production for the Juneau district in 1910. In addition to the producing lode-gold mines there are a large number of promising prospects in the Juneau district on which more or less development work was done during the year.

This district is also the only producer of gypsum in Alaska, and that industry during the last two or three years has grown into such importance that the monthly shipments to Tacoma, where it is used in the manufacture of plaster, increased from about 1000 tons in 1908 to about 3000 in 1909.

Prince William Sound District

The Prince William Sound district promises to become the most important as well as probably the most populous in Alaska within a comparatively short time for two reasons: (1) Because Cordova in this district is the ocean terminus of the Copper River & Northwestern railway; (2) because the Controller Bay or Bering Lake coalfields and numerous copper prospects are also situated within its boundaries.

The copper production from this district during 1909 exceeded 1,600,000 lb., and all except possibly 250,000 lb. was produced from Beatson's Big Bonanza mine on Latouche island, and from less than 5000 tons of ore. Although this mine was the only regular shipper, there was considerable activity shown by owners of other properties in pushing development work. The Big Bonanza since it commenced shipping in 1902, has produced a very high grade of copper ore. The orebody is shown by development to a depth of 130 ft. below the floor of the quarry from which the ore was shipped. Up to the present time only 300 ft. along the strike has been prospected underground, but on the surface several outcroppings occur within the length of the property along the strike of the orebody (4500 ft.). The country rock on the hanging-wall side is a slate, while on the footwall it has been variously designated, usually as a quartzite. There are about 3000 ft. of underground workings.

At the Ellamar or Gladhaugh mine on Virgin bay, which, until 1907, was a regular shipper of a good grade of copper ore, exploration work with diamond drill and also the construction of a cofferdam to make it possible to mine out a body of ore that outcrops on the beach below tidewater, and was left above the first level, progressed steadily.

Development work was also done at properties at Landlock bay, Fidalgo bay, Wells bay, Knight's island, Galena bay, Cordova bay, and near Shoup glacier in Valdez bay. Except at the last mentioned locality where high-grade, free-milling gold quartz is being mined, all these are copper properties in varying stages of development; some, like the Standard Copper and Three Men companies on Landlock bay and Girdwood and Barrack's on Latouche island, made shipments, and are equipped to ship regularly when the price of copper goes up; others, like the Millard property on Galena bay, the Schlosser and the Blakeney on Fidalgo bay, are nearing a point of development which the owners consider justifies them in installing equipment for shipping.

While copper mining will undoubtedly be an important industry in the district, there is no doubt but that coal mining will be even more so when Congress passes legislation under which the owners of claims in the coalfields near Katalla, commonly known as the Controller Bay fields, are enabled to open collieries, and when the Copper River & Northwestern railroad builds lines so that the coal can be hauled to the coast. Especially will this be so if smelteries are built in the district and the Seattle, Tacoma and other markets in the State of Washington are supplied. Lack of such legislation is retarding the development of these coalfields as well as the building of lines of railroad into them, so that during 1909 there was nothing done in the coal-mining industry, and only very little boring or prospecting for oil.

Seepages of oil occur in the same section as the coal, and as early as 1902 systematic prospecting was carried on. Several diamond-drill holes were put down by an English syndicate which is also heavily interested in the coalfields, but this work was suspended when the coal lands were withdrawn from entry. While some oil was produced, yet it is not known yet whether wells that would produce on a commercial scale can be developed.

The work of construction on the Copper River & Northwestern railroad, that has been carried on by M. J. Heney steadily since 1907, made Cordova the most important point in the PrinceWilliam Sound district and encouraged many prospectors to explore the country along the line of the railroad as well as around Cordova bay. Their work resulted in the locating of several promising prospects, not only near the salt water on Cordova bay, but also on the lower Copper river, near Alganik, and as far up as Taral, near the mouth of the Chitina river, southwesterly from what is known as the Copper River belt.

The building of this railroad is a stupendous undertaking, more especially when it is considered that the present development of the country is so limited that only one mining property, the Bonanza, situated over 200 miles northeasterly from the ocean terminus, is sufficiently developed to warrant an estimate with regard to freight traffic. The cost for construction, especially for bridges across the Copper river, has been enormous. The first 100 miles is completed, and when a trail is made from Copper Center, over the military trail from Valdez to Fairbanks, to the mouth of the Chitina river, undoubtedly the travel from and to Fairbanks and the Tanana valley will be diverted from Valdez. The Copper river from Taral up to Copper Center is navigable a portion of the summer for very light-draft boats, one of which made that trip during 1907. Just above the mouth of the Chitina river the railroad crosses the Copper river from the west to the east side, and from there will follow up the Chitina river and make connection with a tram line from the Bonanza mine.

Location surveys have been made for a branch of this line of railroad from the lower Copper river to the Bering Lake coalfields, a distance of about 80 miles in a southeasterly direction. During the summer of 1909 it was reported that construction was to be commenced on this branch at once, but this was abandoned until such time as the question of title to the coal lands is definitely settled. A few miles of track was laid by this company in 1907 from Katalla, on the coast, east from the mouth of the Copper river, toward the coalfields. It was then proposed to make Katalla the ocean terminus, but work on this line was stopped in the autumn of the same year and has never been resumed. This section of track will, I presume, be used when the branch to the Copper river is built.

The other railroad enterprises propos-

ing to build into this coalfield and the Copper River country, have apparently all died natural deaths, thus removing all competition from the path of the Copper River & Northwestern Railroad Company. During the summer of 1909 bonds to the amount of $50,000,000 were issued by this company and the property mortgaged to secure this amount.

Kenai Peninsula District

The Kenai Peninsula district owes its importance chiefly to the fact that Seward, at the head of Resurrection bay, is the ocean terminus of the Alaska Central railroad, thus making it the gateway to the Cook's Inlet placer and hydraulic diggings and also to the Matanooska coalfields, the objective point of this railroad. A limited quantity of gold was produced by the hydraulic mines and from some new discoveries of gold-bearing quartz on Willow creek, a branch of the Susitna river, but there was no other mineral production during 1909.

Gold-bearing quartz was discovered on False creek, about 20 miles out from Seward, in 1905; but more serious work was done on the locations during the summer of 1909, when an arrastra was installed, and, it is said, sufficient gold saved to pay the cost of the development work.

There was quite a stampede in August to Moose pass, about 45 miles from Seward, owing to the locating of gold-bearing quartz veins and the bonding of the Gilpatrick group to Watson & Snow for $80,000. Although about 50 claims in all were located during the summer there was comparatively little work done on any except the Gilpatrick group, and not sufficient there to demonstrate the value of the camp. During 1910 this should be ascertained, and there is a good chance there for the development of an important lode-mining camp.

The Willow Creek camp, from all reports, also promises to become a prosperous lode-mining camp, especially if the railroad construction is continued in 1910. This road will afford easy access into the Susitna, Yentna and Mantanooska water sheds, considered by good prospectors as offering the best chances for discoveries of gold-bearing, free-milling quartz of any section of southwestern Alaska.

The railroad was completed to the head of Cook's inlet, 72 miles from Seward, in 1909. It has been in course of construction since 1904. During the year it was in the hands of a receiver, and the last 20 miles, the construction of which had been left unfinished, was completed. Recently the railroad was sold at receiver's sale and a new company, called the Alaska Northern Railroad Company, organized. It is the expressed intention of this company to continue construction in 1910 and complete the road to the Matanooska coalfields, about 150 miles beyond the present northern terminus, at the earliest possible date. It is reported that the site for a naval coaling station on Resurrection bay has been approved by the Navy Department, the site being within easy reach of the Alaska Central railroad.

Copper River District

The Copper River district may, for the purpose of this review, be considered to include all of the territory between the Chitina river on the south, the Tanana and Yukon on the north, the International boundary on the east and the Copper river basin on the west. These boundaries will include the placer diggings on Slate and Valdez creeks and the hydraulic mines on the Nizina river, as well as the copper deposits in the belt a short distance north of the Chitina river. The Assay Office at Seattle reports the receipt of $106,655 in placer gold from this section during the first ten months of 1909.

The portion of this district in which placer gold is liable to occur is quite extensive, but owing to the ice fields and precipitous mountain ranges, small sections only have been explored. Although a considerable quantity of placer gold has been produced every year since 1898, yet the most attention has been given by prospectors to prospecting for copper in the belt north from the Chitina river. High-grade copper ore is here found at and near the contact of limestone and igneous rock.

During last summer it was reported that the Morgan-Guggenheim syndicate, which is building the railroad, had purchased all of the remaining outside interests in the Bonanza mine, and also the interests of the Great Northern Development Company and the Alaska-Kotsina Copper Company, and also those of Henry Bratnober and associates in the Nabesua-White River copper belt. If these reports are correct, this syndicate operating as the Alaskan Copper and Coal Company acquired a very large acreage of the Copper River district.

During 1910 there should be such systematic development work done in this inland copper belt as will forever set at rest all speculation as to its future prospects. There is no doubt as to the grade of the ore so far exposed, which is much higher than is usually found; the questions of tonnage, cost of mining and transportation remain to be determined.

Considering the limited development work that has been done in this district and the great amount of cash expended, without including the enormous cost for railroad construction, there is not a particle of doubt but that the cost up to the present time has been greater than the cost of opening up any other copper camp in the United States. Owing to this fact it is necessary that the tonnage developed, as well as the grade, should be exceptional in order to insure dividends from future operations sufficiently high to make these properties attractive investments.

Yukon Basin District

For the first ten months of 1909 the Assay Office at Seattle reports the receipts from the various camps in this district as follows: Tanana, $5,631,836; Circle, $59,275; Koyukuk, $388,922; Eagle, $28,923. The discovery of gold-bearing quartz veins near Fairbanks, in the Koyukuk and Chandlar valleys, and in the Bonnifield district will have a tendency to attract hard-rock prospectors into the territory heretofore the home of the placer miner. Doctor Brooks, of the U. S. Geological Survey, speaks in encouraging terms of the lode prospects so far discovered, and in the press bulletin issued by the Survey these discoveries are discussed at considerable length. This discussion may be summarized thus: So far the development has been so limited that, while the prospects have promising possibilities, yet it is too early to warrant the expression of any opinion as to their ultimate value. Development work has been confined to surface prospecting, sinking on veins to depths of less than 100 ft. and tunneling along them to distances not much exceeding 100 ft. The material has been milled in small lots by means of a small stamp mill established at the town of Fairbanks during the winter of 1909.

About the only new features chronicled during 1909 with regard to placer mining in this district were the discoveries of pay streaks on Otter creek, a tributary of the Haiditarod, itself a tributary of the Innoko river. The Innoko district is credited with a probable yield of $300,000 during 1909, indicating that systematic mining followed the prospecting done in 1908. Other reports are of the discovery of placer gold on the Tolusak, a tributary of the Kuskokwin, in what seems to be an extension of the same belt as that of the Innoko and Haiditarod. Stampedes of considerable magnitude were reported during the summer and autumn from Fairbanks and other older placer camps into the newer and more attractive fields, and it is quite possible that during 1910 a considerable increase in the production of placer gold from the Yukon Basin territory will be recorded.

The Alaska Road Commission was active in building new trails and improving the trunk roads in the district, and this will have an important bearing on the future exploration of this almost unexplored portion of Alaska.

In placer mining the dredge and hydraulic plant are rapidly taking the place of the individual miner in portions of this district, and especially in the Fortymile basin where three dredges were in operation during 1909, one of these working on the south fork of Fortymile and the other two on Walker's fork.

It is reported that, because of the isolated positions of these dredges, the initial cost for installation was probably twice as much as it would have been in some other portions of Alaska, and besides, for two of these dredges the ground has to be thawed. The operations so far have been successful, and therefore a precedent has been established.

SEWARD PENINSULA DISTRICT

The output of placer gold received at the Seattle Assay Office from the Seward Peninsula district, during the first ten months of 1909 is reported at $4,035,983; this was all placer gold. Around and at Nome the installation of larger plants proceeded rapidly enough to insure the keeping up of production, especially during such a dry season as that of 1909. It is generally conceded by those who have thoroughly studied the conditions that there is quite an extensive area containing reserves of gold-bearing gravel; but the question of water supply will have to be seriously studied and met before much advancement can be made in mining on a large scale. Large plants are needed to handle such quantities of the lower-grade gravel as will insure satisfactory results to the operators.

So far as the tin deposits in this district are concerned, there was apparently little activity in the section where they occur. A big lot of specimens of both lode and stream tin was shipped to the Alaska Yukon Pacific Exposition at Seattle. The isolated location, the closed sea during a long period each year and consequent lack of regular transportation and the question of cost will always enter largely into the problem of mining the tin ore in this section. Before any serious development is undertaken, those who propose to invest the required capital should have all the conditions thoroughly examined by experts who have made tin mining a specialty.

Arizona

BY WILLIAM P. BLAKE *

The continued low price of copper turned the attention of prospectors and miners more and more to the other metals, notably to gold, silver-lead and zinc.

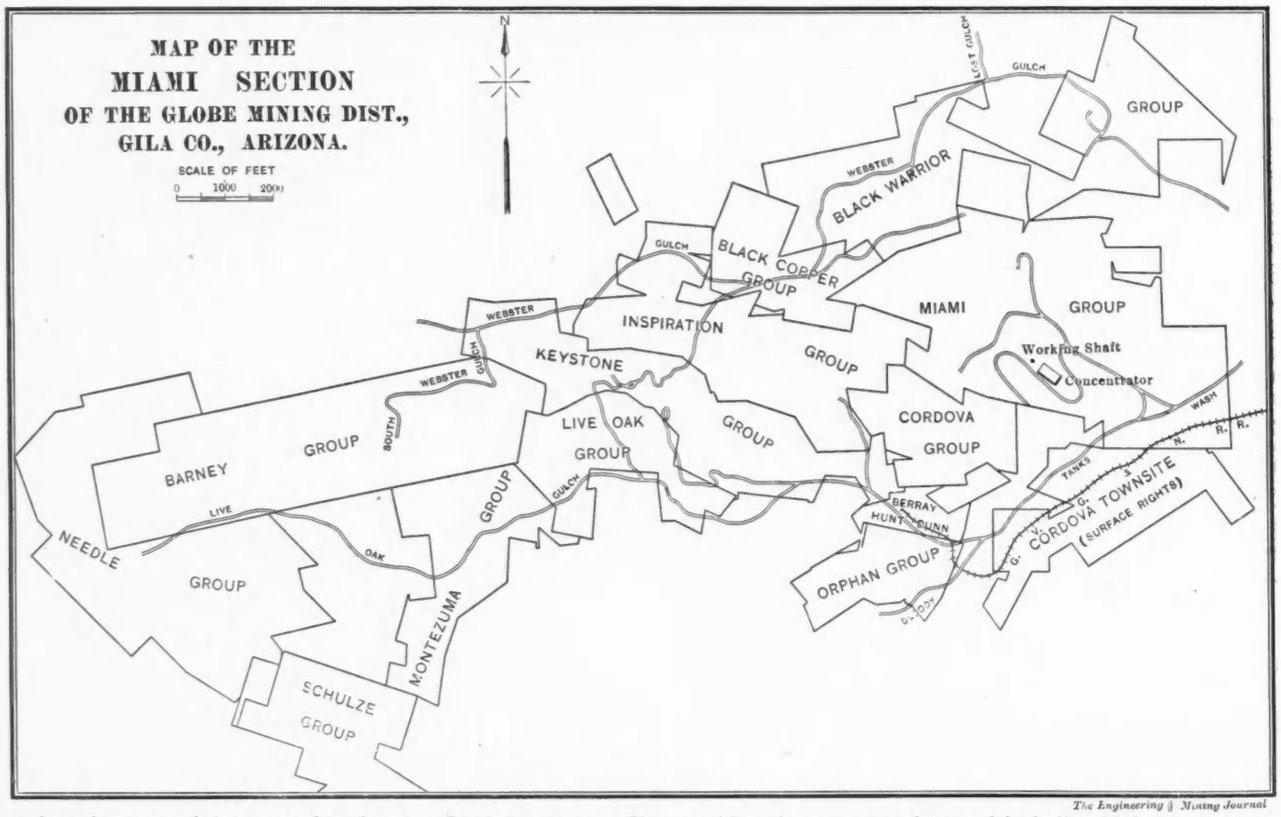
GOLD

The active development of the gold region of western Arizona continued during 1909 with most encouraging results, especially in Yuma and Mohave counties, where new properties have been opened. The existence of a gold-bearing region along the western border of the Territory is now recognized. This region is coincident with the uplift of the hydro-mica schists of the Arizonian, noted throughout the Territory as the country rock of valuable mineral deposits. It is of extreme antiquity, antedating in deposition the ancient sediments of the Silurian and Cambrian seas. These schists have a wide development west of the Harquahalla mountains, especially near Vicksburg, where they are traversed by many quartz veins.

The King of Arizona, in southern Yuma county, was worked without interruption, and added about $20,000 monthly to the gold output of the Territory. The North Star, now known as the Golden Star, maintained its prestige as a large producer and recovered from the destruction by fire of the ore chutes at the mill.

Prospecting and locating were actively prosecuted from Castle Dome on the south to and including Mohave county on the north. Mack's Ruby gold mine, about five miles above Parker, was bonded by Eastern men and is under exploration.

The gold mines of Mohave county were actively worked and were so well represented at the Territorial fair as to secure



The Engineering & Mining Journal

*Territorial geologist of Arizona, Tucson, Arizona.

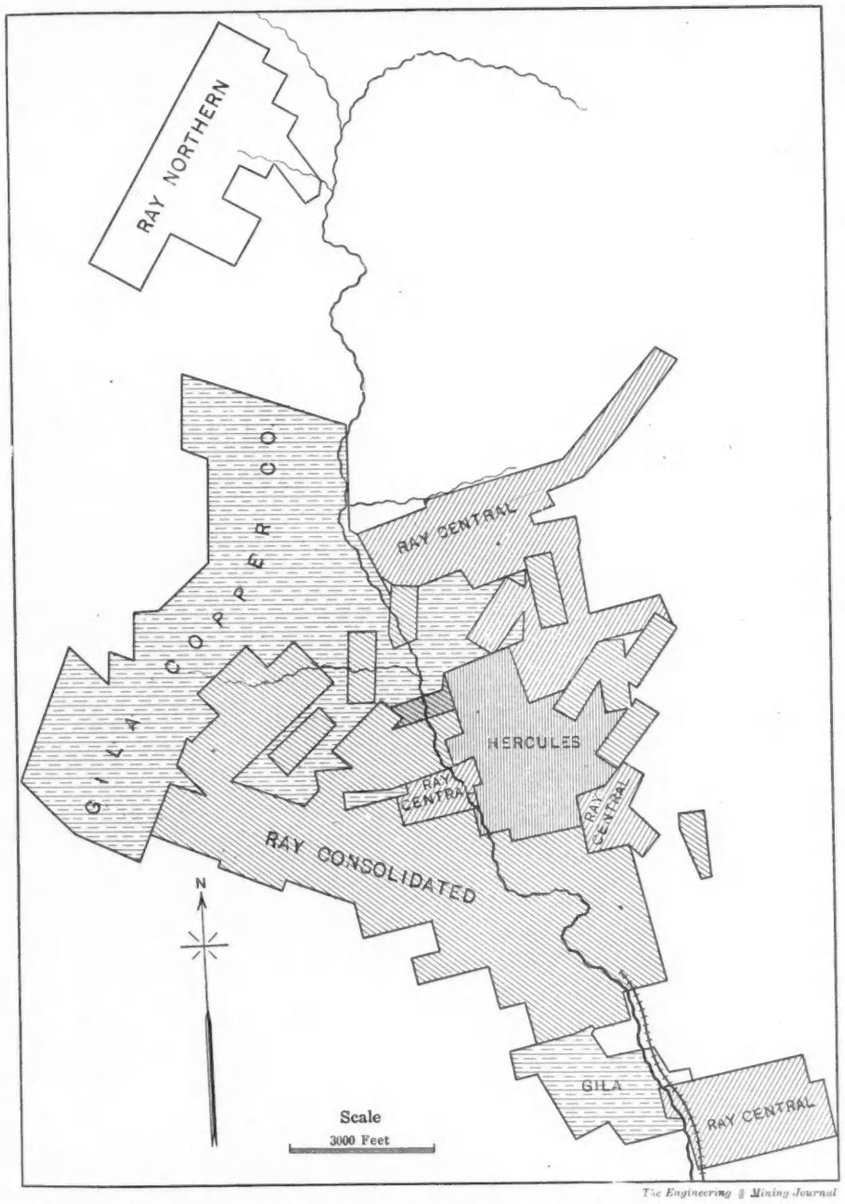
the medal for the best mining exhibit. The ores of the Gold Road mine were prominent. A gilded representation of a gold bar valued at $45,000 indicated the result of 15 days' run of the mill. The Tom Reed mine, about 1½ miles south of the Gold Road, is in the same formation and has similar ore. A 250-ft. shaft and about 1800 ft. of drifts and crosscuts have proved the existence of a large body of free-milling ore in this mine. The property is credited with the production of $300,000, and has acquired added prominence by the reported transfer of the controlling interest to John Hays Hammond and associates.

In Maricopa county, the old Vulture mine, near Wickenburg, operated successfully and shipped bullion after April. A new mill of 100 stamps is planned. Five bulletins of progress were issued during 1909, showing active sinking and driving and the development of reserves. In Pinal county work upon the Mohawk, near the Mammoth, at Shultz, continued as in 1908 under the direction of Mr. Roberts.

In Graham county the Crawford mines, north of Clifton and Morenci, were under active development and a small cyanide plant was operated with a reported extraction of 85 per cent. A new property, called the Gold Belt, was opened near Morenci and has a 10-stamp mill nearly ready to start. The Stafford mine, Vicksburg, was opened by an 80-ft. incline and a drift of about 90 ft. in ore.

An accident in June caused the stoppage of the pumps on the 1000-ft. level of the pump shaft of the Tombstone Consolidated Mines Company, and the mines were speedily flooded. The water rose rapidly to the 800-ft. level. A new set of pumps equal in capacity to those drowned were installed on the 800, and when the 1000-ft. level is unwatered, and the pumps are recovered, the maximum total pump capacity will be about 12,000,000 gal. daily, or 8500 per min. The day before the accident the quantity of water pumped was 6,706,080 gallons.

Shipments of ore and concentrates were continued from the 700- and 800-ft. levels. The exploration of the ground below the old water level fully confirmed the expectations formed of the geologic conditions and mineralization of the lode below the permanent water level. Neither the grade nor character of the ore was affected by the water.



SKETCH MAP SHOWING HOLDINGS OF PRINCIPAL COMPANIES AT RAY, ARIZONA

COPPER AND RAILWAYS

The Centurion mine at Johnson, Cochise county, yielded rich ores of copper, resembling those of the Copper Queen, from cave-like ground on the 225-ft. level. A 125-ton smeltery was blown in, and connection established with the Southern Pacific railway. Several companies were organized and the region actively prospected. The branch railway is known as the Johnson, Dragoon & Northern Railway, and was completed in November.

The transfer of the Saddle Mountain properties to the Development Company of America included the Deer Creek coalfield and the gold-bearing lodes in the andesitic hills south of the creek.

The opening of new copper districts stimulated the construction of new branch railways from the mines to the smelteries. It is said that the Development Company of America will build from Winkelman to Sasco, where the ores of the Imperial mine are smelted, and that it may extend a line to the Ajo and Gunsight districts in the southwest.

At Courtland, Cochise county, large bodies of low-grade copper ore were opened. The requirements of the smelters at Douglas resulted in the extension of two lines of railway from Douglas to the mines, and in the stimulation of prospecting for the precious metals. The discovery of gold-bearing quartz lodes was reported in November.

In the Tyndall district, Santa Cruz county, large shipments of low-grade, pyritic copper ore were made from the Horey mine to the smelteries at Globe. Advantage was taken of a low freight rate on ores averaging less than 10 per cent. copper. Some of the shipments assayed less than 6 per cent. copper.

At the Salero, the main shaft on the Darwin was sunk to the 400-ft. level and a 72-ft. crosscut was extended to the lode, which was found to maintain its average width of 15 to 20 ft. Drifting on this lode for 400 ft. or more, east and west, failed to show more than occasional green stains of copper. Two raises on the vein were in progress at the end of the year.

The World's Fair, the Mowry and other properties in the region south of Patagonia remained idle during the year. The sale of the Flux and other properties projected in 1908 was not realized.

An interesting exhibit was made at the Territorial fair by the Kay Copper Company of a newly opened deposit of sulphide copper ore in schist, closely resembling the occurrence at the United Verde, Jerome. The deposit is on the Agua Fria river, Yavapai county, about 60 miles from the Verde mine, and is under development. The sulphides are intercalated with the schist in broad lenses, often of high-grade chalcopyrite.

The Copper Mines Company of Arizona installed two Keystone churn drills near the Metcalf and was nearly ready to begin the prospecting work at the end of the year. The Shannon railway from the mines at Metcalf to the smeltery at Clifton was nearly complete at the end of October and was promised to be in running order by the end of the year.

Several of the older and neglected claims in western Pima county were reopened with satisfactory results. The silver-lead mines of the Vekol were reported as producing high-grade ore. The deposits of disseminated copper ores at the Ray and at the Miami (Globe) were prospected by churn drills at the angles of 200-ft. squares. The assays showed a wide distribution of low-grade ore. This was blocked out by crosscuts and raises at regular intervals with the result that the estimated quantity of ore is expressed in millions of tons.

Zinc, Cobalt and Tungsten

An important addition to the mineral products of Arizona was found in the deposit of zinc ore in the form of the sulphide (black, jack) from the Golconda mine, in the Union Basin district, Mohave county. Shipments of 1000 tons per month of 46 per cent. ore, containing also $10 per ton in gold, were reported to have been made from the Union Basin company to smelteries in Oklahoma.

The discovery of cobalt ore in quantity added to the variety of the mineral products of Arizona. It occurs in the Black Hills mining district about 8 miles south of the United Verde mine at Jerome. An assay yielding 8 per cent. cobalt and 1½ per cent. nickel was reported. A carload was shipped to New Jersey as a test.

The several properties of tungsten ore in the form of hübnerite at Dragoon and at Gigas, south of Tucson, remained unworked during the year, though there seemed an increased demand for either wolframite, hübnerite or scheelite. A change of ownership in the Bradford property at Gigas suggested a probable early resumption of work and production of hübnerite concentrates. Samples of tungsten ores from two or three sections in Mohave county were shown at the Territorial fair, notably from Cedar district and the Williams mines, Greenwood.

Electric Power

The utilization of the waters of Fossil creek for the production of electric energy by the Arizona Power Company was an event of great importance to the mining interests of central Arizona. Wires were strung through mining districts as far as Prescott. In other parts of the Territory power plants have also been erected.

Utah

BY PERCY E. BARBOUR *

During 1909, most of the mining districts of Utah made strides which mark that year as one of the greatest in Utah's mining history. None of the various mining camps declined, but one or two are still in the doldrums left over from the panic of two years ago.

Bingham

Bingham easily held the most conspicuous position in mining operations in Utah by reason of the enormous output from the porphyry mines. From 13,000 to 15,000 cars of ore were shipped from Bingham per month. At the maximum output, a train of ore left Bingham cañon for the Garfield plants every two hours during the day. Most of this tonnage came from the Utah Copper and the Boston Consolidated. The Yampa mined 800 tons per day but treated it all in its own smeltery in the cañon. The Utah Consolidated mines shipped about 800 tons per day to the Garfield smeltery and the leasers in the Commercial and Lark properties approximately 300 tons.

The railroad increased its equipment by the addition of eight new Mallet compound locomotives and a large number of steel cars. This will ease the transportation problem and allow a heavily increased production. With this aid and the number of new mills and mines that will enter or reënter the shipping list, 1910 will see a far greater production of ore than 1909.

The Utah Copper alone mined and treated more than 2,750,000 tons of ore during the year. The largest day's shipment was 13,700 tons which would have been still larger if the railroad could have furnished sufficient number of cars. When it is considered that the total switching yard for the purpose of handling this tonnage and the necessary empties and the making up of the ore trains consists of but four tracks about a quarter of a mile long, limited by the steep and narrow cañon, the immensity of the tonnage handled is emphasized. During the first three quarters of the year the total production of fine copper was 12,107,549, 13,774,412 and 15,299,674 lb. respectively at a total cost, including also selling and eastern expenses, of 9.68, 9.192 and 8.077c. per lb., according to the company report. During the last quarter the total mining expense was 25.22c. per ton; the total milling expense was 56.85c.; making a total mining and milling expense of 82.07c. per ton of ore. This included all possible charges and the proper proportion of stripping expense. The ore averaged less than 2 per cent. copper, 0.015 oz. gold and 0.15 oz. silver per ton. Except the ore which comes from development work all underground mining has ceased and all the output is coming from the steam-shovel operations. The company has 21 locomotives and 19 miles of standard-gage track for the handling and disposing of the capping; and has more than 20 miles of underground workings.

The mill at Copperton and the mill at Garfield were both run all the year, except for a short shutdown of the former for some changes and repairs. The Garfield mill has a nominal capacity of 6000 tons per day but easily handled a tonnage almost 33 per cent. larger than this with satisfactory results.

A sample of the blasting practice in connection with Bingham steam-shovel mining was a round of nine holes loaded with eleven tons of powder, which broke 87,000 tons of ore.

The Boston Consolidated company stopped mining by steam shovels and is doing all its mining underground, using the square-set system in its so-called sulphide mine and the caving system in its porphyry mine. By the former method the cost per ton is $1.688 and by the latter method 66.7c. per ton. The mine is equipped with 12 locomotives, 6 miles of narrow-gage track, and 80 rock drills, and employed between 500 and 600 men. The mill at Garfield placed the thirteenth and final unit in commission in July and after that between 2500 and 3000 tons of ore per day were milled. The product for the year amounted to about 20,000,000 pounds of fine copper. The total

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milling expense was 50.11c. per ton. The company's latest reports stated that copper was being produced at a fraction under 10c. per lb. About 250 men were employed at and around the mill. In all probability another unit will be added to the mill.

In November, the Ohio Copper Company started up the first 750-ton unit of its 2250-ton mill. The second unit was held back by the non-arrival of some of the electrical equipment. The mill is situated at Lark over the ridge from Bingham cañon and only 3000 ft. from the Mascotte tunnel which connects with the Ohio shaft at a distance of 14,000 ft. from the portal. The ores will be taken through this tunnel to the mill, thus giving the Ohio the simplest transportation problem of any of the big Bingham producers. The Ohio ores carry about 1.75 per cent. copper with some gold and silver, though occasionally high-grade ore is encountered.

The Utah Consolidated, operating the Highland Boy mine, sent about 800 tons per day regularly to the Garfield smeltery. This output was limited by the capacity of the aërial tramway. An unusual amount of development work has been done underground to get the mine in shape for a continuous production of 1200 tons per day which it will be called upon to furnish to the International smeltery at Tooele. The tramway being built from the mine to this smeltery is nearly completed. The cost of copper was given as 9.58c. The new smelting contract is said to be much more favorable than the old one and the transportation cost, by the elimination of the railroad haul, will be reduced 35c. per ton so that the property is expected to make a new low-cost record during 1910. The Highland Boy ores carry over 2 per cent. copper, 1½ to 2 oz. silver and $1 to $2 in gold per ton.

The Utah Metals company was the result of the recent consolidation of the Bingham Metals and the Bingham Central-Standard companies. The company owns about 2500 acres in Bingham district. A tunnel is to be driven from the westerly side of the range from Middle Fork cañon, through the claims and into Bingham cañon. This tunnel is already in a distance of 3000 ft. It is 7x7 ft. in the clear, is to be relaid with 35-lb. rails and will have to be driven 10,000 ft. farther to reach Bingham. The portal of the tunnel is within four miles of the new Tooele smeltery which will reduce the transportation of the ore to a minimum.

The Bingham Mines Company, the successor to the erstwhile tangled affairs of the Bingham Consolidated, renewed operation, through leasers, of several of its properties both in Bingham and Tintic. The company did not operate extensively but made money on its operations, which are increasing in magnitude, and it seems likely will yet retrieve the fortunes of the old Bingham Consolidated.

The Mascotte tunnel which is driven from the easterly side of the range, starting at Lark, toward Bingham cañon, is in a distance of 14,000 ft. It would require only a few thousand feet to extend the tunnel under Bingham cañon and but 16,000 ft. of tunneling to reach Pine cañon on the Tooele side where the International smeltery is being built. This tunnel is bound to be the main artery of the Bingham district in the not distant future and Heinze showed remarkable prescience in acquiring it at the beginning of his operations in Utah.

The Bingham-New Haven mill of 100 tons capacity was started and the Butler-Liberal mill, capacity 250 tons, was remodeled and put into commission during 1909. The Utah-Apex mill is being entirely reconstructed and will have a capacity of 250 tons when completed.

Park City

Park City, one of the most important lead camps of the country and which has produced $120,000,000 since its discovery, was the scene of several consolidations and of continuous expansion. The Silver King Coalition, including the original Silver King mine, which has already produced $20,000,000, is said to have blocked out in the mine $25,000,000 which is a better showing than at any previous time in its history. Over $12,000,000 have been paid out in dividends. About 400 men were employed. The Ontario, which is credited with a still larger production, resumed shipments which are expected to soon return it to the dividend class. The Silver King Consolidated encountered good ore on both the 1550- and the 2050-ft. levels.

The Daly-Judge found a new orebody just below the 1400-ft. level, carload shipments from which averaged 23 per cent. lead, 29.3 oz. silver and 24 per cent. zinc. On the 1200-ft. level another orebody was discovered. These discoveries were in the territory which will be drained by the new tunnel from the Snake Creek side of the range. This tunnel is to be driven by the Snake Creek Mining and Tunneling Company which is fathered by the Daly-Judge company. It will be of great benefit to all the other properties in the neighborhood, nearly all of which are in the enterprise. The tunnel will be about three miles long.

The American Flag took over the Constellation group and increased its equipment. It is considering the erection of a mill to recover the gold lost in concentrating the silver-lead ore. The Daly-West, which was forced to draw heavily on the ore reserves in the upper portions of the mine during the time the lower portions were drowned out owing to the cave in the Ontario drain tunnel, paid dividends, which it was not earning, until the treasury surplus was reduced lower than previous policy had dictated. This course was more or less forced upon the company by one faction which had always been opposed to maintaining a large surplus. The mine is looking well and the working force has been increased. The West Quincy and the Thompson companies arranged for a consolidation, the new company to be known as the Quincy-Thompson Consolidated.

Alta

There was an increased amount of activity in Alta and adjacent districts. The Emma Copper Company after much litigation actual and threatened owing to debts and mortgages emerged from the trouble freed from obligations and entered upon active development work. The Columbus Consolidated made an entirely new discovery in a shoot parallel to its old orebody and began shipments from it, thus increasing the output of the mine. The Rainbow Mining Company, situated in a section long considered unfavorable, struck a body of lead-silver ore in its tunnel. The Big Cottonwood Copper and Gold Mining Company encountered in its tunnel the contact for which the neighboring Mountain Lake Company was also driving. Copper ore carrying considerable amounts of gold and silver was found on the contact. The Wasatch-Utah near the mouth of Little Cottonwood developed a vein of gold quartz which was sold to the smelters for converter lining. The Yellow Jacket tunnel at a distance of 1000 ft. struck 6 ft. of copper-gold ore. The old Prince of Wales mine, which shipped largely in the old days, is being developed by a tunnel driven from the opposite side of the mountain which will give a depth on the vein of about 2000 feet.

Mercur

Mercur is still Utah's greatest gold camp and in the last seven years has produced 56 per cent. of the gold produced by the State. The Consolidated Mercur at whose Golden Gate mill the cyanide process was first tried on an extensive scale in this country, has produced over $14,000,000 and has paid in dividends over $4,000,000. In 1909 it mined and milled approximately 750 tons of ore per day. The Mercur ores are complex, classified as oxidized and base; the base ores require roasting before cyaniding. This cost $1.05 per ton of ore roasted. The total average cost of mining for 1909 was $1.53 and for milling $1.09, making a total cost of $2.62. The mill heads averaged $3.58 and the tailings 88c. per ton. The cyanide consumption amounted to 0.78 lb. and the zinc consumption to 0.36 lb. per ton of ore. Nearly 300,000 tons were mined and milled during the year. The Boston-Sunshine company remodeled the Sunshine mill and for several months treated 125

tons of ore per day. The payment of dividends was begun. The mill heads averaged $3.50 and the tails 35c. per ton. The milling costs were 88c. per ton. The consumption of cyanide and zinc was 0.76 and 0.45 lb. respectively. The Daisy mines were purchased by a close corporation and the old mill which was used for the Sacramento dump ore was acquired and remodeled. The West Dip installed equipment, remodeled its mill and repaired its six-mile pipe line from Ophir. When these two mills are in full operation Mercur will be mining and milling 1200 tons of ore per day.

Tintic

Though there was a serious slump in the stock of several of its prominent mines, Tintic during 1909 maintained its position as the camp with the largest number of individual shippers and dividend payers. The deeper workings of the camp are showing up well and promise as bright a future as the past has been. The Eagle & Blue Bell shaft was sunk below the 1000-ft. level, the Grand Central was working on the 2200, the Centennial-Eureka on the 2260, the Lower Mammoth on the 2200, the Mammoth on the 2100, and in each case the lower workings were as good or more promising than on the upper levels. Some new shippers entered the list and several old-time shippers resumed. The introduction of churn and diamond drills for prospecting was an innovation in Tintic. The Ajax passed to the control of the Loose interests and was then turned over to the Golden Chain which will develop its property through the 1100-ft. shaft of the Ajax.

Beaver County

Of most import to Beaver county was the final successful adjustment and reorganization of the Newhouse Mines and Smelters under the new name of the South Utah Mines and Smelters. The Newhouse properties were bought at foreclosure sale by the Trust Company of America, by whom they were turned over to the new company. Before the closing of these properties the output amounted to more than 500,000 lb. of copper per month. The new Cactus mill has a capacity of 1200 tons per day. The mine is opened to a depth of about 1000 ft. Samuel Newhouse declined the presidency of the new company.

The reorganized Majestic Mines Company reopened the Harrington mine. New machinery was added, the mine provided with ample pumping equipment and a 6-in. water column put in the 500-ft. shaft. This new shaft encountered an entirely new body of silver-lead ore which varied from 8 to 15 ft. in width and on the 500 level was 120 ft. long. No work was done at the O. K. or the Hickory, all work having been centered on the Harrington. In the Hickory are several thousand tons of 2½ per cent. copper ore and undeveloped possibilities of considerable promise. The O. K. also has a good showing.

The Red Warrior did several thousand feet of development and discovered and developed a body of sand carbonates of large proportions. Sixty-five carloads of ore netted the company $55,000. The mine is five miles from a railroad. The Cedar-Talisman after the consolidation confined its work to the lead-silver ores of the Cedar which were opened on the 500 level. On the 225-ft. level a drift was run to cut the zinc ores of the Talisman for which the mine was offered $25 per ton, f.o.b., Milford. The Blackbird prospected its territory with drills. The Beaver Carbonate developed sufficient ores to justify a mill which is now under consideration. The Utah Gold and Copper was optioned to persons who contemplate a mill and 30 miles of railroad.

Tooele County

Shipments from the Deep Creek section incur a freight charge of $25 per ton, yet an occasional shipment was made with profit. The Western Pacific railroad, which was placed in operation in 1909, passes within 30 miles of the district and promised to build a spur to the camps in the spring of 1910. The Tonopah & Tidewater road which is coming through from Goldfield to Ely is expected to reach Salt Lake by making connection with the Saltair road and will pass near enough to Deep Creek to be an outlet for it. Either road will cause extensive development in this camp. The Western Utah Copper Company developed large bodies of copper ore and discovered an entirely new body of lead ore of shipping grade for a width of 75 ft. The district is at present of indeterminate area and is spoken of indefinitely as the Deep Creek, the Dugway, or the Clifton district. The present shipping point is Wendover.

The nearest thing to a new bonanza which Utah had during 1909 was the Silver Island Coalition property. Four tunnels were driven in ore from the surface, from which sensational assays were obtained. Carload shipments to the Salt Lake smelteries netted the company $65 to $100 per ton, which considering the long wagon haul and the high freight rates is approaching bonanza ore. Wendover is also the shipping point for these mines.

Seiver and Piute Counties

The Sevier Consolidated, which had been in the hands of its creditors for a long time, resumed work at Kimberley under the direction of the Salt Lake Hardware Company interests. The mine has been a good producer and has good underground showings and seems to require only good conservative management. Both mine and mill are equipped with complete and modern electrical machinery. Electricity is supplied by the company's power house in Clear Creek cañon. The Gold Development Company at Marysvale began work preliminary to the reopening of the mines and the building of a 300-ton mill and an aërial tram. Several other properties were working in this district in which, although primarily a gold camp, some copper and lead prospects of considerable importance were developed.

Iron County

At Modena, the Gold Springs Mining and Power Company installed two 190-h.p. Westinghouse gas producers, two 16x18-in. three-cylinder gas engines, 160 h.p. each, and two 110-kw. generators. This plant is to furnish power to other mines in the Gold Springs district which is 10 miles from Modena. Lack of power prevented them heretofore from carrying on extensive operations now planned. Fay, Uvada, Stateline, 25 miles away, and other towns are relying on this plant for power and there is no doubt that the plant will be enlarged as soon as the first installation is running smoothly. The Ninety-nine Copper company at Good Springs, Nev., and the Iowa Copper company, 25 miles east of Modena, increased their working forces. The Hoosier mine which has extensive zinc orebodies will resume shipments in 1910, preparations for which are now under way.

Washington County

The Old Silver Reef property, which was once famous for its silver production but which was forced to close on account of the increasing amount of copper, was acquired by a Salt Lake company. The old stopes are said to contain a large tonnage of ore which will average 4 per cent. copper and which is amenable to leaching. A 125-ton mill has been arranged for.

Grand and San Juan Counties

In the La Sal mountains in Grand and San Juan counties, although isolated from railroad facilities, considerable work was done in gold mining. Besides quartz mining there was one hydraulic installation working and numerous long-toms and sluices working on a small scale but with results which hold out much hope for this district which is at present so little known.

Box Elder County

The Park Valley gold district in the northwestern part of the State about 20 miles from the Southern Pacific railroad, though comparatively new and unknown, did an increasing amount of work during the latter months of 1909. The Century mine, which has produced $250,000 but which was never profitable as an enterprise, started to remodel its mill. It has considerable ore blocked out. The Susana developed sufficient ore to justify a 40-ton mill which was installed. The Doctor Mining and Milling Company was a new incorporation which started work on a

group of claims near the Century and Susana.

The Smelting Plants

The Garfield smeltery increased its roasting capacity by the addition of more McDougal furnaces. It built and successfully ran a new basic-lined copper converter. This converter is of the horizontal cylindrical type, 22 ft. long and 10 ft. in diameter. It has a capacity of 40 to 50 tons of copper per day. The silica necessary to slag the iron of the matte is supplied by dumping raw silicious ore into the converter.

The Highland Boy smeltery near Bingham Junction, now officially known as Midvale, was dismantled and delivered to the new Tooele smeltery where the greater part of it was utilized in the new construction.

The Bingham Consolidated smeltery has not been operated since it was closed at the time of the smoke suits two years ago. It is rapidly falling to pieces. The Bingham Mines Company, the successor to the Bingham Consolidated, made a favorable smelting contract with the Yampa Smelting Company for the treatment of its Bingham ores.

The Yampa smeltery closed its converting department and contracted to sell its matte to the Garfield smeltery. The Yampa had a peculiar accident during the rainy season. A cloudburst sent an unusual flood of water down the steep side of the mountain on which the smeltery is situated, breaking in the side of the building and carrying away the wall of a reverberatory furnace which was full of matte. The resulting explosion shook Bingham cañon and buried in mud a couple of workmen who were later rescued uninjured.

The Knight smeltery at Tintic which was blown in during July, 1908, was forced to suspend operations due to a lack of sufficient and suitable smelting ores. The smeltery has four lead stacks and one copper furnace. A considerable shifting of the balance of power in a mining way in the Tintic district materially changed the ore-supply situation from what it was when the smeltery was projected. The securing of long-time ore contracts from the mines by the smelters of the Salt Lake valley made it impossible for the Tintic smeltery to secure the proper fluxing mixture and the shutdown was made imperative.

Work on the smeltery of the International Smelting and Refining Company at Tooele progressed during 1909 with great rapidity. If it were not for the delay now experienced due to the non-arrival of the structural steel the completion of the plant would probably have anticipated the fixed date. The shops, power plant, crushing and sampling plant, and the roasting plants were practically finished, as was also the 350-ft. brick chimney. The foundation for this stack contained 1200 cu.yd. of concrete. The main furnace building will contain five reverberatory furnaces, each 102x19 ft., and one blast furnace, 51 ft. long. The converter plant will also be under the same roof. The plant is laid out for symmetrical additions and extensions as this is not expected to be the final limit of size or capacity.

At the United States smeltery the copper furnaces are still idle as they have been since the injunction secured by the "smoke farmers" in 1907. A baghouse system to treat the copper fumes and render them innocuous to vegetation is being designed. The court gave permission for the resumption of copper smelting when such a baghouse is installed. The lead plant ran steadily. The fumes from the lead smeltery are neutralized by the use of lime and zinc oxide, the latter produced from the roasting of the zinc-mill concentrates, and the gases are then passed through the baghouse where all the dust is filtered out. The gases escaping through the stack are invisible as they emerge from the top. The solid particles are removed and the sulphurous anhydride neutralized. In connection with the smeltery the company has a wet-concentrating mill where the lead ores of the Bingham mines are treated. A tube mill was added to regrind the sulphide concentrates which it does with exceptionally satisfactory results and without making much slime. The zinky concentrates are sent from this wet mill to the new zinc mill which was installed and started during the latter part of 1909. This mill has a complete equipment of the Huff electrostatic separators which are making a satisfactory separation of the zinc from the lead and iron, so that the zinc product can be shipped to the Eastern zinc smelters without entailing penalties for lead and iron and the lead and iron product can be treated at the lead smeltery without incurring a penalty for zinc.

Zinc

The increased price for zinc, due to the tariff, the success of the Daly-Judge mill in Park City, and the Huff electrostatic mill at the United States smeltery stimulated the zinc producers of Utah to an increased output and further increases will continue to be made. The American Fork district in Utah county, the Good Springs district in Iron county, the Horn Silver and the Cedar-Talisman mines in Beaver county, devoted special efforts to opening up their zinc deposits. Pioche, Nev., which is close to the Utah line in Iron county, has also large zinc deposits which are being similarly developed. The Monte Cristo at Good Springs shipped to Kansas smelteries and the Yellow Pine has more than $500,000 blocked out which will now be mined.

Graphite

The Homber Mining Company of Salt Lake City opened and made shipments during 1909 from graphite deposits in Box Elder county. The shipments averaged from 90 to 98 per cent. pure graphite. The clean, ground product found a ready local market at about $100 per ton. The deposit is in the form of a well defined vein about 20 ft. thick. It was crosscut by prospectors in 1864 but they were after coal and the deposit remained undeveloped until recently. The mine is four miles south of Brigham City, three miles north of Willard and is about two miles east of the Oregon Short Line railroad.

Oil

The Rangely oilfields in Uinta county, on the border between Utah and Colorado, contain about fifty wells. None of these wells flows but they will furnish by pumping from 5 to 100 barrels per day. Lands taken up here years ago and patented by the homesteaders were acquired by long lease or purchase by various oil companies and a considerable amount of drilling and prospecting is still going on. The Moffat railroad, the Denver Northwestern & Pacific, will pass within a mile of the Rangely wells and will give a great impetus to the promising operations there.

In San Juan county, in the extreme southeastern corner of the State, are other extensive oil lands. All the unlocated oil lands were recently withdrawn from entry. This district is at present greatly handicapped by its distance from the railroads but a pipe line and two railroads have been surveyed into the fields which are about 50 miles wide by 90 miles long. There were 16 producing wells, one of which has produced by pumping 600 bbl. of oil per day. The oil-bearing sedimentaries have a thickness of about 3000 ft. The oil has a paraffin base. The London & San Juan Company installed an outfit capable of drilling 3000 feet.

The Virgin oilfield in Washington county in the extreme southwestern corner of the State was the scene of considerable oil excitement about a year and a half ago but the oil encountered at a depth of 500 ft. was in small quantities. At a depth of 600 ft. a hard limestone was encountered which discouraged further work. Some companies prospected steadily, however, with the result that the 400 ft. of limestone was penetrated and the shale underneath yielded oil. Underneath this shale are brown oil sands for a thickness of about 200 ft. The Virgin oil has a density of 25 to 30.

Surface indications in several other counties gave promise of oil and attracted the attention of Eastern oil men who did quietly a large amount of reconnaissance work in the various prospective fields.

Coal and Hydrocarbons

The coal-mining industry maintained steady operations during 1909 without much change of conditions or output.

The Uinta reservation in Uinta county produced an increased amount of hydrocarbons and with the completion of the Moffat railroad through the county, this industry will assume important proportions. About 28,000 tons were shipped during 1909 via the Uinta railway. The principal mineral mined was uintaite, known locally as gilsonite. Gilsonite is used for street paving, roofing and similar purposes. Elaterite or mineral caoutchouc, an elastic bitumen, was also produced in some quantity. Elaterite is used for roofing, and by mixing it with other hydrocarbons, a mineral rubber is being manufactured from which a Salt Lake company is successfully making automobile tires.

Cement

The cement industry in Utah is growing. The principal outputs were at Devil's Slide on the Southern Pacific east of Ogden and from Parley's cañon near Salt Lake City. At Devil's Slide is a large and modern plant. The largest Salt Lake plant was closed to undergo repairs and extensions. Construction was begun on a new plant near Brigham City in Box Elder county.

South Dakota

BY J. V. N. DORR *

The year 1909 was not a very prosperous one for the mining industry in South Dakota and its end is overshadowed by the shutdown of the Homestake mines and mills to avoid a strike. Those familiar with the Black Hills, however, do not feel discouraged, as the possibilities of the country have by no means been exhausted, and the mines now down will undoubtedly be started again.

The Homestake Trouble

The matter in everyone's mind at the time this is written is the shutdown of the Homestake, which has thrown 2500 men directly out of employment. While the time for resumption of work cannot be anticipated, the ultimate outcome will undoubtedly be the operation of the property on a non-union basis. The history of the trouble is of general interest. The Homestake company has always maintained the best relations with its employees and has had the unique record of operating 31 years without a strike. Good wages were always paid and the management maintained cordial personal relations with the men that were unusual with such a large company. During the whole time the property has been open shop and the only attempt to make it closed shop, made about the time of the organization of the Western Federation of Miners, was met by a notice from the management that no discrimination would be shown between union and non-union men.

The origin of the present movement may be traced back to the autumn of 1906, when the men asked for eight hours work with the same daily pay they were receiving for 10 to 12 hours. The company refused the request at first, but finally granted it without a strike, under conditions which enabled them to exact nearly the same amount of work as before in a shift, so that the operating costs were not materially increased. It was apparent, however, that the men considered that they had won an easy victory and there was more or less agitation for an increase of pay, which was stopped by the mine fire of 1907. An increase of the dividend to 75c. a share for one month only in November, 1908, renewed the discussion, and it was generally thought that it would be brought up actively when the million-dollar waterpower system, which the company then began, was completed.

The union started an active campaign last summer to increase its membership, importing organizers and speakers, and sending committees to persuade recalcitrant workmen to join. The first overt act in the present trouble was the adoption of a resolution by the unions concerned on Oct. 10, demanding that all eligible men join at once, and stating that any man who neglected to join would be dealt with as the union might determine. This was followed by a resolution, passed Oct. 24, that all men failing to join by Nov. 25 would be declared "unfair," and no members of the union would work with them after that date.

The company took no action until Nov. 10, when it filed suit in the United States court against the union for $10,000 damages alleged to have been sustained on account of the intimidation of the men, whose working value had been thereby diminished. Finally on Nov. 17 the district was greatly surprised when notices were posted and published that after Jan. 1, 1910, no union men would be employed on the property and that all employees desiring to work after that time must register before Dec. 15. The leaders of the union were astounded by this movement, for they had apparently taken the liberality and kindness of the management as a sign of weakness and had anticipated as easy a victory as in the eight-hour movement.

On Nov. 23, the company, finding that the union had decided to call out its men on Nov. 25, shut the property down with the exception of work on the waterpower plant. A number of the employees, as well as men from the outside, have been employed as watchmen and there has been no violence of any sort attempted. The company has not given out the number of men who have applied for work, but it is understood that applications are coming in rapidly and it is probable there will be enough men available to operate part of the property at any rate early in the year. It is not expected that any violence will occur, as the company is amply prepared for any emergency and the leaders of the union are strongly against any disturbance.

Much discontent was caused among the men when they found that instead of getting strike benefits from the start, they were expected to use up all their own funds before applying for aid.

To an outsider it appears as if the management, while friendly to unions in general, realized that, with unlimited power the federation would surely aim to live up to the avowed principles of the order, and believing, as they assert, that "labor produces all wealth" (evidently recognizing physical labor only), and "wealth belongs to the producers thereof," they would endeavor to gather it in. The remark of a member of the executive board to a committee of mine operators, during the strike over the eight-hour question two years ago, throws further light on their attitude. He said, "Boys, you might as well give the men eight hours and get as much of that as you can, for we will be coming up here again asking for a six-hour day some time." While the legal right of all men to get all they can for as little work as possible is recognized by everyone, it seems that, from the employees' standpoint, poor judgment was used, and the federation will have only its managers to blame if it loses a large membership in the Black Hills.

Improvements at the Homestake

The Homestake company finished the addition to the slime plant during the year and commenced the construction of a hydraulic power plant in Spearfish cañon. The installation includes several miles of tunnels and is expected to furnish from 3000 to 4000 engine horsepower at the mills at a cost of at least $1,000,000 for the plant. The saving in operation will more than pay interest on

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the money expended, and it is expected that the plant will be running by the end of 1910.

Silicious Ore Mines

There have been no new developments in this district during the year. At its close the only fine crushing mills operating at full capacity are the Mogul, handling about 350 tons, the Golden Reward, 200 tons, and Lundberg, Dorr & Wilson, 100 tons. The Imperial company, while still prospecting for ore on the lower contact in the Portland district, is running one shift and treating about 40 tons. It is perhaps, of metallurgical interest to note that the first three mills above mentioned are all grinding the ore with chile mills and are using the Moore process for treating the slimes, whereas several years ago stamping and decantation were in general use.

The recent purchase of adjoining property by the Wasp No. 2 will give renewed life to that remarkable property, which is now handling about 200 tons of ore in two eight-hour shifts.

Galena District

The Golden Crest Company completed its 200-ton mill during the summer, but has not started it as they are engaged in enlarging and deepening the shaft.

The Branch Mint company is shut down. It has appeared in court proceedings that the promoter thereof, Mr. Hardin, who spent upward of $500,000 on the mill and other surface equipment, was not selling treasury stock as was generally supposed, but selling his own stock and loaning the proceeds to the company. When the showdown came, he filed a lien against the company for $375,000 and bid the property in.

The Gilt Edge Maid mine is shut down, but negotiations are under way to secure capital for operating it on the large scale required to make it yield a profit. The company apparently possesses a very large body of low-grade ore.

Black Hills Development and Financial Corporation

An interesting experiment in promotion, after what is said to be English methods, is being tried here. Robert Bunce, a London banker, has organized the Black Hills Development and Financial Corporation with $3,500,000 capitalization. Of this stock $1,000,000 will be used to purchase mining claims that are undeveloped; $2,000,000 will be sold at par for money to develop and equip the claims secured, and the $500,000 left will go for promotion expenses. After securing all the claims possible, the company will select five of the most promising, and spend $100,000 upon each for development. The mine showing the greatest amount of pay ore will then be equipped with a mill and put on a paying basis. A sub company will then take the property and the parent company will keep one-half its stock and sell the balance for enough to repay it for expenses incurred. This capital will now be available to develop and equip a second property, and eventually the parent company should own a half interest in a number of valuable mines and still have its money.

The company gives as its consulting engineer a distinguished South African engineer, now operating in Mexico, but has apparently selected its claims and determined the amount of stock to be paid for each without technical advice. Mr. Bunce will act as managing director for the next five years, which would be restricting the power of the stockholders for some time. Such a project requires the highest technical skill and most careful management to make it a success, and the outcome here will be watched with interest.

General Conditions

In the Black Hills there are a number of mines not operated now, which could undoubtedly be made to earn profits with a reasonable expenditure of capital and careful management. The region has been greatly handicapped in the past by the large number of claims managed by the men who promoted them, and who considered that the ability to extract money from the pockets of the tenderfoot "back East" proved conclusively that they could develop and operate a mine.

Labor conditions have also retarded development, for in the Terry district, where most of the prospecting is to be done, the union has insisted on 50c. more per day for surface work than is paid in Lead or Deadwood and absolutely refuses to allow any contract work. It is probable that the present condition of the mining industry, with so many mills shut down, and those operating making very little, will convince the union men that their own interests will be best served by assisting capital in every way in development.

The use of electric power through the Black Hills offers an opportunity for economy in all mining work and it appears to me that conditions are becoming more favorable for investors to come in and secure mining property at a reasonable price.

Montana

BY W. P. CARY *

The more important of the coal mines in Montana were operated by the several railway and large copper-mining companies. Carbon county had a number of active producers during the year, among which were the Washoe Copper Company's mines at Bear creek, the Northern Pacific Railway Company's mines at Red Lodge and the Bridger Coal Company's mines. In Yellowstone county, the Chicago, Milwaukee & Puget Sound Railway operated mines at Roundup, and in Casade county the Great Northern railway's mines at Sand Coulee produced their usual tonnage. In Deer Lodge county, the Bielenberg and Higgins mines were the principal producers.

Copper

Copper, as has been the case for many years past, was the most important mineral product of the State in 1909. Production in the Butte district was steady and continuous throughout the year with the exception of an occasional shutdown due mainly to unfavorable weather conditions, such as extreme cold spells. The various operating companies of the Amalgamated Copper Company were easily the greatest producers and showed the most development work. The Boston & Montana company operated the Mountain View, Leonard, Pennsylvania, East and West Colusa and the Badger State. At the Badger State operations were confined to development work. The shaft was sunk from the 800-ft. level to the 1400-ft. level, and crosscuts were run north and south on the 1300-ft. level. A connection was also made with the Moose mine. At the Pennsylvania, an air shaft was constructed to the 1800-ft. level. The principal mining was done on the 1400-, 1600- and 1800-ft. levels. Production at this mine throughout the year averaged between 1000 and 1200 tons daily. A crosscut was run from the 1800-ft. level of the Mountain View to the same level of the West Colusa, a distance of about 1400 ft., and was used to convey the copper water from the Mountain View to the West Colusa and from there to the Leonard where it is pumped to the surface. At the East Colusa operations were hindered somewhat by a smoldering fire in the old stopes.

The Anaconda Copper Mining Company operated the High Ore, Never Sweat, Anaconda, Mountain Consolidated, St. Lawrence, Bell, Diamond, Buffalo, J. I. C., Modoc, Belmont and Right Bower mines. At the Anaconda, St. Lawrence

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and Never Sweat mines operations were seriously hampered by smoldering fires. These three mines adjoin one another and the fire generated fumes which made it difficult to work them except on a limited scale. The shaft at the Diamond mine was sunk from the 2200- to the 2800-ft. level, while that of the Mountain Consolidated was sunk from the 2200- to the 2300-ft. level. At the Right Bower a shaft was sunk from the surface to the 600-ft. mark. The several mines of the company operated continuously throughout the year.

The Butte & Boston company operated the East and West Gray Rock, the Berkeley and Silver Bow mines without interruption. At the West Gray Rock the shaft was sunk from the 700- to the 1100-ft. mark. This mine gives promise of surpassing the East Gray Rock, which has always been the greater producer.

The Washoe company's smeltery in Anaconda was threatened with a shutdown as a result of the suit brought against the company by the farmers in the Deer Lodge valley, in which the plant is situated, but the Federal Circuit Court decided in favor of the company and refused to issue an injunction. The shutting down of the smeltery would have spelled disaster for a great number of the citizens of the State who are dependent upon the mines for their livelihood, and the court's decision was received with rejoicing.

The Parrot company operated the Parrot and Little Mina mines. At the Parrot the principal work was done on the 1200-, 1400-, 1600-, 1700- and 1800-ft. levels. At the Little Mina the shaft was sunk from the 1000- to the 1200-ft. level. Operations were carried on on the 600-, 800- and 1000-ft. levels.

The Trenton Mining Company operated the Gagnon mine throughout the year and opened up orebodies of greater value than any discovered in the mine for years. A new perpendicular shaft was begun to take the place of the incline shaft, and was sunk 400 ft. Production averaged between 700 and 800 tons daily.

The operating mines of the Butte Coalition company were the Rarus, Tramway and Minnie Healy, the latter being worked through the Tramway shaft. During the year the extensive development work at the Tramway and Minnie Healy, which has been carried on for the last two years, was completed and the orebodies of the latter mine were placed upon a producing basis. The company, starting with a total daily production of about 1300 tons, increased its output gradually until over 2000 tons were produced from the Tramway and Rarus shafts, exclusive of the ore of the Coalition which is hoisted through the shaft of the Boston & Montana company's Pennsylvania mine. At the Tramway the shaft was sunk from the 1700- to the 1965-ft. mark, while at the Rarus the shaft was sunk 95 ft., reaching a depth of 2395 ft. The air shaft was enlarged from three to four compartments, giving increased ventilation through the Speculator shaft. Ore was mined on the 1000-, 1200-, 1600-, 1800-, 2000- and 2200-ft. levels and production averaged about 1500 tons daily. The Granite Mountain claim, having a shaft 500 ft. deep, was purchased from the Lewisohns, and raises were started under this shaft from the 1200-, 1400- and 1600-ft. levels of the North Butte ground to make the Granite Mountain shaft into an air raise. Throughout the year the company observed a policy of reticence with reference to the work underground, and but little definite information was given out. It is generally understood that the ore disclosed on the 2000- and 2200-ft. levels was not up to the standard of that previously mined on the 1600- and 1800-ft. levels.

The Davis-Daly company operated its claims through the Colorado shaft, which was sunk from the 1500- to the 1800-ft. level. The upper 900 ft. of the shaft was enlarged from two to three compartments, thus making the shaft three-compartment throughout. Shipments averaged between 150 and 200 tons daily, most of which came from the 1400-ft. level. During the year a considerable body of good ore was discovered and the property placed upon a permanent producing basis. Troubles among the stockholders resulted in a victory for F. A. Heinze, who will dictate the policy of development work in the future as in the past.

The Original Mining Company, controlled by W. A. Clark, operated the Original and West Stewart mines steadily throughout the year, the ore being treated at the Butte Reduction Works, also owned by Senator Clark. The shaft at the West Stewart was sunk from the 2100- to the 2300-ft. level, while that of the Original was sunk from the 2200- to the 2400-ft. mark. With the increased depth the value of the orebodies materially increased. The Elm Orlu mine, also owned by Senator Clark, developed into a zinc producer, and its ores were treated at an experimental zinc concentrator built for that purpose at the Butte Reduction Works.

The East Butte Copper Company absorbed the properties of the Pittsmont company during the year, thereby gaining a smeltery for the treatment of its ores as well as the valuable orebodies of the Pittsmont mine. At the East Butte mine operations were confined for the most part to the 600-ft. level, from which shipments were made to the Pittsmont smeltery. The vein was cut on the 900-ft. level but a strong flow of water was encountered which necessitated the suspension of operations at that point. At the Pittsmont mine a new 250-ton blast furnace and a new hoist were installed and considerable custom ore was treated. Operations were chiefly on the 800-ft. level, although work was also done on the 1000- and 1200-ft. levels. The East Butte company also worked the dump at the old Parrot smeltery by means of a precipitating plant.

At the Tuolumne Copper Company's property the shaft was sunk from the 1250- to the 1450-ft. level. On the 1400-ft. level the continuation of the North Butte company's Edith May vein was cut in August and proved to contain high-grade copper. Beginning in October, shipments were made at the rate of 100 tons daily. During the course of the year this mine passed from the experimental stage to the ranks of the steady shippers. There were some rumors that the Tuolumne company's right to the orebody discovered would be contested by the North Butte company, but no legal steps were taken.

At the Butte & Balaklava property the shaft was sunk from the 1240-ft. mark to the 1400-ft. level. The work of enlarging the upper 500 ft. of the shaft from two to three compartments was also begun. Beginning in November, shipments were made averaging between 50 and 75 tons daily. The mine developed during the year from the prospecting to the producing stage.

The Corbin district in Jefferson county ranks next to Butte in importance from the copper standpoint. The Boston & Corbin mine is the most important in the district and work was prosecuted there steadily throughout the year. The shaft was sunk to the 700-ft. level and enlarged from two to three compartments. The principal work has been done on the 500-ft. level in exploring the orebodies of the Bertha and Fairview claims. The Boston & Alta company was organized to take over the old Alta mine. A new surface plant was installed and a new shaft sunk 300 ft., from where a crosscut was started to the vein. The Corbin Copper Company, with a large amount of mining ground, passed into the producing stage in November. At the Minneapolis-Corbin company's ground a shaft was sunk to a depth of 250 ft. The Montana-Corbin company, after a number of changes in management and control of the property, resumed operations in November.

Zinc

While the State has never been known as a producer of this metal, yet recent developments at the Butte & Superior company's Black Rock mine in the Butte district indicate that the day is not far distant when this metal may become of importance in the State's products. During the year the Black Rock shaft was sunk from the 1400- to the 1600-ft. level, and a body of high-grade zinc ore was blocked out. On the 1400- and 1600-ft. levels three veins were cut, and on the 1600-ft. level stoping was started. Plans were made for the erection of a 750-ton zinc concentrator on the property, and work upon the foundations begun.

Gold and Silver

The receipts of the United States Assay Office, at Helena, show that the precious-metal output of the State increased materially during 1909. In Silver Bow county, the British-Butte company started to operate its gold dredge in January and continued operations until November. The company is reticent in giving out information and therefore results of its operations are problematical. The title to the company's ground was in litigation during the year and has not yet been finally determined.

In Broadwater county the Keating Gold Mining Company and the Ohio-Keating company showed the best results. The Keating produced steadily at between 50 and 100 tons daily. The Ohio-Keating was not formed until May, but since that time sank its shaft an additional 100 ft., and shipped during October, November and December.

In Fergus county the Barnes-King, Cumberland and Kendall properties were operated. The Barnes-King and Cumberland made a number of shipments. In Madison county the Conrey Placer company had three gold dredges in operation throughout the year. The McKee group and the Pioneer company also carried on operations. In Granite county the Bimetallic mine continued to operate throughout the year and a new cyanide plant was installed. Deer Lodge and Lewis and Clark counties also produced considerable gold and silver.

New Mexico

BY R. V. SMITH *

The mines of New Mexico are among the oldest in the United States. The Santa Rita mines were worked as early as 1769 and furnished copper to the Mexican government for its coinage for 50 years before the discovery of copper in Michigan. Placer gold has been produced since 1538, with more or less interruption on account of Indian outbreaks and drought. Turquoise mines were opened by the Indians and abandoned before the days of the Spaniards. The Maxwell land grant, in Lincoln county, is now open to individual locators by the purchase of mineral-land scrip which allows the holder to prospect the whole grant and locate claims on any untaken land. The scrip is sold by the trustees of the grant, at Raton. The reclamation work of the Government will also have an immediate influence upon the development of the country.

From all indications the great need for transportation facilities in the different parts of the Territory is about to be partly supplied. Five railway enterprises are under way and one of them, the railway into the copper districts in the Burro mountains, is under construction. This line runs from Leopold and Tyron in the Burro mountains to Whitewater station on the Silver City branch of the Santa Fé. It is being built by Phelps, Dodge & Co. primarily to transport the ore from their mines in the Burros to the smeltery in Arizona. Some construction was also done on the New Mexico Central, which is a consolidation of two previous projects and will serve the copper, zinc and gold regions between Santa Fé and Torrance, on the El Paso & Southwestern, thus reaching the vicinity of Los Cerrillos, San Pedro, and by branch, the Hagan coalfields and the Ortiz mountains.

In New Mexico, 1909 was a year of important developments and of increased production in all lines of the mineral industry. Of the 252 corporations organized and filed during the fiscal year ended June 30, 1909, 55 were mining incorporations with a total authorized capitalization of $68,450,000, being 60.3 per cent. of the total authorized capitalization for the year; 55,305 acres were taken for mining purposes and 93 lode claims were approved. Of these claims 68 were in Grant county, the most productive and the most extensively developed part of the Territory; 15 were in Socorro county, nine of them being in the zinc district; eight were in Santa Fé and one in Otero county.

Production in 1909 did not increase in proportion to the development. There was a decided increase, however, in practically all lines. The accompanying tabulation of the production for 1909 is based upon information gathered from private correspondence and previous records. The total mineral production of the Territory, coal and building materials included, is estimated at $8,250,000.

MINERAL PRODUCTION OF NEW MEXICO FOR 1909.

	Quantity.	Value.
Iron	124,000 tons	$ 436,000
Gold	19,400 oz.	401,000
Silver	648,000 oz.	332,000
Copper	9,400,000 lb.	1,222,000
Zinc	28,880,000 lb.	1,530,000
Lead	4,800,000 lb.	206,400
Bismuth*	.....	.....
Turquoise*	.....	.....
Natural cement*	.....	12,000
Coal†	.....	.....

*Data not available.
†Statistics given in another article.

Minor Operations

Placer mining in the northern counties was in a dormant state. Several new mining companies were organized, but no discoveries of new districts, equal in importance to that of the previous year near Sylvanite, were reported. Bismuth was added to the list of minerals produced, shipments of several cars coming from the San Andres mountains, nearly west from Tularosa. Experimental shipments of fluorite were made from the mines in the vicinity of Deming. The highly silicious gold-silver and gold-copper ores of Lordsburg and the country to the south went in slightly increased quantity to the Arizona smelteries where it was used for converter linings.

Oil appeared as an article of commerce for the first time in the history of the Territory. The Madison well, near Artesia, was brought in late in November and the oil used as fuel in local plants. A shipment of a few barrels from another well went to El Paso during December. An important development in the oil business should be recorded in 1910.

Gold

The gold produced in 1909 came mainly from placers and the mixed ores of copper, lead, or silver and zinc, of the central and southern counties. By far the most productive areas were those reached from Silver City, in the southwestern part of the Territory. Placer mining in Colfax county, which was formerly the most active section, and where hand methods, hydraulicking and dredging have all been tried, was largely suspended during 1909. All summer, however, California operators were making a thorough sampling of the placer ground near Elizabethtown and its vicinity as far as Ute park, 18 miles from Elizabethtown. The Empire hand drill was used with success and proved the gravels to be of fairly regular grade with few boulders, and suited to modern dredging. Placer mining in other localities increased, particularly at Pinos Altos, nine miles from Silver City, where gold-bearing gravel carrying from $3 to $4 per yard was hand washed whenever water was available. The placers at Delores were worked by hydraulic methods, and small operations were carried on in the central counties at Nogal and other points.

Lode mining in the north-central counties increased and development was pushed at San Pedro, Cerrillos, Madrid and, in fact, all the gold camps. The Aztec mine with 40-stamp mill at Elizabethtown added to its $4,500,000 record. Some of the mines shipped to the Pueblo, Colo., smeltery, including the Ajax

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and the Pay Ore group, both new mines. Extensive cyanide tests are being conducted on the gold ores of this section, but no installations were made in 1909. Considerable activity exists in the vicinity of White Oaks. The mill of the Old Abe ran steadily handling the ores of leasers. A rich strike of tellurides in the White mountains caused a rush of prospectors to the section. At Parsons the 200-ton cyanide mill was idle pending a reorganization of the company. Large bodies of low-grade ores which may be quarried cheaply exist here. The ore averages higher than $3 per ton, and development was under way.

The camps in the Black range and others in Sierra county were all active. Mining in the Black range was conducted at seven camps. The principal mines added to their equipment, increased shipments and continued to operate their mills. Silver and lead as well as gold were produced. The erection of one mill was commenced. Development in this region is rapidly bringing it to the front as a producer of high-grade ores, some shipments showing as high as 20 oz. gold per ton. The low-grade ores are in many cases being stocked, the object being to further develop the orebodies and apply cyanide treatment later on.

In Socorro county four cyanide mills were operated, one being the 20-stamp mill at Rosedale, where all-sliming in cyanide solution followed by treatment in a Burt filter is practised. The other three mills are in the Mogollon mountains, 90 miles north by stage from Silver City. The mineralized zones lie on both sides of the range, the mines of the Ernestine Mining Company and the Socorro Mines Company lying on the west side. The ores of the district run from about $10 at the surface to $22 per ton in depth (about equal value in gold and silver). Mining reached a depth of 1600 ft. Pan amalgamation was attempted in early days on these ores, but gave way to concentrating and sliming of the tailings in cyanide solution. The Last Chance mine of the Ernestine Mining Company, and the Top mine were recently consolidated.

A new and thoroughly modern cyanide mill of 150-tons capacity was built by the Socorro Mines Company. Crushing with stamps and tube mills in cyanide solution with pressure filtration in Burt filters and zinc shavings precipitation is practised. Dorr classifiers are used, also Brown-Pachuca tanks for agitation with compressed air. The mill was completed in the latter part of 1909 and run with steam power pending the completion of the hydroelectric plant. The mill at the Cooney mine, across the range, was run for a short time. In December the property was sold to a company of Nova Scotia capitalists, and extensive rearrangements and developments undertaken. The Cooney mill was the first to run in the district, was destroyed and in 1909 rebuilt. During the last few months telephonic communication was established between the Mogollons and Silver City, and a company organized with $1,000,000 capital to give transportation facilities to the section by the building of a railroad on which motor cars are to be operated.

In Grant county gold was obtained from the Pinos Altos and other placers in the vicinity of Silver City and Hachita, from the mixed gold-copper ores of Lordsburg, Steins Peak, Central, etc., and from the gold-silver-lead ores of Sylvanite, Steeplerock, and other districts. At Sylvanite the prospector's flurry is over and shipments were made to Douglas and El Paso from several of the developing properties. The ores ranged from $20 to $50 per ton, and this in one case after the choice ore had been picked and sent to Colorado. The Eureka-Sylvanite Mining Company owning the Ridgewood claim, which was one of the claims from which good ore was shipped, and the Hardscrabble Mining Company, owning the Gold Hill claim, were among the best properties. On Gold hill the proving of 6 ft. of shipping ore of increased value and of the continuation of the ores at a depth of 300 ft. was an important development. Hachita, 12 miles away, at the junction point of the El Paso & Southwestern and the Arizona & New Mexico railways, reaching both Douglas and Morenci, is the shipping point. Wagon haul is $2.50 on ore, and freight to Douglas $1 per ton (for ores of less than $50 value). In view of the conditions at the close of the year the camp may be relied upon to fulfil the expectations its discovery aroused.

The camps near Lordsburg, which is the junction point of the Southern Pacific and the Arizona & New Mexico railways, shipped about 40 cars per month throughout the year. The shippers received a premium for the ores in most cases on account of their desirable character for use as converter linings. The two principal districts were Pyramid and Virginia. The Eighty-Five was perhaps the chief mine and worked about 50 men. The Viola and the Nellie Bly mines, more or less inactive since the slump in silver, were reopened. A Partridge hot-blast smeltery of 10-ton capacity is being installed upon the property of the Bonnie company to treat the 10,000 tons of ore now on the stock piles, and the ores developed in its mines which carry gold, silver and copper. The discovery of what appears to be an ancient abandoned gold ledge a few miles from the Mogollon road was made by Leonard Smith.

Silver

Silver forms about half the bullion value at Mogollon and Rosedale. Silver mining was prosecuted for the silver content of the ores in Grant, Socorro and Luna counties. The reopening of the silver mines on Chloride Flat, near Silver City, and Lordsburg, was significant. Steeplerock, Granite Cap, Pyramid, Hermosa, and the camps in the central part of the Territory were all more actively developed than during 1908. The experimental mill at Lake Valley, on the Monarch mine, wherein it was intended to separate silver and lead from zinc, was not entirely successful, principally on account of lack of water for proper sizing of the ore. The mill was idle at the close of the year.

Lead

The total output of the Territory for 1909 is estimated to exceed that for 1908 by about 60 per cent. The principal lead-mining districts are distributed for the most part in the central and southwestern parts of the Territory. Where the ores occur in limestone they carry silver, and where they occur as veins in the eruptives they usually also carry gold and copper. Mining was more active than for several years past, the additional supply coming mainly from the increased production of lead-zinc ores of the southern counties. A significant development was the opening of two bodies, from 14 to 50 ft. thick, and carrying 12 to 16 per cent. lead carbonate, and zinc in considerable proportion, on the properties of the Boston Cerrillos Mining Company at Los Cerrillos. Some of the most prominent districts working were: Cook's Peak, where the American Smelting and Refining Company operated its mines under leases (the old dumps were hand-jigged to produce 40 per cent. concentrates); the Sandias mountains; the San Andres; Tres Hermanas; Lake Valley, and the Organ mountains, where development was pushed on several properties. The old Stephenson Bennett mine was in the hands of a receiver and was not operated.

Copper

The status of copper mining was most gratifying. Prospecting, development, or systematic mining of ores was conducted in 16 different counties during the year. The number of individual shippers a little more than doubled over those of 1908. The Grant county districts produced the greater part of Territorial output, and here the Santa Rita mines and the Burro mountain company were the principal producers, over half the total for the Territory coming from the Santa Rita.

The official transfer of the Santa Rita copper properties to the Chino Copper Company, of New York, financed by Hayden, Stone & Co., occurred during 1909. Developments are reported to show 6,000,000 tons of actual and probable ore of 2.49 per cent. average copper content; there are also 150,000 tons on the dumps. Eight churn drills are now further prospecting the orebodies. The ores can in large part be mined by steam

shovels from the crescent-shaped basin and caving methods applied cheaply in the extraction of the balance. The ores carry native copper in the upper parts of the mines and occur as disseminated sulphides in the porphyry beneath. For over 100 years this orebody has been worked, usually under the leasing system whereby the native copper has been extracted, and occasionally the oxides hand sorted for sale. The mill originally built by leasers, but now used experimentally by the company, treated about 135 tons a day.

Another important transfer completed near the close of the year was that of the Burro Mountain Copper Company to Phelps, Dodge & Co. for $2,300,000. The mill on this property has run steadily for years, having produced about 15,000,000 lb. Over 15 miles of openings have been made into the two mines of the Burro Mountain company. The Chemung Copper Company, operating at Tyron, claims to have 8,000,000 tons of actual and probable ore, with an average of more than 2.5 per cent. copper.

The completion of the Burro Mountain Railroad will make possible the reopening of the smeltery of the Savannah Copper Company, which owns extensively developed mines both in the Burros and at Pinos Altos and a smeltery at Silver City. No smelteries in the Territory were operating during 1909, but those at Orogrande and at Deming were overhauled. The Silver City plant is ready to start at a few days notice.

Zinc

New Mexico has since 1902 enjoyed considerable prominence as a zinc producer, and in 1909 made a greatly increased production. At Magdalena William F. Gordon, in a 50-ton mill, erected during the summer, demonstrated in a trial run the applicability, under skilled metallurgical control, of the Sutton Steele and Steele pneumatic tables to the separation of the carbonates, sulphides and oxides of lead and zinc from each other and from silicious gangue material. The Graphic, in which development has been conducted with a large force for three years and where a large body of zinc ore is blocked out, commenced the erection of a pneumatic mill along the lines of the Gordon mill. The Graphic has been a large producer. At Kelly, the lease of C. T. Brown and the Kelly mine were the only producers until the latter part of 1909. The water-concentration mill on the Kelly was operated and the concentrates were shipped to Colorado.

The United States Smelting, Refining and Mining Company, having purchased the mines of the Cleveland group, near Silver City, commenced developing the large bodies of blende by churn drills, and shipped several cars for experimental purposes. Hachita, Cooks Peak, Hanover and Los Cerrillos were all on the shipping list during 1909, the Los Cerrillos camps sending their ores to Colorado for the first time, though the presence of zinc was known for many years.

Iron

The Colorado Fuel and Iron Company have extracted over 1,000,000 tons of iron ore with open-cut and milling methods at Hanover and Fierro, in Grant county, since the mines were opened in 1900. During 1909 new surface arrangements were installed at Fierro, and the ores are now being blocked out to a lower level. The output from Fierro was nearly 500 tons per day for most of 1909, giving a total production of about 124,000 tons. The company worked a force of about 40 men at Elder, on the El Paso & Southwestern railroad, 35 miles above Carrizozo, taking out ore for shipment in 1910. The deposits of the Oscura mountains may be opened in 1910 by Duluth capitalists whose intentions are to build from White Oaks to the Oscuras and erect an iron-reduction plant at or near the White Oaks coalfields.

Turquoise

Turquoise occurs in America in several places outside of New Mexico, but practically the entire market for the gem in the United States is supplied by the mines of this Territory. While the actual value of the gems produced by the four working localities cannot be stated, it is known to have greatly exceeded that for 1908. The American Turquoise Company, controlled by Tiffany & Co., New York jewelers, has for many years operated the mines near Cerrillos in Santa Fé county, and continued to work them during 1909.

The mines in the Burro mountains in Grant county, about 15 miles from Silver City, are said to be the largest and most valuable in the world. Here, during 1909, a new deposit, about 1000 ft. east of the former pit, was opened and worked by four levels, with the result that the quantity of gems produced was more than trebled and that of matrix doubled over that of 1908. A compressor plant was installed and about 100 tons of rock handled per day. The gem-bearing rock undergoes a preliminary hand sorting at the mines and the high-grade gems are shipped to New York.

Colorado

BY GEORGE E. COLLINS *

The mining industry in Colorado was fairly prosperous in 1909, but there were no very important new developments. At the time of writing it is not possible to forecast the output with any approach to certainty: but I believe it will be found that the gold production increased over that of recent years, while that of silver and other metals was somewhat lower.

Gold and Silver

Cripple Creek—The business interests in the camp complain of depressed conditions; but shipments were large, and on the whole the year was a satisfactory one. The relative importance of the Portland lessened, and will doubtless continue to do so; but the Elkton, Vindicator, Golden Cycle, Strong, Granite, El Paso, Cresson and Mary McKinney kept up a large output. It is probable that the present production of the camp will be maintained for some years to come. No very sensational new discoveries have been reported. The new mill at Stratton's Independence began treating 250 tons of dump material daily by concentration and raw cyaniding, at a profit of probably 75c. per ton. The roasting mill designed by Philip Argall to treat the regular mine ores is not in operation.

The Roosevelt drainage tunnel was driven 11,705 ft. by the end of November, and was within a comparatively short distance from the contact of the granite and the fissure volcanic rocks in which most of the veins occur. During the year remarkably rapid progress was made in extending the tunnel.

Gilpin and Clear Creek Counties—The output was probably about the same as that of 1908, possibly a little larger. In Gilpin county the deep Nevadaville mines are still submerged awaiting drainage by the Argo (Newhouse) tunnel, which advanced at an average rate of 300 ft. monthly. The actual drainage of the district will, however, in all probability proceed more slowly than at Cripple Creek. None of the larger mines were especially prosperous. The greatest producer was probably the Fifty company, which maintained a large output from the Bobtail vein. The Saratoga is now in

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condition for active work through the Newhouse tunnel. The Topeka was unwatered and opened.

At Idaho Springs the Sun and Moon, which was operated in 1908 under lease, was at first unsuccessful, but work was later resumed by local operators who opened up a body of ore of good shipping grade. The Gem and Lamartine were worked on the tribute system, but the output was less than in recent years. The Stanley, also under lease, is being unwatered.

At Georgetown the Capital tunnel was probably the largest producer. Connection was made from the Burleigh tunnel to the Seven Thirty, which was drained and opened for work. In the Argentine district the Santiago and Waldorf properties opened up considerable bodies of ore; the grade, however, is rather low, and the expense of working higher than in the more accessible camps.

San Juan District—The production of the Camp Bird mine, near Ouray, was greater than ever and the proportion of net profit remarkably high. A considerable output was maintained by lessees from the Revenue group, but in other respects mining in Ouray county was inactive.

San Juan county had a poor year, owing partly to another fire at the Gold King which caused a suspension of work at that property for a great part of the year, and partly to a succession of washouts on the railway which prevented all shipments throughout the summer. The camp is again busy, the Old King, Sunnyside and Hercules being the principal producers. The Iowa-Tiger was worked by a local leasing syndicate with very profitable results. The ore of this mine is largely galena, containing gold and silver. The Silver Lake mines, carrying gold, silver, lead and copper, were operated entirely by tributors, some of whom have done well. The Gold Prince, formerly known as the Sunnyside Extension, was operated by a receiver appointed by the court.

At Telluride the three great mines are the Smuggler-Union, Liberty Bell and Tomboy, which jointly produced nearly all the output, with some assistance from the Alta and a few smaller properties. The Smuggler opened up good ore in the 10th level, between the Bullion and Pennsylvania tunnels, which will enable it to maintain its output for several years more. The Liberty Bell exposed a large tonnage above the Stilwell tunnel, which insures a long life. The grade of the ore in the Argentine vein of the Tomboy company decreased considerably in depth, but, thanks to a large tonnage and cheaper mining costs, it was still profitable.

Recent events indicate that too much weight can hardly be attached to the difficulties and dangers attending mining in this region, due to the rugged topography and the isolated situation of the mines. Great care in future should be paid to selecting the situation of mill and mine buildings, and protecting them from snowslides. The danger of destructive fires must be guarded against by fireproof construction and better discipline among the employees.

Other Districts—At Leadville the gold-bearing district was a center of interest, and what is hoped may prove an important orebody was opened in the Highland Mary on Breece hill. The Ibex group maintained a large output, mined principally by leasers. The New Monarch mine is shipping about 1500 tons monthly to the Salida smeltery.

In Summit county the dredging industry was extended by the construction of two heavy dredges on the Blue river, and a second boat was placed in operation in French gulch. The latter is currently reported to have done especially well. It does not, however, seem probable that the industry will extend to the other districts in Colorado, or that it will become relatively important.

At Aspen an important discovery was made in the Free Silver shaft, operated jointly by the Della S. and the A.-J. and Smuggler interests. The output showed a notable increase during the last two or three months, and a further increase is probable.

Conditions in the other precious-metal producing centers of the State were unchanged. The only new discovery which seems likely to be of importance was one of gold-bearing sulphides, of shipping grade, in a vein of gneiss underlying the sedimentary formations on Elk creek, near Newcastle, a coal-mining camp on the Denver & Rio Grande railroad.

Lead, Zinc and Copper

As is well known, the ores of lead, zinc and copper in Colorado almost always contain notable amounts of gold or silver, while the precious-metal ores, excepting in the Cripple Creek district, often carry enough lead or copper, after hand sorting or mechanical concentration, to pay part of the smelting charges. It should, therefore, be understood that as a rule no hard and fast line can be drawn between the precious-metal and base-metal producers. Excepting in the Leadville district there are few mines the ores of which yield a greater return in base metals than in gold and silver. At Aspen the low-grade silver ores carried some lead and zinc, but would often be too poor for profitable working but for the high lime excess which enabled them to secure special smelting rates.

There were also no exclusively copper-producing mines in the State, the greater part of the output coming from gold-silver ores shipped from Gilpin, Clear Creek and Lake counties, and from the San Juan district. In Hinsdale county the Frank Hough, a copper-bearing vein on Engineer mountain just over the San Juan line, was the most promising and perhaps the most important producing mine. Shipments were made principally by the way of Silverton, and work was pushed on a 2500-ft. tunnel through the mountains to open up the orebody in depth from the west side. The San Antonio, in the Red Mountain district, also made notable shipments of high-grade copper ore.

The production of lead and zinc around Leadville fell off greatly after the suspension of work in the downtown mines, which completely filled up with water. A large output, however, was maintained from the Yak tunnel, and the Iron-Silver company is again shipping on a large scale.

Other notable lead-zinc shipments were made from silver mines in the Creede, Georgetown and Summit County districts, and also from the San Juan. The old Mary Murphy property at Romley, in the central part of the State, was acquired by an English company, and may at some future time become a notable producer of lead and zinc, with some silver and gold.

Rarer Metals

The output of tungsten concentrates from Boulder county remained comparatively small, owing to inactive demand from the manufacturers of high-speed steels and the existence of a considerable accumulated stock. A new mill is being completed near Nederland by the Primos company, one of the two largest producers, and it may be confidently expected that the tungsten industry will be active in 1910.

The Vanadium Alloys Company's mill at Newmire, San Miguel county, was in operation during the greater part of the year.

Some small shipments of pitchblende were made from Gilpin county, where it occurs as pockets and lenses in gold-silver-bearing veins in gneiss.

General

No review of conditions in Colorado would be complete without mention of the passing of the Argo smeltery, which for a generation was the main outlet for the ores and concentrates of the northern counties. A new smeltery of the semi-pyritic type was built close by, and is now being operated by the Modern Smelting and Refining Company, and there are reports of the reopening of the Carpenter plant at Golden. It remains to be seen whether the industry will gain as much from these as it must inevitably lose by the closing down of the Argo works. The American Smelting and Refining Company's plant at Durango was hard hit by the railroad washouts near Silverton and Telluride, from which its ore supplies were derived. The Globe smeltery at Denver was only partly supplied with

ore from this State. One may look in vain for signs of great prosperity, present or prospective, in the smelting industry here, such as might encourage further competition or justify the press clamor against the "trust," which is rather unreasonably accused of bleeding the mining industry to death. As I have repeatedly pointed out, what we really need is the discovery of new mines and new mining districts, and unfortunately there is little chance of finding either without far more energetic prospecting than has been done for some years past.

A project which, if successful, may be of great importance, is an experimental mill now being erected at Georgetown for the treatment of mixed lead-zinc-copper sulphide ores bearing precious metals. The treatment is to be by dry chlorination and electrolysis of the fused chlorides, somewhat on the lines of the Swinburne-Ashcroft process, tried several years ago on the Broken Hill ores. The occurrences of such ores in the State, especially in the central districts and in the San Juan, are numerous, and should some such method prove economically successful it may eventually be of great value to the mines of this State.

Nevada

SPECIAL CORRESPONDENCE

There are in operation in the State more than 286 producing mines and more than 400 others are operating, but not shipping. The financial crisis of 1907-08, following a phenomenal activity in mining and prospecting consequent to the Tonopah and Goldfield discoveries, caused the suspension of hundreds of operations. During 1909, some of the most likely of these operations resumed and some new exploration work was undertaken, particularly in the northern counties. The industry has now, however, largely passed back to the hands of actual miners and is not dominated by speculators and paper miners, as in the boom days following 1902.

Attention was given during 1909 to the opening up of the old camps in Eureka county, and the resurrection of the Comstock operations, after more than 20 years of sleep, is assured. The abandoned Ely copper camp has come to the front in a few years as one of the greatest copper-producing areas in the country. Zinc mining in the southern and central part of the State has been put on a good basis by proper development. In fact, real mining is going on in nearly every camp, and the general results accomplished are most important for the future of the industry. Many new treatment plants have been completed or begun during the year, and the railroad situation has been improved by extensions and reduction of rates. Some of the new mining centers have lost much of their spectacular population, but the loss, if such it be, is made up by the substitution of a stable, well-paid class of workmen and technical men.

Storey County

The task of unwatering the Comstock mines, which has been under way since 1898, the year of the formation of the Comstock Pumping Association, was characterized by more definiteness and energy in 1909 than heretofore, with resulting good success. This change is due to the change in the control of several of the principal mines, now in the hands of the so-called Tunnel crowd, consisting of Edward C. Sturges, Franklin Leonard, Jr. and their associates, who control the Belcher, Crown Point, Yellow Jacket, Consolidated Virginia, Ophir, Mexican, Potosi and Savage mines and also the Comstock or Sutro tunnel and the Yellow Jacket mill. Under the contract with the Comstock Pumping Association the tunnel company has expended nearly $335,000 for new timbering, railroad track, drain flume and complete repairs. The company is now using electric storage haulage, but for economic reasons will install a trolley haulage system.

The tunnel drains and ventilates all the mines at a depth below their respective collars of from 1650 to 2000 ft., and is essential in the operation of the properties. Owing to the fact that the tunnel belongs to an independent company and is depending upon a tonnage tax for operation, it is deprived of any income at the present stage. This necessitated the coöperation of the Pumping association and its interests with the tunnel interests, which coöperation was brought about in 1908 through the negotiations of Messrs. Sturges and Leonard. Since the Pumping association was formed, seven shafts have been fully equipped with modern electric hoists. These include the Union, Consolidated Virgina, Ward, Yellow Jacket, Belcher and Overman. The Mint, Combination, Ophir and Alta are also open to the Sutro tunnel level, and in good repair. The Mexican and Ophir are used as air shafts. The Combination and Alta are both fully equipped with hoisting works, air compressers and complete machinery. In the C. & C. shaft the Reidler electric pump and the Risdon hydraulic elevator lift the water to the Sutro tunnel level. In the Ward shaft the pumping equipment was built by the International Steam Pump Company and is known as the Blake-Knowles express pump.

The output from the deep levels of the Ophir, since the drainage began, amounts to $1,700,000; the output in November, 1909, was approximately $50,000, and this output was approximately maintained throughout the year. The Mexican mine opened a new orebody at the 2300 or deepest level, which is now being prospected. The Consolidated Virginia began sinking as soon as the drain flume in the tunnel was completed and has now reached the 2800 level. The Ward shaft has equipment to reach the 3100 level, and is now down 2575 ft. The Alta shaft will be used for deep drainage in the Gold Hill mine.

The Yellow Jacket, Crown Point and Belcher are all producing low-grade ore which was not available formerly for economical operation. This ore is being milled in the new Yellow Jacket concentrating mill, which has a capacity of 6000 tons per month and is reported to be making a saving of from 83 to 89 per cent., yielding a concentrate valued at $150 to $250 per ton. The Butters plant is handling low-grade ore from the surface workings of the Chollar and Potosi, and high-grade ore from the lower levels of the Ophir and Consolidated Virginia.

The Comstock company's mill at the mouth of the tunnel is now in operation treating ore from the Savage mine, which is delivered through the tunnel. Since the operations of the Pumping association the Consolidated Virginia has produced approximately $800,000. As an indication of the ores which are expected in the deep levels the following report for a December week from the Ophir mine is of interest: On the 2000 level, 37 cars assaying $65 per ton; on the 2200 level, 80 cars assaying $39.34 per ton; on the 2300 level stopes, 303 cars assaying $38.32 per ton; on the 2300 level drift, 65 cars assaying $58.33 per ton.

It has been demonstrated that the ores of the Comstock are easily concentrated and that the tailings can be successfully beneficiated by cyanidation. There are nine reduction plants at work on or near the Comstock lode at present. These include the Butters plant, the Yellow Jacket mill, the Comstock Tunnel Company's mill, the Dietrich mill, the Rocky Point mill, the Overland mill, the McTeague mill, the Davis mill and the Pfeffer mill. The plants are all small, except the Butters plant and the Yellow Jacket mill.

The district is now supplied with cheap electric power, costing from $4.50 to $6 per h.p. per month, according to the

amount consumed. This price is in contrast with the reported cost of power in early days, when the pumping was done with the Cornish pumps at $34 per h.p. per month. Other commercial and economic conditions in the camp have greatly improved since the early days of its operation and make possible the mining and treatment of ore which formerly was of no value.

The funds for the pumping and development of the Comstock mines have been raised chiefly by assessment under the California law. Recently the earnings of the Ophir & Consolidated Virginia have been diverted to the work of the Pumping association and the Tunnel company.

Esmeralda County

Esmeralda county lies in the southwestern part of the State and has an area of more than 7000 sq. miles. It contains a score or more of developed, partly developed and developing mining camps. Most of these are producing the precious metals, but other mineral products are distributed throughout the county.

By comparison with the feverish activity of a few years ago, the Goldfield camp was very quiet during 1909. Yet during that period the camp produced more gold than ever before and satisfactory results were obtained from the explorations in several of the properties. In July, according to the report of the State mine inspector, there were 18 mines operating on company account, employing 677 men. In addition to this, a like number of leases employed 116 men. Of the men employed by mining companies, nearly 75 per cent. were on the payrolls of the Goldfield Consolidated.

The remarkable record of the Goldfield Consolidated, both as to gross output and as to cost of mining and milling, is the interesting feature of the operations in this camp. This property, which was in charge of John H. MacKenzie, now retiring, has made a record in respect to operations which is worthy of note in the annals of the mining industry. The consolidation of several properties into this company in 1908 had the results of decreasing the general activity in the camp, but it also permitted the effective and economical management of this vast mining property. The result has been eminently satisfactory in the matter of total profit and gross cost. The new 600-ton mill was placed in operation during the year. At the present time the only other large producer in the camp is the Florence mine, also equipped with a modern mill.

During the year there was comparatively little prospecting in the area about Goldfield. This abandonment is due partly to the aftermath of the financial crisis and also due somewhat to the publication of Mr. Ransome's report by the U. S. Geological Survey. This report indicated that the known orebodies were confined to the dacite, and that the ore-bearing formation was limited in area and largely confined to the territory controlled by the Goldfield Consolidated company. It is thought in the camp that Mr. Ransome's report was ultra-conservative, and there are those who believe that the last word as to the geology and ore deposits of this camp has not yet been said by any means. In this same official report it was pointed out that the veins, when they pass from the dacite into the latite, would possibly become impoverished. This official expression proved somewhat of a damper upon those who wanted to believe that good veins always get better with depth. However, the fact is that in this camp since this report was published the Goldfield Consolidated company has followed its orebodies into the latite and found them as rich as ever.

In the Silver Peak district, the Pittsburg-Silver Peak Gold Mining Company completed its new mill, which has an approximate capacity of 12,000 tons per month. It is interesting to note that the first cyanide mill in Nevada was installed in this district. At the time of the first introduction of this process, other operations had been carried on in the district for some time, but the results were mainly unsatisfactory until the new lease of life began with the general resumption in the industry in the State.

Other properties in this district are the Silver Peak-Valcalda, in which the Newhouse interests have acquired control, and the Goldfield-Silver Peak property on which a 10-stamp mill is being installed to treat the free-milling gold ore by plate amalgamation. The Scotch Lassie property has been satisfactorily developed, and the company is negotiating for the erection of a custom mill for its own use and for tributary properties.

Exploration and development work were carried on extensively in the Lida district, 32 miles from Goldfield. This is one of the oldest camps in the State, and its mineral area is extensive. On the Monarch a silver-lead strike was made. The Rea group installed a hoist and is sinking. The Nevada Exploration Company carried on exploration on the Wisconsin group. Nevada-Florida installed a 10-stamp mill. The Washington-Nevada sunk 500 ft. in development of a property in this district. The Indian Spring company installed equipment and is developing. The old Centennial is being explored, and the Death Valley mine, east of Lida, now known as the Red Wing, has developed high-grade silver-lead ore.

At Tule cañon a placer deposit was worked in a small way by owners and leasers. An attempt to take out the product by dry washing was not satisfactory. The Eagle property is developing a gold-quartz vein in this district.

In the Tokop district, about 50 miles southeast of Goldfield, Peter J. Somers and associates carried on development during the year. The district is considered as presenting favorable opportunities. In the Bonnie Claire district, 60 miles from Goldfield, a section in which there were extensive operations in the early '80s, the Bonnie Claire company has carried on successful development work and has erected a mill at Thorp's wells. The Oriental in this camp is being operated by leasers.

In the Hawthorne district the Lucky Boy attracted attention during the year, and it is reported that the property has been sold to the United States Smelting, Refining & Mining Company. A considerable amount of work is being done in this district by leasers. In the Horn Silver section the Great Western mine now equipped has been developed by the Russell brothers. The Hubbard lease on the Mountain King is reported to have produced over $1,000,000 during the year. J. C. McCormick of Goldfield has a lease on an adjoining property and is now sinking to the 300-ft. level. Another lease in this district, known as the Ingalls-Brodigan, is also sinking and drifting. On the Mitchell lease a complete plant was installed and work carried on to 300-ft. depth. The Collin shaft is deeper than 400 ft. The Oddie lease is adjoining the McCormick and Brodigan leases, and a new plant has been installed for the development of the property. The Spencer lease is operating on the Lucky Boy vein.

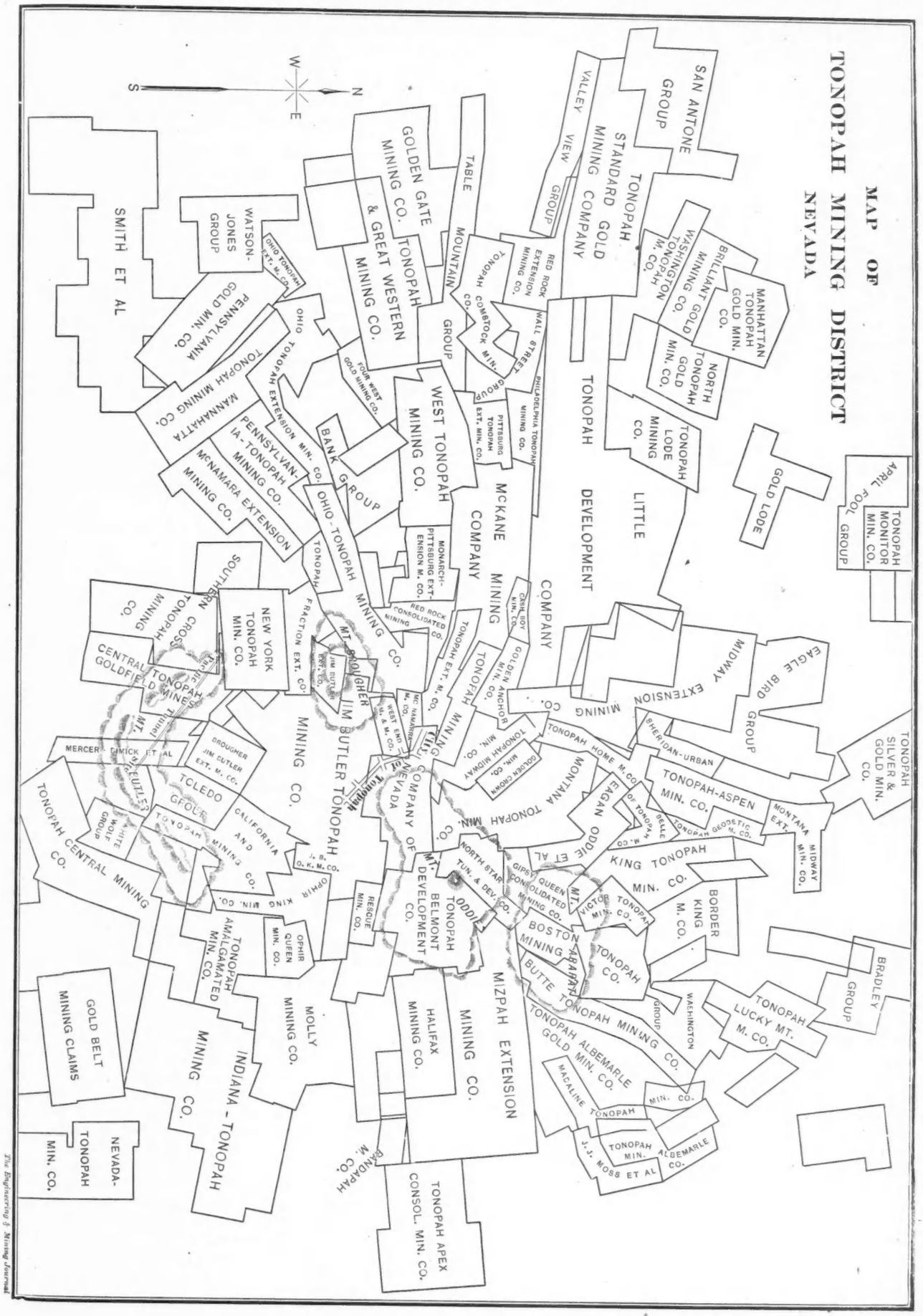
The Rawhide district came into existence on Christmas day, 1906. The first tumultuous years of the camp's existence have now yielded to a state of calm, waiting for the coming of a mill which will enable the various leasers and miners to treat their ores successfully in the district. Some rich ore has been shipped.

Near the Rawhide camp is the Regent district, in which the Black Eagle property is being developed, and also the Royal and Regent properties.

The Luning Gold Mine Syndicate, the Lotta mine and the Nevada-Silver lease (formerly the Hidden Treasury) are working at Luning, a few miles north of Mina. The Nevada Copper Hills property at Acme is also developing. At Wassuk, 12 miles northwest of Lucky Boy, some new developments were undertaken during the year, which promised well.

Nye County

The Tonopah mine claims to be the greatest silver-producing mine in the United States, and it is asserted that its dividends for the last three years have been greater than that of any other silver producer in the world. To a certain extent the underground work at Tonopah has conflicted with some of the conclusions of J. E. Spurr, United States geologist, whose report on the camp was at the time issued accepted as final. This conflict is particularly true as regards the formation. Some of the exposures of



igneous rock which were called dikes by this authority, have turned out, by development underground, to be intrusive masses, indicating a succession of flows. Definite information as to results of explorations in depth in the camp have not been made public.

Montana-Tonopah continued to operate its mine and mill successfully and efficiently, and the discovery of new orebodies in the property is reported. The West End Consolidated company developed a large tonnage of second-grade ore and continued shipments of high grade. The MacNamara carried on development work, blocking out milling ore. Numerous leases operated successfully in the district. Belmont, Midway and Tonopah-Extension all continued to be active producers.

Bullfrog was generally inactive. The principal mine, the Montgomery-Shoshone, made a successful showing during the first six months of the year, treating about 6000 tons per month from the 200 and 300 levels. During the last half of the year the net production of the mine decreased considerably. The Montgomery Mountain company is exploring the South-Rhyolite contact, adjoining the Montgomery-Shoshone properties. Other active properties in the district are the National Bank, the Original Bullfrog, Gold Bar, West Extension and Bullfrog-Mohawk. Owing to the lack of milling facilities much of the low-grade ore in the district is at present not available.

At Pioneer, the Bullfrog-Mayflower properties continued operations during the year. Many shipments of high-grade ore were made from this and other properties. At Golden Arrow the Kawich Consolidated continued sinking, and other properties were operated with fair success by leasers. The Round Mountain district has maintained a steady output since its discovery. Dry working and sluicing has been carried on successfully in the district. The Sunnyside mine has developed as a free-milling property and the mill has been operating steadily. Extensive bodies of milling ore have been opened up at the Daisy, the Sunnyside and the Sphinx.

White Pine County

The Robinson camp at Ely continued during the year to be the scene of the successful exploitation of enormous, low-grade, porphyry, copper orebodies, characteristic of that district. The Nevada Consolidated, the largest operating company, more than verified expectations during the year. The production was mainly from the Eureka or Copper Flat property. A new orebody was discovered by drilling in this portion of the company's property at a point west of the Eureka shaft. This is known as the Liberty, and it is intended to open it up later as a steam-shovel operation. The Ruth mine east of the Eureka is fully equipped and is held in reserve. On the Veteran mine of the Cumberland Ely work was suspended in the early part of the year on account of labor troubles, and it remained idle during the year. This property has now been merged with the Nevada Consolidated. The Steptoe plant worked almost entirely during the year on ores from the Copper Flat orebodies, treating about 6000 tons per day. No plans for the improving of the Veteran mine belonging to the company have yet been made public. It is indicated in the quarterly reports that the cost of producing ores from the Veteran mine is high.

The Giroux and other properties in the district were purchased during the year by the Cole-Ryan interests. The Alpha shaft of the Giroux property, in which a disastrous cave-in occurred some time ago, was found to be in such a condition that it was necessary to sink a new shaft. In doing this a body of high-grade ore was found in the lime out from the contact, but the extent of this discovery has not yet been determined.

There was a general revival of prospecting in the camp on several properties, particularly the Boston-Ely and the Ely Consolidated. Prospecting is being done on the Ely Central property, which was the subject of some interest in connection with operations on the New York curb market.

Several gold-quartz properties were developed during the year at Osceola and operations have been carried on in a small way on the tungsten deposits in that section. A number of properties are developing in the White Pine district, which in early days was an extensive producer. This district, which lies 36 miles west of Ely, is likely to become an important producer with the construction of the projected railroad from Ely to Goldfield, which passes close to it. At Granite, 25 miles north of Ely, important silver-lead properties were exploited during the year and attention was given to the lead deposits at Cherry creek.

Eureka County

Eureka county, in the central part of the State, has experienced the beginnings of a revival which promises to be important. The mines were first discovered in 1864 and the Eureka camp is credited with an output of not less than $125,000,000, principally during the decade succeeding the discovery. The mines have been practically abandoned until within the last few years, and during 1909 positive steps were taken to investigate and resume operations in this historic district. The Eureka-Windfall property has done extensive development and completed the installation of a mill costing $30,000. The Holly mine constructed a concentrating plant and blocked out much ore. The operating properties in the district are given as follows: Cyanide mine of Eureka, the Richmond-Eureka, West Eureka Windfall, and Diamond and Excelsior companies.

Some prospecting has been done at Secret cañon and at Prospect mountain. In the old Cortez district a number of locations have been made and some properties taken under option. The Cortez Metal Recovery Company constructed a 100-ton cyanide mill for the treatment of the ore from the dumps of the Garrison mine. Several properties at Mill cañon in this district have been under option during the year to outside interests and a shipment amounting to $75,000 has been made. The Keystone mine in the Roberts district is now developed by a tunnel 2000 ft. long and a shaft 150 ft. deep.

Churchill County

In Churchill, the west central county, is the camp of Fairview, in which moderate development is being carried on and small shipments made, principally by leasers. The Wonder camp is also in Churchill county and is today practically abandoned, a monument to the flitting hopes of many mining-stock investors of the boom years. At Shady run the Nevada Gold Mining Company is developing by tunnels and is planning to commence operations.

Douglas County

In Douglas county development and prospecting have been caried on in Pine Nut and Silver Lake districts, and at Buckskin. Work has been done on a placer property owned by the Success of Nevada company.

Elko County.

In Elko county little new development in mining took place in 1909. The attempt to revive the old Tuscarora district has been suspended for the time, although the results there were reported as satisfactory. Some work is being done at Cornucopia and at Spruce Mountain. A new camp at Contact in the northern part of the country has recently been attracting attention. At Gold Circle a number of properties continued development in the vicinity of the town of Midas and development was carried on on the properties in that section. On the Lucky Girl mine a 20-stamp mill has been erected.

Humboldt County

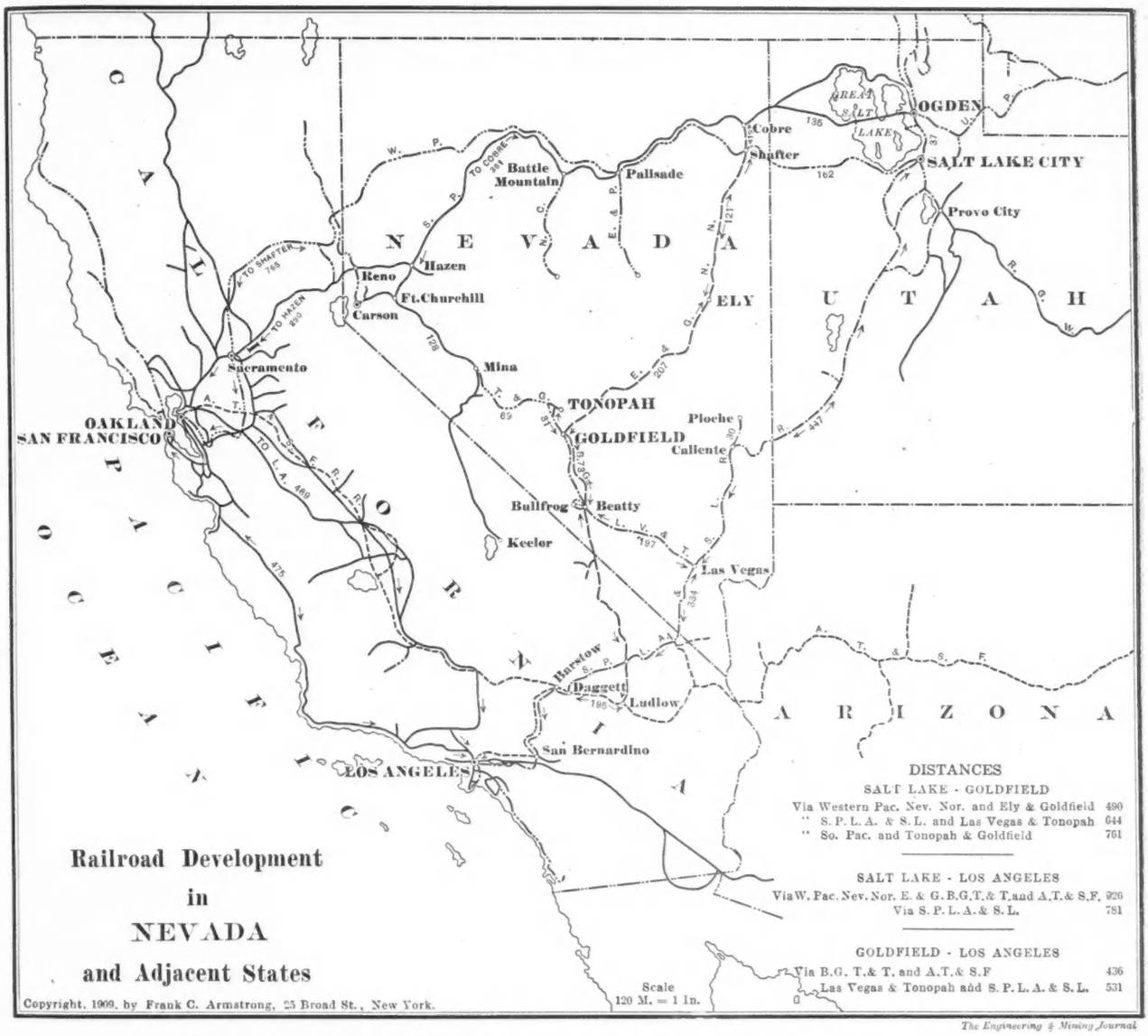
There was little new development in Humboldt county during 1909. In the Seven Troughs district work was carried on by several operating and leasing companies, and the prospects for the district are more encouraging. At Rosebud, Jessup and other districts some development was done, and operations at the Golconda, on Ruby Hill, and other properties have been successful. Important discoveries were made at the National mine near Winnemucca and some rich shipments made. The sulphur properties in this county have continued to produce during the year.

Lyon County.

In Lyon county there was some re-

vival of activities at the old camp of Silver City. The Mason Valley district, now being tapped by a railroad, has presented important developments in the Mason Valley mines and at the Ludwig mines belonging to the Nevada-Douglas Copper Company. The Western Nevada properties in the Reese River district and recently completed a new mill. Several Battle Mountain properties have been shipping, one of them, the Glasgow-Western, has developed a large tonnage of copper-silver ores. Operations on the antimony properties near Battle Mountain mines, and work was resumed during the year in the Peavine district.

The two southeastern counties, Lincoln and Clarke, include the important Searchlight and Eldorado districts and the Pioche district. In the Searchlight district the Quartette company continued de-



SKETCH MAP SHOWING RAILROAD DEVELOPMENTS IN NEVADA AND ADJOINING STATES

Copper Company and other properties at Yerington carried on developments during the year. A gypsum deposit at Mound House shipped extensively during the year. The Ramsey district has been developed and is considered as promising.

LANDER COUNTY

In Lander county, adjoining Eureka county, the revival of the old districts has also extended. At Austin, Reese River, Battle Mountain and the Lewis district old properties have been taken up and developed to a considerable extent. The Austin-Manhattan company has acquired

were suspended during 1909 owing to the low price of the metal.

OTHER COUNTIES.

Ormsby county has a variety of mineral resources which were exhibited extensively during the year. A graphite operation is carried on in Eagle valley; important clay deposits are being utilized near Carson. The Brunswick Consolidated company in the Delaware district carried on extensive developments during the year. The Bonanza property in Jack's valley was under development.

Washoe county contains the Jumbo camp, which now has several producing

velopments with success. At Eldorado canon development was done. The attempt to work the alluvial deposits of the Colorado river by dredging was not successful. A number of properties in the Pioche camp were consolidated during 1909 and some operations carried on, but the shipments were suspended in the early autumn owing to difficulties in securing railroad and treatment rates. Near Las Vegas, Robert T. Hill has been in charge of scientific explorations for gold ores during the year. At Good Springs important copper, zinc and lead deposits have been successfully developed.

RAILROAD DEVELOPMENT IN NEVADA

Plans have been consummated during 1909 for the construction of the railroad link between Ely and Goldfield, thus making a new through route from the important Salt Lake railroad center to the Los Angeles transportation connections. The new road shortens the distance between Salt Lake City and southern California, and by its connections with the Western Pacific, a Gould road, and with the Santa Fe at the Tonopah & Tidewater junction it forms an outlet for the southwestern traffic of this important system. The new system includes the new road to Ely, the Nevada Northern and the Tonepah & Tidewater road now extended to Goldfield from California. The relative proportion and directness of the new through route is indicated on a map published herewith. Aside from the importance as enlarging the general transportation facilities of the West this new road has a direct bearing upon developments in Nevada. The road leaves the Tonapah & Tidewater roads at Cuprite, nine miles south of Goldfield in the Cactus valley. At this point are deposits of native sulphur, carrying gold. From Cuprite the road runs up Cactus valley in a northeastern direction. The first camp of importance on the line is at Gold Center, 20 miles from Cuprite. This is a low-grade camp, which will be likely to develop as a large producer with the advent of transportation. Tributary to Gold Center are the camps of Trappman, Jimtown, Antelope and Cactus Springs, all promising gold-silver districts and within 30 miles of this station. From Cactus valley the route leads into Kawich valley and 50 miles from Cuprite the Golden Arrow district is reached. This camp has already developed successfully and gives promise of rich production. Ten miles north of Golden Arrow and on the line of the road is Bellhellen, a gold and silver camp, and near this is the new camp of Clifford. Five miles from Clifford the road passes through Warm Springs pass and enters the Hot Creek valley and thence passes midway between the old time camps of Tybo and Reveille, with a branch surveyed to each. These camps were extensive producers of rich silver ores in the early '60's and it is likely that they will be revived with the coming of the railroad. Considerable development has been done at the Tybo mines in the last few years and it is claimed that smelting ore has been developed which can be successfully shipped at the present time.

The ores of the last two camps contain much lead. From Tybo the road passes into Railroad valley to the east of Pancake range and west of the White Pine range, and then through the White Pine range to the farming settlements of Blue Eagle, Currant Creek, Duckwater and White River. The one time important camp of Hamilton will be reached in this section and it is predicted that this camp, which was famous in the '60's for its silver output, will again become important with the building of the railroad. After crossing the White Pine range the railroad proceeds direct to the Robinson camp, connecting with the Nevada Northern railroad and thus forming the through connection to both the Harriman and the Gould systems to the north.

At the close of 1909 the Western Pacific completed its trans-continental line from Salt Lake to California, opening up an important new area in Nevada and providing a new line across the State.

Better transportation facilities are to be provided for Pioche by extensions of the branch from the Salt Lake-Los Angeles road at Caliente.

The Nevada Copper Belt Railroad practically completed its road from Wabuska on the Southern Pacific to Yerington in the Mason Valley copper district. This road, which will be in operation early in 1910, is controlled by the Nevada-Douglas Copper Company and will not only put this company in a position to smelt and market its products, but will be a great stimulus to the development of other important properties in the district.

Idaho

SPECIAL CORRESPONDENCE

Notwithstanding the failure of the lead and silver market to respond proportionately to the general improvement of business in the country the output of the silver-lead mines of the Cœur d'Alene district was more than in 1908. There was little interest taken in the unproductive properties and there has not been very much outside development work. The mines tributary to the new North Idaho railroad to Murray are taking advantage of the transportation facilities furnished and have started shipment.

IMPROVEMENTS IN MILLING.

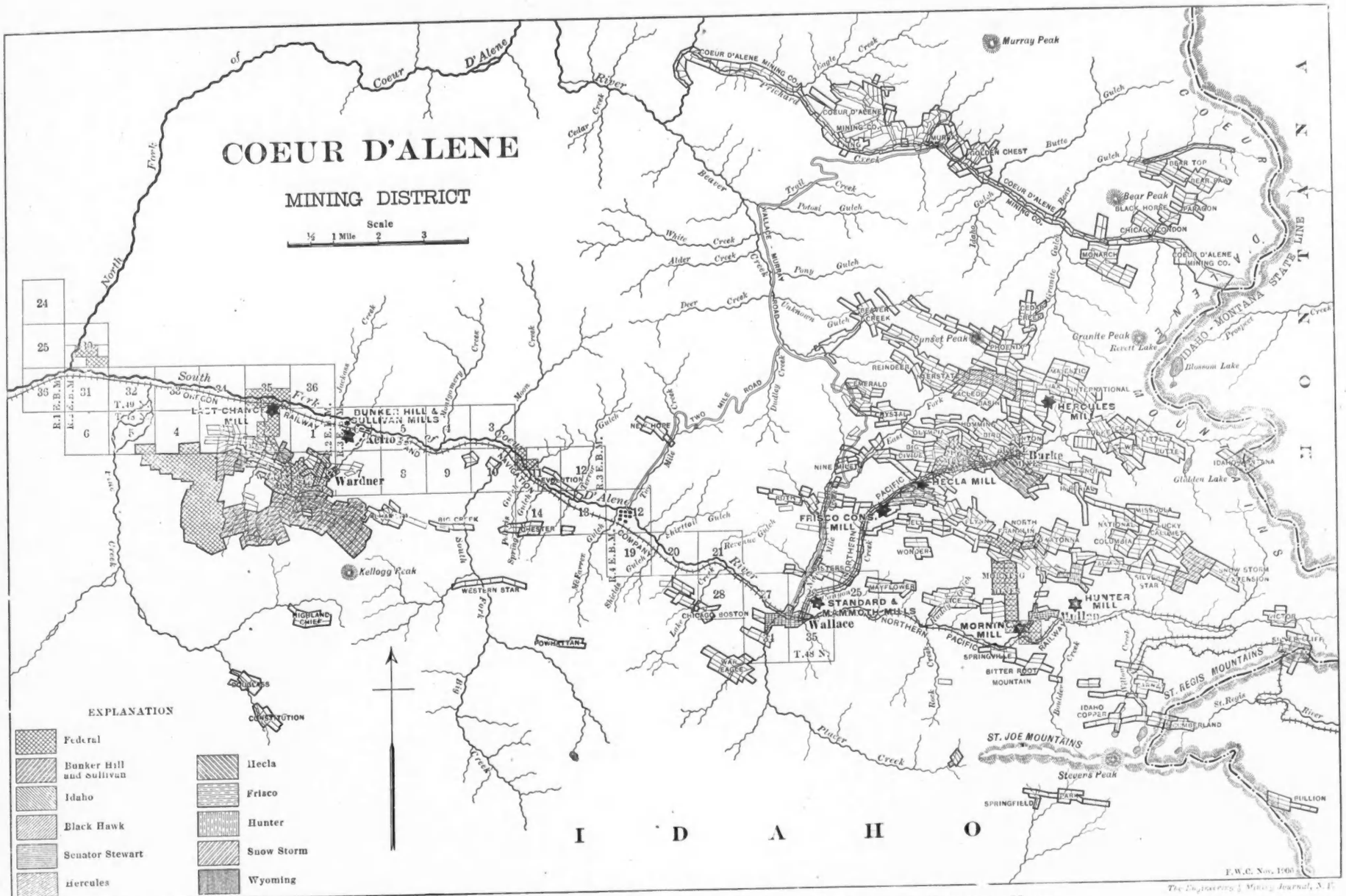
The older producers in the district gave more study to the improvement of ore treatment methods. The Federal company is obtaining satisfactory results from the Hancock jig on fine ore. The experience of the Cœur d' Alene mills has shown that the Harz jig, as originally constructed and operated was susceptible of much improvement. Improvement has been largely achieved in classifying and jigging the finer sizes, using the Caetani jig, which appears to do as good work as the Hancock on the finer sizes. It also has the advantage of sucecssfully separating all the slimes and sending them to the slime department directly from the first compartment, without traveling the length of the jig, and making further treatment necessary as the Hancock arrangement demands. Briefly it may be said that the old style of Harz jig will in a few years be entirely superseded by improved jigs of the type sucessfully used in some of the Cœur d'Alene mills, and by the Hancock pig for finer sizes.

The new mill of the Bunker Hill & Sullivan has been completed and is now in regular operation. Work is being done remodelling the old concentrators for reworking of the many thousands of tons of tailings. At the present market prices it will require very careful work, both metallurgicaly and mechanically to make this retreatment operation profitable.

The improved zinc market has resulted in the resumption of operations at the Success mine. The tariff law as enacted proved satisfactory to the lead interests and also gave new life to the zinc mining possibilities of the State. Attention was given to the possibility of increasing zinc production in view of the advancing market in the latter half of 1909. The lead production of this district, on the whole has increased.

RECENT COEUR D'ALENE DEVELOPMENT.

In the Cœur d'Alene district the Hercules mill burned Sept. 6 and the company leased the Tiger mill at Burke and made extensive improvements. The Last Chance mine completed the tailing plant during the year. The Enaville smeltery was blown in in November, using the Blanchard process. Work was commenced in a slimes plant on the south fork of the Cœur d'Alene river to treat the products from the Morning mills. The Snowstorm Extension Company transferred its holdings to a Los Angeles company. The Jack Waite property was sold to Patrick Burke of Murray. The Snowstorm made a contract for shipment of ore to California for treatment and increased its shipments to about 6000 tons per month. The Monarch mill treated about 2000 tons daily. The Hecla has been shipping since June. The National, east of Mullan, advanced the tunnel to strike the orebody at 1600 ft. Lucky Calumet, west of the Snowstorm is installing a 4000-ft. aërial tramway. The



MAP OF THE CŒUR D'ALENE MINING DISTRICT SHOWING SITUATION OF MILLS AND PRINCIPAL MINES

Mark Sullivan property was transferred to E. L. Cowell of Missoula and equipment is being installed. The Cœur d'Alene North Fork Company started its concentrator in November. The Marsh silver-lead claims near Burke were sold in December for $150,000. The Black Horse built a 150-ton mill at Murray.

Deep Workings.

The Cœur d'Alene mines have been successful in development in depth. The Bunker Hill & Sullivan mine is now 3000 ft. below the apex of its orebody. The Standard Mammoth is working at 2750 ft. in excellent ore. The Hercules at Burke is working at 2000 ft. in depth with ore of high grade. The Morning mine at Sullivan is down more than 2000 ft. The Hecla mine at Burke is 1200 ft. below the surface. It is reported that at 2200 ft. in depth in the Tiger-Poorman mine the oreshoots had contracted in width, but that there was a portion of the oreshoot which gave indications which would justify explorations to several hundred feet more in depth, which was the experience in other parts of the districts. There is at present no immediate prospect of the conclusion of the litigation involving the Bunker Hill & Sullivan and the Federal properties. The Cœur d'Alene district employs about 3500 men who are paid half a million dollars monthly.

During 1909 the Chicago, Milwaukee and St. Paul road completed its line to the Pacific coast. In Idaho the line extends through the southern border of the Cœur d'Alene district and affords an outlet for numerous copper, gold and lead-silver prospects in that section.

The Government reserved during 1909 large areas for a future phosphate rock supply for the country. Operations were continued to a small extent on the phosphate deposits at Montpelier, in Bear Lake county.

California

SPECIAL CORRESPONDENCE

The gold output of California can be counted on as $18,000,000 to $20,000,000 annually with great regularity, the only variation depending on the character of the season, that is, the rainfall, which furnishes the supply of water in larger or smaller quantity. With a small precipitation the gravel mines have short seasons for washing and some of the mills of the quartz mines have to stop work for lack of power. Large numbers of the quartz mines of the State are now run by electric power, generated by water originally, so that when water supply is short the electric current can not be supplied in sufficient quantity. Some of the larger properties are now equipped with auxiliary steam power plants, ready for use in case the water or electric power plants fail. This is not the case with all mines. Again heavy flood seasons have an effect, especially on the dredging industry, as was the case in 1907 when a number of dredges at Oreville were wrecked or damaged. There are about 4000 known mines of gold, silver, copper and lead in California of which 1100 are producing to a greater or less extent, the others being in course of development or held by annual assessment work. The quartz mines are yielding more gold than the placers, as has been the case for many years, but the quartz mines are not increasing their yield as the placer mines are, and before long it is expected that the placer yield will exceed that from quartz mining operations.

The total gold yield for California for the year 1908 was placed by the United States Mint and United States Geological Survey at $19,329,559 and the silver at 1,703,700 fine ounces, the latter of an average commercial value of 53 cents. It is probable that the yield of 1909 will vary little from this, though there may be shown an increase of a few hundred thousand dollars in gold, with a slight falling off in silver output. No special activities were shown in quartz mining in 1909, except in the county of Sierra where discoveries of very rich ore were made in reopened mines. The finding of "candlebox" ore in one mine led to the development of several others, long idle.

In other districts there were few changes of conditions to be noted. The Grass Valley district of Nevada county, continues to be the leading quartz-mining section of the State. None of the other counties, even those of the Mother lode, approach it in production of gold. The deep mines of the State are yielding annually about 2,500,000 tons of ore of which 2,000,000 tons are milling ore, averaging from $5 to 5.75 per ton. The rest is copper ore, which is treated at smelteries. This carries gold and silver. In fact, by far the largest proportion of the silver is derived from the treatment of copper ore. The silicious ores needed for flux with the copper ores in late years has had a marked effect on gold mining. Thus many mines can be profitably worked without reduction works, there being ready sale for the quartz. This is especially the case in Shasta county where the largest smelting plants for copper ore are in operation.

Dredge Mining Increasing.

The quartz mines of California are now producing annually a few million dollars more than the combined forms of placer mining, which include dredge, hydraulic, drift, river-bar, ocean beach and surface placers. The dredges are now yielding about 80 per cent. of the placer gold output. Dredge mining is now the most progressive and growing of the different forms of gold mining carried on in California. With about 75 dredges at work the annual gold yield from that source is between $7,000,000 and $7,500,000. When this form of mining was commenced at Oroville in 1898 the yield for the year was only about $19,000. Since then over $31,000,000 have been produced by dredging operations, and the business is increasing yearly. The latest machines built are very costly and heavy, and are capable of handling over 250,000 cubic yards of material monthly. Some of the machines are doing the work at an operating cost of less than two cents per cu.yd. Dredge mining is now being carried on in 10 counties of California, the largest operations being in Butte, Yuba and Sacramento counties. A few dredges are working in Calaveras, Siskiyou, Trinity, Shasta, Merced and Stanislaus counties, and new grounds for dredging purposes are being prospected in many places. Larger machines are taking place of lighter and smaller ones in the older dredging fields of the State.

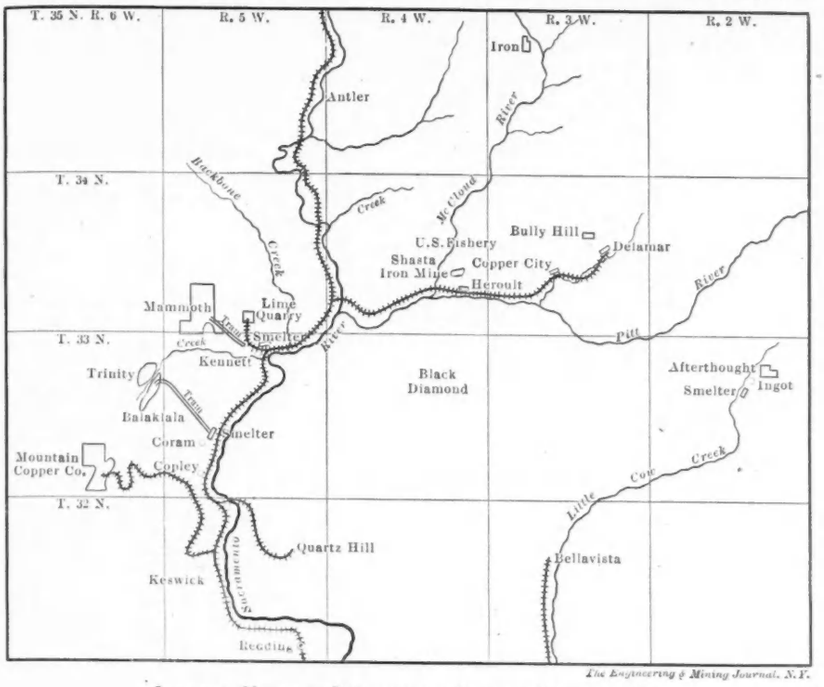
Decline of Hydraulicking

Hydraulic mining is in a decadent stage, the total yield from this source being less than a million dollars annually. The most prosperous counties for this form of gold mining are Siskiyou and Trinity. Drift mining also is showing a lessened yield from year to year, though there are signs of revival in drift work, especially in the upper mountain counties of Sierra and Plumas, where a number of old drift properties have lately been reopened and some new ones started. The partial cessation of hydraulic mining in the mountain and foothill central counties has cleared the streams of debris, so that placer mining on the surface and in rivers has been more prosperous than for a long time. Indeed this form of gold mining seems to be taking on a new lease of life as the yield has been growing annually. The mountain streams have been mined lately on old bars. Mining the sands of the ocean beaches has not been carried on to any great extent for the last few years, but as the heavy storms of this winter have been unusually severe, the beach sands

will be concentrated so that this form of mining should be profitable at many places in the spring of 1910.

There are now seven counties in California which are yielding over a million dollars in gold each year, the heaviest producer being Butte county, where the largest number of dredges are situated. This county is yielding between three and four million dollars gold annually. Nevada county, the center of the quartz mining industry, is yielding about two and a half million. Yuba county, with its many dredges, yields over two million. Other million dollar gold counties are Amador, Calaveras, Sacramento and Shasta. The latter named county is the most productive in the State with regard to minerals of all kinds, mainly on account of its copper industry, its record being now nearly $7,000,000 annually.

Altogether the total mineral output of California in 1908 was $66,363,198. For 1909, doubtless an increse of several millions will be shown when the final figures are available. The mineral industry of the State is in a favorable condition. In the matter of gold mining the counties showing the largest increase of output lately are those where the dredging enterprises are carried on to the greatest extent. In silver mining there was an increase of output, but the lower price of the metal keeps values down.



SKETCH MAP OF PORTION OF SHASTA COUNTY, CAL.

MOTHER LODE OPERATIONS

The mines in the Mother Lode counties of Amador, Calaveras, El Dorado, Mariposa and Tuolumne still continue to furnish three-fourths of the milling ores of the state, though the average recovery per ton is much less than in the other counties where the veins are smaller and richer. The average recovery is less than $4 per ton when all the counties in the Mother Lode are considered. In Nevada county, where the most productive quartz mines of the state are being worked, the average value recovered per ton is considerably over $10 in gold and silver. Some of the gold mines in Amador county, on the Mother Lode, are now being worked to a vertical depth of 3400 ft. and at that depth are taking out as good ore as they ever had near the surface. This has encouraged men working other deep mines, and explorations are now being made deeper than ever before. Shafts 1000, 1500, and even 2000 ft. deep are being sunk without stopping to drift, so as to open properties in a suitable manner.

Altogether, California is doing well with its mining industry. In certain branches great progress has been made in late years. The structural materials, clays and petroleum, have advanced materially in importance. Gold mining has about held its own in the last decade, but shows signs of augmented annual yield owing to the increase of gold dredging and the custom generally of deeper mining.

Texas

BY W. E. KOCH AND J. K. PRATHER *

Mining operations in Texas during 1909 were greatly curtailed on account of the need of a fair mining law, the present one handicapping the prospector beyond all reason and retarding the development of the mineral wealth of the State. Several copper properties in the Sierra Blanca and Quitman mountains about 75 miles east of El Paso were worked in 1909. In the Devil's ridge F. W. Tommee opened up some good ore and Oct. 1, J. H. Gilcrease shipped to the El Paso smeltery from the Thunder Bird mining district in the Quitman mountains the fifth car of chalcopyrite ore carrying 18 per cent. copper.

The mill of the Presidio Company, at Shafter, ran continuously during 1909. Young Brothers also operated a mine in this district. About 300,000 oz. of silver are produced annually in Presidio county, near Shafter. Ten miles west of Shafter, J. T. Fredley opened a property in the Cienega mountains. The Republic Mining and Milling Company, operating in the same region, voted to restart their Bonanza zinc mine and dry mill. In Brewster county the quicksilver mines of the Marfa & Mariposa and Chisos companies produced about 90 flasks a week and the latter company did much development work.

The El Paso Tin Mining and Smelting Company has been developing its property since October by means of three shafts and two tunnels. The new workings are in ore, which occurs as cassiterite in quartz veins, or disseminated through the country granite. These mines are situated about 16 miles, by road, north of El Paso, on the eastern slope of Mount Franklin. Roads were laid out, and a mill and smeltery site graded. Near Van Horn, 120 miles east of El Paso, the Texas Turquoise Company obtained some fine stones. Little was done to develop the sulphur beds in El Paso and Reeves counties.

Practically no exploitation of the iron, gypsum or asphaltum deposits was done during 1909. Lignites of Eocene age extend over a belt 200 miles long and were mined in nine counties. In 1908 847,970 tons, valued at $838,490, were extracted. The coal is of Cretaceous and Carboniferous age, and was mined in seven counties, 1,047,407 tons valued at $2,580,990 being extracted in 1908.

*Mining engineers, El Paso, Texas.

Review of Mining in Foreign Countries

The Year's Developments in South Africa, Australasia, Mexico, Canada, Central America, Peru, Chile and Other South American Countries

STATISTICS OF PRODUCTION

The Witwatersrand showed further improvement during 1909 in the milling of gold ores. The immense consolidations installed large milling units and worked a lower grade of ore at lessened cost and for a higher recovery.

In Australasia, a feature of the operations was the recovery of zinc from tailings in the Broken Hill district. Ontario showed an increased production of silver, nickel and iron, but the petroleum output fell off slightly. Mexico had to contend with low prices for her chief products, silver and copper. The feature in Mexico was the steps taken toward treatment of low-grade ores and tailings.

Mining in Central America was generally at a standstill, as regards new developments, on account of political conditions.

South American countries, particularly Bolivia and Ecuador, are seeking the development of their mineral resources by the building of railroads and, in some instances, by more favorable laws.

Australasia

BY F. S. MANCE *

In reviewing the mining industry in Australasia during 1909, it is found that the aggregate value of the production fell considerably short of that of the two preceding years. The yield from the gold mines was again lower than in the previous term and, by judging by existing conditions, there seems little, if any prospect of better results being achieved during the year 1910. The production of silver and lead suffered by the closing down of several of the mines at Broken Hill, and was less than for many years past. The copper-mining industry made a better showing than anticipated, and the output of the large producing mines was on an increased scale. The records of the yields from the tin mines, however, are not nearly so satisfactory as for the year 1908. The prominent feature of the year's work was the important advance made in the solution of the problem of turning to profitable account the large heaps of zinkiferous tailings on the Broken Hill field, by means of which the value of the mineral wealth was largely enhanced.

The returns show that the gold-mining industry in Australasia, as a whole, made no headway during the year. The output was mainly contributed by the established mines, and the yields diminished in value as depth was attained. It is estimated that the yield for 1909 is about 123,000 oz. less than that of 1908.

The comparative statement shows the output during the last two years, the figures for 1909 being based on the yield for the first 10 months of that year. It will be seen that the state of Western Australia is still the largest contributer, having furnished 47 per cent. of the total estimated yield for 1909. The gold-mining industry now seems to have reached a normal level in this state, and the present rate of output should be maintained for some years to come. The efforts directed toward reducing mining and milling costs, and to securing a higher extraction were attended with satisfactory results, and ores at one time regarded as valueless are now made to yield profitable returns. In addition the developments at depth in the mines on the Boulder belt are such as to afford good grounds for satisfaction. In the Great Boulder Proprietary the workings have attained a depth of 2500 ft., and the lode where located by means of a bore at a depth of 2400 ft. was proved to be 14 ft. wide, and for a width of 3 ft. it assayed 22 dwt. per ton. Borings conducted at deeper levels gave even better returns. The main shaft in the Golden Horseshoe is over 1800 ft. deep, and the lode at the bottom level was proved for a width of 12 ft., and assayed 9 dwt. of gold per ton. The Ivanhoe main shaft is being carried down to 2270 ft., and at the 1820-ft. level the Ivanhoe-East lode was driven along for a length of 400 ft. or more, and proved to have a value of over $12 per ton. It will thus be seen that these mines possess extensive ore reserves. The sound position of these old established mines is enhanced by the fact that several discoveries of importance have been made, work recently undertaken having proved an extension of the payable auriferous area both to the north and south.

GOLD PRODUCTION OF AUSTRALASIA.
In Fine Ounces.

	1908.	1909.
Western Australia	1,647,911	1,604,500
Victoria	670,910	639,000
Queensland	465,085	455,000
New South Wales	224,792	208,000
Tasmania	57,085	45,000
South Australia and Northern Territory	9,162	7,500
Commonwealth	3,074,945	2,959,000
New Zealand	471,967	475,000
Total, ounces	3,546,912	3,434,000
Total value	$73,314,671	.....

The East Murchison field includes several promising sections which are rapidly coming to the front. Among these are the Wiluna and Black Range districts, and the former, though somewhat remote from railway communication, should with its extremely large soft lodes become in time a prominent producing center. The principal mines in this area are the Black Range gold mine, Oroya-Black Range, and the Sandstone Development Company's leases. The output of the old field of Yilgarn is on the increase.

The Southern Cross district, which was completely overshadowed and neglected by the sensational Coolgardie discoveries in the early nineties, is now receiving renewed attention. Another progressive district is Meekatharra, where the mines are opening up well. The production of the Mount Margaret field fell off for a time owing to the suspension of operations in the Lancefield mine, but with the remodeling of the plant, this mine again entered the list of producers. The decrease at Coolgardie is largely attributed to the lessened output from the Westralia East Extension mine at Bonnievale, and the Burbanks Birthday mine at Burbanks, but several new mines are developing well, and the industry generally can be said to be on the up grade. The mines at Day Dawn exhibit a decreased yield mainly due to the reduced output from the Great Fingall mine.

Of the important mines outside of the Kalgoorlie-Boulder field, the Sons of Gwalia occupies the premier position. The large and consistent orebodies of this mine are developing most satisfactorily. The completion of the railway to Norse-

*Department of Mines, Sydney, N. S. W.

man has improved mining matters there, and besides cheapening costs has stimulated interest in the field.

In the northern goldfields—Kimberley, Pilbarra, West Pilbarra, Ashburton, and Gascoyne—mining matters are quiet, but the construction of the Port Hedland & Marble Bar railway now under way, and the consequent reduction in transport charges, should give an impetus to operations.

In the state of Victoria the retrogression noticed in the previous year was not arrested, and a further falling off in the yield has to be recorded. On the principal field, Bendigo, operations were, however, attended with greatly improved results and the yields recorded for the first 10 months of the year 1909 are the best since the year 1904. It is also pleasing to note that the dividends for the first nine months of 1909 reached a total of £123,488, as compared with £97,370 for the same period in 1908. The full benefit of the dead work performed during the preceding year was reaped, and, taken altogether, the results contributed by the mines on this field were satisfactory. It is particularly noticeable, however, that the gold was won from the shallower levels, operations at depth not having been attended with the results anticipated. Dredging and sluicing operations still continue to contribute good returns. The decreased production is mainly due to the lessened output from the quartz mines at Walhalla, and from the deep alluvial workings.

The output from the state of Queensland is expected to approach closely to that of the preceding year. During the early months of the year under review the yield was unfavorably affected by the falls of roof at the Mount Morgan mine, which necessitated the suspension of operations at a place from which large supplies of ore were being drawn. It was not possible to face the contingency immediately and to secure sufficient ore from other parts of the mine, so that several of the furnaces had to be closed down for a period. The difficulties have now been surmounted, and during the closing months of the year the deficiency was rapidly liquidated. While there is nothing to record in the way of exceptional discoveries, still there was a steady and consistent output from the principal fields, including Charters Towers and Gympie. This position is clearly reflected by the dividends paid during the nine months of the year which amounted to £324,894, or £70,399 in excess of those for the same term in 1908.

In the state of New South Wales the gold-mining industry was particularly lifeless. The bulk of the yield continues to be furnished by the mines on the Cobar field, and by the dredges. The output from the Adelong division exhibits a satisfactory increase, but against this there was a considerable falling off in the yields from the Wyalong and Hillgrove fields. The state has been favored with exceptionally good seasons, and the pastoral and agricultural industries have found employment for so many additional hands that gold mining, or more particularly the prospecting for gold, has been comparatively neglected.

In Tasmania the yield was contributed mainly by the Tasmania gold mine at Beaconsfield, and by the Mount Lyell mines.

In South Australia the small returns from the gold mines at Mount Torrens, Petersburg, Glenloth, and Tarcoola were supplemented by contributions from the mines at Arltunga and MacDonnell ranges in the northern territory, also by the gold recovered by the Wallaroo & Moonta Copper Company. Reports of recent discoveries at Tanami in the northern territory are such as to emphasize the future possibilities of the "dead heart" of Australia.

In the Dominion of New Zealand the Waihi mine contributed another magnificent output, and still further enhanced its record. During the period ending with the first week in August this mine contributed gold to the value of £569,855, which brought the total value of the yield up to that date to £7,790,090. The dividends paid to Dec. 1, 1909, totaled £3,615,188. The Talisman Consolidated mine on the Karangahake goldfield is the next important producer and the operations conducted during the year have been attended with the most gratifying results. The additions and improvements made in the plants at these mines enabled an increased tonnage to be dealt with, and the indications point to a still larger output being contributed during the coming year. Dredging operations, though not conducted to the same extent as in previous years, still continued to supply good yields in the aggregate. Alluvial mining did not make any noteworthy progress, and owing to the gradual exhaustion of the deposits, a decreased output from this source is naturally to be expected. Taken altogether however, the gold-mining industry in the Dominion is in a flourishing condition.

Silver-lead Mines

The year's results proved disappointing, as owing to labor troubles, mining operations on the Broken Hill field were suspended on several of the large mines from the beginning of January until early in May. The concentrates despatched from the field during the first nine months of the year consequently showed a decrease of 160,972 tons and £630,648 in value. The Broken Hill Proprietary Company did not resume mining operations, but entered into a contract with several of the other companies for the purchase of lead concentrates, while the retreatment plants are kept running on the tailings which have accumulated to the extent of some 3,000,000 tons. The developments at the lower levels of the mine were unsatisfactory, but it is estimated that there are still several million tons of ore remaining to be extracted. Work is not, however, likely to be resumed below ground until a substantial rise takes place in the prices of metals. The fire in Block 11 mine is kept well in check. The output of this company for the half-year ending with May was only 438,109 oz. silver and 7609 tons of lead, as compared with 2,926,148 oz. silver and 47,842 tons of lead for the previous half-year. At the South mine it is estimated that the reserves of ore in sight above the 970-ft. level are sufficient to enable the present rate of output to be maintained for at least 13 years. The new mill is kept running full time treating about 7000 tons of ore weekly and producing 1000 tons of concentrates, and an appreciable reduction in working costs is shown. At the Central mine the bottom levels are opening up better than expected, and a big lode has been located at the 1100-ft. level. A good deal of ground crushed by the creep has again been opened up for production work. At Block 10 mine a new level is being opened up at a depth of 1615 ft., as on account of the orebody being comparatively narrow, operations have to be vigorously prosecuted at the deeper levels to keep the mill supplied. Block 14 mine is producting carbonate ore, but no attempt is being made to work the sulphide ores. The developments in the North mine below ground have proved encouraging. The new mill is now in operation, and a large output of concentrates is being maintained. The British and Junction mines remain closed down.

In the state of Queensland operations at the Mungana mines were affected first by a subsidence in the upper levels of the Lady Jane mine, and afterward by a fire in the workings. However, at the Girofla mines work was pushed on to maintain supplies of ore for the smelteries. For the year ending March the output of the reduction works of the Chillagoe company was 786,692 oz. silver, 6753 tons lead, and 2966 tons of copper.

In Tasmania the Zeehan, Dundas, Rosebery and Mt. Farrell mines were persistently worked and the output of silver-lead ore for the first nine months of the year amounted to 66,106 tons, valued at £240,777.

The silver contained in the gold ores of New Zealand, mined during the first 10 months of this year, amounted to 1,504,400 oz., valued at £149,990.

Zinc

The year's operations on the Broken Hill field showed clearly that the difficulties hitherto experienced in recovering the zinc from the vast heaps of accumulated tailings were successfully surmounted. The Elmore plant installed by

the Zinc Corporation proved an unqualified success. The figures for the month of September may be quoted as thoroughly representative of the results secured: Tailings treated, 19,900 tons; zinc concentrates produced, 7395 tons, assaying zinc 45.8 per cent., silver 14.6 oz. per ton, lead 7.5 per cent.; lead concentrates produced 700 tons, assaying lead 57.5 per cent., silver 37.5 oz. per ton, and zinc 17 per cent.; working costs, 9s. per ton. The British Broken Hill Company is remodeling the mill and intends adding an Elmore plant, while Block 10 Company also proposes to install a similar plant. At the Central mine, operated by the Sulphide Coporation, the flotation (Potter) processes are doing good work, and have entirely superseded the magnetic plants. The Amalgamated Zinc (De Bavay's, Ltd.) is erecting a new mill consisting of two units. It is expected to have one unit in operation by January, 1910, and the other some three months later. When in full swing it is computed that the output will reach 100,000 tons of concentrates per annum. Contracts have been entered into for the sale of 90,000 tons of concentrates per annum for the next three years, and 70,000 tons per annum for the succeeding seven years. The Broken Hill Proprietary Company reports that the tube mills installed in connection with the zinc-treatment plant showed a great improvement in the recovery of the zinc. The flotation plant of this company also produced a large quantity of zinc concentrates. The construction of the spelter plant at Port Pirie was pushed, and it should be completed and in operation at an early date. Even after making considerable allowance for the fact that expectations as to the results likely to be secured may not be fully realized it is apparent that the Broken Hill field has become an important factor in the world's supply of spelter.

PRODUCTION OF MOUNT LYELL COMPANY.

Year.	Ore Treated, Tons.	Metal Produced.		
		Copper, Tons.	Gold, Oz.	Silver, Oz.
1905	412,273	8,203	24,290	739,691
1906	394,752	9,009	23,088	703,945
1907	406,397	7,886	19,449	700,087
1908	401,983	8,641	19,532	681,262
1909	393,749	8,815	13,344	728,707
	2,009,154	42,554	99,703	3,553,692

Copper

The accompanying table gives the output of copper by the Mount Lyell Company, Tasmania, during the years ending with September. The production for 1909 is slightly in advance of that of the preceding term. The assay value of the Mount Lyell pyrites was a little higher, and this is responsible for the increased copper production. Prospecting work was vigorously carried out by the company with encouraging results. The most important development was the proving at the 1000-ft. level in the North Mount Lyell of the downward continuation of bornite ore of a payable grade. The area of the orebodies in the higher levels of this mine, and particularly at the 700-, 850- and 1000-ft. levels, was proved by actual work to exceed that originally estimated, so that the reserves were considerably added to. The cost of producing blister copper for the year ending September was $3.69 per ton of ore treated. Since August, 1903, this company has contributed an output of 51,667 tons of copper, 4,466,200 oz. silver, and 124,691 oz. of gold.

At the Wallaroo & Moonta Company's mines in South Australia operations were continued on similar lines to those of 1908, although the output of copper was slightly increased. With the low prices ruling only very small quantities of outside ores were available on purchase account. The production of copper for the year from all sources, including what is derived from cementation, is expected to be about 5900 tons. The cost of producing "Wallaroo" ingot copper f.o.b. ocean steamer in 1908 was £54 16s. 8d., and for 1909 it is estimated approximately as follows: Mining, £39 3s.; smelting, £14; shipping and other charges, £1 2s.; total, £54 5s. per ton. The material smelted during the year amounted approximately to 170,000 tons. General development work at the mines was fully maintained, and a considerable expenditure was incurred at the Wallaroo mines, and at the smelting works in effecting improvements, and in additions to the plant.

In Queensland the output of copper was on an increased scale, the official figures for the first nine months of the year 1909 fixing the value at £659,885, as against £621,408 for the corresponding period in 1908. The accompanying table showing the output for the year ending with May indicates that the Mount Morgan Company has made headway.

These figures are all the more satisfactory when it is considered that the serious falls of roof which occurred in the months of September and November, 1908, checked operations and interrupted the supplies of ores, with the result that several of the furnaces had to be put out of commission. Operations have since proceeded on an increased scale, and in July the monthly output of copper reached 702 tons, and the production of copper for the first nine months of the year 1909 totaled 4523 tons. The development work undertaken showed that even larger quantities of auriferous copper ore are available than previously estimated, so that the future prospects of this company are bright. The basic ore which is being obtained from the Many Peaks mine obviated the use of ironstone and limestone fluxes, so that not only was the cost of treatment reduced, but a considerable quantity of ore hitherto regarded as unprofitable can now be successfully utilized. The other mines in the northern part of the State are developing well, and as they are being connected up and brought into communication with the seaboard by rail, a large increase in the production may safely be forecasted.

In New South Wales the principal copper producing mines were the Great Cobar, the Grafton, and the Kyloe. The other mines, owing to their lack of connection with the railway system, found the cost of transport too great to permit of operations being successfully prosecuted. The Great Cobar Company at the outset experienced some difficulty in operating the new furnaces installed, and the output was affected on this account. The blister copper produced during the first nine months of the year by this company is estimated to contain 4774 tons copper, 12,893 oz. gold, and 76,518 oz. silver. The developments underground have been particularly satisfactory.

OPERATIONS OF MOUNT MORGAN MINE.

Year.	Gold, Oz.	Copper, Tons.
1906	117,197	483
1907	145,138	4,087
1908	153,091	5,561
1909	138,341	5,799

The Port Kembla works of the Electrolytic Refining and Smelting Company of Australia, Ltd., have been in operation for practically a year. This company deals with the whole of the output of blister copper from the Mount Morgan mine. The smelting department drew supplies of mattes and ores from all parts of Australasia, and although production was materially restricted by the low price of copper, the refinery was able to more than justify its existence. Already the "E. S. A." brand of electrolytic copper has earned favorable recognition in the European markets and with the return of healthful conditions in the mining industry, it would seem that the works will require enlarging.

Tin

In the state of Tasmania the output of tin ore was well maintained, the official returns for the first nine months of 1909 giving the yield as 3208 tons, valued at £336,824. The vigorous policy of prospecting adopted at the Mount Bischoff

mine has resulted in the ore reserves being considerably augmented, and the existing plant was largely added to with the object of increasing the output and lessening working costs. The company was enabled to maintain the remarkable run of dividends, which have now reached a total of £2,187,000, or £182 5s. per share. The Briseis mines continued to furnish tin ore in good quantity, and the output during the month of October, including a portion from the New Brothers No. 1 property, amounted to 88 tons.

In the state of Queensland the industry shows a marked retrogression when compared with the preceding year. The value of the output for the first nine months of 1909 totaled only £165,988, or £111,-181 below that of the preceding term. The decrease is largely due to labor troubles causing a cessation of operations at the principal mines during the earlier months of the year. At the Stannary Hills mine a new plant was erected, and enabled a greatly increased output to be handled at a reduced cost. Development work disclosed that there is sufficient ore at present in sight for three years' work. The Vulcan mine showed considerable improvement during the latter months of the year, and there was a marked increase in the output. The latest reports indicate that a continuation of good crushings may be looked for, as operations disclosed the existence of bodies of ore in portions of the mine previously regarded as worked out. The main shaft at this mine was put down to a depth of 1450 ft. The Smiths Creek mines continue to produce ore of good quality, and the work of development is progressing on satisfactory lines.

In New South Wales the dredges continued to furnish the bulk of the yield, but some of the richer areas have been worked out, and a constant diminution in the yield is therefore, to be expected. The value of the tin and tin ore exported from this state during the first nine months of the year was £231,671, or £19,-935 less than on the preceding year.

In West Australia the output of tin ore has been on a restricted scale, but it is expected that the construction of the Port Hedland & Marble Bar railway will give a stimulus to production.

Other Minerals

Respecting the numerous other minerals mined there is little of interest to report, operations having been governed largely by market conditions. From Queensland good supplies of wolfram continue to be drawn, while at Hillgrove in New South Wales, mining for scheelite was fairly active.

West Africa, Gold Coast and Ashanti

BY W. FISCHER WILKINSON *

The gold production of the Gold Coast and Ashanti, West Africa, during 1909 is expected to amount to £950,000, a figure considerably below that won during 1908, the reason being that several of the mills were shut down. The principal producing mines and the total output for the last ten years are given in the accompanying tables.

The Ashanti Goldfields and Abosso improved their production as compared with 1908 but Taquah did not do so well.

GOLD PRODUCTION OF GOLD COAST COLONY AND ASHANTI.

Year.	£	Year.	£
1900	38,006	1905	657,330
1901	22,186	1906	877,568
1902	96,880	1907	1,154,885
1903	254,790	1908	1,182,680
1904	345,608	1909	950,000*

*Estimated.

Broomassie and Bibiani remained about the same. Prestea Block A, Abbontiakoon Block I, and Wassau, which gave a considerable production in 1908, milled only in the early months of 1909. The Akrokerri company, which appeared in the producing list in 1908, went into liquidation. The Ashanti Goldfields, Abosso, Prestea, and Abbontiakoon maintained their grade, but the others showed a decrease, which was especially marked as regards Taquah and Broomassie. Attention was called last year to the high grade of Taquah as compared with other mines of the banket group. The dredging companies contributed a small amount to the production.

*Consulting mining engineer, London.

Ashanti Goldfields

The Ashanti Goldfields Corporation improved its position decidedly during 1909 and is now perhaps the strongest mining company in the Colony.

Justice's Find, the new orebody of great width and value discovered in 1908, continued to open up well, and the development of the mines at Obuasi was of a favorable character. The main oreshoot of the Obuasi mine, which was cut at the third level of the Ashanti mine last year, was further developed on that level as well as on the sixth level. On the third level the oreshoot was proved to have an average width of 8 ft. and an average value of 3 oz. gold for a length of 502 ft. On the sixth level the same oreshoot proved to be shorter—about 220 ft. long—and to assay 27 dwt. over a width of 15 ft. The ore reserves at all the mines at the end of October were valued at over half a million tons of a gross value of two million pounds sterling, with an estimated profit in sight of over a million sterling.

GOLD COAST AND ASHANTI PRODUCING MINES IN 1909.

	Date.	Tons.	Value of Yield.	Value per Ton.
				s.
Ashanti Goldfields	Jan.-Oct.	45,754	£174,641	50.6
Abosso	Jan.-Oct.	55,142	132,622	48.0
Taquah	Jan.-Oct.	50,933	114,539	44.8
Broomassie	Jan.-Sept.	20,036	81,269	80.1
Bibiani	Jan.-Oct.	45,754	79,703	34.4
Abbontiakoon *a*	Jan.-May	27,439	48,218	34.6
Wassau *b*	Jan.-April	22,250	29,050	27.8
Prestea (Block A)*c*	Jan.-June	46,500	79,377	34.0

a Shut down June. *b* Shut down May. *c* Shut down July.

For the year ended June 30, 1909, 70,-345 long tons were milled, yielding bullion to the amount of £174,368 or 49s. 5d. per ton (44s. per short ton of 2000 lb.). The cost of mining, milling and general mine expenditure was 24s. ($5.84) per long ton. Freight and insurance of bullion, London expenses and the royalty of 5 per cent. of the gross value of bullion payable to the Government came to 4s. 7d. per ton. Depreciation and development account for 6s. 7d. per ton, making altogether a working cost of 35s. 2d. ($8.56) per ton. The development expenditure charged to working cost, it may be noticed, was only 25 per cent. of the expenditure incurred during the year, and though it may be a fair figure, it would have been sounder policy to have charged it all away to working expenditure.

The process of amalgamation followed by cyaniding was discarded, as no better extraction than 60 per cent. could be obtained by that method. The ore coming from the mine was crushed dry in ball mills, roasted in Edwards' furnaces and leached with cyanide solution, an extraction of 93.5 per cent. being obtained; the cost of mining was 6s., and of reduction 14s. per ton. The oxidized ore from Justice's Find was crushed wet and filter-pressed, at a cost of 10s. per ton for treatment and 4s. for quarrying, an extraction of 87.2 per cent. being obtained. The Obuasi ore yielded 15.14 dwt. and Justice's Find ore yielded 14.76 dwt. per ton. Having regard to the large increase in the ore reserves it was decided to in-

crease the capacity of the reduction plant from 7000 to 10,000 tons per month, when it is expected that the total costs will be 32s. per ton of 2240 lb., and the profits about £24,000 per month.

ORE RESERVES IN GOLD COAST AND ASHANTI MINES.

	Date.	Long Tons.	Value per Ton, dwt.
Abbontiakoon	April 30, 1909	117,000	13.3
Abosso	July 31, 1909	265,000*a*	11.3
Ashanti Goldfields	Nov. 30, 1909	519,300*b*	18.2
Bibiani	Dec. 31, 1908	61,000	14.47
Broomassie	Dec. 31, 1908	9,851	32.6
Broomassie	Dec. 31, 1908	70,000	7.0
Prestea (Block A)	July 31, 1909	327,000	11.0
Taquah	June 30, 1908	176,971	21.8
Taquah	July 31, 1909	66,000*c*	26.0
Wassau	Jan. 31, 1909	137,475	7.2
Cinnamon Bippo	June 30, 1909	213,000	7.97

*a*Estimate of Arthur Wilkinson, inspecting engineer.
*b*Excluding 8 to 9 dwt. ore.
*c*Estimate of Arthur Wilkinson of ore in rich section.

Recent Reports Optimistic

The goldfield was a disappointment on the whole to its supporters up to the present time. Money was poured into the country with little return. In spite of previous failures a large amount of fresh capital was found in 1909, under the lead of the Consolidated Goldfields of South Africa, for giving the field another trial. This renewal of confidence is the outcome of a favorable report made by Walter Broadbridge, who expressed confidence that the mines could be made to pay. "The industry," he said, "needed energetic measures; the problem was to be solved by organization, development and, in certain instances, reconstruction. Development far in excess of that existing was necessary in order to provide for 100-stamp equipments with a big margin of ore reserves." In concluding a lengthy report he said that he hoped he would not be considered unreasonably optimistic in stating that the Gold Coast, including the Tarkwa field, in spite of the bad climate, has the makings of an industry which, if cerefully fostered and placed on a more substantial footing, will become one of the most important gold producers in the world.

This report was indorsed by J. H. Curle, who visited the country toward the end of 1908, and whose conclusions were summed up as follows: (1) It is a great goldfield, and if properly handled it should become a valuable one; (2) facilities for cheap working—outside of the climatic factor—are good; (3) the climatic factor is not so serious as has been thought.

As regards the climatic factor, Mr. Curle laid great stress on the necessity of exterminating the malaria mosquito. His plan was to cut down all growth for a mile round the mine, sow there a thick creeper grass, drain all damp ground, organize a supply of good food and in a word do everything that the experts of the tropical school of medicine could suggest.

Another favorable report written in 1909, dealing principally with the Taquah, Abosso and Prestea mines, is one by Arthur Wilkinson, an engineer of Rand experience. Unlike Mr. Curle, Mr. Wilkinson thought that labor was the crux of the whole question of successful gold mining in West Africa.

These reports have been quoted somewhat extensively as they led to the investment of large sums for the further development of the goldfield, sums which call for large profits from the mines to provide for adequate interest and redemption. The market valuation of West African mining stock now runs into millions and the future is alarmingly discounted. The gold production is now about one million sterling and the profits probably scarcely one-tenth of that. Very large increases are therefore needed to justify the prices at which the mines are now valued. Most of the money recently subscribed will go into the mines which are crushing or have been crushing, but some of it will be employed in testing the ground between the known oreshoots. The evidence so far obtained of the banket being payable over wide areas, as on the Rand, has not been encouraging and until more favorable results are obtained the valuation of companies by claim area, which is sometimes done, is to be deprecated.

Rhodesia

BY W. FISCHER WILKINSON *

The gold production of southern Rhodesia, that is of Rhodesia south of the Zambesi river, for the first ten months of 1909 was £2,156,999 and, allowing £431,400 for November and December, the total for 1909 may be expected to be about £2,590,000, somewhat in excess of the production of the previous year. The statistics in the accompanying tables are those of the Rhodesia Chamber of Mines, which happily from a statistician's point of view, changed its financial year to commence Jan. 1 instead of April 1.

As in 1908, the production was largely made up by a large number of small producers. There were about 115 companies or individuals making returns, a large number of whom worked with a five-stamp battery, or with chilean mills, Huntington mills, Wheeler pans or dollies. The 14 largest companies mentioned in the table accounted for about 46 per cent. of the output. The 101 other producers had, therefore, an average output of about £14,000, and if a few more of the larger producers had been added to the list of fourteen, the figures would have been still more striking.

Besides gold the country produced silver (contained in the gold bullion), lead, copper, chrome iron, wolfram, coal, antimony, asbestos and diamonds, aggregating about £200,000. As regards diamonds, an action brought by the British South Africa Company against the De Beers Consolidated Mines, Ltd., is now being tried to determine the validity of the De Beers diamond concession.

GOLD PRODUCTION OF SOUTHERN RHODESIA.

	Tons Milled.	Value of Gold Won £	Value per Ton, s.
Prior to Sept. 1, 1898	....*	23,456	.....
Sept. 1, 1898, to June 30, 1899	81,841	177,072	43.26
July 1, 1899, to June 30, 1900	104,746	208,877	39.88
July 1, 1900, to March 31, 1901	140,716	320,457	45.54
Year ended March 31, 1902	249,667	640,661	51.32
Year ended March 31, 1903	338,156	709,461	41.96
Year ended March 31, 1904	516,747	845,359	32.71
Year ended March 31, 1905	787,936	1,113,068	28.25
Year ended March 31, 1906	1,100,609	1,556,741	28.28
April 1, 1906, to Dec. 31, 1906	1,051,908	1,531,481	29.10
Year 1907	1,610,875	2,178,886	27.05
Year 1908	1,819,230	2,526,006	27.77
Year 1909†	1,850,000	2,590,000	28.00

*No details available. †Partly estimated.

The Mines

The most important mines as far as output is concerned, were the Globe & Phœnix and the Eldorado. The former mine has been working a number of years, and is probably the deepest mine in the country, the main shaft being 2300 feet deep. The bottom of the mine developed well, and a large increase in the profits was obtained. The ore reserves, which on Dec. 31, 1908, had a gross value of £485,020, were estimated on Sept. 30, 1909, to have a value of £1,045,151. The Eldorado mine, which commenced crushing in 1907, also turned out well. The ore worked is popularly described as "banket," though it has little resemblance to the Rand banket, having

*Consulting mining engineer, London.

the appearance of a hornblende schist or gneiss containing pebbles and boulders. During the year a fresh issue of capital was made for the purpose of adding to the plant and for sinking a new main shaft and an extension shaft.

OUTPUT OF PRINCIPAL MINES OF RHODESIA FOR NINE MONTHS ENDED, SEPTEMBER 30, 1909.

Name of Mine.	District.	Gold Produced.	Reduction Plant.
Bucks	Buluwayo.	£36,227	4 stamps.
Bush Tick	Buluwayo.	24,621	20 stamps, 1 chilean mill and 2 pans.
East Gwanda	Buluwayo.	75,331	60 stamps, 1 chilean mill.
Lonely	Buluwayo	40,940	10 stamps.
Gaika	Gwelo.	43,626	5 stamps, and 1 chilean mill.
Globe & Phoenix	Gwelo.	169,466	40 stamps, and 3 Wheeler pans.
Selukwe	Gwelo.	50,562	40 stamps.
Surprise	Gwelo.	34,020	20 stamps.
Wanderer	Gwelo.	55,305	Rolls, dry process.
Battlefields	Hartley.	46,763	2 Huntington mills, 1 chilean mill and 2 pans.
Giant	Hartley.	52,591	15 stamps, 1 tube.
Eldorado	Lomogundi	127,474	20 stamps, 2 chilean mills and 8 pans.
Jumbo	Mazoe.	65,048	30 stamps.
Penhalonga	Umtali.	67,254	60 stamps, 4 Huntington mills.

The Selukwe mine, one of the oldest mines in the country, was a producer, the gold won in the last financial year having amounted to over £63,000, but the operations were carried on at a loss. The Wanderer mine has been working a low-grade, auriferous deposit in the Selukwe district for some years, but was not a financial success. During the year a reconstruction of the capital was made to purchase the Camperdown property, which will be brought into connection with the Wanderer mill by a ropeway two or three miles in length. The Wanderer mine was worked as a quarry and the ore milled by a dry-crushing plant.

The Giant mine, which had to curtail operations last year on account of the collapse of its main shaft, will shortly be milling on the old basis. The mill is being increased by 15 stamps, and an output of 12,000 tons monthly arranged for. The new shaft, which is "timbered" with steel sets, was down to the sixth level (708 ft.) in July. The orebody is a wide schistose lode. On June 30, 1909, the ore reserves were 204,846 tons valued at 10.4 dwt. The mine is expected to be one of the largest gold producers of Rhodesia.

The most interesting event of the year was the discovery in the Abercorn district, at a place situated about 60 miles northeast of Salisbury, of an auriferous conglomerate. This conglomerate is reported to be similar as regards origin, though not in appearance, to the "banket" of the Eldorado mine in the Lomogundi district. This formation had been recognized some time previously, for F. P. Mennel referred to it in a paper presented to the Geological Society of South Africa and classified it with the Eldorado "banket" formation; but its auriferous character does not appear to have attracted much, if any, attention. The Shamva property, on which the most work has been done, has a line of old workings approximately 1500 ft. in length. The Consolidated Goldfields of South Africa has acquired a large interest in this property, and H. A. Piper, the consulting engineer, reported favorably upon it.

The year was marked by a good deal of reconstruction work as regards finance, in which work Rhodesian financiers should now be experts as they have had much experience. A number of fresh enterprises were launched, in which the Transvaal mining community has taken a prominent part—a feature which has a favorable significance. On the whole it may be fairly said that the year was one of progress as regards mining, and that the prospects for the future are encouraging.

The Transvaal

BY W. FISCHER WILKINSON *

In round figures the total gold production of the Transvaal for the year 1909 may be expected to amount to something in excess of £31,000,000, an increase over the production of 1908. The accompanying table, which gives the value of the gold won from the Witwatersrand district and from mines in outside districts, shows—if the war period is neglected—a constant increase year by year.

In spite of the enormous production there is good reason for predicting that the zenith has not yet been reached. The limiting factor today is not so much the extent of ground suitable for mining as the labor required for exploiting the mines, and as difficulty is now being experienced in providing for present requirements, rapid expansion in the gold output is not to be expected.

To illustrate the progress that has been made, it is interesting to compare the returns of the mines of the Witwatersrand district for the month of September with the corresponding figures for the same month of the previous year. In September, 1909, there were 600 additional stamps working and 39 additional tube mills, with the result that the tonnage milled increased 13.4 per cent. The average grade of ore treated, however, was lower by 2s. 6d., and the costs by 6d. per ton, or considerably less than the fall in grade. The total value of gold won was 3.6 per cent. in excess of that won during the same period in 1908. The net profit per ton fell by about 15 per cent.

*Consulting mining engineer, London.

TABLE I. YEARLY PRODUCTION OF TRANSVAAL MINES.

Year.	Witwatersrand District. Tons Milled.	Value.	Value per Ton Milled, Shillings.	Outside Mines Value.	Transvaal Total.
1884–9	1,000,000	£2,440,000	48.83	£238,231	£2,678,231
1890	730,000	1,735,491	47.4	134,154	1,869,645
1891	1,154,144	2,556,328	44.2	367,977	2,924,305
1892	1,979,354	4,297,610	43.4	243,461	4,541,071
1893	2,203,704	5,187,206	47.0	293,292	5,480,498
1894	2,830,885	6,963,100	49.2	704,052	7,667,152
1895	3,456,575	7,840,770	45.2	728,776	8,569,555
1896	4,011,697	7,864,341	39.2	739,480	8,603,821
1897	5,325,355	10,583,616	39.74	1,070,109	11,653,725
1898	7,331,446	15,141,376	41.3	1,099,254	16,240,630
1899	6,872,750	15,067,473	48.84	661,220	15,728,693
1900	459,018	1,510,131	65.82	.....	1,510,131
1901	412,006	1,014,687	49.25	81,364	1,096,051
1902	3,416,813	7,179,074	42.00	74,591	7,253,665
1903	6,105,016	12,146,307	39.79	442,941	12,589,248
1904	8,058,295	15,539,219	38.46	515,590	16,054,809
1905	11,160,422	19,991,658	35.82	810,416	20,802,074
1906	13,571,554	23,615,400	34.8	964,587	24,579,987
1907	15,523,229	26,421,837	34.04	981,901	27,403,738
1908	18,196,589	28,810,393	31.6	1,147,217	29,957,610
1909*	20,800,000	30,073,000	28.8	1,024,000	31,097,000

*Estimated.

Lower Grade of Ore Worked

It will be noticed in the table of production and from Table II that the grade

of ore milled, as measured by the yield, which was about 92 per cent. of the original value, was lower than that treated in 1908, and considerably less than 10 years ago; and, indeed, the figures rather understate the fall in grade because the extraction is now generally higher than in former years. This reduction of grade was due mainly to the deliberate policy of taking out of the mines ore of lower quality than was formerly mined.

TABLE II. RETURNS FROM TRANSVAAL ORES.

	Recovery per Ton.	Costs per Ton.	Dividend per Ton.
	s.	s.	s.
1897	39.7	29.6	10.2
1898	41.3	28.0	13.0
1899	43.8	34.8	8.9
1903†	39.8	28.8	11.0
1904	38.5	29.0	9.5
1905	35.8	27.2	8.5
1906	34.8	26.4	8.2
1907	34.0	25.0	9.0
1908	31.6	22.2	9.4
1909	28.8*	19.6*	9.2*

*Estimated. †1900-1902 War period.

Note—Table compiled from returns of gold mines of the Witwatersrand to show the value per ton received, the dividend paid per ton and the cost of working (here taken as the difference between the value recovered and the dividend).

The effect of this policy is, of course, to lower costs, as the wider the stopes the less is the cost of mining. It has also the effect of adding considerably to the gross production of gold in any particular area. In all mines there are ores ranging in value from zero up to the highest grade, and one of the most difficult problems that a mine manager has to face is to decide what is the ideal grade. If he mines closely he gets a large profit, high costs and a reduced life. If he aims at getting every ton of ore out of the mine that will pay expenses he gets low costs, small profits or none at all, and a long life. He has, therefore, to strike the happy medium and extract a grade of ore that will give what he considers the best results.

Opinions differ as to whether the policy of including low-grade ore has not, in the majority of cases, been carried too far. I think that it has, and that in many cases a raising of the grade at the expense of longevity and of the working costs would produce better financial results for the shareholders. The subject is too technical to be discussed at length here—the reader must go to the transactions of the technical societies for detailed examination of the subject—but attention may be called to the great influence that the law of compound interest has in deciding the question of ideal grade. Gold is not productive until it is extracted from the mine and turned into bullion. And it is this principle which so strongly favors the policy of mining a high- instead of a low-grade ore.

If a mine has a life of 20 years on a basis of producing 500,000 tons per annum at a profit of 20s. per ton, its present value, assuming the investment is required to pay 6 per cent. and to give back the capital at the end of the life by a sinking fund invested at 3 per cent., is about £5,150,000. If the grade is reduced so as to give a 15s. profit per ton, the life must be extended to about 50 years in order to obtain an equivalent present value, or, in other words, to make the change of policy justifiable.

The lowering of the grade has, therefore, to be treated with great caution. Many of the mines now working are no doubt low-grade by nature, but there are probably not a few in which the grade has been reduced below what is financially sound for the sake of low costs and extended life.

TABLE III. DISTRIBUTION OF GOLD WON IN THE TRANSVAAL.

	1906.		1907.		1908.		1909.	
	£	Per Cent.	£	Per Cent.	£	Per Cent.	£	Per Cent.
Working costs	14,637,043	66.23	17,000,000	63.813	16,600,000	58.2	17,860,000	57.64
Dividends	5,234,750	23.69	6,750,000	25.337	8,000,000	28.1	9,300,000	30.01
Profits tax	475,000	2.15	600,000	2.252	740,000	2.6	928,275	3.00
Reserve fund, Debenture, Redemption, Machinery, Renewals, etc.	1,753,914	7.93	2,290,490	8.598	3,168,368	11.1	2,897,693	9.35
	22,100,707	100.00	26,640,490	100.00	28,508,368	100.00	30,985,966	100.00

Note—Year ended June 30. Compiled by Consolidated Goldfields of South Africa from Mines Department Statistics.

The larger scale of working also had a beneficial effect in reducing costs, as it allowed the fixed charges to be spread over a larger tonnage. Besides the reductions resulting from the above causes, reductions were made by improved methods of mining and by increased efficiency of labor.

The system of breaking ore on day shift alone was adopted on several mines with great advantage to ventilation and, therefore, to the efficiency of the workers. The single-shaft system also allowed of better supervision. The increased use of electric power contributed considerably to the reduction in costs. In metallurgical work benefits were obtained through the use of heavier stamps and of improved appliances for handling sands.

There were thus several influences at work to bring about a reduction in costs, and it is not easy to apportion them. The popular explanation is that this reduction was due to large-scale working, an explanation which the advocates of amalgamations strongly support. But, although some appreciable reduction was no doubt due to this cause, owing, as noted above, to the reduced weight of fixed charges, I believe it is mainly the policy of working poorer ores that has created the fall in costs. Both breaking and development benefit largely by the adoption of this method of working.

The favorable influence of modern plants and shafts must also be noted. One of the most cheaply worked mines, as well as one of the deepest, is the Simmer Deep. During the month of September, 1909, the costs at this mine were only 12s. 7d. per ton, and that on a production by no means the largest on the field. These costs compare favorably with an old established mine like the Robinson Deep, which works a larger tonnage for 16s. 6d. per ton. As a general rule, it will be found that the mines with the lowest costs are those with wide reefs and large mills. Where the reefs are narrow and where, consequently, a be less. I noted this point in the 1908 review, saying that in comparing costs it was necessary to remember that the ton of today was not the ton of yesterday—meaning, of course, that it differed in quality. I make this explanation because I have been questioned as to my meaning.

TABLE IV. ANALYSIS OF WORKING COSTS IN THE TRANSVAAL.

	1906.		1907.		1908.		1909.	
	£	Per Cent.	£	Per Cent	£	Per Cent.	£	Per Cent.
White wages	5,049,780	34.5	5,946,000	34.98	5,650,000	34.0	6,050,000	33.87
Colored and Chinese	2,781,038	19.0	3,241,900	19.07	3,400,000	20.5	3,900,000	21.84
Stores	5,781,632	39.5	6,439,600	37.88	6,300,000	38.0	6,630,000	37.12
Sundries	1,024,593	7.0	1,371,900	8.07	1,250,000	7.5	1,280,000	7.17
	14,637,043	100.0	17,000,000	100.00	16,600,000	100.0	17,860,000	100.00

Note—Year ended June 30. Compiled by Consolidated Goldfields of South Africa from Mines Department statistics.

Working Costs

Owing largely to the policy of working lower-grade ores, costs showed a marked diminution over those of previous years. It must be obvious that when wider stopes are kept and ore which in former years was left in the mine is sent to the mill, the cost calculated on the diluted ton will

large production cannot be maintained, the costs are comparatively high, but it does not follow that the mines are being less efficiently worked. To illustrate the general effect of large-scale working, the accompanying analysis (Table V) of 60 companies making returns for August, 1909, has been prepared.

TABLE V. AVERAGE MILLING COSTS ON THE RAND.

Tons Milled per Month.	Number of Companies.	Average Cost per Ton Milled.
		s. d.
Under 10,000 tons...	12	22 8
10,000 to 20,000....	15	19 2
20,000 to 30,000....	12	17 4
30,000 to 40,000....	8	16 2
40,000 to 50,000....	7	15 0
Over 50,000.....	6	15 4

The results obtained by the six largest producers during August, 1909, are given in Table VI. In the Randfontein South, the East Rand and the Crown mines the milling plant is not in one unit.

TABLE VI. COSTS AT THE LARGE MILLS.

	Yield per Ton Milled.	Costs per Ton Milled.	Profit per Ton Milled.
	s. d.	s. d.	s. d.
Knights Deep..	21 5	12 6	8 8
Randfontein South.....	28 9	19 2*	9 6*
Robinson Deep.	26 9	16 9	9 8
Simmer and Jack.....	26 4	11 10	14 3
East Rand Proprietary.....	29 3	15 2	13 9
Crown Mines...	33 11	16 4	17 2

*Estimated.

Perhaps one of the best ways of illustrating the reduction in costs and in what departments the chief savings were made, will be by giving the detailed costs over a number of years of the Simmer & Jack mine, one of the outcrop companies, which at present is the cheapest worked mine on the field. The reduction in underground costs is striking. Since 1908 the mine was worked on day shift alone, a system that proved very economical.

TABLE VII. WORKING COSTS AT THE SIMMER & JACK.

Year Ended June 30.	1905.	1906.	1907.	1908.	1909.
Tons milled.....	475,181	624,507	717,524	785,310	831,040
	s. d.	s. d.	s. d.	s. d.	s. d.
Mining, hauling and pumping.....	14 3	12 4	11 0	8 11	6 4
Transport of quartz; crushing and sorting; milling and cyaniding.....	5 0	4 7	4 3	4 2	3 9
Development and redemption.....	2 6	2 6	2 6	1 9	1 9
General charges, renewals, maintenance, etc.....	1 6	1 0	1 7	1 5	1 3
Total costs.....	23 3	20 5	19 4	16 3	13 1
Total yield.....	32 0	31 10	33 5*	33 4	29 9
Total profit.....	8 9	11 5	14 1	17 1	16 8

*Includes ¾ reserve gold declared.

Labor

As mentioned above, the question which agitated the mining community most during 1909 was that of the native-labor supply. Table VIII shows the latest statistics of white, colored and Chinese labor employed on the gold mines of the Transvaal, as well as the figures for previous years. The figures are encouraging, showing a steady increase in spite of the repatriation of the Chinese. During the later months in the year there was a falling off in Kafirs which caused considerable alarm, and the outlook for the future was not promising.

The recruiting agencies are making greater efforts, and the shortage is being met to some extent by increased efficiency in the native himself and by the practice of greater economy in labor on the part of the managers. The statistics also show an increase in the employment of white labor, the ratio in August being 1 white to 7.7 natives.

As an example of what can be done by better organization attention may be called to the case of the Simmer & Jack where, during the last financial year, a larger tonnage was treated with a less number of natives. The tonnage increase was 5.8 per cent. and the labor decrease was 12 per cent. The repatriation of the Chinese laborers continued during the year and it is expected that by April, 1910, all will have gone.

TABLE VIII. LABOR EMPLOYED IN TRANSVAAL GOLD MINES.

MINES DEPARTMENT STATISTICS.

		White.	Colored.	Chinese.	Total Colored and Chinese.
1902.....	July.....	8,162	32,616	.....	32,616
	Dec.....	10,292	45,698	.....	45,698
1903.....	June.....	11,825	66,221	.....	66,221
	Dec.....	12,695	73,558	.....	73,558
1904.....	June.....	13,413	74,632	1,004	75,636
	Dec.....	15,023	83,639	20,885	104,524
1905.....	June.....	16,939	104,902	41,340	146,242
	Dec.....	18,159	93,831	47,267	141,098
1906.....	June.....	17,959	90,882	52,352	143,234
	Dec.....	17,495	98,156	52,917	151,073
1907.....	June.....	17,166	111,862	51,517	163,379
	Dec.....	17,697	129,618	37,118	166,736
1908.....	June.....	18,181	147,557	21,460	169,017
	Dec.....	19,605	164,826	12,275	177,101
1909.....	June.....	21,620	175,895	7,317	183,212

Dividends

The dividends declared for the half year, January to June, amounted to £4,549,097 for the Witwatersrand companies, and £50,201 for the outside mines, a total of £4,599,298. The total for the year may, therefore, be expected to be between nine and ten million pounds sterling, showing a considerable increase over 1908. Table IX gives the dividends paid from 1887 to date.

Amalgamations

The policy of amalgamating companies into larger units, which was discussed at some length in the 1908 review, was continued during 1909. The most notable of the amalgamations is that of the Crown Mines, a company formed to acquire several of the most important companies of the central Rand. The advantages officially claimed for the amalgamation were as follows: (1) Considerable prolongation of profitable life, which materially reduces the annual amount investors should set aside for amortization. (2) Increased facilities for maintaining a regular grade of ore. (3) Increased facilities for reducing working costs without impairing efficiency, by centralization of administration and concentration of work. Such reduction spread over the life of the amalgamated company will amount to an important sum.

A large amount of deep-level ground was included in this amalgamation, and it was estimated that the life of the new company would exceed half a century.

Other amalgamations that took place during the year were: The Kleinfontein Deep and the Van Ryn Deep; the Ferguson, East Randfontein, Van Hulsteyn and Johnson, combined into the Randfontein Central; the Consolidated Main Reef, the Main Reef East and the Main Reef Deep absorbed by the Consolidated Main Reef; the Rand Klipfontein and the Klipfontein Estate amalgamated into a company called the Rand Klip; the Lancaster and Lancaster West; the Robinson, Porges, South, North and Stubbs Randfontein into the Randfontein South; the Langlaagte Estate, Langlaate Block B, and the Langlaagte Exploration absorbed by the Langlaagte Estate; the Geldenhuis Estate, Geldenhuis Deep and Jumpers Deep absorbed by the Geldenhuis Deep; the Rose Deep and Glen Deep, the combined companies being continued under the name of the Rose Deep.

Besides these amalgamations, several

of the companies were reconstructed for the purpose of obtaining fresh working capital or additional claims. Among these may be mentioned the Aurora West, the Brakpan, the Western Rand Estates Company, the Main Reef West, the Rand Collieries, the Apex Company, the Meyer and Charlton, the West Rand Consolidated and the Van Dyk. An important change in ownership took place when the Rand Mines Deep Company sold its property to the Rand Mines, Ltd.

From what has been said it will be seen that the year was one of great activity in consolidating mining areas and in reorganizing the finances of a large number of companies. The reconstruction work that has been going on has brought out a large amount of fresh capital, most of which has gone toward developing the eastern Rand.

In the western end of the Rand, activity was not so great, and the goldfield from a producing point of view may still be said to end at Randfontein. On the Western Rand Estates, where the Randfontein series is claimed to have been proved by boring some years back, active development work is proposed, so that perhaps in the near future this end of the Rand may attract more attention.

TABLE IX. DIVIDEND LIST OF TRANSVAAL GOLD MINING COMPANIES.

Year.	Dividends.	Year.	Dividends.	Year.	Dividends.
1887	£12,976	1895	£2,046,852	1903	£3,362,237
1888	112,802	1896	1,513,682	1904	3,928,487
1889	432,541	1897	2,707,181	1905	4,857,539
1890	254,551	1898	4,864,973	1906	5,735,161
1891	334,698	1899	3,109,041	1907	7,131,612
1892	901,470	1900	nil	1908	8,751,282
1893	955,358	1901	415,813	1909*	4,599,298
1894	1,532,284	1902	2,121,126		

*January to June.

Notable Events

Of the notable events of the year, the heavy floods, which took place in January and which for a time caused considerable trouble to the mines and in one case a serious disaster, deserve mention. Through the collapse of a dam on the May Consolidated, the Witwatersrand (Knights) mine was flooded, with the result that seven white miners and 121 natives lost their lives. Twenty-four natives were rescued after an imprisonment in the mine of eight days, during which time they do not appear to have suffered very much except from anxiety that the time put in underground would not be paid for. It is at all events recorded that on being brought to surface the first thing they attended to was to see that their time tickets were properly filled in.

The Witwatersrand mine was particularly unfortunate as regards accidents, as another accident took place shortly before the flooding accident just recorded, some lives being lost through gas. It is mentioned here because it produced deeds of heroism on the part of several of the white miners, one of whom, John Jones, happily survived, receiving subsequently the Edward medal which was created by His Majesty Edward VII, in 1907, as a reward for bravery in mines. This is the first time this distinction has been won on the Witwatersrand goldfields.

Another event of the year was the calling for tenders for leases of mining ground owned by the government. Two areas on the farm Modderfontein and one in the central Rand were offered, the conditions being that a certain sum of money, calculated to be sufficient to bring the mine to a producing stage, should be guaranteed and that a percentage of the profits based on a sliding scale should be paid to the government. A further condition is that a portion of the capital shall be offered for subscription to residents in the Transvaal.

During the year the Act of Union agreed upon by the four colonies, Cape of Good Hope, Natal, Orange River, and the Transvaal Colonies, received the royal assent and will come into force next year.

Miners' Rights under Surface Plants

A feature of the year's work was the negotiations between the mine owners and the government with regard to the mining rights of *bewaarplaatsen* and water rights, that is, areas reserved for surface plant or the storage of water. Under the gold law the mining rights under these areas are vested in the government; they are, as a rule, too small to be worked separately, and can be profitably exploited only by the adjoining mines. At a recent meeting of the Meyer & Charlton company, George Albu announced that a satisfactory settlement had been reached. It was agreed that the *bewaarplaatsen* and water rights are to be worked by the mine on the basis of equal division of the profits between the mine and the government.

In order to convert this arrangement into a practical form the present value of the estimated profits to be won from the government ground (less 50 per cent. accruing to the mining company) are to be reduced to a corresponding percentage of the present value of the total profits to be earned over the extended area. In the case of the Meyer & Charlton, the government will get between 10 and 15 per cent. of the profits in return for the *bewaarplaatsen*. This seemed a complicated arrangement and one which will lead to difficulties in the event of the area being still further increased in the future; but it is satisfactory that some agreement was at last reached.

Development in Depth

As regards the continuation of the gold content as greater depths are reached, the work done during the year was, on the whole, satisfactory. Whether the formation becomes impoverished in depth has always been a mooted subject, and even today it is impossible to give a decided answer one way or the other. The falling off in the average yield from year to year is largely due to the practice of working poorer ores than formerly, and is, of course, no proof of impoverishment. The evidence now available seems to indicate that the ores will vary in the deeper workings, just as they do near the surface. At all events, in some of the deepest workings, such as at the City Deep and at Brakpan, good ore was found, while in other places the grade shows a distinct falling off in depth.

One of the best examples of this is the Robinson Deep on the central Rand. The operations of this mine during the last few months did a great deal to shake the confidence of investors in deep-level mines, not so much on account of the lower grade encountered in depth, which may be only temporary, but on account of a sudden heavy fall in the profits which took place. This occurrence, taking into account the value and tonnage of the ore reserves, was not due for a year or so. The Robinson Deep has always been regarded as one of the safest securities on the Rand, and its failure to keep up its reputation is a blow to the credit of the industry generally.

The deepest workings on the central Rand are those of the Village Deep, where the reefs have been cut by the Turf shaft at a depth of about 4000 ft. Only a small amount of development was carried out, but that done was not especially encouraging. The latest report—that for September—gives the following results: South reef at 16th level, 38.5 in., 7.3 dwt.; main reef leader at 17th level, east drive, 58 ft. reef, 51.57 in., 4.89 dwt.; west drive, 64 ft. reef, 44.85 in., 4.03 dwt. A note is made that in the above exposures of south reef and main reef leader there are included upper bands of very low grade which, if persistently poor, might be excluded from stoping operations, thus improving the average grade. In the 18th level the main reef leader, when first cut, showed an average width of 45 in., and an average assay of 13.1 pennyweights.

The City Deep development afforded strong evidence of the occurrence of payable ores at great depths. The workings of this mine are at a depth of 3000 ft., and up to Sept. 30, 1909, the tonnage exposed amounted to nearly 1,500,000 tons averaging 8.9 dwt. (37s.), over a stoping width of 64 inches.

In the far-eastern Rand, good assays were also secured at great depths at Brakpan, where the samplings over a length of 6647 ft. of reef showed a width of 37.2 in., averaging 7.8 dwt. The ore reserves in this mine were estimated in round figures at 400,000 tons, from which 29s. per ton can be recovered. In this mine the main reef was intersected in No. 2 shaft at a depth of 3695 feet.

On the Van Dyk mine, on the other hand, the development work has given disappointing results. At the Simmer Deep and Jupiter mines, which were worked at a depth of from 3000 to 4000 ft., crushing returns of about 18s. and 23s. per ton, respectively, were obtained, recoveries that do not leave a large margin for profit. At the Cinderella Deep, another deep mine, a yield of 30s. per ton was obtained for several months.

Mexico

SPECIAL CORRESPONDENCE

During 1909 the operating mines in Mexico had to contend with the continuation of low prices for silver and copper, the principal mining products, and the developing companies were hampered by the difficulty in securing sufficient capital on good terms, due to the unsettled political conditions in the country which were at an acute stage during most of 1909. The industry, too, had to face the prospect of an increase in ore freight rates on the government-controlled railroads and to adjust itself to the installation of a protective freight rate on imported coal and coke.

The delay in the final passage of the new mining law, enacted in December, 1909, after more than two years' discussion, unsettled many new mining enterprises in which foreign capital was invested, because of the uncertainty as to the final results in regard to the so-called "anti-foreign" clauses of the law as submitted. The large mines met the low prices by introducing economies of operation and improvements in method and equipment.

The political situation improved in recent months and there is now a restored confidence at home and abroad in the permanency of the Government and in the continuation of its liberal policies toward the mining industry and foreign investments. The mining law as enacted is entirely satisfactory, and its main new provisions are considered favorable to the industry even as compared with the former very favorable law. There remains the fact that the combined taxation borne by the industry is heavy, and but little of the money raised by taxation from the mines is returned to their benefit by the way of much needed public and local improvements. This situation is more than offset, however, by the cheap cost of operation, mostly in the labor item and the low prices, comparatively, at which the mines have been and can be bought.

The foreign interests in Mexican mining continue to increase as compared to the Mexican holdings. American capital controls probably in excess of 75 per cent of the operating and developing properties of Mexico. The English interest is next in importance, and in 1908 and 1909 this interest increased. The German and French operations are small, comparatively, although not unimportant. Probably 90 per cent. of the mining operations in Mexico today are controlled by foreigners and mostly owned, too, outside of the country. This is an anomalous condition fraught with an important bearing on the future of the industry and of the country.

The mining industry of Mexico is rapidly entering the industrial stage, in which large operations treating low-grade ores at a small profit are the feature and the basis of the business. This is notably true in the camps of Guanajuato, Pachuca, Santa Eulalia, Cananea, Mazapil and Teziutlan, in Oaxaca and in Jalisco, and in other of the old districts once famous for their production of bonanza ores and now to become noted for their output of great tonnages of low-grade ores, yielding an increased metal product and an increased profit. The success and improvement in the treatment of the abundant low-grade silver ores of the country by cyanidation is the chief factor in this new order, and it is evident to those who know the conditions of the many old mining districts of Mexico that this change is only just beginning. This period of industrial mining requires larger capital, all of which must be secured abroad, and technically skilled men, most of whom come from the United States and from the British mining colonies.

The importance of the mineral areas of Mexico has become more generally recognized in the last few years by reason of the intelligent exploration and competent investigation made by representatives of investing English and American companies, and also by the scientifically directed explorations which have been extensively carried on in the older camps. For example, it is said that there is now more ore developed in the Santa Eulalia camp in Chihuahua than has been taken out of it in 200 years. In Pachuca it is evident that in the next 50 years there is a likelihood that the output will be as great, in the aggregate, as it has been in the last 300 years. There are, too, hundreds of districts in remote mountain localities unsupplied with the economic conditions for mining, which offer certain promise of successful exploitation. These districts are all being investigated and they only await the coming of the right men, with sufficient faith and capital to realize their possibilities.

Gold and Silver

The greater part of the precious-metal production of Mexico has been and is silver. In the times past when silver commanded a higher price, the rich and easily mined bodies of silver ore yielded veritable bonanzas, comparable to the output of any of the gold-mining camps of the world in profit and in total value. With the decrease in the price of silver, however, the output has continued to increase so that silver today makes up the bulk of the precious-metal yield of the country,

The silver production for the fiscal year ended June 30, 1908, was 28,572 kg., and in 31 years, according to government figures, it has exceeded 225,000 kg. The official figures for the current fiscal and calendar year are not available but they will undoubtedly show an increase in the silver output. This increase came mainly from the older camps in which many mills using modern processes and treating large tonnages are now in operation. It is to be noticed that this large silver production comes largely from low-grade ore (running perhaps as high as one "kilo" (32.15 troy oz.) in silver). Much that is treated contains from 400 to 800 grams of silver per ton. Some of the mines of Mexico produce rich ore, 7 to 20 kg. per ton, but this is the exception.

The gold production of Mexico, according to official reports, for 31 years, has amounted to more than 334,228,518 pesos. The gold yield has grown during the period covered by the above statistics from 1,473,912 pesos per year to 38,096,661 pesos for the fiscal year 1908-09. The greater part of the gold production was in connection with the silver output. The gold ratio to silver is fairly constant in most of the camps and runs from four to ten grams of gold to the kilogram of silver. Formerly this was largely lost in the old patio process treatment, but with the introduction of cyanidation most of this gold is recovered. Also considerable gold was produced in connection with the

copper output of the country, which after several months suspension is now greater than ever before. The El Oro camp in Mexico produced mainly gold. There are gold districts in Oaxaca, Puebla, Sonora and Colima, but the operations in most of these, at present, are on a small scale.

Practically no successful placer or gravel operations are under way in Mexico at the present time. The reported rich placers of Sinaloa have been examined and condemned by American dredging engineers. The elaborate attempt to operate placers in eastern Chihuahua has so far failed. Some placer gold is obtained in Sonora, in the Altar district and also from the Fuerte and Yaqui rivers. An American company has undertaken to exploit the old placer deposit in Colima, near the Pacific coast, which in former days produced extensively and which has continued to yield in a small way under primitive methods.

Several attempts have been made to develop the gold district in Oaxaca, with the prospect at present of the successful operation of several small properties. The most notable gold property in Mexico, the Lluvia del Oro in Chihuahua was hindered in operation during 1909 by the delay in the installation of necessary machinery. An English-owned gold property at Mezquital del Oro in Zacatecas was recently revived.

No notable new silver or gold districts were discovered during 1909, but development of the older districts, Guanajuato, Pachuca, El Oro, Parral, Santa Eulalia, etc., gave much encouragement as to the future production of the low-grade, silicious and iron-lead-carbonate silver-bearing ores. The resumption of operations at the Cananea copper mines added to the silver and gold output.

The most notable features during recent times in connection with silver mining in Mexico are the development of the application of cyanidation to the silver ores and the working out of the mechanical and chemical problems which enable the profitable treatment of ores containing as low as 400 grams (12.9 oz.) in silver per ton. In Jalisco important progress has been made.

Copper

There was no particular change in the copper-mining industry in Mexico during 1909. The Cananea mine, the most noted in the country, resumed full production. The Boleo mine, in Baja California, owned by the French Rothschilds, continued to work at full capacity, and is now producing regularly, shipping its products by boat to France. The Cananea company made extensive new installations for ore treatment and improved and changed the methods of mining so that the production is now on a greatly reduced cost basis. The copper smeltery at Teziutlan, in the state of Puebla, was not in operation during the year, but an extensive hydroelectric plant was installed and the smeltery is ready to operate at full capacity, treating the ores from the company's mines at Teziutlan and from Los Ocotes mine, owned by the company in Oaxaca. The Continental mine at Panuco, in the state of Coahuila, was idle during the year, pending investigations as to a special process of the peculiar ores there found. The English-owned Mazapil Copper Company, operating in the northern part of Zacatecas, and with a copper smeltery at Mazapil, continued to produce to normal capacity throughout the year.

The custom smelteries at San Luis Potosi, Chihuahua, Aguascalientes, Monterey and Torreon treated ores from the smaller mines operating in tributary sections. Attempts to develop the mines in the Jalisco districts have been so far mainly unsuccessful owing to transportation difficulties. However, the Carrizo smeltery is now in operation and will shortly increase its output, and a projected railroad will relieve the condition as to transportation in that section.

The ill-fated La Dicha mine, in the state of Guerrero, is in the hands of the creditors, and attempts at development have been abandoned. Another important property is being opened up at La Union in this same state, tributary to a tidewater port. The copper deposits of the state of Michoacan were, in the main, idle during 1909. The property belonging to the Rothschilds at Inguarán has been extensively developed and is said to have blocked out several million dollars worth of ore running from 2 to 4 per cent. copper; but it is impracticable to operate without a railroad and no move has been made toward a railroad so far. Several smaller properties in this state have been developed in a small way, and there is promise of extensive copper production from Michoacan when transportation conditions are improved.

Numerous copper properties were operating during 1909 in Durango and Chihuahua and also in Sonora. An English company is exploring for copper on the isthmus of Tehuantepec at a port called Tonala. The famous mines at Las Minas, in the state of Veracruz, were examined during 1909, but no negotiations resulted.

The attempts to finance the smeltery and copper properties at Zimapan in the state of Hidalgo, have so far not been successful. The prospects are that this district will become an important producer.

No great copper deposits similar to the porphyry copper deposits of the United States have so far been developed in Mexico, but undoubtedly such deposits exist and were entirely overlooked in the effort to find rich ores which would justify working under the adverse conditions which in the main prevail as regards the Mexican copper properties. Several experienced engineers are giving this phase of the copper situation in Mexico attention at this time.

During 1909 the Mexican government granted to the Cananea Consolidated Copper Company the right to import oil free, as a concession to advance the interest of this company and to encourage it to resume production on a large scale. The concession has proved a large item of saving in the operations of this company.

Lead

The main lead production of Mexico comes from the Central Plateau country, where the great camps of Sierra Mojada, Almaloya, Niaca and Santa Eualalia are situated. These lead ores occur mostly as carbonates and are necessary and useful in the smelting operations. The lead production from the numerous mines in the northeastern states of the republic continued large, and was from widely distributed camps. This ore was mostly shipped to the smelteries at Monterey. Most of the lead ores in Mexico carry silver and are available for this reason. The lead, as bullion, is mostly shipped to the United States for refining.

Zinc

The zinc operations in Mexico during 1909 received a decided setback with the enactment of the American tariff. During the early months of the year the ores were shipped to the United States under the disputed tariff ruling and the tariff was paid or guaranteed mainly by the buyers. After the decision which removed this duty was rendered, a considerable increase in zinc shipments resulted, but this was soon stopped by the enactment of the law by Congress which placed a duty of 1c. per lb. on the zinc contents of imported ores. In addition to this the zinc ores, under judicial decision, must pay the lead duty on all lead over 0.1 per cent. With these conditions it was impossible to ship zinc ore to the United States at the prices which prevailed in the early and middle parts of 1909, but with increased prices in the United States the business was resumed, and the shipments of zinc from Mexico are now nearly normal.

Some ore from Mexico is going abroad, particularly from the southern part of the country, but in the main the shipments are to the Missouri-Kansas zinc plants. The chief zinc production is in the northern states, mainly from the limestone deposits.

There are other zinc deposits in connection with the precious-metal veins, as in Parral and at Charcas, and experiments are under way to extract these zinc ores for the purpose of producing a zinc product and at the same time beneficiating the remaining ore. Numerous concessions for zinc smelteries for Mexico were granted in the last half of 1909,

but so far nothing has been undertaken in a definite way in regard to this matter. The whole subject has been thoroughly investigated several times by competent interests and the decisions have been adverse.

Tin

Mexico continued to produce a small amount of tin from the scattered deposits in the Central Plateau country, but no undertakings of importance are under way, and in the main the output was produced by natives using primitive methods and operating on a very small scale. The tin belt extends from Durango to Guanajuato, and the tin deposits are very numerous, but so far no one of them has been of importance.

Iron

The most important iron-mining operations in Mexico were carried on in the northern part of the country, and on the properties tributary to Monterey used as a base of supply for the Monterey iron and steel plant. The Tula iron works in Jalisco were recently taken over by an American syndicate and are now being financed on a highly inflated basis. The Honey iron furnace in Hidalgo operated in a small way, producing a high quality of charcoal iron, and it is expected that the plant will increase its output with the extension of the railroad now being built into that section.

Extensive explorations of the coal and iron deposits in Oaxaca were carried on during the year, with reported good results; and the iron deposits in southern Mexico and on the Pacific Coast were investigated with a view of determining the possibility of deposits suitably situated and sufficiently important to justify development for shipping abroad.

Oil

The oilfields of Mexico continued to be developed extensively, but the results as to production were not altogether satisfactory. The Dos Bocas well produced an enormous outflow of oil, all of which was lost in the subsequent fire which followed the coming-in of the well. A commercial war between the Waters-Pierce Oil company and the Pearson oil interests was waged during the year, and the prospects are that there will be a consolidation of the oil interests at no very distant date. Some oil explorations were carried on in the northern part of Chihuahua by the Hearst-Keene interests, but the results were not made public.

Other Mineral Products

A regular shipment of sulphur was maintained during the year from the deposits at Los Cerritos in the state of San Luis Potosi. This material was sent to Germany. Some sulphur was produced in Durango for the local market, but the amount was small.

Several small shipments of mica were made from the deposits in Oaxaca. The mica occurs in fracture crevices in the limestone and is in the main small, although of good quality.

The shipments of graphite from the mines in Sonora continued. Some attempts were made to develop deposits of this material in the state of Oaxaca.

A deposit of cadmium was reported from near Tehuacan, Puebla, and samples of the product were sent to Germany for investigation, but so far no commercial shipments have followed.

Several attempts have been made to secure vanadium ores from the San Luis Potosi and Zacatecas for shipment. A deposit of mimetite at Zacatecas was exploited during the year and a few tons of ore prepared for shipment, but owing to the complex character of the product, which carried about 2.2 per cent. vanadium, no shipments resulted.

Some nickel-cobalt ores were reported to be mined on the Pacific coast near the boundary between Tepic and Jalisco. Several shipments from this section were made some years ago, and it is likely that other shipments will follow soon, although the deposit is reported to be small.

No attempt was made to work the manganese properties in Mexico. This material is found in several localities and has been exploited in a small way, but owing to the cost of transportation and the comparatively low grade of the product no satisfactory market has been found for it.

The salt deposit at Salinas in the central part of Mexico was extensively operated by an English company, and the government has been negotiating for concessions to operate the extensive deposit on Carmen island, off the coast of Sonora.

Mexico continued to produce a small amount of mercury from several deposits, principally in the state of Guerrero, but the production was much less than the consumption. There are numerous deposits in the country which are now being investigated, and it is likely that some of them will come into the productive list soon. One of these is the Santa Rosa in the state of Morelos.

Coal

The bituminous coalfield in Coahuila, in which nearly all of the operating coal mines are, is 50x40 miles in extent. The coal series consist of shale and sandstone. There are usually two seams of coal, the upper thinner and from 1 to 4 ft. thick, while the lower is from 4 to 10 ft. thick. The present output of this coalfield is about 3500 tons daily; the yearly consumption of coal in Mexico is about 4,500,000 tons, and that of coke is about one-fourth of the coal consumption. The coke output is about one-eighth of the consumption, the deficiency in coal and coke coming from the United States and Europe.

The average cost of mining coal, including the royalty of 20 centavos per ton, timbering, depreciation of plant and surface expenses is from 2 to 2.50 pesos per metric ton. Mine timber is a large item in the cost as most of it is imported from Texas. The labor is cheap, and there are no strikes nor labor-union difficulties. The mining laws as to liability for accidents are favorable to the companies. Clean, washed coal brings, f.o.b. railroad cars at the mine, 6 to 6.50 pesos per metric ton; mixed with shale and bone, 5 pesos per ton.

The coal makes a commercial coke, as good for some purposes as the imported coke. There are now 400 beehive ovens at the Las Esperanzas and Agujita mines. It takes about 40 tons of coal to yield 6½ tons of coke, and the cost of washing and burning is about 1.50 pesos per ton. The coke brings from 15 to 17 pesos f.o.b. cars at the mine.

There is another coalfield in northern Mexico, near the boundary, producing lignite, the demand for which is limited at present. Other coal deposits are in Sonora, Puebla, Oaxaca, Veracruz and Jalisco, but none of them are being commercially exploited at this time.

New Negotiations

The most notable mining deal in Mexico during the year, and in fact for many years, was the sale of the Santa Gertrudis mine at Pachuca to the Camp Bird, Ltd., for 9,000,000 pesos. Negotiations for the La Blanca mines in the same district failed to materialize. The Exploration Company of London has recently taken an option on the Campo Morado mine in Guerrero for 20,000,000 pesos, and is at present examining the property. Several English syndicates have options on important properties in Oaxaca, among them being the English firm of John Taylor & Sons. The Denny Brothers, of South Africa and Australia, have options on Mexican properties for English syndicates. The Cole-Ryan interests have taken over the Concheño mine in Chihuahua formerly controlled by the Greene Gold-Silver Company. Numerous important deals have been made in the Hostotipaquillo district of Jalisco and several negotiations are now under way there.

New Reduction Works

During the year the San Rafael mine at Pachuca completed a new cyanide mill with latest improvements. Work was begun on the mill for the Santa Gertrudis mine, in the same camp, which will now be greatly enlarged by the new owners, the Camp Bird, Ltd. The San Francisco hacienda at Pachuca enlarged and improved its equipment and La Union hacienda was changed from barrel chlorination to cyanide, using chilean mills for grinding. The Seguranza cyanide mill at Zacualpan, state of Mexico, was com-

pleted during 1909, and the Cinco Estrellas mill at Pinos, Zacatecas, also the new Benito Juarez mill, near Pinos. The El Bote mill at Zacatecas was remodeled. In Jalisco, the Virginia & Mexico mill was completed and several other mills started. The Virginia y Tapada mill at Totolapam and the Guebesbe mill at Ocotlan in Oaxaca were built last year. El Oro mills installed auxiliary turbine engines for power to replace the electric power from Necaxa, which was interrupted several times during the year by accidents. Several mills at Guanajuato were enlarged or remodeled during the year, and the new Carmen mill begun; the electric power installation was enlarged to meet the increasing demands. The Veta Colorado mill at Parral was started, but not completed because of financial difficulties; and the Palmilla mill at Parral was begun. Several smaller mills were built in Chihuahua, notably at the Rio Plata and Lluvia del Oro, and the zinc mill at Lagos. Experiments with dry concentration of zinc ores were carried on at Calera, Ahumada, at the San Francisco del Oro mine in Chihuahua and at Charcas, San Luis Potosi. Magnetic separation was installed at Santa Barbara and Parral. New mills were built at Llanos and Alamos and elsewhere in Sonora.

The smelting situation was not materially changed during 1909. The Torreon independent plant installed copper converters. A Monterey plant continued to exclusively refine and part bullion. The Chihuahua plant of the American Smelting and Refining Company and the new Velardeña plant were run to full capacity. A smeltery was built at Zacatecas for the Magistral mine, and one at Balsas for the Maine & Nebraska company. The Carizzo smeltery in Jalisco was completed. The smeltery at Teziutlan, Puebla, was equipped with electrical power from a new hydroelectric installation. A small lead stack was built at Tehuacan, Puebla. The 300-ton smeltery at Fundicion, Sonora, was started but discontinued owing to the lack of suitable ore mixtures. It will be started again soon. The Cananea Consolidated plant was remodeled and greatly improved in efficiency.

Numerous aërial trams were installed in different parts of Mexico during the year and as well as much modern hoisting and mining equipment. Practically all of this new equipment came from the American manufacturers, although some of the tube mills and heavy steel was from Germany and England.

New Railroads

The railroad construction during 1909 was mainly confined to the important Harriman extensions on the West Coast and in Sonora. The Orient road, projected by the Stilwell interests, completed the bridge across the Coñchos river, east of Chihuahua, and made some extensions in that direction, The road has done very little toward connecting the short, but very costly, gap between the westward extension from Chihuahua and the line from the Pacific port. It is announced now that this work will be undertaken and that funds are available for it.

A new line has been projected west from Durango, backed by state and government subsidies, and another line is about realized, extending from Guadalajara to the port of Chamela on the Pacific. Numerous lines in the south of Mexico have been projected on paper during the year, and it is likely that some of them will be realized. Some extensions from the terminus of the Southern railroad at Oaxaca were advanced in construction, and other projects were held up pending the fate of the Southern railroad in reference to the "Merger."

An important railroad line from Toluca to the Pacific has been surveyed, and it is reported that favorable advance has been made toward financing it. Another line from Teziutlan in the state of Puebla to Nautla, a gulf port, is also about to be undertaken.

In the main the railroad advance in Mexico during the year was unimportant, outside of the Southern Pacific operation, and not in accordance with the urgent needs of the extensions from the main trunk-line systems to meet the necessities of the industries of the country for better transportation. The attempt to establish navigation on the Rio Balsas has not been realized as yet, but there is expectation that this important waterway will be utilized in the near future.

A Canadian syndicate has taken over the Sierra Madre & Pacific railroad, leading southwest into Chihuahua from El Paso, and presumably will extend it. This syndicate will also probably become interested in the proposed railroad across northern Mexico from Monclova to Chihuahua. At Guanajuato work has been commenced on a belt-line railroad to connect the mines, and the Central line has extended the branch from Marfil into the city.

Central America

Salvador

The Butters Salvador mines have operated successfully and regularly during 1909. About six miles from these mines some Californians are developing the Mina Gigante and constructing a cyanide plant. Some other operations have been started, but have not reached the point of production as yet.

Nicaragua

Owing to the entirely unsettled state of affairs in Nicaragua very little mining development was undertaken during 1909. The deposits at Rama and Piz Piz near Bluefields have been operating continuously and small mills were installed. The product is gold and the ore is reported of high grade. Important deposits north of Lake Nicaragua have been under negotiation during the year, but owing to the insecure political condition the negotiations have not been consummated. There are a number of important gold camps in the country, which, under favorable conditions, would undoubtedly attract foreign capital. Most of the foreign capital invested in Nicaraguan mines is from America, although some English capital has also been invested there.

Costa Rica

Some American companies have been interested in the gold deposits in Costa Rica, but the results have been somewhat slow in developing and the outcome of these negotiations and operations is more or less uncertain, due to the difficulty of carrying on commercial operations in the country and the lack of transportation and economic and sanitary conditions in some of the camps.

British Honduras

An American company undertook some development work in British Honduras during 1909, but the results are not yet known. The operations are in a region of comparatively high altitude, about 8000 to 9000 ft. above sea level.

Guatemala

There was very little change in the mining situation in Guatemala during 1909, owing to the continuation of unsettled political conditions. Some railroad building was undertaken in the country in connection with the projects for the extension of the Pan-american railway from Mexico through this country, but in the main the progress of railway building and mining has been at a standstill.

Honduras

While silver and gold are the most important metals mined in this country, denouncements have also been made of lead, copper, iron, antimony, zinc and

nickel, and of other mineral products such as opals, kaolin, marble, saltpeter, chalk, coal, asphalt and petroleum. During 1909 only two or three mining companies were in successful operation in Honduras. The most important company is that of the New York & Honduras Rosario Mining Company operating in San Juancinto, in the department of Tegucigalpa. During 1909 it mined and milled 32,790 tons of ore, which yielded 975,500 oz. of silver and 13,130 oz. of gold. The company's production is shipped to New York in the form of cyanide precipitates.

A discovery of copper was reported in the department of Yoro, in which the veins are said to be 14 ft. in width. The copper mines of Guanacostre in the department of Olancho contain high-grade copper ore, but in 1909 were not worked to any extent.

South America

Argentina

The English-owned property, known as the Famatina, has continued to operate extensively and successfully during 1909. The company inaugurated the smelting plant during the year. The mine is in the Rioja province. An aërial tramway and briquetting machinery were installed during the year.

The richness of the Argentina in coal mines and petroleum deposits has long been known but up to the present time these resources have practically lain dormant. Recently activity has been manifested in the exploitation of petroleum deposits in Comodoro Rivadivia. The republic imports annually about $8,000,000 worth of coal, $1,500,000 of petroleum, and $500,000 of naphtha. That these products exist in large and paying quantities in different parts of the country, at Mendoza, Neuquen, and Rivadivia, has been fully established. The San Julian coal, which has the peculiarity of burning without producing smoke, might become a fuel of value for maritime use in case of war, and the Mendoza, San Juan, Neuquen, Salta and Juyjuy coal would find favor as fuel for railroads and industrial companies.

Brazil

No important new mining operations are reported as being inaugurated in Brazil during 1909. Development work has been carried on near Itabira do Matto Dentro in the state of Minas, Geraes, at the micaceous iron-ore deposits, carrying free gold. The deposit is said to be extensive and the gold carries a small percentage of palladium.

The manganese deposits have been worked regularly, but no new deposits have been opened. The central railroad has installed additional rolling stock, to better the transportation conditions in connection with these operations.

American and British representatives have continued prospecting the deposits of hematite in central Minas and work is planned for the deposit of magnetite near the port of Antonina, in Parana. Copper mining has been carried on in the Ceara properties and in the deposits of Rio Grande do Sul. These deposits yield enough gold and silver to pay the working cost, according to reports. The investigations have been continued in the Diamantina district and the production of bort and black diamonds continues to be important.

A variety of pale topaz was obtained from Rio Grande do Sul and tourmalines, beryls and aquamarines are mined to a considerable extent in Minas Geraes. The monazite deposits in Bahia and Espirito Santo have been worked extensively under concessions and most of the product is shipped to Hamburg, where it is used for its thorium content. Further prospecting shows that the monazite has a fairly wide distribution east of Minas and in the state of Rio de Janeiro. The shipment in 1908 was 2000 tons and the shipment for 1909 is probably in excess of this. Some mica is produced in Brazil and sold in Germany. Asphalt is reported along the coast of Bahia.

In general the mineral resources of this vast country are largely unexploited and largely unknown. Some projected railroad building now under charge of American contractors will probably open up important new districts in the near future.

Concerning the alluvial deposits in the state of Matto Grosso in southern Brazil, and which have been attracting attention by reason of the flotations in Buenos Aires, the bulletin of the Bureau of American Republics publishes the following data:

"Of late years many companies have been floated in Buenos Aires to dredge rivers descending from the Matto Grosso central hills. They have almost all been failures. Although gold undoubtedly exists, the difficulty of importing and setting up effective machinery in a district where all experience has yet to be gained, combined with the scarcity of skilled labor, makes the whole business very risky. The safest process of alluvial mining here would be to make share arrangements with a large number of native prospectors and washers, running at the same time a general store in some central position where they could sell their earnings and refit. For, if a river changes its course during a flood (as often happens here) it is much easier to shift an Indian with his tin washpan than to do the same with a 1000-ton dredge, however uptodate. The hills of Matto Grosso are older in formation than the Andes and much more denuded. Such gold particles as they contained are, therefore, today widely distributed in alluvial plains or in the water courses leading to them. The territory is so large that a closer examination might well result in the discovery of feasible workings. Meanwhile the method of grubstaking prospectors and goldwashars on shares, as suggested, is the cheapest method of verifying whether paying deposits exist."

Mining Companies in Brazil

Aurifera de Minas Geraes.
Extraction Mineral Brasileira.
Geral de Minas de Manganez.
Industrial Norte e Oeste do Brasil.
Manganez Queluz de Minas.
Morro da Mina.
Mineracao do Brasil.
Manganez da Bahia.

Belgian Companies.

Cuivre de Camaquam.
Société Belge Brésiliene.
Compagnie de l'Urucum.
Société Ind.—Agric au Brésil.
Minière Belge Brésiliene de Trez Cruzes.

British Companies.

Agua Suja Gold Mining Company.
Brazilian Diamond and Exploration Company.
Brazil Diamond Fields Corporation.
Conquista Xicao Gold Mines.
Ouro Preto Gold Mines of Brazil.
St. John del Rey Mining Company.
Sao Bento Gold States.
S. José Diamond and Carbons Company.

United States Companies.

Brazilian Diamond Mining Company.
Datas Diamond and Gold Company.
Diamond King Mining Company.
Diana Mining Company.
Pittsburg Brazilian Dredging Company.

Rio Plata Dredging Companies.

Brumado Gold Dredging Company.
Cabacal Gold Dredging Company.
Diamantino (Matto Grosso) Dredging Company.
Este Matto Grosso Company.
Matto Grosso Gold Dredging Company.
Rio Plate Dredging Companies.

A list of the operating Brazilian mining companies, incorporated under the federal laws, as furnished by the consul-general for Brazil at New York is given herewith.

British Guiana

In British Guiana several American companies have been carrying on developments in quartz-gold properties. One, the Aremu Mining Company of New York, has a mill under construction, and the South American Gold Company, of the same interests, is operating a placer property in this country.

The exports of gold for nine months ending Sept. 30 were reported at 48,769 oz. in 1908, and 46,919 oz. in 1909. An export of $28,000 in value of diamonds is also reported, a slight increase over last year.

Chile

Several English- and German-owned companies, as well as local companies, continued to operate gold and copper properties in this country during 1909. The most important operation in which American capital is interested is the Braden Copper Mines Company, which controls 204 acres of property, on which a reduction plant has been installed, which has been recently increased from 250 to 400 tons daily capacity. A new mill of 1600 tons daily capacity is being constructed and will be completed early in 1911. Construction was continued on the railroad which the company is building from Rancagua to the mines, and the entire line will probably be ready for operation during the spring of 1910. The company reports as developed 5,000,000 tons of ore averaging 2 7/10 per cent. copper. Water power is utilized for the production of electrical power.

Oilfields in the south of Chile have been investigated during 1909 with success, and several companies have been formed to exploit them.

A French company has been developing copper deposits at Naltagua. A smeltery and an aërial tramway have been installed.

The report of the government commission which investigated the coal lands near Concepcion and Telcahuana, states that there are more than 80,000,000 cu.m. of soft coal within an area of 80,000 sq.m. The vein in places is 3½ m. thick, and the coal is said to be of fair quality.

The nitrate interests at Iquique recently petitioned President Montt for the renewal of the Nitrate Association Propaganda. A commission, appointed by the government, recommended that the state receive a sum equal to 1d. for each 46 kg. of nitrate exported, to be expended in promoting the nitrate industry, either by reducing the cost of production, increasing the consumption, or in opening new markets; that the scientific and industrial propaganda remain under the direction of the Nitrate Association Propaganda; that the state deliver annually to the Nitrate association an amount sufficient for the payment of its services, and that the commercial propaganda and the development of the nitrate industry, in so far as the cost of production and the propaganda at home and abroad are concerned, be placed under the direction of an advisory nitrate council. The commission further recommended the establishment of a technical industrial nitrate laboratory the centralization of the sale of nitrate, the systematic examination of present nitrate deposits, the search for new deposits, and the placing of sacks used in the exportation of nitrate on the free list. There is an export tax of 56c. per Spanish quintal of 101.42 pounds.

On Jan. 31, 1909, there were 145 separate nitrate works in Chile, and it is a very difficult matter to get all the interests together. There are several strong companies that own several plants each, and it is among these that the most opposition to combining is found.

During May, 1909, the price of nitrate was quoted as low as $1.60 per quintal, delivered alongside steamer in Chilean ports.

Colombia

During 1909 the investigation of the gold-placer deposits in Colombia was carried on by engineers representing several American companies which have concessions or own property in the river districts of north central Colombia. The result of these investigations has demonstrated that the deposits are comparatively rich and that they are extensive, but the cost of installing and operating modern machinery in the district has deferred the realization of the possibilities of these gold properties. The government has appointed a special agent to investigate the platinum resources of the country, and it is reported that negotiations were entered into with the Russian platinum producers to control the world's market on platinum. Nothing definite has been announced as regards this important move affecting the two principal sources of platinum.

The Gualpala Mining Company installed a cyanide plant during 1909, using sectionalized machinery, made especially for the company at San Francisco. Several English companies have taken up and continue operating gold-quartz properties in the southern districts of Colombia. The operations are on a small scale, but the ore is rich and makes profits on the basis of small operations and in the face of exceedingly large cost for transportation of products and equipment.

The record of the enormous production of gold in Colombia in the past is a testimony to the possibilities of the country, but the political, economic and social conditions, as well as matters of topography and climate, are all factors which determine the extent and speed of the realization of the mineral possibilities of the country. During the year the progressive President Reyes resigned, and there was some uncertainty as to the conditions that would follow. In the main the government has continued to be progressive and liberal, and indicates a fixed policy of encouraging foreign operations in mining in the country. Some American companies are investigating in copper deposits in Colombia, and an iron deposit near the Carribean sea has been examined during 1909. The government has unsuccessfully undertaken to finance several railroads which, when realized, will mean a great deal to the mining operators of this country.

In the main it may be said that the American exploiters are principally interested in the placer deposits for dredging and hydraulic operations and in possible copper mines, while the British capital in Colombia is mainly invested in the rich gold-quartz veins in the interior. Some French and German capital is also interested in mining in the country. The operations carried on by native capital are comparatively limited.

During the year the Colombian government entered into a contract with a British syndicate for the exploitation of the emerald mines at Muzo. By the contract the syndicate will pay the government £250,000 annually out of the gross output. The net income in excess of this amount is paid equally to the government and the company. The contract gives the syndicate the exclusive right of exploitation for 20 years.

Mines of gold, silver, platinum and precious stones (excepting emeralds) may be denounced and taken up in Colombia by the first discoverer, whosoever may be the owner of the land on which the mine is situated. Minerals found on national property may be taken possession of in the same way, with the exception of coal, guano, and other similar manures, brine springs and salt beds. By presidential decree of Sept. 21, 1909, the export of all metals is declared free of duty, abrogating the general provision in regard to this matter.

Ecuador

The policy of the Ecuadorian government in utlizing the $12,000,000 indemnitl paid by Brazil in connection with the boundary dispute to establish a system of railroads in the country is having its results in a revival of the latent mining interests of this South American country. Statistical data are entirely absent in regard to the operations in 1909. One American company in that country places the output of gold and silver for 1909 at about $400,000. Among the American companies interested in Ecuador is the South American Development Company of New York, which has properties near Zaruma, in the province of El Oro. These mines have operated continuously during the year, but data as to results are not obtainable.

The United States Gold Dredging and Rubber Company of New York is interested in an extensive placer deposit in

the province of Esmeraldas. This company has property near the large holdings, acquired during 1909 by Coats and associates, of London, who also control the Playa de Oro estate, holding large property interests in the same province. Negotiations for a consolidation of the English and American interests were discussed during 1909, but the terms have been refused by the American interests.

The Ecuadorian government is anxious to interest foreign capital in the development of its mining enterprises and has established liberal mining laws. Concerning the new railroads the Consul General for Ecuador in New York writes: "We have three railways in Ecuador: The Guayaquil & Quito, which runs from Guayaquil, the principal port of Ecuador, to Quito the capital. This railway was built with American capital. Another road is being built from the port of Bahía de Caráquez, in the Province of Manabí, to Quito. This railroad is financed by French capital. There is a very short road from Puerto Bolivar, Province of El Oro, to Pasaje."

A bill has been introduced into the congress of Ecuador amending the mining code so as to permit private persons to acquire mines of gold, silver, copper, platinum, mercury, lead, zinc, bismuth, sulphur, cobalt, tin, antimony, precious stones, etc., the state reserving the right to own and exploit petroleum, coal and asphalt deposits, iron mines and fossil substances.

Peru

The extension of the government-aided railroad system in Peru has opened up the possibility of important developments in the Andean districts of the country. The Cerro de Pasco property, controlled by the Haggin interests, has been put on a successful basis through the management of R. H. Channing. The property was extensively developed by the American company for a number of years, but owing to conditions it was necessary to build railroads and install much equipment in order to make the operation profitable. The smeltery is now running successfully, the company is utilizing coal from the local fields as far as possible, and has provided adequate railroad facilities. A hydroelectrical installation is being made, which will also influence the operations. The company is now producing at an annual rate of 40,000,000 lb. of copper, which is shipped to the United States for refining. Several American and English companies are operating gold placer and vein properties on the western slope of the Andes at the head waters of the Amazon. These operations are carried on remote from railroad transportation and at a large expense; roads have been built and considerable equipment taken in to the properties.

The American Vanadium Company has made shipment from the notable deposits of vanadium ores, discovered near Cerro de Pasco. The ore runs as high as 24 per cent. vanadic acid and is exceptional in extent and richness. It is controlled by Pittsburg capital. The Vanadium company has, during 1909, developed its mines to the extent of determining that the value and richness of the deposits are exceedingly great. The company is now prepared to realize from the property.

An article on the coal deposits of Peru was published in the Journal, Nov. 13, 1909, and also a map of these same deposits in the Journal, Dec. 25, 1909. An English company organized as the Chimbote Coal and Harbor Syndicate took control of the Recuay coalfields four miles from Chimbote on the Pacific and proposes to operate them extensively, producing a coal reported to be anthracite. A report of the Lobitos Oil Fields Company, a corporation organized in London in 1908, for exploiting petroleum deposits of northern Peru, shows that shipments of Peruvian petroleum were made to Japan and the River Plate, and that a fair price was obtained. At the beginning of 1909 there were 62 oil wells in operation in the district referred to, the annual production of which was over 7000 tons of crude petroleum. A number of wells in northern Peru are being prepared for exploitation, and the output in the future will probably be greatly increased owing to the development of these new properties.

The Peruvian government has continued a liberal and progressive policy in regard to the development of its natural resources and general confidence is expressed in its stability and the good faith of the government toward the foreign interests in the country. An American-English syndicate has taken over the state railroad systems in exchange for assuming the large bonded indebtedness of the country, and English, American and German capital is largely invested in the railway and mining interests in the country.

Venezuela

The end of the Castro reign in Venezuela has attracted attention again to the possibilities of the exploitation of the mineral resources of that country. The output of asphalt has in a measure been resumed, and the adjustment of the relations between the syndicate and the government has been worked out through diplomatic agencies. Another matter which is under consideration between the American and Venezuela governments relates to the important iron deposits on the Oronoco river. These deposits were the subject of an exploitation undertaken by Minnesota capitalists about 10 years ago. The deposits were then reported to be extensive and to be very favorably located for access to tidewater. The concession owning them became involved in a dispute with the government of Venezuela, and the whole matter has been dropped until recently. It is now reported that Charles M. Schwab has been interested in an investigation of these deposits and that there is a likelihood of the concession rights being restored on certain conditions.

There are practically no data concerning the mineral resources of this country, although it is known that it has in the past produced considerable of the precious metals and several copper properties have been operated there. One belonging to an English firm near Tucacas, a few miles from Puerto Cabello, recently made a shipment of 600 tons of copper to England. Other properties in this locality are offered for sale by Venezuela. A gold property in the interior has continued to produce extensively for some time, and most of the output has gone to the government under Mr. Castro. The new government is seeking to invite foreign interests to develop the mineral resources of the country and is offering attractive concessions. The government controls remunerative salt monopolies.

It is entirely likely that Venezuela will, in the near future, become an important producer of gold and silver if the reported conditions concerning the resources of the interior are at all trustworthy.

Dominican Republic

The important minerals found in the Dominican Republic in modern times are gold, silver, iron and copper ore, lignite, salt and petroleum. Gold is the only mineral that has been worked to any extent. In the time of Columbus the Indians paid tribute in gold, and in the year 1496 the records show the following mines or placer workings: La Vega, the Cibao, the San Cristobal, and the Buenaventura.

Some gold is at present washed from the sands of the Yaque, Verde, Bao, Jaina and Mao rivers and their tributaries by the natives with the most primitive apparatus. None of the mining men now in this country claim to have located quartz veins that would pay for the working. There are no doubt some gold deposits, not only in the river beds but also on the hills, that have never been worked, and there is probably gold remaining in the old workings that could be saved by modern machinery and dredges.

There is abundant water and sufficient fall for drainage in most parts of the gold country, but a great drawback is the difficulty encountered in getting machinery to the interior, on account of the entire lack of wagon roads.

Bolivia

BY J. AGUIRRE-ACHA *

The situation of Bolivia in the center of the continent of South America is in a certain way disadvantageous on account of the lack of seaports, and the fact that it can depend only on some river ports in the north and east of the national territory for transportation by water; but to this position is also due the fact that the country embraces a part of the three geographical divisions of South America, possesses mineral riches of the Andean range, the tropical products of the river Amazon and the plains of the river Plate, suitable for cattle raising.

The ease of exploitation of the coast regions of South America has caused the neglect of other points which are richer but less accessible. An example of this assertion was the famous Cerro de Potosi in Bolivia. The city of this name, situated at 4146 m. (14,925 ft.) above the level of the sea, today has only 25,000 inhabitants, while formerly it contained more than 250,000 and occupied the second place after Madrid in the Spanish dominions of Charles V. There are 64 silver-bearing veins in this range, and the tailings of the enormous extraction of 363 years still offer a possible source of tin when transportation is improved. The same is to be noted in the deposits of Porco, Colquechaca, Carangas, Ayopaya, Arce, etc., which only await the railroads to forward their accumulated products to the markets.

BOLIVIAN EXPORTS, JAN. 1 TO AUG. 31.

Metals.	1909.	1908.
Tin	22,806,037 kg.	19,075,202 kg.
Copper	2,304,763 kg.	2,004,498 kg.
Bismuth	256,920 bs.	216,798 bs.
Silver	1,114,413 bs.	1,457,297 bs.
Gold	56,225 bs.	.....

Fuel and Railroads

Besides the distance at which these centers are situated from the Pacific ocean and the deficiency of means of transportation, there is the great difficulty of lack of fuel for smelting and the consequent necessity of exporting the ore. For this reason many projects have been presented for taking advantage of the water power in the eastern valleys, not far from these mining centers, and for exploiting the deposits of lignite that are found at a somewhat greater distance.

There are now two railroads leading to the high table land from the coast of Chile and Peru; another, coming from the Argentine, will soon cross the southeastern part of the republic; and a fourth will unite more intimately almost all the mining zone of Bolivia with the port of Arica. There is thus a total of nearly 700 miles of railroad constructed up to the present time and an equal amount in construction and projection, without including in these figures the Madeira-Mamore railroad, on the Brazilian-Bolivian frontier.

The extent of Bolivian territory is a little greater than the combined area of the States of New York, Pennsylvania, Maine, Louisiana, California and Colorado, and the mining region embraces nearly one-fifth of that comprised in the mining districts of the western part of the United States, exclusive of Alaska. In addition to silver, the resources of the country include copper, tin, wolfram, bismuth and gold. The methods of exploitation are still primitive in most of the mines. There are, however, installations like that of Huanchaca, well able to compete with the best in the world in the extraction of silver. From 1873 to 1904 this mine produced 4600 tons of metal ready to be exported, and employed during 1909, in the 598 hectares that it possesses, nearly 5000 laborers. The tin mines, near the railroad lines, can be worked with profit even if the price of tin in London should decline to £100 per ton.

PRODUCTION OF TIN IN BOLIVIA.

Years.	Cassiterite, Kilos.	Tin, Tons.
1900	16,231,200	9,740
1901	21,915,900	13,149
1902	17,608,300	10,564
1903	no figures	no figures
1904	21,545,703	12,927
1905	27,689,621	14,613
1906	29,373,538	17,624
1907	27,677,780	16,608
1908	29,938,828	17,962
1909 (8 months)	22,806,037	13,884

The manner of acquiring mining property is by purchase, by claiming the forfeiture of a concession for fault of payment of the tax, or by discovery of a new mine that belongs only to the state and is free of any other individual claim. The foreigner has the same right to these methods as a native of the country. The legal formalities and procedure to assure possession of the property have been much simplified in the last few years. The taxes on mining property, as well as those levied on the exportation of the mineral products, are small, since Bolivia endeavors to stimulate greater production rather than to restrict it.

Mineral Resources

The following data, from the official publication *Hacianda é Industria*, give an idea of the recent mineral production compared with that of previous years, it being necessary to bear in mind that the Bolivian peso (boliviano) is equivalent to a little more than $0.39. From Jan. 1 to Aug. 31, the exportation of minerals in 1909 reached 25,256,047 bs., as against 23,765,592 bs. in 1908, an increase of 1,490,455 bs. during the eight-months period referred to.

The data referring to silver are not complete because in the figures for 1909 is not included the production from Huanchaca, which would increase still more the difference in favor of the first eight months of 1909. The exact figures of the exportation of gold are difficult to obtain, as the declarations depend to a great extent on the good faith of the exporters.

PRINCIPAL MINING COMPANIES IN BOLIVIA.

Companies.	Metals.	Home Offices.
Compañia Huanchaca	Silver.	Huanchaca.
Compañia del Socavon	Silver.	Oruro.
Compañia de San José	Silver.	Oruro.
Compañia Colquechaca Aullagas	Silver.	Colquechaca.
Compañia Gallofa	Silver.	Colquechaca.
Compañia Consolidada	Silver.	Colquechaca.
Compañia Guadalupe	Silver.	Potosí.
Compañia de Porco	Silver.	Potosí.
Compañia de Portugalete	Silver.	Potosí.
Compañia del Real Socavon	Silver.	Potosí.
Compañia de Andacaba	Silver.	Potosí.
Nueva Compañia de Lípez	Silver.	Santa Isabel.
Compañia de Berenguela	Tin.	Arque.
Compañia de Colcha	Tin.	Arque.
Compañia de Milluni	Tin.	La Paz.
Andes Tin Company	Tin.	La Paz.
Benedicto Goytia	Tin.	La Paz.
Jorge Machicado	Tin.	La Paz.
Franco Hermanos	Tin.	La Paz.
Pascual Cesarino	Tin.	La Paz.
Harrison & Bötiger	Tin	La Paz.
Matias Mendieta	Tin.	Potosí.
Julio Martens	Tin.	Potosí.
Arturo Arana	Tin.	Potosí.
Lucio Leiton	Tin.	Potosí.
Juan Rubarht	Tin.	Potosí.
Víctor Fuentes	Tin.	Potosí.
Compañia de Monte Blanco	Tin.	Potosí
Compañia de Chocaya	Tin.	Potosí.
Compañia de Avicaya	Tin.	Potosí.
Compañia de Antequera	Tin.	Oruro.
Compañia de Guanuni	Tin.	Oruro.
Compañia de Negro Pavellón	Tin.	Oruro.
Compañia de Morococala	Tin.	Oruro.
Compañia de Colquiri	Tin.	Oruro.
Roberto Peláez	Tin.	Oruro.
Jerman Fricke & Co	Tin.	Oruro.
Simon I. Patiño	Tin.	Oruro.
Juan B. Minchin	Tin.	Oruro.
Compañia Llallagua	Tin.	Llallagua.
Soux & Hernández	Tin, silver.	Potosí.
Alfredo Meting	Tin, silver.	Potosí.
Bebin Hermanos	Tin, silver.	Potosí.
M. Diaz & Co	Tin, silver.	Potosí.
Urriolagoitia & Co	Tin, silver.	Potosí.
Compañia de Huaina Potosí	Tin, silver.	La Paz.
Aramayo Francke & Co.	Tin, bismuth, silver.	Tupiza.
Penny & Duncan	Tin, silver, copper.	Oruro.
Compañia de Corocoro	Copper.	Corocoro.
Berthin Freres & Co	Copper.	Corocoro.
Compañia de la Chacarilla	Copper.	Corocoro.
Compañia Los Angeles	Copper.	Corocoro.
Compañia de Chuquiaguillo	Gold.	La Paz.
Compañia de Yani	Gold.	La Paz.
Incahuara Dredging Co.	Gold.	La Paz.
Compañia del Rio de San Juan	Gold.	Tupiza.
Compañia de Amayapampa	Gold.	Potosí.

*Consul General of Bolivia, New York.

Bolivia furnishes nearly 19 per cent. of the world's total production of tin, and a large increase is expected when the railroads which are in actual construction are completed. The following statistics are from a careful study of the production of tin by Casto Rojas, subsecretary of the treasury. The fineness that is generally calculated for the cassiterite or *barrilla* exported from Bolivia is 65 per cent.; but the production of tin in the last nine years is given in an accompanying table on a basis of only 60 per cent.

Much interest was shown in copper in Bolivia. The railroad from La Paz to Arica will traverse the region of Pacajes in which deposits of importance have been discovered. This road will be opened for public use in about two years. Wolfram was exported during 1909 from the provinces of Sicasica. There were some companies organized for the exploitation of gold in the tropical region of the department of La Paz. The problem that presents itself here is the opening of roads to permit the introduction of proper machinery. An English company which has interests on the Kaka river and an Italian company on the Tipuani river are working on this. The enterprise of the Chuquiaguillo river, a few miles from the city of La Paz, was the most prosperous gold operation. The exploitation of silver depends on the quotations of the great markets, but will now be aided by the building of the railroad to Potosi.

Ontario

BY THOMAS W. GIBSON *

The province of Ontario is now easily first among the silver-producing communities of America, its annual output being little short of that of the three best silver States in the Union combined—Colorado, Montana and Utah—and nearly 50 per cent. of the entire production of the United States. In 1909 the output was in the neighborhood of 25,000,000 oz., having a value of approximately $12,500,000. In 1903 there was practically no silver produced in Ontario. In 1904 the first ore was raised at Cobalt, and to the end of 1909 the total yield was about 63,000,000 oz., woth $33,000,000.

Though Cobalt is without doubt the richest silver field that has been opened anywhere during the present generation, no one can tell how much longer the present rate of production can be maintained. The probability is, however, that the camp will be a producer for years to come. The mines are worked wholly for their silver contents. The ore contains other elements of value, namely, cobalt, nickel and arsenic, but the latter two bring no returns to the mine owner, and the enforced production of cobalt ore is far in excess of the world's consumption. The greater number of the veins at Cobalt occur in conglomerate of Lower Huronian age; perhaps 90 or 95 per cent. of the production has been from this conglomerate. Veins are also found in the diabase and in the Keewatin, some of them quite rich.

The chief producers during the year were Nipissing, Crown Reserve, O'Brien, La Rose, Kerr Lake, Coniagas, Trethewey, Buffalo, Temiskaming & Hudson Bay, clustering around Cobalt station on the Temiskaming & Northern Ontario railway. In southeastern Coleman, the Temiskaming worked rich but somewhat irregular deposits in the Keewatin, and ore was also found on the adjoining property, the Beaver. In the neighboring camp of South Lorrain, to the east, several mines are likely to become of importance, among them the Wetlaufer, Keeley and the Haileybury Silver Mining Company. Anvil Lake, Elk Lake and Gowganda are still under development, and some properties will make shipments of ore during the present winter. None of these camps, however, have so far proved equal to Cobalt.

Concentration plants for low-grade ore are becoming numerous in the Cobalt camp, and most of the high-grade ore is treated in Ontario. There are reduction works at Copper Cliff, Deloro and Thorold. Part of the high-grade ore and most of the low-grade goes to smelteries in the United States.

Nickel

The nickel mines of Sudbury district were vigorously worked in 1909, and the production of nickel will be in the neighborhood of 12,000 tons, a considerable advance over any previous year. The value of the nickel in the matte will be, say, $2,550,000. The production was wholly from the Canadian Copper Company, Copper Cliff, and the Mond Nickel Company, Victoria mines. The former company confined its operations to the Creighton and Crean Hill mines, both carrying nickel and copper. In Creighton the nickel predominated and in Crean Hill the copper. The Canadian Copper Company exported its bessemer matte to the United States for further treatment, and the Mond company to Wales. The Dominion Nickel-Copper Company is building a railroad from the Canadian Northern to Whistle mine.

During 1909 a new nickel area was exploited in the township of Dundonald, a short distance west of the Temiskaming & Northern Ontario railway, near Frederick House lake. A body of pyrrhotite, very like that of the Sudbury mines, was located by a prospector named Kelso. The nickel contents of the ore vary somewhat, but are well within the workable limit. An option was taken on the property by the Canadian Copper Company, but after exploitation by the diamond drill it was abandoned, owing, it is said, to the limited size of the orebody.

The copper production of Ontario depends upon the nickel production, since this metal is found associated with the nickel of Sudbury. The output in 1908 was 7561 tons, and for 1909 the yield will be about the same. The sulphide mines of the north shore of Lake Huron have not been producing largely during the last few years, but the deposit at Bruce mines has now passed into the control of R. W. Leonard, of St. Catharines, and will doubtless contribute to the output in the future.

Iron, Zinc and Gold

The iron-ore output for 1909 will be in excess of that of 1908, when it was 216,177 tons. Most of the ore came from the Helen mine, Michipicoten, but Moose mountain and Bessemer contributed a considerable amount of magnetite. At Loon lake, east of Port Arthur, two carloads of hematite were shipped toward the latter end of the season by the Dominion Bessemer Ore Company, being the production of a deposit in the Animikie rocks of that district. The ore was found in horizontal layers a few feet below the surface and was of good quality, though not high in metallic contents. At Woman river an iron formation of considerable extent was located, and bodies of workable ore are believed to exist. The pig-iron production in 1909 will considerably exceed that of the previous year, when it was 271,656 tons. Blast furnaces were in operation at Saulte Ste. Marie, Port Arthur, Midland and Hamilton.

A little zinc ore, about 785 tons, was raised at the Olden mine in the county of Frontenac.

The yield of gold in 1909 was not important, coming mainly from the Laurentian mine in the Manitou region. Considerable excitement was aroused by the discovery of gold in the Porcupine Lake region, which lies west of Night Hawk lake on the Hudson bay side of the hight of land. A large number of claims were staked, following upon the finding of free

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gold in quartz in a number of places, and some of the properties give promise of being valuable. A good deal of the territory is covered with drift, which makes prospecting difficult. A rush into this district was in progress as the year closed.

NONMETALLIC AND OTHER MINERALS

The nonmetallic minerals of Ontario are numerous and valuable. They include petroleum, natural gas, salt, feldspar, corundum, graphite, gypsum, iron pyrites, mica and other economic substances, as well as clays, limestones and building stone.

The production of petroleum diminished. In 1908 it was 18,479,547 Imp. gal. In 1909 it will not greatly exceed 17,000,000 gal. The decrease was partly caused by the slight diminution annually going on in the old fields of Lambton county, and partly by the more rapid falling off in the wells of the newer Kent county field. About one-half of the requirements of the refining trade are now supplied by importation of crude oil from the United States. On the other hand, the production of natural gas increased. In 1908 the yield was valued at a little less than $1,000,000; in 1909 it will probably exceed that figure. The gasfields are as follows: Essex and Kent counties, Haldimand field, including Norfolk county, and the Welland county field. Of these the Haldimand field is now the largest producer. The exportation of natural gas has ceased.

The iron-pyrites industry is steadily increasing in importance. The Northern Pyrites Company, near Minnietakie lake, on the Grand Trunk Pacific, shipped a considerable quantity during 1909. Other deposits were worked in eastern and northern Ontario.

The Portland cement industry also expanded. During the year a merger was formed, taking in several of the Ontario plants and some in Quebec and other provinces. The Ontario output in 1908 was 2,022,877 bbl., and this will no doubt be exceeded in 1909.

Mica, feldspar, talc, apatite and quartz were all produced in varying yet important quantities. Arsenic was refined from the ores of cobalt at Deloro, Copper Cliff and Thorold. Building materials such as brick, lime and stone were produced probably in excess of 1908, since the building trade during the year was active in the cities and towns of this province.

British Columbia

BY E. JACOBS

The total mineral production of British Columbia, providing the accompanying preliminary estimates for 1909 are substantiated by the official figures, approximates a value of $347,804,000. Of this amount gold represents $126,317,000, silver $30,081,000, lead $23,298,000, copper $55,242,000, miscellaneous metals $991,000, coal and coke $102,782,000, building materials, etc., $9,093,000. The proportions of value are metalliferous minerals $235,929,000 and non-metalliferous $111,875,000.

MINERAL PRODUCTION OF BRITISH COLUMBIA IN 1908-'09

	1908.		1909.		Increase or Decrease.	
Gold, placer	32,350 oz.	$647,000	30,000 oz.	$600,000	D 2,350 oz.	D $47,000
Gold, lode	255,582 oz.	5,282,880	250,000 oz.	5,167,500	D 5,582 oz.	D 115,380
Silver	2,631,389 oz.	1,321,483	3,000,000 oz.	1,470,000	I 368,611 oz.	I 148,517
Lead	43,195,733 lb.	1,632,799	46,000,000 lb.	1,748,000	I 2,804,267 lb.	I 115,201
Copper	47,274.614 lb.	6,240,249	41,000,000 lb.	5,289,000	D 6,274,614 lb.	D 951,249
Zinc	.....	270,000	.....	500,000	.....	I 230,000
Total—metalliferous	.....	$15,394,411	.....	$14,774,500	.....	D $619,911
Coal	1,677,849 l.t.	$5,872,472	1,940,000 l.t.	$6,790,000	I 262,151 l.t.	I $917,528
Coke	247,399 l.t.	1,484,394	277,000 l.t.	1,662,000	I 29,601 l.t.	I 177,606
Building Materials, etc	.....	1,100,000	.....	1 200,000	.....	I 100,000
Total—non-metalliferous	.....	$8,456,866	.....	$9,652,000	.....	I$1,195,134
Total production	.....	$23,851,277	.....	$24,426,500	.....	I $575,223

The production in 1909 is estimated at $24,426,500, as shown in some detail in the tables herewith. In calculating the tables, the following prices were taken, the figures in parentheses representing prices in 1908 where this price differed from the average for 1909: Gold, placer, $20 per oz.; gold, lode, $20.67 per oz.; silver, 49c. (50.2c.) per oz.; lead, 3.8 (3.78)c. per lb.; copper, 12.9 (13.2)c. per lb.; zinc, 5c. per lb.; coal, $3.50 per long ton; coke, $6 per long ton. Silver is less 5 per cent. and lead 10 per cent. of the average New York market prices for ten months.

GOLD.

The shortage in the placer gold output is attributable to a restricted supply of water, with a resultant shorter period of gravel-washing operations. Provision is being made in Cariboo for extended operations during 1910, chiefly on the properties of John Hopp, near Barkerville, and the leases represented by Howard W. DuBois. These leasers are constructing a 20-mile ditch and flume from Swift river to the Quesnel Forks neighborhood, preparatory to hydraulicking on a large scale. There was no dredging for gold in the province in 1909, though a number of bars in the Fraser river were prospected. The Guggenheim hydraulic-gold properties in British Columbia, in the Quesnel Forks and Atlin camps, were not worked during the season on the large scale that was expected. Recently a move was made to work some placer leases situated in the Big Bend of the Columbia District, north of Revelstoke, where good results were obtained in earlier years.

The decrease in the production of lode gold was largely in Rossland, a result of the suspension of production at the Le Roi mine, pending the carrying out of systematic exploration with a view to finding new orebodies of a payable grade in the deeper levels of the mine. The Center Star group of the Consolidated Mining and Smelting Company of Canada, Ltd., made a slightly larger production of gold than in 1908, and the Le Roi No. 2 equalled its 1908 production from its Josie mine. There was no change of importance among the smaller mines in Rossland camp, although work was done in several of them.

The Boundary district, as in earlier years, made a fairly large production of gold, which in the mines of that district is in association with copper. The greater part of the lode gold produced in British Columbia was from smelting ores, there being only two mining divisions in which gold ores were milled to any considerable extent, viz.: Nelson and Osoyoos. The Nickel Plate mine at Hedley was sold during the year to the Hedley Gold Mining Company. Development work will be done on the Nickel Plate in 1910, following extensive diamond drilling done in 1909 and additions are being made to power plant at both the mine and the 40-stamp mill, the former including the installation of the second half of a Rand-Corliss, compound-condensing air compressor, which may be operated either by Pelton wheel or steam; at the mill regrinders and filter press are being added.

The advance made in Nelson district came mostly from Sheep Creek camp, in which several mines were developed with promising results. At Ymir the only producer was the Yankee Girl, operated by a New York company organized during the year. Texada island made an increased output of lode gold from two or three mines, the gold occurring in an ore also containing silver and copper.

Silver

Nearly half of the increase in silver output was made in Ainsworth camp, in West Kootenay. The Blue Bell mine on Kootenay lake contributed about 38,000 oz. more than in 1908; the Whitewater and Whitewater Deep mines, situated between that lake and the Slocan mining division, about 58,000 oz., and various other mines in the division together made up about 75,000 oz. of the total increase.

In the Slocan division the Richmond-Eureka mine produced 197,000 oz., 37,000 oz. more than in 1908, while the Van Roi, an English-owned property, yielded an increase of about 38,000 oz.

The production of East Kootenay mines was nearly 100,000 oz. less than in 1908. Several mines in the Nelson division, the Silver Cup in Ferguson camp, Lardeau, and the Marble Bay and Cornell mines on Texada island increased their silver output. The finding of native silver in bornite ore at between 900 and 1000 ft. depth in the Marble Bay mine was one of the most interesting features of the year's mining in the Coast district; the more so since the first-class ore also contained about $10 per ton in gold.

The average silver content of the ores of the big Boundary mines appeared to be slightly lower than in earlier years: the difference per ton was not considerable, but in the aggregate silver content of the total tonnage—nearly 1,600,000 tons—mined and smelted, it was distinctly noticeable.

A further increase in the quantity of silver produced in the province is expected in 1910, for substantial progress made in 1909 in the Ainsworth and Slocan districts may be expected to be maintained, while better results are looked for in East Kootenay. Boundary mines will increase their tonnage also, and in the Coast district new mines, in the Portland Canal district, will begin producing.

Lead.

The increase in production of lead over 1909 was about 2,804,000 lb., about 46,000,000 lb. having been produced. In past years production has ranged as high as 63,358,000 in 1900. The stimulating effect of the bounty paid by the Canadian government on lead produced in the Dominion is shown by the statistics. Production for 1903, the year immediately preceding the granting of the bounty, had fallen to 18,089,000 lb., but since 1904 it was not lower than 43,000,000 lb. in any year, while it rose to 56,580,000 lb. in 1905. The bounty is determined by the price of lead in London, it being on a sliding scale to insure to the Canadian producer a minimum price of £17 per ton. The maximum bounty is 75c. per ton paid when the London quotation is £14 10s. or lower.

East Kootenay produced more than half the lead mined in British Columbia. Its total for 1909 was less by between 3,000,000 and 4,000,000 lb. than that of 1908, partly owing to a suspension of production at the Sullivan Group mine (this mine later resumed work), and partly to a decreased output of this metal from the St. Eugene and North Star mines. The output of mines in the Ainsworth mining division was over 10,000,000 lb., double that of 1908. More than half of this increase was made by the Blue Bell mine, with a production of about 6,466,000 lb. in 1909 as against 2,600,000 lb. in 1908. The Whitewater and Whitewater Deep mines produced about 3,355,000 lb. as compared with 2,000,000 in the preceding year. The Cork mine, on the south fork of Kaslo creek also contributed to this increase, though in much smaller degree.

The production of Slocan mines fell off approximately 750,000 lb., the chief losers being the Rambler-Cariboo and Standard mines. Richmond-Eureka and Van Roi both considerably increased their output, the former producing 1,357,000 lb., and the latter 1,788,000 lb. of lead.

In the Nelson division, the Yankee Girl, at Ymir, was a new producer, with between 300,000 and 400,000 lb. to its credit. The Iron Mountain Company's Emerald mine, near Salmo, advanced its production from about 400,000 lb. in 1908 to 764,000 lb. in 1909. The La Plata, on Kokanee creek, near Nelson, was idle all the year.

The Consolidated Mining and Smelting Company of Canada, Ltd., during 1909 increased the lead-smelting capacity of its works at Trail and also enlarged its electrolytic lead refinery. Two lead stacks have each an average smelting capacity of 150 to 170 tons of ore per day. Steel water jackets were substituted for iron in these two furnaces, the number of tuyeres increased to 22, a 50-ton bullion pot installed and provision made for molding the lead into anodes at the furnace. An improved mechanical feed was installed at the furnaces. The number of Huntington-Heberlein circular roasters for lead was increased to seven and converting pots to 15. The lead refinery was enlarged to a daily capacity of about 120 tons of refined lead. The number of electrolytic tanks is now 596, these being housed in a building 600 ft. in length.

Copper.

The copper production was about 6,274,000 lb. less than that of 1908, though official returns may change this figure. About 1,500,000 lb. of the decrease was due to the suspension of production at the Le Roi mine, Rossland. There was a comparatively small decrease in the production of the Center Star, in the same camp, and a slight increase in that of the Le Roi No. 2 company's Josie mine. The small mines of Rossland camp did not contribute any quantity of copper worth noting.

In the Boundary district the Granby company's mines led with a production estimated at between 23,000,000 and 24,000,000 lb. Those of the British Columbia Copper Company, with only about 6,500,000 lb., showed the effect of three months' idleness consequent on a strike at the colleries from which this company obtains its supply of coke for smelting. The Consolidated company's Snowshoe mine, with 3,775,000 lb., made a gain of about 2,500,000 lb. over 1908. The Dominion Copper Company mines were not operated during 1909. Comparatively big tonnages and low mining and smelting costs were prominent features of the copper-producing industry of the Boundary district.

MINERAL PRODUCTION OF BRITISH COLUMBIA IN 1909 BY DISTRICTS.

Name.	Divisions. 1908.	Divisions. 1909.	Districts. 1908.	Districts. 1909.
Cariboo District	.....	.....	$ 405,000	$ 390,000
Cariboo Mining Division	$ 355,000	$ 350,000	.....	.....
Quesnel Mining Division	30,000	25,000	.....	.....
Omineca Mining Division	20,000	15,000	.....	.....
Cassiar District	.....	.....	298,234	267,319
East Kootenay District	.....	.....	4,802,680	4,991,446
West Kootenay District	.....	.....	5,448,224	5,851,670
Ainsworth Mining Division	422,181	932,134	.....	.....
Nelson Mining Division	462,836	678,604	.....	.....
Slocan Mining Division	676,580	1,073,080	.....	.....
Trail Creek (Rossland)	3,713,392	3,023,711	.....	.....
Other parts	173,235	144,141	.....	.....
Lillooet District	.....	.....	13,779	10,000
Yale District	.....	.....	7,649,963	6,710,413
Osoyoos, Grand Forks and Greenwood Mining Divisions	7,545,380	6,426,609	.....	.....
Similkameen and Nicola	101,583	280,804	.....	.....
Yale Mining Division	3,000	3,000	.....	.....
Coast District (Nanaimo, Alberni, Clayoquot, Quatsino, Victoria)	.....	.....	5,233,397	6,205,652
	.....	.....	$23,851,277	$24,426,500

The Granby company lately completed the improvements to its smelting plant which were commenced in the previous year. The maximum treatment capacity of the smeltery is now about 4500 tons of ore per diem, as evidenced by a recent full week's run giving an average of 560 tons per day per furnace for seven furnaces then in blast. The eighth enlarged furnace was since blown in. Enlargement of two of the three 700-ton blast furnaces of the British Columbia Copper Company is to be made to provide for the ore from a mine the company opened in Wellington camp, Boundary district, and also for ore from the New Dominion Copper Company's mines, which it is stated will be treated here. There does not appear to be any probability of the Dominion Copper Company's smelting works at Boundary Falls being used again under existing conditions.

The Tyee Copper Company installed a second blast furnace at its works at Ladysmith, Vancouver island. There was no production of copper ore on Vancouver island in 1909 worth mentioning, but the Tyee company kept its works operating on ores from other parts. During twelve months ended Aug. 31, 1909, approximately 45,000 tons of ore were smelted and matte containing about 3,500,000 lb. of copper produced. The new furnace is 48x160 in. at the tuyeres. Its capacity is estimated at about 12,000 tons of ore per month.

Exploration work was continued at the Britannia mine, on Howe sound, and latterly about 100 men were employed at mine and mill. Some of the orebodies carry a considerable percentage of zinc, and a roaster, cooler and Wetherill magnetic separator were installed for the purpose of determining in a commercial way whether the iron and copper can be separated from the zinc. The mill was remodeled, and its capacity brought up to 500 tons per day. Experimental work in saving the chalcopyrite contained in the highly silicious gangue characteristic of Britannia ore was continued. There is little probability of active production in the near future, the present intention being to definitely determine both the approximate tonnage of ore available and the best means of preparing it for smelting.

The large shoot of bornite ore in the Marble Bay mine, Texada island, was opened on the 960-ft. level for a length of 210 ft. with ore in the face at each end of the drift. A shipment of about 11,000 tons of second-grade ore from this mine returned 4 per cent. copper. A neighboring mine, the Cornell, reported 6.2 per cent. from 11,000 tons of ore.

In the northern part of the British Columbia coastal district there is promise of a substantial production of copper ere long. Herbert Carmichael, assistant provincial mineralogist, officially reported on the Red Cliff, distant about 20 miles from the head of the Portland canal, and the Hidden Creek group, on Observatory inlet, a branch of the Portland canal. The establishment of a smeltery in the vicinity is proposed.

Iron and Zinc

Iron mining in British Columbia, at no time of great importance, was practically at a standstill during the last two or three years. A large deposit of iron on Texada island was bonded to some United States men, but no steps were taken by them in the direction of mining the ore. In past years about 30,000 tons of this ore were shipped to Puget sound, Wash., and smelted in a charcoal furnace erected at Irondale, near Port Townsend.

A company was organized to establish iron and steel works at or near Vancouver or New Westminster, the latter within 20 miles of the mouth of Fraser river, but the plans of those in charge of this enterprise are not yet fully matured. The deposits of iron on Vancouver island remain undeveloped, as, too, do those known to occur in the Kootenay district, in the southern interior of the province.

There was more activity during 1909 in connection with the mining of zinc than for several years previous. Zinc was produced commercially at four or five mines, while at others tailings from silver-lead-concentrating plants were stored for later treatment. The largest producer of zinc in British Columbia was the Lucky Jim mine, in the eastern part of the Slocan district; much of the crude ore from this mine contained 52 per cent. zinc and was shipped without concentration. The Whitewater and Van Roi mines, the former in the Ainsworth mining division and the latter in western Slocan, both made a zinc concentrate. The Whitewater shipped 4360 tons of zinc concentrate averaging approximately 15 oz. silver per ton and 42 per cent. zinc; the Van Roi made about 1400 tons of similar concentrate assaying about 44 per cent. zinc and 50 oz. silver per ton. The Ruth, at Sandon, also made a zinc concentrate from its silver-lead-zinc ore, and shipped 655 tons in 1909. The ore of the Blue Bell contains much zinc, but so far no production of the metal on a commercial basis has been made at this mine. A group of mineral claims on Pingston creek, opposite Halcyon hot springs, on which there is a large surface showing of zinc ore, was lately bonded to New York men who are commencing development of the property.

Borax Mining in the United States in 1909

There was little or no change to be noted in the condition of the borax mining industry in this country during 1909. As in previous years, the output continued to come from California. Few mines were operated even then, most of them having closed down two years ago at the time of the drop in price of the refined product. The annual output has varied little, mining being carried on to keep pace with consumption, which has not increased to any extent if at all. The quantity produced was from 23,000 to 25,000 tons crude, valued at from $900,000 to $1,000,000, the value being fixed in proportion to the quantity of anhydrous boric acid contained. Most of the mineral mined contained 35 to 45 per cent. anhydrous boric acid. The marsh muds formerly worked carried only from 2 to 3 or 4 per cent. anhydrous boric acid, and they had to be concentrated before shipment to the refineries. The mining of these low-grade borates has practically ceased in the desert regions of California, the larger companies having given up their mines and plants as not profitable at recently prevailing prices. However, a large English corporation proposes to work some tracts of surface deposits of this character on an extensive scale, but as yet no production has been made.

The only productive deposits of importance in California were those of the Pacific Coast Borax Company, in Inyo county, and the Sterling Borax Company, at Lang, in Los Angeles county. In both cases the companies worked veins of colemanite. The Borax Properties, Ltd., has a surface deposit at Otis, San Bernardino county, which is expected to shortly become productive. Several of the old companies formerly working deposits in Ventura and San Bernardino counties became a part of the Sterling Borax Company, and the old mines were given up.

There is some talk of one or two claims at Griffin or Frazier, Ventura county, beginning operations again in the summer of 1910, but this is somewhat doubtful if prices of refined borax do not advance. With such an advance in price a number of claims once worked may resume, but until this happens their rehabilitation is not probable.

Crude borax was shipped to refineries in the East just as mined, though some of the low-grade mineral was calcined to concentrate it before shipment.

The Petroleum Industry of the United States

Total Production Decreased about 2 Per Cent. California Field Largest Producer; Mid-continental close Second. Texas-Louisiana Declined

PRODUCTION 180,717,696 BARRELS

The accompanying table shows the revised figures for the production of crude petroleum in the United States in 1908 and preliminary estimates for 1909. There was a decline in production in 1909 amounting to about 4,000,000 bbl. or over 2 per cent. California, however, showed a very satisfactory increase of output, the 1909 total being nearly 30 per cent. larger than that of 1908. The Coalinga oilfield was the largest producer in California. The oil production of the State in 1909 was valued at almost $27,000,000 which figure is larger than that of the gold output of the State and larger than the production of the Mid-continental oilfield. The output of this field in 1909 was 7 per cent. less than for 1908 when it led the producing districts of the country.

PRODUCTION OF CRUDE PETROLEUM IN THE UNITED STATES.
(In Barrels of 42 Gal.)

Field.	1908.	1909.
California	45,000,000	58,250,300
Colorado	411,836	(a) 500,000
Gulf { Texas	11,206,464	9,593,000
Gulf { Louisiana	6,835,130	3,192,000
Illinois	38,844,899	29,500,000
Lima { Indiana	7,287,000	6,192,000
Lima { Ohio		
Mid-continental (b)	50,741,678	46,826,196
Kentucky-Tennessee	1,250,000	(a) 1,250,000
Appalachian (c)	24,240,000	25,394,200
Wyoming	(a) 13,000	(a) 15,000
Others	(a) 3,000	(a) 5,000
Total	184,711,413	180,717,696

(a) Estimated.
(b) Kansas and Oklahoma.
(c) Pennsylvania, New York, West Virginia and eastern Ohio.

The oilfields of Texas and Louisiana showed a greatly decreased production in 1909, every large pool except Caddo recording a smaller output than that for 1908. Humble was the largest producer. Prices were somewhat better in this section. The dissolution of the Waters-Pierce company by the Federal Government was an important happening in 1909. Illinois produced in 1909 only about 75 per cent. as much petroleum as in 1908. The Appalachian field, however, obtained a slightly increased output.

Petroleum in Texas and Louisiana

SPECIAL CORRESPONDENCE

Development in Texas and Louisiana during 1909 did not open up any new gusher pools, consequently production declined materially. Anse Le Butte, Markham, and Goose Creek dwindled into small and costly pools confirming the opinion of most operators. Drilling at Piedras Pintas, the Mission and other fields, that at first gave promise of a reasonable output, were only conclusive in proving them to be of small area and limited capacity. Operations in the Caddo region were unsatisfactory on the whole and the production much less than anticipated. The proven area of the old pools was extended little, the field work consisting largely in cleaning out and deepening old wells. Salt water increased greatly in the majority of the pools, particularly at Spindle Top, Humble, and Jennings. The latter pool was especially disappointing and the output was less than half that of 1908 when it produced a much larger yield than any other coastal pool. While field conditions were uniformly discouraging crude-oil prices were fully up to expectations because local consumption exceeded the production.

Output

The 1908 production in Texas was 11,206,464 bbl., of which 10,483,000 bbl. originated in the coastal region. The Louisiana production in 1908 was 6,835,130 bbl. and the total coastal production 17,318,330 bbl. The 1909 production of Texas, as nearly as it is possible to estimate, was 9,596,000 bbl., of which 8,921,000 bbl. were credited to the coastal field. The Louisiana estimate was 3,192,000 bbl., making the total output of the coastal region 12,113,000 bbl. The figures given indicate a decline of 1,610,460 bbl. in Texas (practically all in the coastal field) and 3,643,130 in Louisiana, every large pool showing a decrease except Caddo. The total value of the crude product was, however, only about $1,500,000 less than in 1908 for the average price per bbl. was about 12c. higher. The Humble pool was the largest producer in 1909, with a production of over 1,000,000 bbl. greater than that of Jennings, which was the leader in 1907 and 1908.

The estimated yield of the larger pools was as follows: Humble, 3,151,000; Jennings, 2,047,000; Sour Lake, 1,763,000; Spindle top, 1,400,000; Saratoga, 1,247,000; Batson, 1,230,000; Caddo, 1,036,000. In northern Texas the Powell field was much the largest producer.

The daily runs of the coastal field in 1908 averaged 44,131 bbl., while in 1909 the daily average declined from 39,000 bbl. in January to less than 31,000 bbl. in November. It is difficult to estimate the stored coastal crude, which was 2,786,000 bbl. in February, but it was probably not in excess of 1,500,000 bbl. on Dec. 31; nearly all of which was held by refinery interests and not available for general consumption. According to the *Oil Investors' Journal* the total number of completed wells for 11 months was 677, of which 449 were oil producers, 30 gas wells and 198 dry holes, and the December completion hardly exceeded 40 wells. The completions in 1908 were 833, which shows a reduction of more than 200 wells in 1909.

In addition to the large decrease in number the average initial well capacity was much less than in 1908. Sour Lake and Caddo were the only pools that showed increased activity. Batson, Humble, Spindletop and Jennings had the largest proportion of dry holes, Saratoga and Sour Lake the smallest. The number of wells drilled at Jennings was only half as large as in 1908 and dry holes were nearly as numerous as producing wells. In north Texas the Corsicana field was inactive but the number of wells finished in the Powell and Henrietta pools was more than double that of 1908. Many of the gas wells in the Caddo and Henrietta fields were of large capacity. Those in the latter were utilized to supply gas to Henrietta, Petrolia, and Wichita Falls and half of the 125-mile line to Dallas and Fort Worth was constructed.

The Mississippi Valley Gas and Pipe Line Company obtained a franchise to supply New Orleans from the Caddo field and are actively developing wells of ample capacity in the Vivian pool. The proposed pipe line will be about 350 miles long and cost $7,000,000 while the franchise stipulates that gas must be supplied within 30 months for 45c. per thousand feet up to a consumption of 60,000,000 ft. and over that amount for 40 cents.

The record of completed wells does not include any outside the well known pools. Wildcat drilling was undertaken in about 25 counties in Texas and 11 parishes in Louisiana extending over a wide area; many of the wells were not completed, though not finally abandoned. A few wells made a small showing of oil but the only one of prominence was a well near Electra in Wilbarger county, northern Texas. It was finished late in the year and is said to be capable of producing 40 bbl. of 41 deg. B. oil from a sand found at 1200 feet.

Prices

The market for crude was weak early in January, prices at most points averaging 56c., with Caddo light selling at 50c. and heavy at 40c., Corsicana light at 70c. and fuel oil at 48c. In February when it was realized that the production was declining much below consumption, posted credit-balance prices advanced 2c. and spot oil at Jennings brought as high as 70c. The advance continued during March and April when credit-balance prices ranged from 72@76c. and Caddo oil brought from 50c. for fuel oil to 60c. for light grades suitable for refining. The market remained stable but inactive until July when the credit-balance prices stiffened to 75c. and remained unchanged to the end of the year, some oil selling as high as 80c. on contract.

The stable prices indicate that the market in all portions of the territory adjacent to pipe lines or refineries is now dominated by the cost of Oklahoma crude. A considerable portion of the fuel-oil demand was satisfied by refinery residuum and consumption would be large if more tank cars were available. The stability of prices and the ability to obtain long-time contracts may increase the consumption which undoubtedly declined owing to the high price and disinclination of coastal producers to make contracts guaranteeing price and delivery. The average posted credit-balance price for 1909 was 70@71c. in the coastal fields except Caddo, where the average was 50@55 cents.

Refineries and Pipe Lines

The Standard Oil Company was constructing a refinery near Baton Rouge which, when completed early in 1910 is to have a still capacity of 10,000 bbl. The capacity of the Texas Company plant at Dallas was increased by 4800 bbl. daily in June and the Texas City Refining Company put in operation a new 2000-bbl. plant on the bay shore opposite Galveston. The Security Oil Company refinery near Beaumont was idle part of 1909 and the plant of the United Oil and Refining Company at Spindletop was closed down in August owing to financial difficulties which necessitated the appointment of a receiver.

Competition in refined products was very keen in 1909 and consumers had no reason to complain of prices or quality. Water shipments from Port Arthur and Sabine increased about 50 per cent. over those of 1908. The 1908 shipments of all grades and classes totalled 8,128,573 bbl. while the shipments for 11 months of 1909 aggregated 10,995,496 bbl., of which 7,579,812 bbl. were refinery products. Most of the cargoes were manifested to Gulf or eastern Atlantic ports and the rest were consigned for European or Mexican consumption. Practically all the refinery products (except asphalt) were derived from Oklahoma crude and the bulk of the crude shipped was from coastal fields. New pipe line construction in Texas was generally for the purpose of increasing the facilities for tranferring Oklahoma crude. The Gulf Pipe Line Company completed a 6-in. line from Sour Lake to Houston in order to save freight rates in supplying fuel oil to south Texas points. In Louisiana various laterals were laid in the Caddo field and a portion of the Standard Oil line from Oklahoma to Baton Rouge was completed.

Legal Proceedings

The onerous injunction and seizure of tank cars in the action under the anti-trust laws against the Security Oil Company, Navarro Refining Company and the Union Tank Line Company made it difficult to obtain an adequate supply of crude and prevented shipment of refined products by these concerns. When the action was tried the Security Oil Company and Navarro Refining Company admitted that their products were sold, under agreement, exclusively to the Standard Oil Company. Judgment was pronounced fining them, ordering their charters canceled and perpetually enjoining them from doing business in Texas. The Union Tank Line Company was fined $75,000 and their cars in custody ordered sold.

In the case of Texas vs. Waters-Pierce Oil Company the Supreme Court of the United States confirmed the State court on all points, a receiver was appointed, judgment given for ouster and a fine of $1,623,900 with costs imposed. The large fine was duly paid to the State Treasurer, the property sold in December to interests friendly to the defendants and the company will be reorganized by H. Clay Pierce, who successfully defended the criminal action against him.

Texas Districts

Sour Lake, the only pool showing an increased output over that of 1908, was the center of interest in the early part of the year on account of the development of the deep sand on the south side of the field. The field was also extended slightly to the northeast and the monthly production increased to 175,000 bbl. These extensions failed to maintain their yield, however, and the production declined to 125,000 bbl. in November. While the Humble pool retained its position as the largest producer in Texas its output declined 600,000 bbl. and well completions were 50 less than in 1908. Salt water proved a serious problem to contend with in the deep sand of the northern extension and operators were satisfied with 100-bbl. wells in the 900-ft. sand. The situation is best shown by the fact that the average initial capacity per well declined from 215 bbl. in 1908 to about 60 bbl. in 1909. Spindletop and Batson were featureless with output diminishing slowly but surely. The Saratoga pool was extended a short distance south and southwest. It yielded 300,000 bbl. less than in 1908 but the monthly reports show that its production varied little during the year and that the proportion of dry holes was very small. At Markham the Producers Oil Company abandoned the field after expending $150,000 in obtaining an insignificant production. Goose Creek had only one producing well at the end of the year and the production in the Mission Field, Bexar county, and at Piedras Pintas, Duval county, remain nominal. Hoskins Mount in Brazoria county developed several good wells and, while the shipments to date have been comparatively small, the pool showed more promise of an increased output than any of the new districts.

Louisiana Districts

The Welch field continued to give a small yield from old wells. All efforts to extend the Anse Le Butte pool were failures and the November production was only about one-third of that of January. The most disappointing feature of the year was the enormous decline in production at Jennings where about 50 wells were completed and the initial capacity of the producers was absurdly small when compared with previous years. A reduced yield was anticipated but not a decline of over 3,000,000 bbl. Some idea of the rapid encroach of salt water and consequent failure to hold up production was shown by the monthly runs which declined from 255,000 bbl. in January to 131,000 bbl. in November.

While the proven area in the Caddo field was largely extended in spots, field operations were not nearly as extensive as expected, though double what they were in 1908. The monthly production increased from 54,000 bbl. in January to 115,000 bbl. in November while the total yield was 400,000 in excess of 1908. The territory is apparently spotted and the wells vary greatly in capacity and in quality of crude. The producing wells are in the vicinity of Lewis, Vivian, Mooringsport, Oil City, Pine Island, and Hart's Ferry. Vivian the most northerly pool (eight miles north of the regular deep sand) not only produced heavy oil but some extremely large gas wells. These oil and gas wells are in the shallow sand and cost much less to drill than in other

Caddo pools. Many of the outside tests resulted in dry holes but the largest well of the year was brought in during November, two miles from the Texas line. This well which is four miles from the nearest well in the deep sand, is said to be 2350 ft. deep and to have had an initial capacity of 2000 bbl. of 41 deg. B. oil.

Ten samples of Caddo crude were examined by the U. S. Geological Survey. They were all black in color, had a specific gravity ranging from 21.3 to 41 deg. B., and gave no indication of sulphur. Their asphalt content was usually less than half of one per cent. and in no case exceeded one per cent; only two samples contained gasolene and the kerosene varied from 12 to 55 per cent.

The State survey issued a preliminary bulletin relating to the oil and gas in northwestern Louisiana and it will be followed by a more detailed report now in preparation by the U. S. Geological Survey.

The Appalachian Oilfield

BY H. C. GEORGE *

The oilfields of New York, Pennsylvania, West Virginia, southeast Ohio and Kentucky produce a high-grade petroleum with a paraffin base. These oilfields are included under the general name the "Appalachian Oilfield." This oilfield, for a number of years, has shown a steady decrease in production, but owing to the discovery of some large wells in West Virginia during 1909, a slight increase is recorded. The total production of the Appalachian oilfield in 1909 was 25,394,200 bbl., as compared with 24,240,000 bbl. in 1908, 25,500,000 bbl. in 1907, and 27,345,000 bbl. in 1906.

At the beginning of 1909 crude petroleum of the Pennsylvania grade sold for $1.78 per bbl. A break in prices came in April, and finally in November the uniform price paid was $1.43 per bbl. The average price during the year was $1.62 per bbl., as compared with $1.78 in 1908 and $1.74 in 1907.

New York and Pennsylvania

Petroleum developments in Pennsylvania and New York during 1909 have been the repetition of the history of these fields during the previous five years. The production has been maintained only by the yearly drilling of about 4000 wells with a daily average production per well of about 2¼ bbl. Most of the oil territory in these two States is of the long-lived kind, owing mainly to the density of the sand rock containing the oil.

In the Allegany County field in New York, more than half of the producing wells, which number about 6000, were drilled 25 years ago. Hundreds of others equally as good were "pulled out" at the time of the big excitements in other fields between the years 1882 and 1892 for the purpose of securing the "junk" for use elsewhere. During the last five years, many of these abandoned wells have been redrilled and placed on a paying basis. During 1909 a test well was drilled in this field to a depth of 3200 ft. The well was cased to 300 ft. From 975 ft. to 2650 ft. the drill encountered black and brown shale. At 2650 ft. the Niagara limestone was reached. From 3050 ft. to 3115 ft. a salt bed was passed through. From 3115 ft. to 3200 ft., the bottom of the hole, the drilling was in blue slate.

Drilling operations in Pennsylvania are naturally limited by the scarcity of available territory and the small wells secured. But territory which would have been considered of no value a few years ago is now secured and thoroughly drilled. The decrease in the market price of petroleum during 1909 had a tendency to limit operations and developments in the Pennsylvania and other fields, where only small wells could be hoped for; not so much on account of the decrease itself, but more on account of the feeling of uncertainty that it created. Nearly all of the wells drilled in Pennsylvania during the year were small. A good well was struck last April in the Bradford sand at Smithport, McKean county. Probably the best well drilled in the State during the year was the one completed last October near Bakerstown, Allegheny county. The production during the first 24 hours was 350 barrels.

Ohio

The Steubenville pool in Jefferson county has been furnishing the largest producers in Ohio. But the limited area of this field will not justify hopes of any great increase in production. Operations were active during 1909 in Fairfield and Perry counties. The wells drilled are not large, but they indicate the existence of considerable undeveloped oil territory. In the earlier part of the year one of the best wells credited to the eastern fields was drilled in Ludlow township, Washington county. It produced in the first 48 hours about 2500 bbl. In the Woodsfield district, Monroe county, some good producers were found as a result of extended field activity. Neither Jefferson nor Columbiana counties has been very successful in field operations or new production.

West Virginia

West Virginia, during the last few years, has stood first in new production in the Appalachian field. Lincoln county led in active work and increased production during the earlier part of 1909. This was chiefly due to a number of fair producers in the Berea grit formation. Much exploration work was done in Putnam, Kanawha, Boone, Logan and Mingo counties, but with indifferent success.

The best well drilled in August in the Appalachian field was found in the Shinnston pool in Harrison county. At its best it produced about 80 bbl. per hour, and it averaged about 1700 bbl. per day at the end of a week. This well furnished about half of the new production credited to West Virginia in August.

Previous to August in 1909, southeast Ohio stood first in new production in the Appalachian field for the year, but at this time West Virginia resumed first place. Last October a well was drilled in the Mannington district in Marion county, West Virginia. It produced 500 bbl. during the first 12 hours. Later it was given a shot and the production was increased to 100 bbl. per hour.

In November the production of the

PRODUCTION OF WELLS DRILLED IN THE APPALACHIAN OILFIELD IN 1907, 1908 AND 1909.

	Number of Wells Drilled.			Daily Production in Barrels.			Daily Production in Barrels per Well Drilled.			Per Cent. of Dry Holes.		
Field.	1907.	1908.	1909.	1907.	1908.	1909.	1907.	1908.	1909.	1907.	1908.	1909.
Allegany County, N. Y.	575	493	468	1,114	880	838	1.9	1.8	1.8	16.0	13.4	7.5
Pennsylvania	3,611	3,748	3,958	12,176	9,532	10,361	3.3	2.5	2.6	21.0	19.0	15.6
West Virginia	1,320	1,329	1,810	21,300	27,304	35,872	16.1	20.6	19.1	38.0	32.5	36.9
Southeast Ohio	1,335	1,344	2,285	6,793	13,798	25,239	5.9	10.3	11.0	39.5	39.3	36.2
Kentucky	212	205	179	2,006	2,519	2,108	9.4	12.3	11.7	32.0	33.6	44.7
Total	7,053	7,119	8,700	43,389	54,033	81,918	6.1	7.6	9.4	27.0	25.0	25.6

*Director, Wisconsin State Mining Trade School, Platteville, Wis.

Shinnston pool in Harrison county had reached 7000 bbl. per day by the drilling of a few very large wells. Early in December this pool furnished the largest gusher with one exception since the days of the big wells of the McDonald field. No accurate gage could be taken of the production at first, but it was variously estimated from 300 to 500 bbl. per hour. When finally controlled, with facilities to handle the oil, the production reached 4000 bbl. during the first 24 hours. The production of the Shinnston pool in December averaged about 10,000 bbl. per day.

During the latter part of 1909 the Big Injun district in Roane county was most active in development work. This county has more wells drilled and started than any other in the southwest part of the Appalachian oilfield. About the time that operations became more active in Roane county there was a marked decline in Lincoln county. There was considerable development work in Ritchie, Pleasant and Wirt counties during the year. In the "shallow sand" territory in Ritchie county the Grant and Murphy districts produced some good wells. The new wells in Wirt and Pleasant counties are mostly small producers.

An accompanying table shows a complete record of the new production in the Appalachian oilfield. Developments in Kentucky were not especially promising. Nearly half of the wells drilled during 1909 were dry holes, and there are no strong indications in the State of any great extent of oil territory.

Oil and Gas in the Mid-continental Field

BY ERASMUS HAWORTH *

Probably the most interesting development in the Mid-continental field during 1909 was the bringing-in of a new pool six miles north of Okmulgee, at a little siding previously known as Hamilton switch, but now usually called Hamilton. In August a well was drilled which flowed 800 bbl. and which is still making about 600 bbl. per day. Five other wells, each of which is a good producer, were drilled, the last one starting off with a natural flow of 1500 barrels.

The discovery at Hamilton created quite a furor among oil men. The wells are the deepest of any in the entire field, extreme cases are selling at a bonus of $500 an acre. The Hamilton pool lies almost immediately south of the famous Glenn pool which makes it in line with practically all the great producers from Dewey south by way of Bartlesville and Red Fork; one of the most remarkable oil trends in the world.

Some drilling was done throughout the entire Mid-continental area, but the amount was in no wise comparable with that of other years. The production already obtained was more than the markets demanded which accounts for a lapse of drilling activities. In the vicinity of

CRUDE OIL BOUGHT BY THE PRAIRIE OIL AND GAS COMPANY DURING 1909.

Month.	Total Runs, Barrels.	Daily Average, Barrels.	Deliveries, Barrels.	Stored, Barrels.
January	2,684,529	86,597	2,197,351	487,178
February	2,322,582	82,949	1,804,899	517,683
March	2,449,129	79,004	2,178,254	261,875
April	2,294,894	76,496	2,262,918	31,975
May	2,379,196	76,748	2,296,896	82,300
June	2,442,487	81,416	2,117,482	325,004
July	1,871,792	60,380	1,743,330	128,462
August	2,528,107	81,551	2,492,897	35,210
September	2,516,956	83,898	2,405,133	111,822
October	2,382,488	76,854	2,369,525	12,963
November	2,459,353	78,978	2,425,499	33,854
December	2,394,683	78,897	2,209,459	9,393
Total	28,726,196		26,503,643	2,037,719

with the possible exception of a few outside ones in remote districts. The sand lies uniformly 2200 ft. deep and is what practical oil men call a "fine" sand. No large gas wells were obtained, but a steady flow for months with but slight cessation means that there is sufficient gas to produce strong-flowing wells. Further, no one shot any of the wells. Development is being rushed and probably within the next 10 weeks there will be from 40 to 60 wells drilled and the pool at least partially outlined. By the first of December there were more than 40 rigs on the grounds. In midsummer leases could be had almost for the asking, by paying the royalties required by the Interior Department. Now such leases in Muskogee a number of wells were obtained all of which produced the same high-grade oil as of earlier times. Two well defined oil sands are encountered here, one at about 1200 ft. and the other at about 1600. The oil in the upper has an average gravity of about 42 deg. B. and in the lower of about 38 deg. Baumé.

The shallow field in the vicinity of Alluwe and Coody's Bluff remained productive to such a degree that some optomistic operators figure that this field could produce 100,000 bbl. daily should the market call for it. As Nowata is the principal town in this vicinity, it is becoming customary to speak of the region as the Nowata area, although the oil is obtained to the east and northeast of this place.

*State geologist, Lawrence, Kansas.

Pipe Lines

No new oil pipe lines were built during 1909 to carry the oil outside the Mid-continental field. But those in existence were actively in use all the time. The Prairie Oil and Gas Company purchased from 70,000 to 90,000 bbl. daily throughout the year, nearly all of which was delivered to the pipe-line companies, leaving but a small portion to be put in storage as will be seen by an examination of the statistical tables hereto appended. The Texas Pipe Line Company, sometimes spoken of as the John W. Gates company, and the Gulf Pipe Line Company, or Mellons company, each shipped large quantities of oil throughout the year.

OIL PRODUCTION, MID-CONTINENTAL FIELD, DURING 1909.

	Barrels.
Prairie Oil and Gas Co	28,726,196
Texas Oil Co	6,250,000
Gulf Oil and Pipe Line Co	7,375,000
Independent refineries	2,975,000
Fuel oil, crude	500,000
Independent shippers	1,000,000
Totals for year	46,826,196

The Standard Oil Company began work on a large pipe line from the Mid-continental field to the gulf. E. A. McPherson, the contractor, reached the field about Dec. 1 and at once began making active preparations for the construction of the line. One branch of this line will start from the vicinity of Nowata and one from the Glenn pool. The two will meet a little northwest of Muskogee, from which point presumably the line will be carried through Arkansas and Louisiana by way of Baton Rouge, where the Standard Oil Company is now constructing a $2,000,000 refinery. It is hoped by producers that, with the construction of this new line, a much greater demand for oil than has existed for the last two years will result.

Refineries

The great bulk of oil produced in the

Mid-continental field has been refined by the Standard Oil Company. Most of the large number of independent refineries listed for last year[1] operated in 1909 although some of the lesser ones stood idle the greater part of the time. The one at Niotaze, working largely on borrowed capital, began extensive enlargements of its plant, with the ultimate result that it was placed in the hands of a receiver under the Federal court.

Fuel Oil

A larger amount of fuel oil was consumed in 1909 than ever before in the history of the Mid-continental field. Much more than one-half of the oil thus consumed came from the refineries, yet a comparatively large amount of crude oil was taken directly from the wells to the furnaces throughout portions of Texas, Oklahoma, Kansas and Nebraska. The large refinery at Sugar Creek near Kansas City supplied the greater portion of the oil consumed. This refinery gets its supply of crude oil entirely from the Mid-continental field.

Gas

No remarkable developments were made during 1909 either in the production of gas wells or in the extending of gas pipe lines. The Kansas Natural Gas Company remained by far the largest producer and vender of gas for fuel. In the very heart of the gas territory a number of cities and towns which formerly had an independent supply of gas are now connected with the pipe lines of this company. The extension of pipe lines was confined entirely to connecting up more generally, with residences, business houses, small factories, etc., in territory already covered.

Much complaint was made during the early part of 1909, in Kansas City, St. Joseph and Topeka, particularly, and in some other towns to a lesser extent, because the gas supply was insufficient to meet the demands of consumption for domestic purposes. This is also being felt now. The cold weather of early December found Topeka so short on gas that on a few mornings the supply seemed to be entirely exhausted by nine o'clock. Governor Stubbs of Kansas, it is reported, instructed the State's attorney general to look into the matter, and should he find sufficient legal encouragement, to enjoin the Kansas Natural Gas Company from piping gas out of Kansas until its Kansas consumers, with whom it has life contracts, are first served.

Petroleum in Illinois

BY RAYMOND S. BLATCHLEY *

The production of oil in Illinois in 1909 fell far below that of 1908, thus checking the phenomenal growth of the three preceding years. The production was a little more than 29,500,000 bbl. as against 33,685,106 bbl. in 1908. The returns for 1909 are not complete but if it is estimated that the December production was equal to that of November and the tank-car shipments were 1,500,000 bbl., the total is 29,500,000 bbl. for 1909. The pipe line runs of the Ohio Oil Company for various months are given in an accompanying table. The miscellaneous re-

RECEIPTS OF THE OHIO OIL COMPANY IN 1909.

	Barrels.
January	2,494,492
February	2,358,198
March	2,568,392
April	2,388,309
May	2,536,413
June	2,365,956
July	2,413,218
August	2,411,483
September	2,203,705
October	2,228,268
November	2,149,371

ceipts include tank-car shipments for the Indiana Refining Company, the Sun Oil Company, the Cornplanter Oil Company and the pipe line runs of the Tidewater company. The latter company was installed in the field during the earlier part of the spring.

The general production for the first six months of 1909 held up to the average of 1908, but with the coming of summer the decline was marked. The cause for the check lies in the fact that the market was overstocked through continued drilling. This was somewhat further augmented by a drop in the price of oil. Early in the summer the price fell from 68c. per bbl. for oil above 30 deg. B. and 60c. per bbl. below 30 deg. B., to 65 and 57c. respectively. Later it took another decline to 62 and 54c., and finally in October it fell to 60 and 52c. for the two grades. The productive capacity of the field is far in excess of facilities for relieving the supply; in fact the initial production has been higher in 1909 than for the previous year, as greater producers were developed.

WELLS DRILLED IN ILLINOIS DURING 1909.

	Wells Completed.	New Production.	Dry Holes.	Average Initial Production
		Barrels.		Barrels.
January	213	5,060	41	29⅜
February	224	4,833	47	26⅓
March	216	5,018	45	29⅓
April	263	5,237	38	23½
May	321	7,681	45	27⅞
June	342	9,050	53	31⅓
July	346	9,820	50	33½
August	303	8,661	57	35½
September	282	8,324	50	35⅝
October	242	8,904	48	45⅝
November	223	9,628	52	56½
Total	2,975	82,216	526	

Principal Development in Lawrence County

The major development of the year took place in Lawrence county where the deep sands below the coal measures were sought for, these being more prolific than the upper sands. A new pay sand was developed along the southwestern edge of the field in section 30 of Bridgeport township. Oil was found at a depth of 1975 ft. and the initial and present daily yield of the well is 50 bbl. The deeper sands have not been tapped to the full extent because of an inactive market and increased expense from cavy conditions of the lower formations.

Clark, Coles and Cumberland counties decreased from 1908 in the point of drilling and new production. The shallow sands of these counties have gradually lost their production until now they are almost inactive in the original wells. The production of Crawford county kept up through the discovery of new limits at Oblong, New Hebron and Flat Rock.

On Jan. 1, 1909, it was estimated that 13,346 wells had been drilled. Of these

WELLS DRILLED DURING 1909 IN DIFFERENT COUNTIES, ILLINOIS.

County.	Wells Completed.	New Production, Barrels.	Dry Holes.
Crawford	1,979	41,514	334
Lawrence	677	36,496	52
Clark	174	3,174	44
Coles	11	95	2
Cumberland	29	488	10
Edgar	5	10	3
Miscellaneous	100	439	81
	2,975	82,216	526

1821 were dry holes. During 1908 there were 3574 wells put down, of which 561 were dry holes. The new production established for the year was 78,960 bbl. In the first 11 months of 1909, 2975 wells were drilled, with 526 dry holes and a new production of 82,216 bbl. Up to December 1 the total estimate would reach 16,321 wells drilled, of which 2347 were dry. Following the custom of previous years, a record of drilling by months from the *Oil City Derrick* is herewith given; also the drilling record for 1909 in the eastern Illinois fields by counties.

[1] Eng. & Min. Journ., Jan. 9, 1909, p. 97.

*Assistant geologist, State Geological Survey, Springfield, Ill.

There was an increase in "wildcatting" during the year, especially along the western edge of the great structural basin of southern and central Illinois. The territory around St. Louis, in Greene, Jersey, Macoupin, Madison and St. Clair counties, has been widely drilled with but meager results. At Carlinville a fair gas pressure was tapped, and at Waverly, in Morgan county, a small show of oil was obtained. During the latter part of 1909 activity was noticeable in the central-southern part of the State, with especial attention given to the dome structure at DuQuoin, where conditions are favorable to the accumulation of oil.

The finding of oil at Sparta, in 1906, brought on considerable drilling in Randolph county. A small production came in in 1908 but decreased during 1909 and at the present time is all but abandoned. Oil was found in small quantity at Eldorado, in Saline county, and presumably comes from the Chester formation. The deep sands of the main fields come from the same formation, which outcrops near Sparta and in which the oil is found there.

During the year oil was found in three wells drilled near Sandoval, in Marion county. This has caused an unusual activity in that section of the State and as a result there has been a wholesale leasing of farms in all directions, with a considerable loss through payment of exorbitant bonuses. The pay seems to have been limited up to the present writing to a single area covering 300 or more acres of ground. The sands in which the oil occurs are in the Chester formation and apparently correspond to the Buchanan and Kirkwood sands of the main field. The wells averaged about 125 bbl. on initial output. The year as a whole has been prosperous from the standpoint of new production, and with adequate means of taking the oil the outlook for the coming year would be excellent. The use of oil as fuel is commanding attention in the Illinois fields and a new line of demand is being opened up. A decrease in the production of gas was noticeable, thus giving opportunity to the use of oil as a fuel.

The Lima Oilfield

BY H. C. GEORGE *

The output of the northwestern Ohio and the eastern Indiana oilfields, which are included under the general name "Lima Oilfield," has declined steadily. The total production in 1909 was 6,192,000 bbl., as compared with 7,287,000 bbl., in 1908, and 8,030,000 bbl., in 1907.

Twelve thousand wells have been abandoned during the past five years and the production has been maintained only by the constant drilling of new wells. These wells have not been abandoned on account of the scarcity of gas nor the large volume of salt water, but because they no longer produce oil. In other words, the oil-bearing formation has been drained. The percentage of dry holes drilled during 1909 increased, as is shown in the accompanying table, which gives only the new wells and their production.

PRODUCTION OF WELLS DRILLED IN THE LIMA FIELD IN 1907, 1908 AND 1909.

Field.	Number of Wells Drilled.			Daily Production in Barrels.			Daily Production in Barrels per Well Drilled.			Per Cent. of Dry Holes.		
	1907.	1908.	1909.	1907	1908.	1909.	1907.	1908.	1909.	1907.	1908.	1909.
Northwest Ohio...	930	837	917	8,100	9,252	7,771	8.7	11.0	8.4	15	9	9.6
Northeast Indiana.	682	413	304	5,673	3,405	3,852	8.3	8.2	12.6	20	19	27.3
Total.....	1,612	1,250	1,221	13,773	12,657	11,623	8.5	10.1	9.5	17	13.5	14.0

The average price paid for North Lima oil in 1909 was 91½c. per bbl. as compared with $1.03 in 1908, and 93½c. in 1907. South Lima oil has brought 5c. per bbl. less in each of these years.

Oil in California

As shown in a preceding table, California produced 58,250,300 bbl. of crude petroleum in 1909. This represents an increased output of 13,250,300 bbl. The Coalinga field was the largest producer in the State. Considering all of the fields in the State the average price per barrel brought by the petroleum was 56c. The daily average production per well was 43 barrels.

A record production amounting to 5,300,000 bbl., was made during December, the number of producing wells being about 4000. Producers are optimistic in looking for higher prices and expect that contracts made after Jan. 1, 1910, will be made on a basis close to 60c. per barrel.

The Oriental Consolidated Mining Company with mines in Korea, crushed during the year ended June 30, 1909, 296,417 tons of ore, yielding $889,139 in gold.

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Arsenic in 1909

The domestic production of arsenic was increased during 1909 by the introduction of a new producer, the United States Smelting Company, which started its arsenic plant to treat the product of the baghouse of its lead smeltery near Salt Lake City, Utah. The other producers in this country are the Everett plant, of the American Smelters Securities Company, at Everett, Wash., and the Anaconda Copper Mining Company at Anaconda, Mont. The production in the United States in 1908 was 2,600,000 lb., but the consumption was about 12,200,000 lb. The commercial white arsenic produced in this country, being a by-product, the production was not materially affected by the exceptionally low prices which prevailed during the year. The greater part of the arsenic consumed in the United States was imported from Europe, some also coming from Canada and Mexico. The Canadian production was made by three companies: The Deloro Mining and Reduction Company, at Deloro, Ont.; the Canadian Copper Company, at Copper Cliff, Ont.; the Coniagas Reduction Company of St. Catherine's, Ont. The Compañia Minera de Peñoles was the principal producer in Mexico.

Arsenic was quoted at the beginning of 1909 at 2⅞@3c. per lb. There was a slight advance during January and February when the manufacturers of Paris green and other insecticides were making their final purchases. The price worked down to about 2.7c. in March and April, but there was a rally during the succeeding months, especially in June and July, largely the result of speculation as to the adoption of a duty for this product. It was still left on the free list by the Payne law and the price dropped to about 2⅞c. with some quotations for large lots as low as 2⅝c., closing at about 2¾c. at the end of 1909. At these unremunerative prices it is not likely that much profit can be made by many of the producers and it is understood that there has already been a falling off in production abroad, particularly in England.

Tin in 1909

Although the United States is the largest consumer of tin, taking about 40 per cent. of the world's output, no tin was produced in the country in 1909. No work was done at Gaffney in South Carolina, where some concentrates were produced in 1908, though it is understood that preparations are being made to resume operations there. There is a prospect that the Harvey Peak mine in South Dakota may be worked by the new company which has been formed, and which is now carefully prospecting the ground. Some prospecting work has been done in Alaska, and some on the more recently discovered deposits in Texas; but neither, apparently is near the producing stage.

The world's supply of tin continues to come from the Straits Settlements—including the Malay Peninsula; from the Banka and Billiton mines in the Dutch East Indies; from Australia; from Bolivia; and from the ancient mines of Cornwall in England. The Straits, as the usual term is, produced in 1909 the largest quantity, approximately 55 per cent. of the total. In addition to the output of which we have record, there is tin produced in China, but the quantity is uncertain. It is enough, however, to supply the consumption of that country and to permit occasional exports.

So much of the production of tin is from countries where no statistics exist, that we are largely dependent on the trade reports and statistics for the figures. These undoubtedly approximate correctness, since the movement of the metal is closely watched. From the circulars—especially those of Ricard & Freiwald and of De Moñchy & Havelaar, the accompanying tables have been compiled.

For the 12 months ended Nov. 30 the production of tin may be estimated as follows, in long tons:

TIN PRODUCTION OF THE WORLD.

	1908.	1909.
Straits	62,392	59,870
Banka and Billiton	13,785	15,014
Australia	6,119	5,800
Bolivia	16,250	16,500
Chinese exports	4,000	3,500
Cornwall (England)	4,400	4,800
Miscellaneous	250	500
Total	107,196	105,984

No attempt was made to estimate the Chinese production, and it is not included above. The total output showed a small decrease.

The deliveries of tin, in long tons, for the 12 months ended Nov. 30, are estimated by the trade authorities as below, in long tons:

TIN CONSUMPTION.	1908.	1909.
United States	31,700	39,550
Great Britain	29,400	29,334
Other European countries	28,050	30,068
India and China, from the Straits	3,265	3,400
Other countries	4,250	4,350
Australian consumption, etc.	500	500
Total	97,165	107,202

The available figures indicate that there was an increase in deliveries in 1909; and that the consumption exceeded the production. This condition, of course, cannot last; but at present there are no indications of any large new supplies. In the Malay Peninsula more careful and thorough methods of mining are being introduced, and the same is the case in the Banka mines. In Australia, however, the industry appears to be declining.

The production of the Federated Malay States for the 10 months ended Oct. 31 was as follows: Perak, 372,333 pikuls; Selangor, 216,408; Sembilan, 39,597; Pahang, 33,935; total, 662,273 pikuls—or 39,421 long tons—which is a decrease of 46,203 pikuls as compared with the previous year.

Imports of tin into the United States for the 11 months ended Nov. 30 were 89,217,882 lb., and for the full year will probably be close to 100,000,000 lb. This is a substantial gain over 1908, when the imports for the full year were 82,772,678 lb. Nearly 90 per cent. of the imports are Straits tin.

The Tin Market in 1909.

The statistical position of tin, which toward the end of 1908 and during the first quarter of 1909 was a most unfavorable one, improved gradually throughout the balance of the year. The consumption in this country assumed larger proportions, and as shipments from the East did not increase correspondingly, the existing stocks had to be drawn upon. New fields of production were not discovered and the consumers of tin the world over have still in the main to rely for their supplies upon the Straits Settlements and the Dutch colonies in Asia. Reliable figures with regard to the production of tin, especially in the Straits Settlements, are unobtainable, but notwithstanding the somewhat smaller shipments from there, it may be safely estimated that the production has remained at about the same level for the last few years. Whenever shipments came in smaller volume, it was in most cases due to a desire upon the part of the Chinese merchants to influence the European market, rather than through a decrease in the supplies.

The month of January and the early part of February witnessed a considerable decline, brought about by bear operators in London, who were on the one hand supported in their policy by the statistical position of the metal, and, on the other hand, by the Banka sale advertised by the Dutch government. The year opened with prices at about 28¾c. per lb., and this had declined to 27⅝c. by the end of January. The lower quotations created a livelier demand from the American dealers and consumers, and this, coupled with advises of smaller shipments from the Straits, has a sustaining influence on the market. Prices advanced gradually to 29¾c. at the end of March.

Until the middle of August, the market remained rather stationary and did not exhibit any of the violent movements which are characteristic of tin. Thenceforward, the bull leaders in London became more aggressive and succeeded in advancing prices to 30¾c. by the end of September.

TIN AT NEW YORK

Month.	1908.	1909.	Month.	1908.	1909.
January	27.380	28.060	July	29.207	29.125
February	28.978	28.290	August	29.942	29.966
March	30.577	28.727	September	28.815	30.293
April	31.702	29.445	October	29.444	30.475
May	30.015	29.225	November	30.348	30.859
June	28.024	29.322	December	29.154	32.913
			Av. year	29.465	29.725

Prices are in cents per pound.

During October, the tightening in the money market caused speculative holders in New York to liquidate so that business was transacted at prices below the parity at which tin could be imported. The London market, however, remained firm in view of the favorable statistical position and the good consumptive demand in this country. When the domestic deliveries for the month of October, which showed a remarkable expansion in consumption, became known, and when it became manifest that the consumption of tin in this country would continue at an increasing rate, it was easy for the bull party in London to mark prices up rapidly. By the middle of December 32¾c. was being paid in New York, and at the close of 1909 the metal was quoted at 33¾@34c. per pound.

Cripple Creek Production

The gross value of Cripple Creek ores treated during 1909 in the gold-reduction plants at Colorado Springs and Colorado City was $12,158,874, according to preliminary estimates. A total tonnage of 587,442, with an average value of slightly more than $20 per ton is reported for the year. The Golden Cycle mill handled 329,688 tons, worth $6,758,604; the United States Reduction and Refining Company's plant, 147,734 tons worth $3,200,270; and the mill of the Portland Gold Mining Company, 110,000 tons valued at $2,200,000. This amount does not represent the entire production of the Cripple Creek district for the year, as considerable low-grade ore was treated in the district. It is estimated that a total of $15,500,000 was produced.

Dividends Paid by Mining Companies in 1909

The table given below shows the dividends paid in 1909 by a number of the principal mining, metallurgical and industrial companies in the United States and mining companies in Canada, Mexico and Central America; the foreign companies listed are mostly those in which American capital is heavily interested. Totals of such a list necessarily cannot be regarded as complete as there are many very profitable close corporations, the dividends of which are not published and other companies are omitted for various reasons. However, when 66 mining and metallurgical companies in the country paid $54,024,811 to their stockholders, 31 foreign companies paid $11,287,637 and 18 domestic industrial companies paid $85,730,045 in one year, 1909, one cannot fail to realize the immense import of this basic industry.

Comparison of 1909 and 1908 Records

A comparison of the table herewith given and the similar one published a year ago will show that many more mining companies throughout the States paid dividends in 1909 than in 1908. Iron Blossom of Utah, Nevada Consolidated, and Golden Star of Arizona appear in the table for the first time in 1909: These payments were respectively $480,000, $431,700 and $120,000. Goldfield Consolidated paid in 1909, $3,909,616 out of a total $4,621,530 declared to the beginning of 1910. A number of our great mines, such as the Calumet & Hecla, Homestake, North Star, Alaska-Treadwell, Boston & Montana, etc., in all 44 companies, appear in the tables for both years; in 1908 a total of $34,548,859 was paid; a slightly increased total, $34,826,892 was paid in 1909 but nearly all these companies will start 1910 in a much stronger position than they were in at the beginning of 1909. Nineteen foreign companies appear in the list for both 1908 and 1909, the total of these companies for 1909 being $1,386,983 larger than in 1908. The chief gains here are in the Cobalt companies, 13 of which appear among the dividend payers in 1909. Among the industrials listed the chief note of interest is the great payments made by the Standard Oil Company and the United States Steel Corporation.

DIVIDENDS PAID BY MINING AND METALLURGICAL COMPANIES.

U. S. Mining and Metallurgical Companies.	Situation.	Paid in 1909.	Paid per Share in 1909.	Total Paid to Jan. 1, 1910.
Alaska Mexican, g	Alas.	$360,000	$2.00	$2,400,381
Alaska Treadwell, g	Alas.	650,000	3.25	10,885,000
Alaska United, g	Alas.	234,000	1.30	657,680
Amalgamated, c	Mont.	3,077,756	2.00	71,557,871
Am. S. & R., com	U. S.	2,000,000	4.00	17,000,000
Am. S. & R., pf	U. S.	3,500,000	7.00	32,375,000
Am. Sm. Sec., pf. A	U. S.	1,020,000	6.00	4,475,000
Am. Sm. Sec., pf. B	U. S.	1,500,000	5.00	6,732,000
Anaconda, c	Mont.	1,200,000	1.00	44,250,000
Arizona Copper com	Ariz.	455,969	0.30	11,287,228
Arizona Copper, pf	Ariz.	106,354	0.084	1,240,933
Arizona Copper, pf. A	Ariz.	11,537	0.12	172,797
Boston & Montana, c	Mont.	1,800,000	12.00	54,300,000
Bunker Hill & Sullivan, l.s.	Ida.	615,000	2.05	11,286,000
Butte Coalition, c	Mont.	250,000	0.25	2,700,000
Calumet & Arizona, c	Ariz.	800,000	4.00	10,900,000
Calumet & Hecla, c	Mich.	2,700,000	27.00	110,550,000
Camp Bird, g.s	Colo.	787,000	0.96	5,766,650
Colorado, l.s	Utah	960,000	0.96	2,030,000
Colo. Gold Dredging	Colo.	50,000	0.50	50,000
Copper Range Con., c	Mich.	1,536,740	4.00	8,836,255
Daly West, g.s.l	Utah	162,000	0.90	6,039,000
Doctor Jack Pot, g	Colo.	45,000	0.01½	75,000
Doe Run, l	Mo.	380,301	6.00	2,145,306
Elkton Con., g	Colo.	237,500	0.09½	2,479,460
Federal M. & S., pf	Ida.	840,000	7.00	5,171,250
Florence Goldfield, g	Nev.	210,000	0.20	630,000
Golden Star, g	Ariz.	120,000	0.15	120,000
Goldfield Con., g	Nev.	3,909,616	0.90	4,621,530
Great Nor. Iron Ore Prop.	U. S.	1,495,720	1.00	.....
Hecla, s.l	Ida.	30,000	0.03	1,900,000
Homestake, g	S. Dak.	1,310,400	6.00	25,136,840
International Nickel, pf	U. S.	534,756	6.00	2,139,024
Iron Blossom, s.l	Utah	480,000	4.80	480,000
Iron Silver, s.l	Colo.	50,000	0.10	4,650,000
Jamison, g	Cal.	23,400	0.06	354,900
Mary McKinney, g	Colo.	39,126	0.03	880,320
Mohawk Mining, c	Mich.	300,000	3.00	1,950,000
Nevada Con., c	Nev.	431,700	0.37½	431,700
New Idria, g	Cal.	120,000	1.20	1,434,000
North Butte, c	Mont.	1,200,000	4.00	8,600,000
North Star, g	Cal.	575,000	2.30	2,486,988
Old Dominion, c	Ariz.	586,488	2.00	1,294,035
Old Dominion M. & S., c	Ariz.	648,000	4.00	1,012,500
Oroville Dredging, g	Cal.	350,000	0.50	1,383,036
Osceola, c	Mich.	769,200	8.00	7,997,150
Phelps, Dodge & Co.	U. S.	5,392,152	0.12	5,392,152
Portland, g	Colo.	120,000	0.04	8,227,080
Quincy, c	Mich.	440,000	4.00	18,890,000
Round Mountain, g	Nev.	128,311	0.16	224,000
Silver King Coalition, s	Utah	937,500	0.75	1,490,850
Sioux Con., s.l.g	Utah	440,383	0.58	694,393
Skidoo, g	Nev.	50,000	0.05	50,000
Snow Storm	Ida.	225,000	0.15	825,000
St. Joseph, l	Mo.	600,000	0.60	6,758,357
Tennessee Copper, c	Tenn.	250,000	1.25	2,306,250
Tonopah, s.g	Nev.	1,300,000	1.30	4,950,000
Uncle Sam Con., g.s.l	Utah	50,000	0.10	340,000
United Verde, c	Ariz.	449,890	1.50	1,610,267
U. S. Ref. & Min., com	Utah	702,020	2.00	2,499,070
U. S. Sm., Ref. & Min., pf.	Utah	1,700,456	3.50	6,156,896
Utah Con., c	Utah	600,000	2.00	6,900,000
Utah Copper, c	Utah	1,464,036	2.00	2,160,424
Vindicator, g	Colo.	112,500	0.07½	2,047,500
Wolverine, c	Mich.	300,000	5.00	5,400,000
Yuba Con., g	Cal.	300,000	0.12½	.....
Total		54,024,811		

Foreign Mining Companies

Foreign Mining Companies.	Situation.	Paid in 1909.	Paid per Share in 1909.	Total Paid to Jan. 1, 1910
Buffalo, s	Ont.	310,000	0.31	557,000
City of Cobalt, s	Ont.	94,492	0.06	139,385
Cobalt Central, s	Ont.	188,460	0.04	188,460
Coniagas, s	Ont.	360,000	0.45	1,160,000
Crown Reserve, s	Ont.	1,242,500	0.71	1,336,000
Dolores, g.s	Mex.	270,000	0.67½	774,866
Dominion Coal, com	N. S.	600,000	4.00	3,750,000
Dominion Coal, pf	N. S.	350,000	7.00	3,690,000
El Rayo, g. s	Mex.	21,601	0.06	21,601
Esperanza, s. g	Mex.	505,050	1.11	9,895,567
Granby Con	B. C.	270,000	2.00	3,778,630
Guanajuato Dev., pf., s	Mex.	30,000	3.00	184,356
Guggenheim Expl	Mex.	525,000	5.00	5,535,000
Kerr Lake, s	Ont.	690,000	1.15	1,530,000
La Rose, s	Ont.	1,056,732	0.80	1,228,450
Le Roi No. 2, g	B. C.	115,200	0.96	946,800
Lucky Tiger-Comb., g	Mex.	247,000	0.37	481,000
McKinley-Darragh, s	Ont.	224,769	0.10	472,015
Mex. Mill & Trans., pf., s	Mex.	31,500	3.00	65,858
Mines Co. of Am	Mex.	280,000	0.14	3,665,000
N. Y. & Hond. Rosario, g	C. A.	105,000	0.70	2,572,000
Nipissing, s	Ont.	1,350,000	1.12½	3,390,000
N. S. St. & Coal., pf	N. S.	41,200	4.00	721,000
Peregrina M. & M., pf	Mex.	700,000	7.00	258,656
Pinguico, pf., s	Mex.	120,000	6.00	360,000
Right of Way, s	Ont.	184,820	0.37	324,644
Temiskaming, s	Ont.	300,000	0.12	525,000
Temiskaming & H. B., s	Ont.	69,759	9.00	1,171,911
Trethewey, s	Ont.	244,554	0.25	461,998
U. S. & B. C	B. C.	60,000	0.10	1,168,925
Yukon Gold, g	Yukon	700,000	0.20	700,000
Total		11,287,637		

U. S. Coal, Iron and Industrials.

U. S. Coal, Iron and Industrials.	Situation.	Paid in 1909.	Paid per Share in 1909.	Total Paid to Jan. 1. 1910.
Am. Ag. Chem. pf	U. S.	$544,590	$3.00	$2,292,210
Am. Cement	Penn.	120,000	0.60	1,348,000
Central C. & C., com	Mo.	153,750	3.00	2,613,750
Central C. & C., pf	Mo.	46,876	2.50	1,456,562
Col. & Hock. C. & I., pf	Ohio	207,732	3.00	591,550
Consolidation Coal	Md.	358,750	3.50	17,020,770
General Chem., com	U. S.	296,412	4.00	2,445,399
General Chem., pf	U. S.	600,000	6.00	6,555,000
Maryland Coal	Md.	47,125	2.50	2,061,122
Nat. Lead, com	N. Y.	745,268	5.00	3,642,789
Nat. Lead, pf	N. Y.	1,043,280	7.00	18,676,708
Republic I. & S., pf	Ill.	2,143,773	10.50	8,546,406
Sloss-Sheffield, com	Ala.	250,000	2.50	2,133,000
Sloss-Sheffield, pf	Ala.	234,500	3.50	4,338,000
Standard Oil	U. S.	38,800,000	40.00	668,322,000
U. S. Steel Corp., com	U. S.	13,478,317	2.75	94,784,862
U. S. Steel Corp., pf	U. S.	25,219,672	7.00	250,499,867
Va. Car. Chem., pf	U. S.	1,440,000	8.00	15,420,869
Total		85,730,045		

AVERAGE MONTHLY PRICES OF CHEMICALS, EARTHS, MINERALS, ETC., IN 1909

(IN CARLOAD LOTS AT NEW YORK)

Material.	Unit.	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Average 1909.	Average 1908.
Abrasives:															
Corundum, f.o.b. Niagara Falls, pow	C. per lb.	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	7.00
Emery, Turkish flour, in kegs	C. per lb.	2.125	2.125	2.125	1.875	1.875	1.875	1.875	1.875	1.875	1.875	1.875	1.875	1.939	1.75
Emery, Naxas flour	C. per lb.	2.125	2.125	2.125	1.875	1.875	1.875	1.875	1.875	1.875	1.875	1.875	1.875	1.939	1.75
Emery, Chester flour	C. per lb.	1.50	1.50	1.50	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.688	1.50
Emery, Peekskill flour, f.o.b. Easton, Pa	C. per lb.	1.375	1.375	1.375	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.50	1.469	1.25
Garnet	$ per Sh. T.	30.00	30.00	30.00	30.00	30.00	30.000	30.00	30.00	30.00	30.00	30.00	30.00	30.000	30.00
Boric acid	C. per lb.	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.000	7.00
Borax, sacks	C. per lb.	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.75	4.375	4.723	4.25
Alum, lump	$ per 100 lb.	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75	1.75
Aluminum sulphate, com'l	$ per lb.	1.425	1.425	1.56	1.625	1.625	1.625	1.625	1.625	1.625	1.625	1.625	1.625	1.585	1.11
Ammonium sulphate	$ per 100 lb.	3.075	3.075	3.025	3.025	2.90	2.875	2.875	2.825	2.6475	2.625	2.625	2.625	2.845	3.07
Arsenic, white, spot	C. per lb.	3.25	3.195	3.125	2.907	2.912	2.907	3.187	3.042	2.875	2.725	2.739	2.739	2.97	3.81
Barytes, American ground	$ per Sh. T.	16.50	16.50	16.50	14.50	14.50	14.50	14.50	14.50	14.50	13.50	13.50	13.50	14.75	17.06
Chrome ore, New Caledonia, 50 per cent. ex. ship N. Y.	$ per Lg. T.	18.75	18.75	18.75	18.75	15.00	15.00	15.00	15.00	15.00	15.00	15.00	15.00	16.24	17.50
Cobalt oxide	$ per lb.	2.025	2.025	1.30	1.30	1.30	1.30	1.30	1.40	1.425	1.425	1.425	0.825	1.42	1.61
Copperas, bulk	C. per 100 lb.	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00	55.00
Fluorspar, lump	$ per Lg. T.	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00
Fullers' earth, lump	C. per 100 lb.	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	82.50	80.00
Magnesite, Greece, crude, 95 per cent	$ per Lg. T.	9.00	9.00	8.00	8.00	8.00	7.75	8.00	8.00	8.00	8.00	8.00	8.00	8.15	9.00
Magnesite, calcined, powdered	$ per Sh T	30.50	30.50	30.50	32.50	32.50	32.50	31.50	31.50	31.50	31.50	31.50	31.50	31.50	32.75
Gilsonite, Utah ordinary	$ per Lg. T.	32.00	32.00	32.00	32.00	32.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	34.34	33.58
Litharge, Am. powdered	C. per lb.	6.875	6.25	5.875	6.00	5.875	5.875	5.875	5.875	5.875	5.875	5.875	6.000	6.010	6.17
Red lead, American	C. per lb.	6.875	6.625	6.625	6.250	6.250	6.250	6.250	6.250	6.250	6.250	6.250	6.375	6.380	6.52
White lead, Am. dry	C. per lb.	5.437	5.437	5.437	5.625	5.625	5.625	5.625	5.5625	5.5625	5.5625	5.5625	5.5625	5.50	5.52
Nitrate of soda, 95 per cent. spot	$ per 100 lb.	2.175	2.175	2.15	2.148	2.17	2.20	2.15	2.125	2.10	2.10	2.087	2.0875	2.139	2.25
Zinc white, Am. extra dry	C. per lb.	5.375	5.375	5.375	5.375	5.375	5.375	5.375	5.375	5.375	5.375	5.375	5.4375	5.380	5.13
*Phosphate rock:															
*Florida hard, 77 per cent	$ per Lg. T.	8.75	8.75	8.75	8.75	7.75	7.00	7.00	7.00	7.75	7.75	7.75	7.75	7.887	10.00
Florida land pebble, 68 per cent	$ per Lg. T.	4.125	4.125	4.125	3.875	3.875	3.875	3.875	3.875	3.875	3.875	3.875	3.875	3.937	4.42
†Tennessee, 78 to 80 per cent	$ per Lg. T.	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	5.25	6.42
Tennessee, 75 per cent	$ per Lg. T.	4.875	4.875	4.875	4.875	4.875	4.875	4.875	4.875	4.875	4.875	4.875	4.875	4.875	5.15
Tennessee, 68 to 72 per cent	$ per Lg. T.	4.375	4.375	4.375	4.375	4.375	4.375	4.375	4.375	4.375	4.375	4.375	4.375	4.375	4.31
‡South Carolina land rock, 60 per cent	$ per Lg. T.	7.125	7.125	7.125	7.125	3.750	3.750	3.750	3.750	3.750	3.750	3.750	3.750	4.875	6.17
Potassium cyanide, 98 and 99 per cent., 5 ton lots	C. per lb.	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
Kainit, bulk	$ per Lg. T.	8.25	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.50	8.475	8.50
Pyrites:															
Dom., non-arsenical furnace, f.o.b. mines	C. per Unit S. per L.T.	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25	11.25
Dom., non-arsenical fines, f.o.b. mines		10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25	10.25
Imp., non-arsenical furnace		12.50	12.50	12.125	12.25	12.25	12.25	12.25	12.25	12.25	12.25	12.25	12.25	12.29	12.71
Imp., arsenical furnace		12.00	12.00	11.875	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.75	11.79	12.21
Imp., arsenical fines		8.75	8.75	8.75	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	9.00	8.93	8.75
Imp., non-arsenical fines		10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75	10.75
Soda, caustic, 76/60	$ per 100 lb.	1.80	1.80	1.80	‡‡1.95	1.95	1.95	1.95	1.95	1.875	1.90	1.90	1.90	1.895	1.80
Saltcake, bulk	C. per 100 lb.	40.00	40.00	40.00	45.00	40.00	40.00	40.00	40.00	40.00	40.00	40.00	60.00	42.08	42.50
Sodium bromide	C. per lb.	13.50	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	20.00	19.46	15.30
Sodium cyanide, 120-130 per cent. KCN per 100 per cent., 5-ton lots	C. per lb.	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50	18.50
Sodium sulphate, com'l calcined	C. per 100 lb.	75.00	75.00	75.00	75.00	70.00	70.00	70.00	70.00	70.00	75.00	75.00	75.00	72.93	60.00
Sulphur:															
Louisiana, prime to New York	$ per Lg. T	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.08
Talc, domestic	$ per Sh. T.	20.00	20.00	20.00	17.50	17.50	17.50	17.50	17.50	17.50	17.50	17.50	16.00	18.00	20.00
Zinc chloride, gran	C. per lb.	4.625	4.625	4.625	5.50	5.50	5.50	5.50	5.50	4.50	4.50	4.50	4.50	4.948	4.75
Zinc dust	C. per lb.	5.0625	5.0625	5.0625	5.0625	5.0625	5.0625	5.375	5.825	6.375	6.75	6.75	6.75	5.683	5.23
Zinc sulphate	C. per lb.	2.125	2.125	2.375	2.75	2.75	2.375	2.375	2.375	2.375	2.375	2.375	2.25	2.385	2.16
Copper sulphate, carload lots	C. per lb.	4.750	4.700	4.600	4.600	4.324	4.240	4.225	4.225	4.175	3.980	3.9625	4.05	4.319	4.86

*F.o.b. Florida or Georgia ports. †F.o.b. Mt. Pleasant. ‡On vessel, Ashley river, S. C. ‡‡78/60 grade quoted hereafter.

NOTE—These quotations were for ordinary wholesale lots at New York unless otherwise specified and were generally subject to the usual trade discounts. In the case of some of the important minerals such as pyrites, sulphur, etc., in which there are well established markets the quotations fully represent the latter. But in the cases of some of the minor mineral products, the quotations represent what dealers asked of consumers and not what producers realized in selling their outputs as matter of private contract. The monthly figures are the averages of the quotations published in the JOURNAL, except the quotations for white arsenic, copper sulphate and nitrate of soda which are averages of weekly quotations.

Chronology of Mining in the United States in 1909

Jan. 1—General strike of miners in New Zealand on account of Workers' Compensation Act, effective Jan. 1, requiring medical examination for certain diseases.—Strike of miners at Broken Hill, N. S. W.

Jan. 5—Outside steel makers reduced prices.

Jan. 6—Tennessee Steel Company incorporated in Maine with $20,000,000 capital stock.

Jan. 7—U. S. Steel Corporation offers common stock to employees at 50, besides the usual offer of preferred at 110, this being held to imply increased confidence in the common stock.

Jan. 8—Concentrator of Arizona Copper Company, Clifton, destroyed by fire.

Jan. 9—Statistical number of the JOURNAL gave world's mineral production for 1908.

Jan. 10—Explosion in Leiter mine, Zeigler, Ill., killed 27 men.

Jan. 12—Organization of Copper Producers' Association to report monthly production and stock of refined copper. Announcement that Cole and Ryan secured control of Giroux Consolidated Mines Company. Explosion at Lick Branch colliery at Switchback, W. Va., killed more than 105 men. Goldfield Consolidated mill began dropping 100 stamps.

Jan. 13—Explosion of gas at Almassy mine, Resicza, Hungary, killed 12 men.

Jan. 14—Explosion of gas, followed by a dust expolsion, at Aika colliery, Veszprem, Hungary, killed 56 men.

Jan. 19—U. S. Circuit Court of Appeals affirms decisions of Circuit Court and Board of General Appraisers that zinc ore is not dutiable under the Dingley Act.

Jan. 22—The President, in a message to Congress on the conservation of resources, recommended that the coal, oil. gas and phosphate rights still remaining with the Government be withdrawn from entry and leased under conditions favorable for economic development. Flood on the Rand, Transvaal, broke dam and flooded a mine, drowning 160 miners. Kelvin-Calumet copper properties acquired by Ray Consolidated Company, a $5,000,000 corporation.

Jan. 24—Judge Hunt, in the Federal Court, Helena, Mont., gave a decision against the farmers in the Washoe smelter fume case, refusing the injunction asked for. Shutdown of all the mines at Globe, Ariz., because of labor agitation.

Jan. 26—U. S. Steel Corporation quarterly report showed gain in unfilled orders.

Jan. 27—Reports multiply of price cutting by independent steel manufacturers. Explosion in Merchants coal mine of the United Coal Company, Boswell, Penn., killed five men.

Jan. 28—Copper River railroad, Alaska, completed from Cordova to Abercrombie rapids. Fire in Sutro tunnel, Comstock lode, caused minor damages.

Jan. 29—Resumption of work at Globe, Ariz.

Feb. 2—Explosion in slope No. 2 in Short Creek coal mine of Birmingham Coal and Iron Company killed 17 men.

Feb. 8—Strike of men at Velardeña smeltery, Mexico. Second explosion in Leiter mine at Zeigler, Ill., killed three men.

Feb. 10—First report of the Copper Producers' Association shows 144,130,045 lb. copper on hand Feb. 1. Stock of American Smelting and Refining Company transferred from unlisted to listed department of New York Stock Exchange.

Feb. 11—Marianna coal mine resumed operations.

Feb. 12—Three copper companies of Arizona, Copper Queen, Old Dominion and Detroit Copper, filed complaints against railroads for excess freight charges on coke.

Feb. 15—First steel made at Gary, Ind.

Feb. 16—Explosion in West Stanley coal mine, Durham, England, wrecked 700-ft. shaft and killed 120 men.

Feb. 17—Trinity copper mine shut down.

Feb. 19—U. S. Steel Corporation declared open market for steel products. Heavy cuts in prices of steel. Judge Hunt, United States Court of Montana, denied injunction to ranchers to stop dumping of tailings in creek by Butte companies.

Feb. 24—Annual meeting of A. I. M. E. opened at New Haven, Conn. Rolling mills at Gary, Ind., finished their first rails.

Feb. 26—Settlement of dispute between Calumet & Hecla and Osceola announced.

March 2—Explosion at Colliery No. 14, Pennsylvania Coal Company, Port Blanchard, Penn. Six men killed.

March 4—A round of 25 shots exploded prematurely at the bottom of a 2500-ft. shaft at the Diamond mine in the Butte district. Four men were killed.

March 8—The United States loses its suit against the Standard Oil Company in the case of the $29,000,000 fine.

March 11—The Utah legislature passed a bill giving smelteries right of eminent domain in counties of less than 20,000 population. This was done over the governor's veto. The stock of the Phelps-Dodge company listed on the New York Stock Exchange.

March 12—Crows Nest Pass Coal Company passes into the control of the Great Northern Railroad Company and the Granby Consolidated Copper Company.

March 16—A stock dividend of 60 per cent. was declared by the Consolidated Coal Company of Maryland.

March 18—The appointment of a receiver for the Idaho Smelting and Refining Company.

March 20—Explosion at Sunnyside Coal Mine, Ill., caused by a windy shot. Five men were killed.

March 24—A joint meeting of the Mining, Civil, Electrical and Mechanical Engineers was held in New York to discuss the conservation of national resources.

April 1—Explosion in the Echo mine of Buery Brothers Coal and Coke Company, Fayette county, W. Va.; four men killed. Utah Fuel Company fined by the United States Government for conspiracy to defraud the Government of coal lands.

April 2—Coal strike inaugurated at Alberta, Canada.

April 4—Fire broke out on the eighth level of the North Mahoney colliery, Pennsylvania.

April 9—Explosion at du Pont Powder Works, Wayne, N. J. Damage to property, $20,000—Oil still at Point Richmond, Cal., exploded; two men killed; loss, $50,000—Dynamite explosion in Berwind-White Coal Company's mine at Windber, Penn.; seven men killed, four entombed.

April 13—Gas explosion at Superior coal mine at Linton, Ind.; 20 killed.

April 14—Sale of Alaska Copper and Coal Company's Bonanza mine to J. P. Morgan and the Guggenheims.—Eight hundred union coal miners of the Bend Coal Corporation, Johnstown, Penn., go on strike.

April 15—Gas explosion at George's Creek Coal and Iron Company's mine, Farmington, Va. Three men killed.—Over 600 officers of the United States Steel Corporation met at Scottdale, Penn., to receive reports from the commission which visited coal industrial plants in Europe.

April 16—W. K. Niver Coal Company sold by receiver to J. V. McDonald, of New York, for $200,000.

April 17—Bald Butte Mining Company passes into hands of receiver.—J. O. Rogers appointed receiver for Lanyon Zinc Company.

April 18—The directors of the United States Smelting, Refining and Mining Company purchased 100,000 shares of the company's stock from R. D. Evans.—Consolidated Silver Cobalt Mines, Ltd.,

assumed control of the Greene-Meehan Mining Company, Cobalt.

April 19—Pittsburgh Coal Company cancelled contract with Pittsburgh Terminal Railroad and Coal Company, to take effect October 31.—Explosion of gas at Elnora mine, Highland Coal Company, Warnock, O. Six men injured.—La Rose Consolidated Mining Company acquires control of the Lawson mine, Cobalt.

April 20—Judge Goff, of the U. S. Circuit Court of Appeals issues order restraining Chesapeake & Ohio railroad from increasing freight rates on coal from West Virginia points.

April 22—Isabella-Connellsville Company voted first appropriation of $2,000,000 to begin construction work of plant on the Monongahela river.

April 23—Cave-in of M. & B. mine, Duenweg, Mo. Three men killed.

April 27—Judge Hunt dismissed the "smoke" case of F. J. Bliss vs. Anaconda Copper Mining Company and the Washoe Smelter Company.—The New York & Virginia Copper Mining Company was placed in the hands of receivers.

April 30—The three-year wage agreement between the anthracite miners and operators signed.

May 1—Sale of the Walsh & Seibert coal lands in Indiana for $1,500,000 to the Equitable Trust and Savings Company, Chicago.—Strike at St. Joseph Lead Company's mines, Bonne Terre, Mo.; mills closed.

May 3—Supreme Court of the United States declared the commodity clause of the Hepburn Railroad Rate Act as constitutional.—Fire broke out in the Forest Hill mine of the Pittsburg Coal Company, Smithdale, Penn.—Fire in North Mahanoy Colliery, Penn., under control.

May 4—Lake navigation opened at Houghton, Mich.

May 5—Pittsburg Coal Company, Westland, Penn., resumed operations after being closed 8 months.

May 6—Construction of 560 by-product coke ovens at Gary, Ind., begun by the United States Steel Corporation.

May 7—The Stockton Colliery, Penn., employing 800 men, suspended operations until the fall.

May 11—The directors of the Shannon Copper Company voted to finance the Shannon & Arizona Railroad.

May 12—The merging of the Consolidation, Fairmont, Somerset, Clarksburg, and the Pittsburg & Fairmont Coal companies, and their subsidiaries, controlling 200,000 acres of coal land.—The Ohio Coal Company, Evansville, Ind., resumed operations.

May 19—Death of Henry H. Rogers, president, Amalgamated Copper Company.—Frick Coke Company started 1000 additional ovens.

May 21—The $60,000,000 merger of coke plants was completed.

May 22—Largest week's zinc-lead shipment from Joplin district for more than one year.—Price of zinc ore reached $43.50.

May 23—A silver nugget weighing 3000 lb. was found at Cobalt, Ontario.

May 25—Six thousand miners go on strike in the Kanawha field.

May 28—A formal agreement made whereby the Standard Oil Company will control the Galician oil fields.—Hayden, Stone & Co., purchased control of Santa Rita Copper Company.

June 1—Frick Coke Company fired 1200 additional ovens in the Connellsville region.

June 2—The Morris Coal Company, Zanesville, O., resumed operation; 500 men are employed.

June 4—Strike of 400 men at the Charleroi coal mine ended; operations resumed.

June 5—Dominion Copper Company's property sold under foreclosure at Vancouver, B. C.

June 8—The Yukon Gold Company completed a 70-mile ditch from Twelve Mile river.

June 9—A steamer carried away the lower gate of the lock in the Canadian canal at the Sault.

June 10—John D. Ryan elected president of Amalgamated Copper Company. Benjamin B. Thayer elected president of Anaconda Copper Mining Company.

June 11—Fire started in the Jumbo mine of the Pittsburg Coal Company near MacDonald.—Strike at the Iola, Kansas, plant of the Prime Western Spelter Company.

June 15—The Ontario Government sold 15 tracts of land on the Gillies Limit, Cobalt.—Plant of the Nevada Sulphur Company, Humboldt, Nev., burned. Loss, $100,000.

June 16—Jones & Laughlin Steel Company closed deal for coal land involving an expenditure of $4,000,000.

June 17—Jameson Coal and Coke Company closed deal for 7000 acres of coal land near Fairmont, W. Va. Consideration $2,000,000.

June 18—A shipment of gold valued at $3,200,000 arrived at Seattle from Alaska.

June 21—Thomas Iron Company, Easton, Penn., announced an increase of 10 per cent. in wages effective July 1.—The same action taken by several other iron companies.

June 23—Explosion in mine No. 4, Lackawanna Coal and Coke Company, Wehrum, Penn.; 17 killed.

July 1—The eight hours act, limiting the working hours of coal miners in Great Britain, went into effect except in the counties of Northumberland and Durham, where the new rule will not be effective until January 1, 1910.

July 2—The town of Cobalt, Ont., swept by fire, destroying the surface buildings of some of the mines.

July 6—Strike of employees belonging to the United Mine Workers of America, in the Cape Breton mines of the Dominion Coal Company for recognition of their organization, as against that of the Provincial Workingmen's Association, the members of which remained at work.—Explosion at the Cedar Coal and Coke Company's mine at Tollerville, near Trinidad, Colo., killed nine men who were descending in a cage.

July 7—The Delaware, Lackawanna & Western Coal Company organized to handle the sales and transportation of coal mined by the Delaware, Lackawanna & Western Railroad Company, this action being taken to comply with the Hepburn law prohibiting railroads from carrying coal which they own.

July 8—Militia called to Glace Bay, Nova Scotia, to preserve order at the Dominion Coal Company's collieries.

July 10—Announcement of acquisition by the Cananea Consolidated Copper Company of the old W. C. Greene concessions for constructing four lines of railroad in northern Mexico, mainly in Sonora.

July 11—Serious explosion in the Belmez coal mine in Spain.

July 12—Formal organization of the Instituto Mexicano de Minas y Metalurgia.

July 14—Approval of the Secretary of the Interior of the right of way for an 8-in. pipe line to be laid by the Prairie Oil and Gas Company from the Glenn-pool field in Oklahoma, southeasterly to the Oklahoma-Arkansas State line, and to be eventually extended to Baton Rouge, La.

July 16—Fire started by lightning destroyed two tanks containing 100,000 bbl. of oil, belonging to the Prairie Oil and Gas Company, at Bartlesville, Okla.; also, one tank, each, beolnging to the Creston and the Matson oil companies.

July 22—New agreement, running until Sept. 1, 1910, signed by the coal miners and operators in Wyoming.

July 23—Announcement of purchase by Calumet & Arizona interests of the San Felipe group, comprising 260 pertenencias in the Arizpe district, Sonora, Mexico.

July 24—The German Potash Syndicate concludes a temporary agreement for one year, but without Schmidtmann's Sollstedt mine, with which the American fertilizer interests had secured a favorable contract.

July 26—Publication of the Mineral Industry, Vol. XVII.

July 30—Repeated earthquake shocks in Mexico, being particularly severe at Acapulco and Chilpancingo.

July 31—General strike in the coal mines of Great Britain averted by an agreement providing a minimum wage of 6s. per day for the striking Scotch miners.

Aug. 2—The United States Smelting, Refining and Mining Company obtained modified injunction permitting it to smelt copper and other ores in the Salt Lake valley, under certain restrictions, includ-

ing the baghousing of the fumes and neutralizing of acid gases.

Aug. 3.—Announcement of the purchase of the Tula iron properties in the state of Jalisco by the Mexican Iron and Steel Company, which is controlled by Boston capitalists.

Aug. 5—At Cordova, Alaska, a $50,000,000 mortgage was filed by the Copper River & Northwestern railroad, a Guggenheim corporation, in favor of the Standard Trust Company, of New York, this being the largest mortgage ever filed in Alaska.

Aug. 6—New United States tariff law became effective, having been signed on the preceding day by Persident Taft.

Aug. 7—Preliminary proceedings for foreclosure of mortgage on Newhouse Mines and Smelters Corporation property in Beaver county, Utah, in accordance with the plan of reorganization.

Aug. 10.—Strike of United Mine Workers results in the closing of the Spring Hill coal mines in Nova Scotia.

Aug. 11—Title to the various powder mills of the Laflin & Rand Company passed to the E. I. Du Pont de Nemours Powder Company, which has had a stock control since 1902.

Aug. 12—The timber and mineral lands of the Sierra Madre Land and Lumber Company, formerly owned by Col. W. C. Greene, were transferred to the F. S Pearson Syndicate, the consideration being $2,000,000.

Aug. 21—During this week, zinc ore in the Joplin district touched $51.50 base, the highest price since 1907.

Aug. 23—The merger of the principal Canadian producers of portland cement completed by the organization of the Canadian Consolidated Cement Company with headquarters at Ottawa.

Aug. 25—Lake Superior Mining Institute convened at Ishpeming, Mich., for the fourteenth annual meeting, a 3-day session on the Marquette range.

Aug. 29—Serious floods in the vicinity of Monterey, Mex., interfered with transport of ore.

Sept. 5—Union Copper mine, Copperopolis, Cal., sold to Calaveras Copper Company by Ames estate, Boston.

Sept. 6—Hercules mill, Burke, Idaho, burned. Loss, $100,000. No insurance.

Sept. 8—Iron Mountain mine, Indian Springs, Cal., sold to United States Smelting, Refining and Mining Company.

Sept. 9—Announcement of closing of option on Butte-Ely property, Ely, Nevada, to Cole-Ryan interests.

Sept. 17—Old Dominion Copper Mining and Smelting Company awarded $2,029,000 in suit against A. S. Bigelow.

Sept. 24—Florence, Colo., smeltery sold at sheriff's sale.

Sept. 25—Announcement of purchase of Santa Gertrudis mine, Pachuca, by Camp Bird, Ltd., of London.

Sept. 27—Strike at Butte arising from internal dissension in the union settled and mines all resumed work.

Sept. 27—American Mining Congress convened at Goldfield, Nevada.

Sept. 28—Boston & Colorado Smelting Company announces liquidation and the dismantling of the Argo smeltery at Denver.

Sept. 29—Tintic smeltery, Utah, closed.

Oct. 1—Copper converting plant started at the Torreon smeltery in Coahuila.

Oct. 3—Fifteen men killed in explosion in Northwestern Improvement Company's coal mine at Roslyn, Washington.

Oct. 5—Explosion in Extension coal mine at Nanaimo, B. C., resulted in loss of 30 men.

Oct. 6—Doyle-Burns suit involving an interest in the Portland mine, Cripple Creek, Colo., settled out of court.

Oct. 8—Announcement of the purchase of the Burro Mountain mine in New Mexico by Phelps, Dodge & Co., Inc.

Oct. 15—Smeltery of the Arizona United Mines Company at Johnson, Ariz., blown in.

Oct. 19—Receiver appointed for the Frances-Mohawk Mining and Leasing Company, of Goldfield, Nevada.

Oct. 21—Explosion in the Rock Island Coal mine at Hartshorne, Okla., several men being killed.

Oct. 29—Explosion in Rhymney Iron Company's colliery at Glamorganshire, Wales, killing 20 men.

Oct. 30—Twelve men killed in explosion in Cambria Steel Company's coal mine near Johnstown, Pennsylvania.

Nov. 1—Last spike is driven in Western Pacific railway.—Plant of North Ontario Reduction and Refining Company at Sturgeon Falls, Ont., burned.

Nov. 2—The Saddle Mountain properties and a large interest in the London-Arizona Copper Company in Arizona sold to the Development Company of America.

Nov. 3—Announcement that A. Goerz & Co., of London and South Africa, have purchased control of La Fe property at Zacatecas, Mexico.

Nov. 6—W. A. Clark wins in prolonged suit brought by George A. Treadwell, alleging mismanagement of United Verde Copper Company.

Nov. 10—A fire at the Great Boulder Mines of over $1,000,000.—Nine men killed in mine fire at Auchingloss coal mine, Wilkes-Barre, Penn.—Tipple and power house of Neffs Coal Company at Neffs, Ohio, burned; loss, $125,000.

Nov. 13—Fire in the St. Paul mine at Cherry, Ill., resulting in loss of life of more than 300. After a week 20 men were taken alive from the mine.

Nov. 20—Decision declaring the Standard Oil Company, of New Jersey, a violation of the Sherman law.—The new mining law for Mexico approved by the senate without material change from that passed by the lower house and will become effective Jan. 1, 1910.

Dec. 1—Needles smeltery and mining property of Arizona-Mexican Company sold to U. S. Smelting, Refining and Mining Company.—Over three million acres of oil lands in California, Utah and Wyoming withdrawn from entry by order of the President.—Strike of railroad switchmen in the Northwest interferes with mining at Butte and in Minnesota.—Majority of Cumberland-Ely stockholders exchange shares of that company, on basis of 3¼ for 1, for stock of the Nevada Consolidated Copper Company, thus practically effecting a merger.—Homestake mine, South Dakota, closed for indefinite period on account of threatened labor strike. Dividends suspended.

Dec. 4—Suit commenced against Utah Copper Company by E. A. Wall for $3,870,000 for alleged trespass.—Fire at London mine of Tennessee Copper Company destroyed shaft house, imprisoned men being safely rescued.

Dec. 10—Utah Ore Sampling Company, capital $200,000 organized at Salt Lake, as a merger of Utah sampling works.

Dec. 11—First unit of 750 tons capacity of the Ohio Copper Company's mill started at Lark, Utah.—British Columbia Copper Company placed orders for fourth blast furnace.

Dec 12—Gold Belt mill in Clifton district, Arizona, started, this being the first gold mill in the district.

Dec. 13—Continental Copper Company at Keystone, S. D., closes mine on account of pending difficulties with the labor unions.

Dec. 15—The Pittsburg-Buffalo Coal Company bought a large tract of coal land in the Fairmont district, West Virginia.—Option on Reforma mine in Guerrero, Mexico, taken by Exploration Company, Ltd., of London for $10,000,000.

Dec. 16—Numerous arrests in connection with an alleged "high-grading" combine at Cobalt.—Government royalties on several of the Cobalt mines reduced.

Dec. 17—Merger of Dominion Coal Company and Dominion Iron and Steel Company of Nova Scotia effected at meetings at Montreal.

Dec. 18—Contracts let for 110 Koppers by-product coke ovens for the Lake Superior Corporation at Sault Ste. Marie, Ontario.

Dec. 21—Republic Mines Company of Spokane purchases from the Pearl Consolidated Mining Company the Lone Star-Surprise mines at Republic for $225,000.

Dec. 23—Eight men were killed in a gas explosion at mine "A" of the Chicago & Cartersville Coal Company, Herrin, Illinois.

Dec. 31—J. H. McKenzie retired as general manager of the Goldfield Consolidated and J. R. Finlay succeeds him.—Southern Pacific railroad opened as far as Rosamorada, Tepic, Mexico.

Coal Mining in the United States in 1909

Reviews of Mining Conditions in Many Important Centers of Anthracite and Bituminous Production, with Forecasts of Future Production

TOTAL PRODUCTION 437,176,241 TONS

The production of coal in 1909 was greater than in 1908, but did not reach the record total of the banner year 1907. There was an increase of about 10 per cent. in the production of bituminous coal; the anthracite production showed a decrease of about 2½ per cent. The first six months of the year were particularly dull, and the entire coal trade was enshrouded in an atmosphere of gloom. The coke trade began to pick up immediately after the activity in the iron and steel industry commenced. The larger anthracite production in 1908 was caused by the desire on the part of hard-coal operators to store fuel previous to the meeting of the wage-agreement committee, April 1. There was considerable apprehension at the time for fear that a general strike of the miners might result. This increase in the production of anthracite continued through the latter part of 1908 and during the first three months of 1909. When labor troubles did not materialize, production was curtailed in order that the surplus stock might be worked off. The wage scale that was renewed in April, 1909, was practically a continuation of the same agreement that had been in force since the settlement of the big coal strike by the anthracite commission in 1903. The agreement is for a period of three years.

The Coal and Coke Industry in 1909

BY FLOYD W. PARSONS

The close of 1909 showed great activity in all branches of the coal trade. The weather during the last month of the year was sufficiently cold to stimulate the domestic trade, while the demand for steam coals has continued on an increased scale. Prices have not been greatly increased, but the mines have been able to work better time and the increased output has been well taken up. The stagnation that existed in the coke industry during the first half of the year has been entirely dispelled and this branch of the trade has been undergoing a real old-fashioned boom.

Coke prices have been above $3 at the ovens, which prosperous condition caused the opening of many plants and ovens that had been temporarily abandoned. It was the purpose of a number of large operators to bring about a consolidation of all the coke-producing companies with the exception of those plants controlled by the Steel Corporation. For some unknown reason, this combination fell through. The price at which most of the independent operators valued their holdings was about $5000 per acre.

The greatest gain in the coal and coke trade during 1909 was made in the Connellsville coking region. This increased activity in coke manufacture was caused by the rapid recovery in the iron trade in 1909. The production of coke in 1908 fell off nearly 50 per cent., while the output in 1909 returned well toward the high record established in 1907. In the latter part of 1909, the coking industry was greatly handicapped by a lack of labor and a scarcity of water. Shipments were also handicapped by a scarcity of railroad cars. This scarcity of labor and cars was felt in practically all of the eastern coal districts during the latter part of the year.

Perhaps the most noteworthy fact connected with the coal industry of the United States in 1909 was the absence of labor troubles. What few strikes occurred were of a local nature. The year was also exceptional so far as accidents were concerned. In the Eastern States the mines were unusually free from serious explosions, the only important accidents of this character being the explosion at Wehrum, Penn., where 21 men were killed, and the disaster at the Lick Branch colliery in West Virginia, where 65 miners perished.

The Cherry Disaster

The year 1909, however, preserved the record of former years by showing at least one horror. This accident came in the form of a mine fire at the St. Paul mine, Cherry, Ill. It is a mistake to designate the St. Paul disaster as a mine explosion. There is little satisfaction in casting reflections or criticizing the management of mines where such accidents take place. It seldom occurs that such disasters happen without a sufficient cause, which is generally negligence or incompetency on the part of mine officials. The St. Paul mine was not properly equipped to successfully combat a serious mine fire, and as a consequence, nearly 400 lives were sacrificed. The main criticisms with reference to the Cherry disaster were that fire drills had not been practised, and that the shaft and the bottom near the shaft, and about the mine stable were far from being fireproof. The accident did impress mining men with the importance of constructing fire-proof shafts and landings. The fatality also drew attention to the rapidity with which mine timbers covered with dry coal dust will flame and burn.

One other important question brought up by the St. Paul mine fire was the problem of providing safety chambers underground in coal mines. The dangers from mine fires are as great as those from explosions of gas and dust; this latest accident, therefore, has caused strong arguments to be advanced favoring the installation of safety chambers underground. One large Illinois company has prepared plans for an underground safety chamber, which station is to be supplied with oxygen tanks, food supplies, medicine, etc., besides being connected to the surface by a bore-hole permitting the extension of a telephone line to the chamber. Some mine experts have suggested plans whereby it is possible to isolate certain mine areas from contact with the after-gases of an explosion. One such suggestion was that mine managers could install a series of boiler-plate doors in the main entry, the intakes and the return roadway. This engineer conceded that the inner doors in the explosion panel would be blown from their fastenings, but asserted that the outer doors would remain intact, and the men behind them might be safe.

The greatest problem confronting coal men is the question of establishing a proper selling price for their product. Our coal areas are so great and so widely distributed, that every year brings forth a new list of producing mines. The result is that few mines are working more than 75 per cent. capacity; in such important coal-producing States as Illinois, the shipping mines of the State operated on an average less than two hundred days

during 1909. It is easy to see, therefore, that any increased demand for coal is met, not by a betterment in the price of the product, but generally by an increase in production. In some instances the demands of labor have been excessive, so much so that one mine in Pennsylvania recently closed down and is filling its contracts by purchasing coal from other producers, rather than to operate on what is claimed would be an unprofitable basis.

In conclusion, it is safe to say that the great problem confronting the coal industry at the close of 1909 is, how to restrict production so that the present destructive competition will be eliminated and the entire industry placed on a safe and profitable footing. Such a step would be in the interests of the safety of our miners and the conservation of our coal resources, rather than in netting a higher money return to coal owners. Under present conditions, it is impossible for coal operators to adopt necessary precautions and at the same time mine coal profitably. Those mine owners who desire to advance the industry to a high plane and thus preserve their mines and the lives of their employees, are prevented from carrying out any such purpose by the keen competition of other operators who are less careful and whose sole aim is the production of coal at the lowest possible cost.

The Coal Trade in 1909

BY JOHN H. JONES *

The business prospects for 1910 look very encouraging and I feel confident that the half-billion mark will be passed in the production of coal in 1910. Many contracts have been renewed in the different districts at this year's prices, to run another year, which will make it practically impossible for any company assuming such contracts to make satisfactory returns to its stockholders; and the only way in which any coal company will be able to make satisfactory returns to its stockholders, will be by strenuous action on the part of the larger companies in advancing the prices and maintaining them, to permit them to show the earnings which their stockholders are entitled to. We are now enjoying the greatest industrial prosperity that the country has ever witnessed, and in the judgment of many financiers and business men, the next two or three years will be very prosperous.

The production in the Pittsburg district this year will amount to about 50,000,000 tons, and for next year I estimate it will be 55,000,000 to 60,000,000. A settlement will have to be made with the miners as of effect April 1, 1910. As a great many complications have arisen on account of the introduction of safety explosives, and other problems will have to be solved, it is questionable whether the miners and operators will be able to arrive at a satisfactory settlement unless a great deal of diplomacy is exercised in negotiating the settlement. Many of the largest operators and miners' officials are of the opinion that the situation must be handled with great care, the operators now contending that it will be necessary to have a reduction of the scale on account of the additional cost of mining which they think the miners should share, and the miners think the scale should be advanced, owing to the increased cost of living.

*President, Pittsburg-Buffalo Company, Pittsburg, Penn.

The lake tonnage from all districts for the nine years ending 1909, was as follows:

Year.	Pittsburg District.	Ohio District.	W. Va. District.	Total.
1901	3,795,706	1,954,825	787,572	6,538,103
1902	4,704,093	2,689,974	965,769	8,359,836
1903	6,092,047	2,458,265	1,539,435	10,089,747
1904	6,058,383	2,138,274	1,279,876	9,476,506
1905	7,443,883	2,062,692	2,109,262	11,615,837
1906	9,287,272	2,560,906	2,743,732	14,591,910
1907	10,549,995	4,074,296	3,420,941	18,037,232
1908	8,700,000	3,600,000	3,450,000	15,750,000
1909	8,687,305	3,002,815	3,874,570	15,364,690

These figures show the Pittsburg district about at a standstill, and quite an increase in the West Virginia district, with quite a reduction in the Ohio district. Much more coal would have been shipped to the head of the lakes had the railroad companies been able to furnish more cars during the months of October and November. They should not be censured for this, however, as they were prepared to move the coal in the early part of the season had the docks at the head of the lakes been willing to accept the coal.

The majority of the operators of this country are sparing no effort to provide safeguards to the health and safety of their employees. The best thoughts of the mining experts of the world are being brought to bear on the great problems confronting the mining industry. The testing laboratory situated in Pittsburg has been of great good, and I sincerely believe that with the continued use of the combined ideas of brain and skill, the United States will continue to lead the countries of the world in the low mortality rate per million tons of coal mined. The following table will show that we now head the list:

LIVES LOST PER MILLION TONS OF COAL PRODUCED.

United States	3.84
Great Britain	4.15
Germany	6.35
France	5.56
Belgium	6.71
Austria	8.16

There have been and are a number of conditions to be overcome in coal mining which are as yet unrecognized and unknown, but these are rapidly being discovered and overcome. For instance, in past years, explosions in the mines were not nearly as serious as they are to-day because there was not enough air in the mines to render them serious, and the gas would simply burn without spreading and do practically no damage. Modern sanitary ideas demand sufficient air to give every man in the mine enough to breathe and to carry off the foul air and gases, yet an overabundance, in case of a slight explosion at any point, is liable to render such explosion serious on account of the dust it carries in suspension.

In interviews during the last three years, I have recommended a tax on the pay rolls of employers of labor, this tax to be deposited in a special fund which will be administered by a commission, one-third chosen by the governor and two-thirds elected by the people, this commission to administer the fund, and in case of death to see that the widow is provided for and the children properly educated; and in case of injury not involving death, to pay to the injured person a weekly sum equal to the average wage earned by him in the three preceding years. The idea is to prevent employees and their wives and families from suffering want on account of accidents over which they had no control, placing them in position to secure money which would be due them under the law and

which would not be given to them as a charity.

The mining laws of this State are very explicit in saying to the operators: "You must employ certificated mine foremen and fire bosses, and give them absolute charge of your mines. You must provide them with the supplies necessary for the operation of the mines, and your superintendents (practically meaning the owners) must not interfere with these men in the discharge of their duties." These precautions are wise, but notwithstanding all this great care, many serious disasters have occurred. Certainly these State officials (mine and fire-bosses) would not spend their entire time in the mines and permit them to operate if they did not consider that the mines were safe.

Great strides have recently been made in the knowledge of mining conditions, but the personnel of the men in charge and the men employed is a great factor in the safe working of the mines. The fact that a man has done something a hundred times without observing the necessary care and has always escaped injury, breeds within him a contempt for the ever present danger and sometimes causes a reckless disregard not only for his own safety but for the safety of others. This is a factor most difficult to overcome.

It is manifestly impossible to prevent all accidents, but we must figure out the best methods of reducing their possibility to the lowest degree. When we consider that about 85 per cent. of the accidents are not caused by explosions of gas or dust, or blown-out shots, and that more than 50 per cent. of these accidents could be prevented by ordinary care on the part of the injured person, it is easy to see what effect a more rigid police regulation will mean in the future production of coal in this country.

Our State mine inspectors have police power, and they have all risen by their ability from the ranks of the miners, and by the careful study of mining conditions they have fitted themselves for their present positions. They are constantly studying to improve methods and conditions, and I am confident that if we will all coöperate (the mine inspectors, the miners and the operators) it will only be a short time until this country will be able to show a much lower proportion of accidents to the number of men employed.

Coal in the Pittsburg District in 1909

BY B. E. V. LUTY

Coal production in the Pittsburg district in 1909 showed a slight gain over 1908, but fell far short of the output in 1907, the record year. Prices, except toward the close of the year, averaged a trifle below those of 1908, but on account of the greater regularity of operations the results of 1909 were on the whole more satisfactory than those of 1908.

Prices were almost stationary during the first nine months of 1909, averaging on the basis of $1.05 for mine-run. In October, toward the close of the lake shipping season, coal became somewhat scarce and prices took a jump to $1.15@1.25, and during the closing three months of the year the average price was fully $1.15 for mine-run.

The production of the Pittsburg Coal Company, the leading interest, compares as follows:

	Tons.
First nine months, 1907	13,302,634
First nine months, 1908	9,726,387
First nine months, 1909	9,718,334

There was a decrease of 8053 tons from 1908 to 1909, but the output in the three closing months of 1909 ran well ahead of the output in the corresponding period in 1908, indicating a total for the year of about 14,000,000 tons, against 13,217,545 tons in 1908.

The total output of the Monongahela River Consolidated Coal and Coke Company, the leading river shipper, was about 6,500,000 tons. Of this total about 2,000,000 tons was shipped south by water, about 2,000,000 tons was shipped by rail and the balance, considerably in excess of 2,000,000 tons, was shipped by water to consumers in this industrial district.

The river shipping season was unusually short, as it did not open until Jan. 10 of the year, extending to the middle of June, a trifle over five months. During this period there were short spells of low water, not long enough to interfere with steady mining operations. After the close of the regular season there was but one rise, in September, giving only a barge stage, upon which about 100,000 tons was shipped.

The lake coal trade reached a greater tonnage than in 1908, but fell far short of 1907. The season was late in opening, although not as late as in 1908.

No Serious Labor Troubles

No serious labor questions arose in the year as a two-year agreement had been signed in 1908 with the United Mine Workers of America, to run through March 31, 1910. In July some friction arose over the kind of explosives to be used, and for a short time a strike was threatened, but such trouble was averted.

The railroad-car supply was fairly adequate throughout the year, although the usual difficulties were experienced toward the close of lake navigation. On account of the increase in industrial operations a severe car shortage was expected for November and December but the unusually good weather averted serious trouble.

Connellsville Coke in 1908

The production of coke in the Connellsville and lower Connellsville regions may be estimated as below, compared with an estimate for 1908 and the Geological Survey's figures for the three preceding years:

Year.	Short Tons.
1905	15,236,387
1906	17,245,975
1907	19,400,327
1908	10,700,000
1909	17,800,000

Coke production in the Connellsville and adjacent fields naturally followed the course of pig-iron production in the central west. The year opened with increasing production all along the line, but a backset occurred in March and April, after which there was a steady gain until the two closing months of 1909, during which production was practically stationary.

Prices of coke in 1909 showed the most spectacular movement in the history of the industry. Late in 1908 contracts for Connellsville furnace coke were made at $1.90, and later at $2, for both the first half of 1909 and for the entire year, the majority of furnaces making contracts. Pig iron declined steadily in the early months and by April reached a point which induced many furnaces having $1.90 and $2 contracts to insist that they would have to have a readjustment of the contract price or go out of blast. In a number of cases the coke producers consented to a readjustment, the new price generally being $1.60@1.70. In the case of half-year contracts the operators generally insisted upon a contract being signed for the second half at the new price, as a condition of the readjustment. Straight sales for the second half were also made at from $1.60@1.70.

Thus the opening of 1909 saw furnace-coke contracts in force at $1.90 and $2 the middle of the year contracts at $1.60 and $1.70. Then the market turned and a tremendous advance occurred; in August a few far-sighted furnacemen made contracts for 1910 at higher than $2, and in September others contracted at $2.90; in the case of two or three, small tonnages of high-grade coke were contracted for at $3 for the whole of 1910. It has been but rarely that prices approaching $3 have

been obtained on contracts for furnace coke, and then only as the culmination of a protracted rise extending over a series of years. The strongest period was in September and early October, the market softening slightly thereafter until at the close of 1909 it was possible to place contracts for 1910 at $2.80 or possibly less.

Monthly average prices for prompt Connellsville coke in 1909 were as follows, per net ton at ovens:

	Furnace.	Foundry.
January	$1.70	$2.10
February	1.65	2.00
March	1.55	2.00
April	1.43	1.90
May	1.45	1.85
June	1.50	1.85
July	1.55	1.85
August	1.75	2.00
September	2.30	2.50
October	2.80	2.75
November	2.85	3.00
December	2.70	3.10

An illustration of the vagaries of the market was given through the contract made in May between the Thompson-Connellsville Coke Company and the Jones & Laughlin Steel Company, covering 30,000 tons of furnace coke monthly for a period of three years, shipments to begin nominally Sept. 1, or upon the completion of the steel company's three new blast furnaces at Aliquippa. The price was $2, the steel company at the same time agreeing to help the coke company finance the erection of the 400 new ovens required to supply the tonnage. When the news of the contract came out it was received with incredulity in many quarters, it being urged that no large consumer would agree to pay so high a price, but it was merely a case of the steel company being wiser than its critics, since at $2.75 for 1910 coke the price for two following years could be down to $1.62½ and still make the $2 average for the three years.

In the latter part of March, there was launched the ambitious project of consolidating all the coke operations of the Connellsville and lower Connellsville region with the exception of the H. C. Frick Coke Company and some of the independent steel and blast-furnace interests. The real parties back of the movement were never completely identified, their representative being John W. Boileau, of Pittsburg.

Letters were mailed March 19 to all the independent coke operators asking for options on their properties good until Oct. 1. The options were given, although usually at very high prices, much of the coal in the old basin and in the lower district being priced in the neighborhood of $5000 an acre. On June 20, all the options expected having been received, appraisements commenced. It had been given out that the operations would be purchased on a cash basis, but that some of the higher-priced options would have to be scaled down. The appraisements were very thorough, and altogether a large amount of money was spent by the promoters, but the final outcome was a complete failure. Practically none of the options were revised. Instead of the cash basis at first promised, the promoters proposed that the sellers should take stock in the new company, except for a modicum of cash which in most cases would have been insufficient to clear the properties of bonded and floating indebtedness.

When the enthusiasm of the promoters was at its hight the statement was made that the history of the Connellsville coke merger would be made the subject of an exhaustive magazine article, so novel were the principles involved and so skillfully was the work being done, but the outcome of the deal was not as was expected, and it remains that the identity of the principals has not been definitely disclosed, and that the causes prompting the effort and the reasons of the failure are matters purely for speculation. Perhaps the most adequate explanation of why the Connellsville coke properties could not be merged can be found in the one thing of all which time and place change least—human nature. The Connellsville coke operators were ready cheerfully to take their chances for the future, large profits or small profits as time should develop, but to change their hopes into present realization required the offering of the maximum of the possibilities in the form of cash or negotiable securities of guaranteed value, and to do that no capitalists could undertake. The irony of the failure was brought out in the antithesis that in May the critics of the proposition found their *reductio ad absurdum* in the computation that the new company, to make adequate returns on its capitalization, would have to obtain an average of $2 a ton for its coke—a thing apparently not to be thought of in the then temper of the market—whereas before those options expired, Oct. 1, furnace coke on 1910 contracts, made in competition in the open market, carried prices well in excess of $2.75.

No More Beehive Ovens

It is understood to have been definitely decided in the year by the United States Steel Corporation that it will erect in the Connellsville region no more coke ovens, neither the beehive now used nor by-product, except possibly to round out some plants already in operation, and that future expansion with Connellsville coking coal will be with by-product ovens at the point of consumption. The first operation will probably be in the Youngstown district. The advantages of by-product coking have been patent to students of the subject for years, and need not be referred to here. It may be noted, however, as germane to this review, that the H. C. Frick Coke Company is at the present time shipping Connellsville coal from some of its operations to other properties in the region at which the coal is worked out, and paying the railroads something at least for the service, whereas the freight on coke from the Connellsville region to Youngstown, paid regularly on the large shipments being made, is $1.30, while the coal rate is 90c., so that at 75 per cent., the yield expected from Connellsville coal in by-product ovens, against its yield of 66⅔ per cent. obtained in beehive ovens, the freight on the coal required to make a ton of coke would be $1.20, a saving of 10c. per ton of coke in the mere matter of transportation.

The Chicago Coal Market in 1909

SPECIAL CORRESPONDENCE

Considered as a whole, the year 1909 was much more satisfactory to coal dealers in Chicago than the previous year, and in its latter half conditions grew steadily better, making the outlook at the end promising for prosperity in the coming year.

Illinois and Indiana coals, the chief source of supply for Chicago's wholesale trade, sold at about the same prices as in 1908. These prices were low, permitting only a small margin of profit; on screenings, a size largely used, they were lower, for a good part of the year, than in 1908. Competition is keen on these coals; their field of production is large and new mines are coming into existence constantly; so prices have reached a low level at which they seem bound to stay until some sweeping change comes over the coal-producing or the coal-consuming industries.

Opening with a fair sale for domestic coals, because of the weather, 1909 showed in its first half depression for steam coals of all kinds and sizes. Shipments had been largely curtailed to this market in the closing months of 1908, but this condition did not continue to the extent of regulating receipts to the market's consuming capacity. Every few weeks some impatient operator or operators consigned to Chicago enough coal

to make a cut in prices that sometimes was so low as to leave no profit. Strict enforcement of demurrage rules by the railroads caused such sales on almost all kinds of coal at different times in the year; yet the market was free from such demoralization as occurred in some previous years, from general over-shipments.

Early in 1909 Illinois and Indiana screenings were unusually strong because of their use as a substitute for more expensive coals. By September, however, they became very weak and in the latter part of 1909 sold for lower prices than at any time in 1908. In proportion, lump grew strong. Very low prices prevailed on lump during the summer months, but after August it gained steadily in strength. Run-of-mine from Western mines held a medium course between lump and screenings. With the increasing use of automatic stokers, fine coals become more and more in demand in the Chicago market, aside from the months of mild weather when they are popular with steam users.

Sales of coal for harvesting use were probably greater than ever before. This demand, coming in the summer and early autumn, was marked by a preference for high-grade coals on the part of harvesters, and it was accompanied by the general revival of manufacturing and general business, making the summer unusually a busy season for coal dealers.

Average prices, for car lots of Illinois and Indiana coals (which constitute two-thirds or more of the total supply sold in the Chicago market), were as follows:

PRICES OF WESTERN COALS AT CHICAGO.

Month.	Lump and Egg.	Run-of-Mine.	Screenings.
Jan...	$1.85@$2.65	$1.60@$1.75	$1.30@$1.60
Feb...	1.75@ 2.50	1.60@ 1.75	1.30@ 1.60
Mar...	1.75@ 2.50	1.60@ 1.75	1.30@ 1.60
Aprli..	1.75@ 2.30	1.60@ 1.75	1.40@ 1.60
May...	1.75@ 2.25	1.60@ 1.75	1.40@ 1.70
June..	1.75@ 2.25	1.60@ 1.75	1.40@ 1.70
July...	1.75@ 2.25	1.60@ 1.75	1.50@ 1.75
Aug...	1.75@ 2.35	1.60@ 1.75	1.30@ 1.65
Sept...	1.75@ 2.40	1.60@ 1.75	1.20@ 1.45
Oct...	1.75@ 2.50	1.65@ 1.75	1.00@ 1.30
Nov...	2.00@ 3.00	1.75@ 1.85	0.95@ 1.15
Dec...	2.00@ 3.00	1.75@ 1.85	0.95@ 1.15

Eastern bituminous coals gained with the revival of business and smokeless especially found increased favor, though for the greater part of the year it was in over-supply and sold at discounts from the circular prices. Pocahontas and New River brought $3.15 @ 3.80 for lump and egg, and $2.85 @ 3.15 for run-of-mine, the lowest prices being received in the summer. These quotations represent $2.05 over prices at the mines, that being the freight rate to Chicago. Hocking Valley coal throughout the spring and summer was too plentiful for maintenance of the circular price of $3.15, and at times sold for 40c. less than that price. This coal was in good demand throughout 1909, especially in the last quarter, when shipments of it were well regulated to the demand and the circular price was generally adhered to. Youghiogheny, the leading gas coal, sold at $3.15 steadily and figured almost wholly in contract sales. Contracts for supplies of steam coal, of all grades, were made in the spring months of 1909 to a greater extent, probably, than ever before, but at low prices.

Anthracite sold to about its usual amount throughout 1909, at the same prices as in 1908, and the market for it was not marked by any extraordinary features except an unusual amount of free coal, sold at an average of 25c. under established prices, in the summer and early autumn months. All sizes were in good supply throughout the year; in November and December the demand for nut was so large as to make its prompt movement occasionally difficult.

The Alabama Coal Market in 1909

The Alabama coal market suffered greatly through two-thirds of the year 1909. If general conditions throughout the country had not improved greatly during the last few months, the report of the Alabama coal industry in 1909 would have been distressingly poor. The great strides made in coal mining from October to the last of the year succeeded in bringing up the production, and while the official figures will not be out for at least two or three months, there is enough known to place the aggregate around what the production was in 1908, or about 11,523,299 tons. In addition to the business depression that existed in 1908, a strike of four months' duration took place in Alabama. The production of coal for that year went down from 14,424,863 tons (1907), to 11,523,299 tons (1908). In 1909 there was nothing but the after-effects of the panic that had any effect, and the severity of the same can well be imagined when it is stated that the coal output will not exceed the production of 1908.

The consuming element, the iron blast furnaces, called for a large proportion of the coal that was produced during the year. The commercial trade was very dull, in fact, in some instances, mining companies were willing to sell at practically cost, including the wear and tear on machinery and the depreciation in the prospective coal. It was in October before any appreciable improvement in the coal market conditions was felt. The iron making in this State then had a big impetus and the demand for coke improved wonderfully. A scarcity of miners and mine laborers became noticeable and concerted steps were taken to bring in more laborers. The wages of the men in the mining industry in this State were not inducive to bring forth much exertion, and at all properties, except the mines operated with convict labor, several in number, there was nothing better than half-work during the greater portion of the year. An advance in the wage scale among the miners and mine laborers was allowed on December 1. This acted as an incentive for the men to seek the mining work and to urge those at work already in the industry to give better effort.

The State had but little, if any experience, with organized labor around the coal mines in 1909. Very few companies recognized the union during the year, in fact there was so little given out publicly of the existence of an organization among the coal miners and mine laborers that there is doubt as to whether such an organization is being kept up. Former leaders were heard complaining, occasionally getting into print, but the operations in the mining district did not feel any of the effects and those men who remained in the State were glad to accept any little pittance in the way of work that was offered. When the conditions changed for the better there was great activity at the mines and the production grew as if by magic. The Chief State Mine Inspector, Edward Flynn, and his two assistants, watched the mining operations carefully and issued several warning circulars to the operators and to the mine workers to keep down the fatality list, and at the same time to improve the grade of the coal produced.

The Coke Business

Coke was a strong commodity practically throughout the year. By autumn the demand became exceedingly strong, and there was talk of importing some of this product to help out. Old coke ovens were put into shape and started up. Improvements were made at coke ovens already in operation. During the depression last year and a great part of 1909, there was quite an accumulation of coke, but, as soon as the consumption of coke started in and went above the output, the stocks began to dwindle. There was some little coke shipped out, too, during the dull period, but this practice was abandoned as the home demand improved.

Plans are on foot for the construction of several hundred more coke ovens during 1910. An immense by-product plant has been planned by the Tennessee Coal, Iron and Railroad Company, steam and

gasses from which will supply a large power plant, which will in turn furnish power for several industries.

There were a number of transactions during the year 1909 in coal tracts in Alabama, and development has started in several portions. The new year starts in with an activity equal, if not greater, than prevailed in 1907 when the banner production was secured. The prospects are bright for a continuation for some time to come. Should there be no backset, the output at the Alabama coal mines should easily exceed 15,000,000 tons in 1910.

The advance made in coal production in Alabama has been phenomenal. The figures show that in 1870 the State was given credit for an output of 13,200 tons. There was an increase year after year, excepting two or three years, until 1907, when the aggregate output was stated at 14,424,863 tons. Since 1902 the coal production in Alabama has been above the 10,000,000 ton mark.

The coke production in Alabama during the year 1909 was about 2,500,000 tons. In 1908 the State received credit for 2,335,602 tons and in 1907, 3,096,722. The largest output in coke was in 1906, when 3,217,068 tons were reported. Nearly 20,000 men, including convicts, were employed in the coal-mining industry in Alabama. This number will be increased by at least 5000 in the next few months, if the labor can be induced to come here.

Production of Coal in Illinois During 1909

BY DAVID ROSS

From the reports of the ten coal mine inspectors of the State, it is shown that the total output for the fiscal year ended June 30, 1909, was 49,163,710 tons, distributed between the different classes of mines as follows: 384 shipping mines, 47,958,562 tons; 502 local mines, 1,205,148 tons.

The loss in gross tonnage compared with last year was 108,742 tons. There were in use 1246 mining machines, cutting 16,407,692 tons. This is the largest machine output, being an increase of 7.9 per cent. over last year, and an increase of 193.9 per cent. over the product of 1900. This increase in the volume of machine-mined coal is remarkable in view of continued complaints against the differential fixed for this State. Their operations are confined chiefly to the thick veins in the southern part of the State where conditions are more favorable to their employment. The average value of coal at the mines, as returned by the operators, was $1.032 per ton, varying but little from the prices reported during the last several years. Shipping mines operated on an average of 180 days. As evidencing the capacity and equipment of some of the Illinois mines, it may not be improper to mention those of the Superior Coal Company operating at Gillespie, Macoupin county; the No. 3 mine, working 317 days, produced 696,869 tons; No. 2 mine working 226 days, produced 642,075 tons, or an average per day of eight hours each of 3211 and 2841 tons respectively. Two mines furnished more than half a million tons, while 13 produced over 400,000; twenty exceeded 300,000 and 50 produced more than 200,000 tons each.

As a result of the year's work (fiscal year ending June 30), 212 men lost their lives and 781 sustained injuries entailing a loss of 30 or more days' time. This record of fatalities indicates an increase of 16 per cent. compared with 1908 and marks the highest ratio of loss ever experienced during any previous corresponding period. The number of fatal accidents resulted from the following causes: Falling coal and rock, 84; gas and powder, 73; mine cars, 23; other causes, 32.

Coal Mining in New Mexico in 1909

The year 1909 showed a healthy condition of the coal-mining industry in the Territory, notwithstanding the rather stagnant situation in the copper-smelting centers of the southwest, the copper smelteries furnishing one of the principal sources of demand for the products of the coal mines.

The gross production was 3,010,000 tons, an increase of 285,000 tons over 1908, or 10.4 per cent. Of the gross product 35,000 tons was used in operating the mines; the small quantity used for operating is explained by the fact that in the largest producing camp, Dawson, the waste gases from the coke ovens are conducted at high temperature to the boiler plant and furnish the fuel for necessary power at the mines, as also for heating many of the larger buildings. At some of the smaller mines slack is used for boiler fuel and no account of it is kept. The net production, deducting fuel used for operating the mines, was 2,975,000 tons. Of this total net product 2,175,000 tons was shipped to market and was sold at an average price of $1.35 per ton at the mine, or a total of $2,936,250, the price ranging slightly less than in the preceding year, which was $1.40 per ton; although prices strengthened in fall and winter months.

About 800,000 tons of unwashed slack and coal was sent to the washeries and thence to the coke ovens, where 430,000 tons of coke was made from it, which sold for $3 per ton at the ovens or a total value of $1,290,000. The total value of coal and coke was $4,226,250.

While the tonnage of coal produced was greater than in 1908, there was a less number of men employed in and about the mines; 2550 men being employed underground and 550 outside; 34 boys worked underground and 28 outside, a total of 3162 persons employed at the mines; this compares with 3200 men underground and 740 on top, making a total of 3940 men and 120 boys, or 4060 persons employed in 1908.

The greater production with the lesser number of men is accounted for by the fact that during the preceding two years the majority of the miners were engaged in development work, or narrow work, while 1909 had the advantage of an ample number of rooms which were turned during the two previous years of the initial development stage; the majority of the miners being employed in rooms allowed a greater production per man than in the previous years when on narrow work. The same is true of the men employed on top; the equipment was perfected and it required fewer men to handle the product at the surface.

Eleven men were killed in the mines during the year, or 3.47 for each 1000 persons employed or 0.347 per cent. for 1909, as against 21 during the preceding year, or 0.517 per cent., a gratifying decrease, but not as good as it should be. Six of the fatalities were due to falls of rock; 3 by falls of coal and 2 by being run over by mine cars.

Coal Production of Colorado in 1909

BY JOHN D. JONES*

The total output of the various grades of coal in 1909, in Colorado, amounted to 10,736,459 tons, which is an increase over 1908 of 963,452 tons, or 9.85 per cent., and shows that the market conditions have decidedly improved since 1908. The increase is considerably larger in the domestic than in the steam fuel.

The Huerfano county product is classified as bituminous and noncoking, but is in reality a domestic coal and in great demand for its merits as such. Since 1907, Colorado has not been so heavy a consumer of steam coal as it had been for a long time previous to that date. The closing down of the metalliferous mines then and other steam plants depending upon the bituminous mines for their fuel supply has made the demand for this product rather dull. However, they are gradually resuming their normal activity and there will be a marked improvement in the demand for this grade of fuel.

The increased demand for the domestic coals can be attributed to the large additional acreage of farming land placed under cultivation, resulting in the growth of the population and the bountiful crops harvested. Therefore, the increase was only normal and what could be reasonably expected. Yet in the face of this growth of the industry, the operators complain of 1909 as being a lean year for them. This probably was due to the fact that a number of large producing mines opened up about a year ago, putting out large quantities of coal, dividing the business and quickening competition.

Increased Demand for Domestic Fuel

There was an increased demand for domestic fuel in the adjoining prairie States to which much of our coal is shipped, with the possible exception of Texas, which I understand has not taken as much of our product as expected on account of the drought and consequent crop failure. Colorado ships coal to Nebraska, Kansas, Texas and other States where the freight rates are not prohibitive to competition with neighboring coal-producing States. Colorado being situated further away, the rates are higher than those of other States, which is a handicap to our shippers, and it is only due to the superior quality of Colorado coals that this difference in the freight rates can be overcome. There has been considerable agitation in this State for a lower freight rate and should the railroads make concessions the market would expand proportionately.

A Coal War Waged

Owing to overproduction and a slack demand for fuel, a coal war was waged in the lignite districts of Boulder and Weld counties, which resulted in a reduction of 50c. per ton and lasted from February to November 22, when a truce was declared and the old prices were resumed. This probably had the effect of increasing the Boulder-county output, while in Weld county it caused the production to fall below that of 1908. The prices in the other districts were not affected.

In the last 60 days, the demand for coal has been heavy and it is not anticipated that there will be a serious break in the market for several months to come, as there is little coal stored at any point, and the present severe weather will keep the demand steady.

In the early autumn, there was a decided car shortage which has been relieved since the bulk of the crops has been shipped. Never before was there such a demand for cars in Colorado and it was fortunate that the supply had been augmented; the local railroads have also been in better shape to handle the cars, having more ample motive power and an improved method of handling the freight traffic.

No labor troubles occurred in any part of the State and the wage scale of a year ago prevailed. The coke industry also shows a marked increase.

Much development work was done at the Oak Hills and Pinnacle mines situated on the Moffat road in Routt county. The former has attained a monthly output of 15,000 tons and the other at present 2500 tons. From 3000 tons in 1908, Routt county has increased to 89,900 tons. Outside of these two mines, no other mines of any consequence have been opened up in this district. In the accompanying table, the December output was estimated.

SUMMARY OF COLORADO COAL PRODUCTION IN 1909.

Number of mines in operation	193
Tons of lignite coal produced	2,150,280
Tons of semibituminous coal produced	842,927
Tons of bituminous coal produced	7,612,308
Tons of anthracite coal produced	60,944
Tons of unclassified coal produced, estimated	70,000
Total tonnage produced	10,736,459
Increase over 1908	963,452
Tons of coal mined by hand	9,107,349
Tons of coal mined by machine	1,629,110
Total number of mining machines used	198
Total tons of coke produced	1,091,882
Total number of coke ovens	3,309
Number of employees in and about the mines	13,156
Number of employees at the coke ovens	1,089

Coal Mining in Wyoming During 1909

About two-thirds of all the coal mined in Wyoming comes from what is known as the southern field or district No. 1. For the fiscal year ended Sept. 30, 1909, this southern field produced 4,993,819 tons of coal; this output showed an increase over 1908 of 1,224,904 tons.

The State of Wyoming is fast coming to the front as an important coal producer, and the 1909 production exceeded the output of any previous year. Miners in Wyoming are thoroughly unionized and the labor problem is a question of great importance in the Wyoming coal industry. Although miners were plentiful in 1909, it is likely that there will be a scarcity of labor in 1910 similar to what occurred in 1907. Approximately 25 per cent. of the coal production in 1909 was machine-mined. The chain-breast machine was slightly more favored than the puncher type.

*Chief State mine inspector, Denver, Colo.

Coal Mining in West Virginia

BY JOHN LAING†

The West Virginia coal-mining industry has been freer from accidents during 1909 than for some years previous; the only serious accident we have had in the State was an explosion at the Lick Branch mine of the Pocahontas Consolidated Coal Company, on Jan. 12, which killed 7 men; aside from this, West Virginia had fewer explosions and accidents of a minor nature in 1909, than was the case in previous years.

The condition of the mines in West Virginia was much improved in a sanitary way during the year, and the operators spent considerable money in this direction.

The coal production for the year was about 4,000,000 tons less than in 1908; this is caused, first, by the depression of business, and during the last three months by shortage of railroad cars. Many of the mines in West Virginia at present are not working more than three

†Chief State mine inspector, Charleston, West Virginia.

days per week. Following is the production for the first half of 1909, from Jan. 1, 1909, to June 30, 1909: Coal, 20,940,-992 tons, coke 1,710,412 tons.

From June 30, 1909 to January 1, 1910, the West Virginia coal production, estimating the production for December, was about as follows: Coal, 16,000,000; coke, 1,200,000 tons. Grand total for year 1909, coal, 36,940,922; coke, 2,910,-412 tons.

The fiscal year of the department ends June 30, of each year, so the Mining Department will not make a definite statement of production until July 1, 1910.

The Utah Coal Industry in 1909

BY J. E. PETTIT*

The coal and hydrocarbon-mining industries of Utah in 1909 increased 479,-855 tons, making a total output for the fiscal year of 1909 of 2,324,715 tons. The amount of coke was 180,939 tons. There were 15 fatal accidents, 25 serious and 63 nonserious accidents.

There were no labor troubles, and the average wage paid to the miners of this State is the highest in the coal-mining history of Utah. The mines have worked on an average of 280 days, during the past year. The railroads have handled the product in a satisfactory manner, except during the heavy storm period of the latter part of December.

Coal Mining Industry of Indiana in 1909

The total production of coal in Indiana for the year 1909, with the reports for November and December estimated, was 12,200,000 tons. Although the production of the volume of coal of the Indiana mines was materially decreased in 1908, as compared with 1907, the output for 1909 will almost equal that of the banner year.

The improved facilities adopted by some of the older properties and the operation of a number of new mines occasioned a substantial increase in production over the previous year. A portion of this development of the industry is due to the extension of railroad facilities, and a more adequate car service. The primary, as well as prevailing cause of increased production is the rush of orders due to returning prosperity, and the unusually large consumption of Indiana coal by the United States Steel Corporation's immense plant at Gary, Indiana.

The gradual improvement in the productive capacity of the miners, on account of a more general use of coal-mining machinery, has been perceptible in a large degree. The machine-mined product increased in this State until only a few States outrank Indiana in the percentage of machine-mined coal as compared to the total output.

The aggregate total wages reported for mining in both the bituminous and block coalfields, with estimates for November and December, will amount to about $12,-000,000, making the cost of production range from 90c. to $1.20 per ton. The selling price for bituminous coal during the year will average about $1.25 per ton for mine-run, while the block coal prices averaged nearly $2.40 per ton.

According to the monthly reports, about the same number of men are employed this year as last: namely, 19,100, to whom was paid an aggregate of $10,-500,000 in wages (November and December estimated).

NEW MINES OPENED

Ten new mines were opened, and five mines formerly closed or abandoned were reopened during the year. The new mines and the rejuvenated mines are pretty well distributed over the 18 producing counties of the State. The drilling for oil in the western portion of the coalfield has resulted in locating excellent coal beds, and the work of developing the finds is progressing rapidly in several locations. It is generally conceded that the number of mines in the western portion of the field will be increased 10 per cent. within a year.

According to reports made to the Inspection Bureau, there was about $75,000 expended on improvements of various kinds in and about the mines. These improvements are modern, including electric haulage systems, electric mining machines, and improved ventilating equipment. A visit by experts from the United States Geological Survey during the early part of the year resulted in much praise of the modern equipped and excellent condition of the Indiana mines.

Twelve mines were abandoned during the year, as against 28 the previous year. Various causes were assigned for the abandonment, the principal one, perhaps, being the flooding by reason of high waters during the Spring months.

Fatal accidents were fewer, and the number injured decreased materially in comparison with the record for 1908. The fatalities reported were found to be due, for the most part, to the carelessness of the miners and their wanton disposition to violate the provisions of the law intended to protect them from injury or death. Illegal shot-firing was found to be a common cause of a majority of the accidents reported to the department of mining. The recklessness and disregard for laws of safety exhibited daily by the miners when using explosives seemingly increased during the year.

Strikes and labor troubles were less frequent than during the previous year. The controversies arising over provisions of the wage contract were few and of short duration. A riot occurred at the Hymera mine between the American and French miners, resulting in the driving of the French miners out of the community.

*State coal-mine inspector, Salt Lake City, Utah.

Coal and Coke Production in the United States

The following table has been compiled largely from data communicated by the several State mine inspectors, estimates having been made only where no such statistics were available, but in all cases upon the basis of good information:

PRODUCTION OF COAL IN THE UNITED STATES.

States.	1908. Short Tons.	1909. Short Tons.
BITUMINOUS:		
Alabama	11,523,299	11,983,920
Arkansas	1,866,565	1,950,000
California and Alaska	21,760	25,000
Colorado	9,703,567	10,666,459
Georgia and North Carolina	301,640	300,000
Illinois	51,507,991	(a) 49,163,710
Indiana	10,987,419	12,200,000
Iowa	7,490,000	7,500,000
Kansas	5,960,417	6,000,000
Kentucky	9,805,777	9,950,000
Maryland	4,377,094	4,600,000
Michigan	1,839,927	1,900,000
Missouri	3,547,000	3,600,000
Montana	1,979,417	2,204,000
New Mexico	2,772,586	3,010,000
North Dakota	317,840	336,000
Ohio	28,101,949	28,107,000
Oklahoma	3,633,108	3,187,200
Oregon	60,000	72,000
Pennsylvania	118,309,680	130,157,582
Tennessee	6,082,851	6,234,922
Texas	1,280,490	1,310,400
Utah	1,786,204	2,324,715
Virginia	4,224,821	4,310,000
Washington	2,977,490	3,307,000
West Virginia	41,360,500	47,469,797
Wyoming	6,100,000	8,197,200
Nevada and Idaho	10,240	10,000
Total bituminous	337,929,632	360,076,905
ANTHRACITE:		
Colorado	69,440	70,000
New Mexico	20,000	20,000
Pennsylvania	80,240,138	77,009,336
Total anthracite	80,329,578	77,099,336
Grand total	418,259,210	437,176,241

(a) For the fiscal year ending June 30.

PRODUCTION OF COKE IN THE UNITED STATES.

States.	1908.	1909.
Alabama	2,336,602	2,500,000
Colorado	854,662	1,091,882
Georgia and North Carolina	60,000	50,000
Illinois	310,540	315,200
Kansas	10,000	10,000
Kentucky	54,515	64,200
Missouri	5,000	5,000
Montana	29,482	35,600
New Mexico	353,240	430,000
Ohio	240,000	250,000
Oklahoma	24,580	55,000
Pennsylvania	12,287,828	18,717,413
Tennessee	250,491	224,204
Utah	321,200	180,969
Virginia	1,219,927	1,250,000
Washington	37,381	41,090
West Virginia	3,107,000	2,910,412
Other states (a)	1,994,218	2,270,000
Total	23,496,666	29,400,970

(a) Includes output of by-product coke for Massachusetts, Maryland, Minnesota, New York, Michigan, Wisconsin.

THE MINING INDEX

The editors of this paper read all the important publications of the world that relate to mining and the treatment of minerals. This index is published as a reference for all interested and to make it impossible for readers of the ENGINEERING AND MINING JOURNAL to miss any important article published anywhere.

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CLAY.

11307—INDIA—China-Clay and Fire-Clay Deposits in the Rajmahal Hills. Murray Stuart. (Rec., Geol. Surv. of India, Vol. XXXVIII, Part 2, 1909; 15½ pp.)

COAL AND COKE.

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11311—CHILE—The Coalfields and Collieries of the Republic of Chile. Archibald Russell. (Trans. Min. Inst. of Scotland, Vol. XXXII, Part 1, 1909; 54 pp., illustrated.)

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11313—COAL DUST—Suppressing Coal Dust at the Dourges Collieries. M. Bonneau. (Iron and Coal Tr. Rev., Nov. 26, 1909; 1⅓ pp., illustrated.) Translation from *Bull.* de la Soc. de l'Ind. Minérale. 40c.

11314—COAL HANDLING—The McMyler Coal Hoist for Discharging Coal from Wagons into Ships. (Iron and Coal Tr. Rev., Nov. 26, 1909; 1 p., illustrated.) 40c.

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11328—MANCHURIA—Coal Mining in Manchuria. Thomas T. Read. (Min. Mag., Nov., 1909; 4 pp., illustrated.) 40c.

11329—MONTANA—The Central Part of the Bull Mountain Coal Field, Montana. R. W. Richards. (U. S. Geol. Surv., Bull. 381-A, 1909; 21½ pp., illustrated.)

11330—MONTANA—The Fort Peck Indian Reservation Lignite Field, Montana. C. D. Smith. (U. S. Geol. Surv., Bull. 381-A, 1909; 20 pp., illustrated.)

11331—MONTANA—The Milk River Coal Field, Montana. L. J. Pepperberg. (U. S. Geol. Surv., Bull. 381-A, 1909; 25½ pp., illustrated.)

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11337—PEAT INDUSTRY in Its Present State and Its Possibility of Development. E. Nystrom. (Jernkontorets Annaler, 1909; 43 pp.). Gives the history of the peat industry to the present time and discusses the various methods of the manufacture of peat coal and other peat products.

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