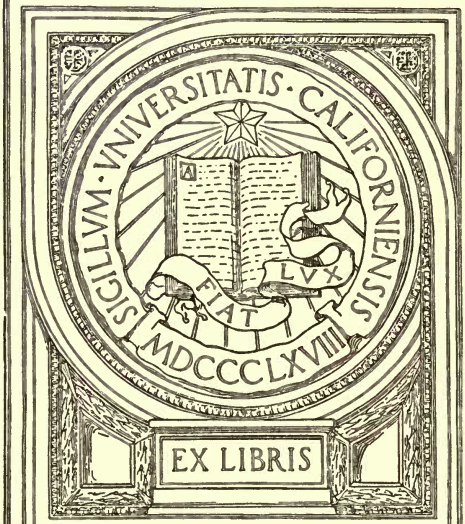

MINING COSTS OF THE WORLD

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A COMPILATION OF COST AND OTHER IMPORTANT DATA ON THE WORLD'S PRINCIPAL MINES

BY

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AND

H. ROBINSON PLATE, MINING ENGINEER

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PREFACE

The writers have long believed that there is need for a book of this character, embodying in condensed form costs and other important operating data on the metal mines of the world.

This book, which covers about three hundred and twenty-five metal mines, is not a text but a compilation of results actually obtained at the various properties shown therein. It should be of material assistance to the engineer, manager, superintendent, operator and student. We realize that nearly every mining man has his own notebook, but rarely are these data complete and conveniently arranged in pocket book form. The examining engineer and operator frequently find it difficult to obtain reliable data in camps they are visiting. This book gives the desired information, embodying as it does most of the principal camps of the world.

It is evident that no just comparison can be drawn between any two mines, as no two are operated under identical conditions. In a great majority of cases we have given operating results for several years. There is a constant aim to increase production with decreasing costs, but as this is not a rapid nor radical movement figures from year to year undergo very slight changes. It is our intention, however, from time to time to augment the book, adding new mines to the list, later data and more complete information.

The figures are taken mainly from the companies' annual reports and financial statements and from our personal notebooks. Some of these annual reports are not as clear nor as complete as they might be; consequently, in these cases our data are brief. Also, there are a few mining companies which do not make public their operations or costs. In a number of instances we have had to calculate costs from financial statements. The data given have been incomplete and consequently exact accuracy is not claimed. Some companies do not segregate the figures that permit of calculating their cost. In such cases we have had to lump the costs into a total. As the companies in general do not publish their annual reports until the second or third quarter of the following year, it is difficult in compiling a book of this character, covering such an extensive field, to bring all properties down to a point to include the last annual report. In the case of the United States mines we have embodied under their respective headings in a great majority of the properties complete operating data for 1913. In the mines of Africa, Asia, Australia and New Zealand this has been impossible. In these sections we have added a table giving a few of the most important operating results of the various mines, thus bringing them down to date.

Accompanying the cost data on the respective properties, the writers have added a few remarks giving brief descriptions of the mines, the methods of mining and reduction employed, and general operating conditions. Owing to the limited space available, these remarks must of necessity be brief.

Because of the impracticability of breaking the tabulated data throughout the book, and in order to do away with the great number of blank pages occurring which would make it impossible to keep the volume within pocket book size, it has been found advisable in many cases to put the remarks in the appendix rather than in the book proper.

The writers wish to express their appreciation to Mr. William B. Thompson for the assistance he has rendered in the publication of this work. Also to Mr. A. Chester Beatty, who through his London Office has obtained numerous reports and other data on the foreign properties.

Our sincere thanks are extended to the many companies for the willingness with which they have sent reports and for other courtesies shown. To the mining men who have contributed data and valuable suggestions we are deeply indebted and particularly to the following for their special help in their respective departments:

United States:

General Data: Walter H. Aldridge, O. B. Perry, Cortlandt E. Palmer, J. Parke Channing, Benjamin B. Thayer, Andrew Walz, James L. Bruce, Heath Steele.

Michigan Mines: R. L. Agassiz, John R. Stanton.

Dominion of Canada: Robert H. Stewart, R. B. Watson, Samuel Cohen.

Central America: Charles Butters, Henry F. Lefevre, Geo. L. Carlisle, Jr.

Mexico: Hugh Rose, Herbert C. Enos, Robert Mulford.

South America: Pope Yeatman, M. W. Atwater.

Africa: James McDougall, William W. Mein, Thomas H. Leggett.

Australia: H. C. Hoover, C. S. Herzig.

Asia: Walter Harvey Weed and "The Copper Handbook" for loan of reports on the Japanese Mines.

Europe and General Foreign Data: Lucius Mayer, Harold A. Titcomb, E. L. Gruver, E. Schoenwald.

In addition to the above the writers wish to thank the numerous engineers who have contributed data on particular mines, mention of whom is made under the respective properties.

E. N. Skinner.
H. R. Plate.

New York,
January, 1915.

CONTENTS

LIST OF MAPS

NORTH AMERICA


ARCTIC
OCEAN
NEW SIBERIA
PRINCE PATRICK I.
PARRY ISLANDS
MELVILLE I.
C. Chelyuskin
Bulun
Sredni Kolymsk
Nizhni Kolymsk
ARCTIC CIRCLE
Point Barrow
C. Bathurst
Great Bear L.
SIBERIA
RUSSIAN EMPIRE
ALASKA
Dawson
NORTH
DOMINION
Yakutsk
Okhotsk
Bering Sea
Sea of Okhotsk
Monday
Sunday
ALEUTIAN IS.
Unalaska
Sitka
QUEEN CHARLOTTE IS.
VANCOUVER I.
Victoria
Vancouver
AMERICA
Irkutsk
ASIA
MONGOLIA
CHINESE EMPIRE
CHINA
Pekin
Mukden
Vladivostok
Hakodate
Japan Sea
Seoul
Tokyo
Yokohama
Osaka
KIUSIU
Shanghai
Fuchau
Canton
Hongkong
FORMOSA
INDIA
Helena
Portland
Salt Lake City
San Francisco
Los Angeles
El Paso
New Orleans
Mexico
Mazatlan
Acapulco
Ogden
St. Louis
TROPIC OF CANCER
PACIFIC OCEAN
HAWAII
WAKE I.
INTERNATIONAL DATE LINE
PHILIPPINE ISLANDS
Manila
China Sea
MICRONESIA
MARSHALL IS.
CAROLINE IS.
GUAM
Bangkok
BORNEO
DUTCH EAST INDIES
Singapore
Batavia
MALAY
EQUATOR
MELANESIA
NEW GUINEA
GILBERT IS.
PHOENIX IS.
ELLICE IS.
SOLOMON IS.
POLYNESIA
MARQUESAS IS.
SAMOA
Apia
Suva
FIJI
SOCIETY IS.
TAHITI I.
LOW ARCHIPELAGO
Palmerston
Coral Sea
Cooktown
NEW CALEDONIA
Noumea
INDIAN OCEAN
AUSTRALIA
OCEANIA
TROPIC OF CAPRICORN
PITCAIRN I.
EASTER I.
Brisbane
NORFOLK I.
KERMADEC IS.
Perth
Albany
Adelaide
Sydney
Melbourne
Auckland
NEW ZEALAND
Wellington
Christchurch
TASMANIA
Hobart
CHATHAM IS.
Dunedin
STEWART I.
AUCKLAND I.
ANTIPODES I.
Antipodes of Greenwich
MACQUARIE I.
EMERALD I.
NIMROD IS.
DOUGHERTY I.
Monday
Sunday
C. S. HAMMOND & CO., N. Y.
ANTARCTIC CIRCLE
WILKES LAND


THE WORLD
GREENLAND (Danish)
Baffin Bay
Davis Strait
ARCTIC OCEAN
Barents Sea
Kara Sea
ARCTIC CIRCLE
ICELAND
BRITISH ISLES
London
Paris
St. Petersburg
RUSSIAN EMPIRE
SIBERIA
EUROPE
ASIA
Constantinople
ATLANTIC OCEAN
New York
AZORES
BERMUDAS
WEST INDIES
Sahara
SUDAN
AFRICA
Cairo
ARABIA
PERSIA
Teheran
INDIA
Calcutta
EQUATOR
Zanzibar
MADAGASCAR
INDIAN OCEAN
Cape Town
C. of Good Hope
SOUTH AMERICA
BRAZIL
Rio de Janeiro
Buenos Ayres
FALKLAND IS.
SOUTH GEORGIA
C. Horn
SOUTH ORKNEY IS.
SOUTH SHETLAND ISLANDS
GRAHAM LAND
ANTARCTIC CIRCLE
Telegraph Cables
Oceanic Routes and Distances

UNITED STATES OF AMERICA

U. S. CURRENCY. TON = 2000 LBS.

ALASKA

ALASKA GOLD MINES CO.

(The Alaska Gastineau Mining Co.)

PERSEVERANCE MINE, JUNEAU, ALASKA, U. S. A.

This property is now held by the Alaska Gold Mines Co. and is being developed to produce a very large tonnage. Extensive preparations such as the construction of the first milling unit of 6000 tons per day, the construction of a large dam for a 5600-kw. hydro-electric plant and the driving of a 10,000-ft. haulage adit are now under way or completed.

During 1912 the mine produced and milled the following tonnage. The figures will be of interest as a guide to what might be expected of the property when thoroughly equipped and operating upon a large tonnage.

COSTS PER TON

Stoping (105,658 tons)	$ .1876
Tramming (74,930 tons)	.1868
Milling (74,930 tons)	.2250
Concent. treatment, shipment, smelting, etc.	.1260
General expense	.0417
Development; prep. of stopes	.0180
Total	$ .7851
Ave. value of mill heads	$1.97
Ave. value of mill tails	.35

Remarks. *Mine.*—The ore occurs as a mineralized zone of slate which is seamed with quartz stringers and lenses. The stoping width varies from 70 ft. to 120 ft. The mine is entered by adit levels and the zone will be mined by a modified caving system and shrinkage stope method.

The ore zone is exposed for a length of over 3000 ft. with backs of from 900 ft. to 1800 ft. above the present working level. The lower haulage level gains a further depth of about 650 ft.

Mill.—The new milling plant will be located at tide water. The flow sheet has not been definitely decided upon but the following scheme will

probably be adopted: Coarse crushing with gyratory crushers, all through Garfield rolls and the entire product to roughing tables; the concentrates to Wilfley tables and this concentrate product to storage. The roughing table tails and Wilfley tails to a series of five spigot classifiers. The first two spigot product to Hardinge pebble mills and the next three spigot product to roughing tables, the tails to the tail race and the concentrates to Wilfley tables; this table's concentrates go to bins and the tails to the tail race. The Hardinge mill product goes to roughing tables and Wilfleys the same as above. The final treatment of the concentrates has not been decided. The mineral content is pyrrhotite, sphalerite and galena. The pyrrhotite is rather lean of gold values, the main values occurring in the other two minerals.

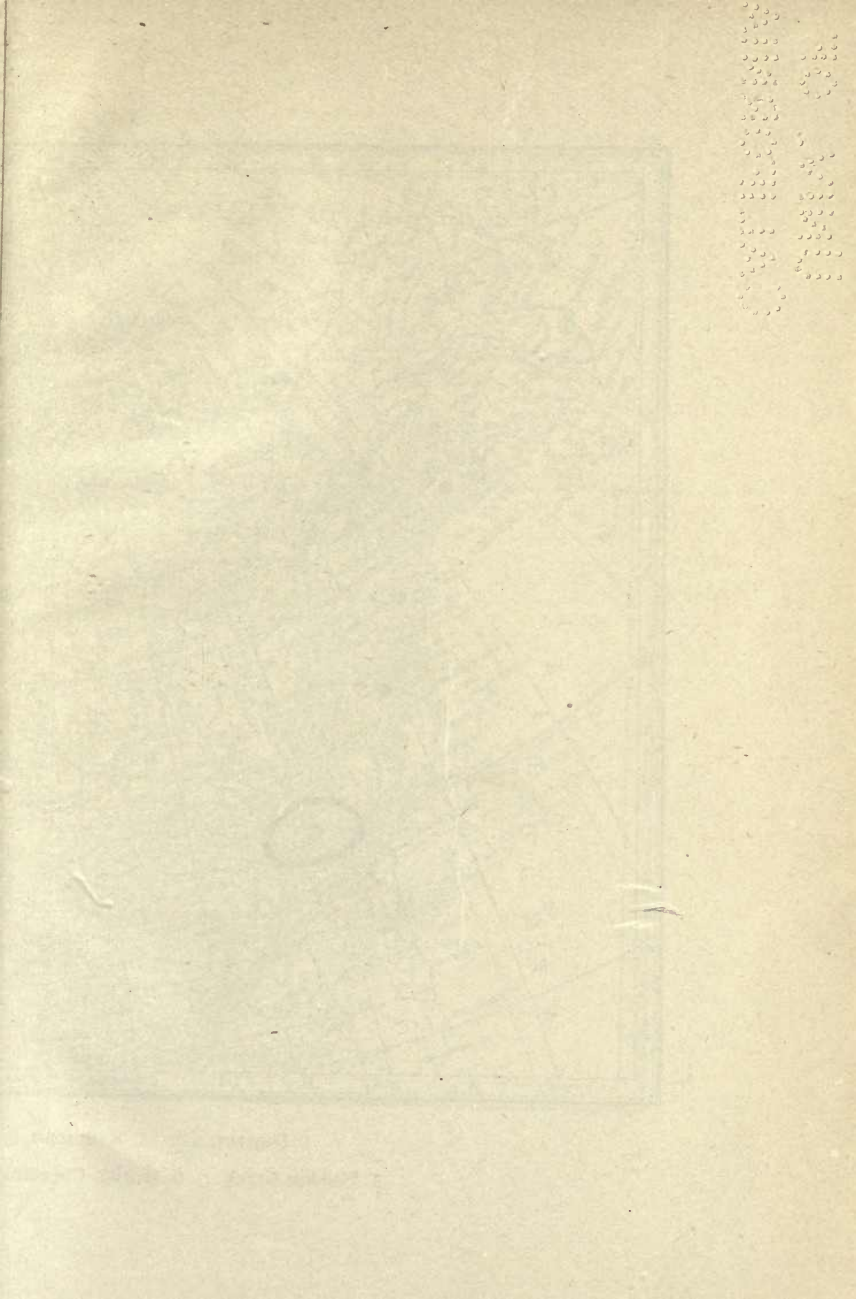
The results shown on "costs per ton" were obtained on less than 500 tons per day and in old mill inadequately equipped.

While an initial mill of 6000 tons daily capacity is being erected, the management states in view of the large tonnage indicated by the present developments that a much larger mill capacity will be provided and that probably the plant will be increased to 20,000 tons per day.

Estimated Earnings.—The engineers estimate that the following results will be obtained on a basis of 6000 tons per day.

Recovery per ton at least	$1.50
Total costs—mining, milling, etc	.75
Profit per ton	$0.75
Earnings per annum 6000 ton plant	$1,500,000

The date for the beginning of active mining and milling operations is set for Dec. 31, 1914, and barring delays a portion of the new mill should be operating prior to that date.



1. Dawson 2. Kennicott

5. Hidden Creek 6. British Columbi

3. Latouche 4. Juneau

section 7. Cobalt 8. Porcupine

ALASKA JUNEAU GOLD MINING CO.

JUNEAU, ALASKA, U. S. A.

The property of the Alaska Juneau Gold Mining Co. is situated on the mainland near Juneau and east of Gastineau Channel. This mine is the first of the big properties on this belt to be equipped and the first unit of the company's mill was placed in commission early in 1914.

A very interesting account of the Alaska-Juneau property appeared in the *Mining and Scientific Press* of December 6, 1913, entitled "Plans of the Alaska-Juneau Gold Mining Co.," by F. W. Bradley. In this article there is given a comparison between the estimated costs at Alaska-Juneau and the average of the large mines on Douglas Island. By permission of that paper we give below this comparison, together with a brief description of the property and operating conditions taken from the information given in the article.

Comparison between the ascertained average costs per ton in the four Douglas Island mines and estimated cost at the Alaska-Juneau, when the latter is working on the same scale as the Douglas Island mines combined is given below:

	Alaska-Juneau	Douglas Island Mines
Mining:		
Development, stoping and general	$.24	$.72
Underground and surface tram., hoisting and pumping.	.16	.23
Total mining	$.40	$.95
Milling:		
Labor	.06	.09
Supplies	.04	.04
Power	.05	.04
Miscellaneous and general	.05	.08
Total milling	$.20	$.25
Concentrate treatment	.07	.08
Plant construction and other costs	.13	.12
Grand total	$.80	$1.40

Description of Property and Operating Conditions.—The Alaska-Juneau is developed by cross-cut tunnel 6538 ft. in length. At this point, a raise 800 ft. long will connect with surface on hanging-wall side of vein. If driven in the vein to apex it would be 2000 ft. long. The portal of the tunnel is about 2 miles back of town of Juneau at elevation of 420 ft. above sea-level.

The Vein.—The vein where cut by the main adit has a normal thickness of about 500 ft. with an average assay value of about $2 per ton. The vein at this point should yield $1.70 per ton. It is expected that an average recovery of $1.45 per ton will be obtained from the entire vein when mining underground 6000 tons per day. This can be done at a total cost of not to exceed 80 cents per ton which cost will be somewhat reduced when eventually mining 12,000 tons per day.

Mining.—The mining will be a combination of the Douglas Island methods and the caving system developed in the adjoining Perseverance mine (Alaska Gold Mines Co.). It is expected that 100 tons of broken ore per machine drill shift will be secured as against an average of 34 tons in the Douglas Island mines. The Juneau vein is slate with loose or free quartz stringers and some metagabbro dikes, between a greenstone foot-wall and a schist hanging-wall, while the Douglas Island vein is a solid hard tough dike of diorite with frozen quartz stringers. Juneau ore is much easier to drill; also, it will slack in stopes, while Douglas Island ore requires considerable bulldozing.

Haulage System.—A trolley haulage system to be installed in present cross-cut and thence over tramway to mill site will handle 6000 tons daily. A sea-level adit is now being driven in order to handle a total of 12,000 tons a day. This tunnel will be 9500 ft. long to the vein at a point 400 ft. vertically below present cross-cut.

Milling.—Mill will be in four units of 150 stamps each. Capacity of each unit 3000 tons per day. The mill-feed can be enriched by sorting and roughing out the waste. It is expected that 20 per cent. of the waste will be trommelled off in the rock-crushing house. This is due to the quartz (the principal values being carried in it) which occurs as loose or free stringers being more friable than the slate and breaking into smaller pieces. In speaking of the values, Mr. Bradley says:

"The principal value in the ore is due to free gold, there being less than 2 per cent. of sulphides, which have an assay value of less than $30 per ton. This is practically all gold, but includes some silver, lead, and copper value. Consequently the concentrates will not be so easy to treat as are the straight iron pyrite concentrates of the Douglas Island mines."

Battery water and water for some power will be taken from Gold Creek. An auxiliary steam plant will also be provided. Eventually hydro-electric power will be obtained from Nugget Creek 15 miles, and possibly from the Speel River.

No figures are given on ore reserves, but in this connection Mr. Bradley states that it is expected that operations on this mine will be continued for a hundred years or more.

ALASKA TREADWELL GOLD MINING CO.

DOUGLAS ISLAND, ALASKA, U. S. A.

Year Now Ends Dec. 31	1912	May 16, 1910, to Dec. 31, 1911	May 16, 1909 to May 16, 1910,
Metal production	$2,183,150.81	$3,258,432.12	$2,076,903.00
Gross "	.....	3,399,478.85	2,171,504.17
Total exp	1,250,598.70	1,937,349.82	1,190,208.84
Total profit	$ 932,552.11	$1,462,129.03	$ 981,295.33
Tons ore milled	892,192	1,349,264	744,226
Val. per ton rec.	$2.447	$2.4157	$2.7939
Val. per ton free gold	1.292	1.3938	1.6177
Val. per ton sulph	1.155	1.0219	1.1762
Gr. val. per ton	2.621	2.5873	2.9549
Profit per ton	1.045	1.0837	1.3185
Costs per ton milled:			
Mining and dev	$ .852	$1.0004	$1.1766
Milling	.204	.1997	.1799
Sulph. ex	.076	.0999	.1219
Gen. exp	.....	.0589	.0567
S. F. office	.....	.0122	.0109
London office	.....	.0014	.0019
Paris office	.....	.0002	.0003
Taxes	.....	.0133	.0035
Bullion charges	.039	.0123	.0139
Con. and repair	.231	.0375	.0316
Total	$1.402	$1.4358	$1.5990[1]
Dev. for year	10,753 ft.	15,533 ft.	13,011 ft.
Total dev	.....	122,563	.....

Ore reserves—6,977,958 tons.

General expense is charged into and absorbed by Mining and Development, Milling, etc. The plant is run mainly by water power, the remaining time by steam.

Running time	Steam	Water	T. crs. per lb. of chrome steel shoes	T. crs. per lb. of iron dies
240 stps. 569.5 days	239	330.5	2.85	4.53
300 stps. 438 days	43	395	2.55	4.40

[1] A charge of $0.0018 per ton for consulting engineer does not show in items.

See also Appendix, pages 347 and 398.

ALASKA MEXICAN GOLD MINE CO.

DOUGLAS ISLAND, ALASKA, U. S. A.

Year Ended Dec. 31	1912	1911	1910
Gross production	$671,473.10	$677,407.85	$781,210.28
Total expenses	413,075.56	419,526.95	500,456.55
Total profit	$258,397.54	$257,880.90	$380,753.73
Tons ore milled	233,289	236,383	222,698
Value per ton recovered	$2.878	$2.9679	$3.4849
Value per ton free gold	$1.314	$1.4246	$1.7760
Value per ton sulpht	$1.564	$1.5433	$1.7089
Gross val. per ton	$3.078	$3.2638	$3.6109
Profit per ton	$1.107	$1.0909	$1.7097
Costs per ton milled:			
Mining and development	$1.139	$1.2036	$1.2198
Milling	.231	.2697	.2481
Sulpht. expenses	.084	.0999	.1237
General expenses	.....	.1259	.0895
San Francisco office	.....	.0170	.0181
London office	.....	.0031	.0036
Paris office	.....	.0005	.0006
Taxes	.....	.0161	.0198
Bullion expenses	.053	.0123	.0157
Construction and repairing	.264	.0244	.0067
Boarding house losses	.....	.0011	.0061[1]
Interest	.....	.0012	.0466[2]
Total	$1.771	$1.7748	$1.7983
Development, feet	3,530	3,613	6,646

Remarks.—Mill has 120 stamps.

Stamp duty tons per 24 hours 5.27
Per cent. sulphurets in ore 2.26

The mine is located on Douglas Island adjoining the Alaska Treadwell and is under the same management. The same general conditions apply to the two properties. The mine is operated through shaft to a depth of 1570 ft.

Running time of mill ..... 373.25 days.
Run by steam power ..... 201.3 days.
Run by water power ..... 171.9 days.

In mill 1 lb. chrome steel in shoes crushed 2.61.

In mill 1 lb. iron in dies in shoes crushed 5.71.

The mill sands are used to fill stopes.

Ore reserves—1,040,631 tons.

[1] Con., eng. and stock expenses only. [2] Alaska United bullion account.

For more recent operations see Appendix, page 398.

ALASKA UNITED MINES

DOUGLAS ISLAND ALASKA, U. S. A.

Year Ends Dec. 31	1912	1911	1910	1909
Ready Bullion Claim:				
Gross production	$611,603.35	$519,283	$489,693	$494,227
Total expense	343,230.08	.....	.....	.....
Profits	268,373.27	.....	.....	.....
Tons of ore milled	216,454	223,668	232,330	227,710
Value per ton recovered	$2.826	$2.32	$2.11	$2.17
Free gold	1.460	.....	.....	.....
Sulphurets	1.366	.....	.....	.....
Gross value per ton	2.996	.....	.....	.....
Profits per ton	1.240	.61	.64	.61
Cost per ton milled:				
Mining and development	$1.009	.....	.....	.....
Milling	.253	.....	.....	.....
Sulphuret expense	.106	.....	.....	.....
Const. and repair	.177	.....	.....	.....
Bullion charges, etc	.041	.....	.....	.....
Total	$1.586	$1.71	$1.47	$1.56
700 Claim:				
Gross production	$570,985.93	$528,623	$402,764	$459,246
Total expense	360,324.89	.....	.....	.....
Profits	210,661.04	.....	.....	.....
Tons of ore milled	234,339	224,968	188,329	190,474
Value per ton recovered	$2.437	$2.35	$2.14	$2.41
Free gold	1.198	.....	.....	.....
Sulphurets	1.239	.....	.....	.....
Gross value per ton	2.607	.....	.....	.....
Profits per ton	.902	.79	.53	.63
Cost per ton milled:				
Mining and development	$1.024	.....	.....	.....
Milling	.217	.....	.....	.....
Sulphuret expense	.080	.....	.....	.....
Const. and repair	.181	.....	.....	.....
Bullion charges, etc	.036	.....	.....	.....
Total	$1.538	$1.56	$1.61	$1.78

Remarks.—The same general conditions apply here as at Alaska Treadwell. Ore reserves—1,154,273 tons.

For more recent operations see Appendix, page 398.

BEATSON COPPER CO.

LA TOUCHE ISLAND, ALASKA, U. S. A.

Year Ended Dec. 31	1912
Average Crude Ore:	
Per cent. copper	6.38
Silver, ounces (approximately)	1.00
Costs per ton:	
General labor	$ .07
Ore-breaking	1.53
Tramming	.15
Ore-sorting	.05
Loading steamers	.09
Supplies	.33
Salaries	.14
Shift boss	.05
Laboratory	.08
Electrical power lighting	.02
Compressor plant	.19
Maintenance and repairs	.18
General expense	.01
Office salaries	.05
Marine insurance	.01
Depreciation mine Liability insurance	.06
Total cost at mine	$3.01
For freight rates and smelter charges see "Remarks"	
Cost per pound:	
Approximate, crediting silver	8¢

Remarks.—Property situated on coast. One-mile tramway to water. Mine is developed entirely by tunnel, no shafts. Ore-bodies average 40 to 150 ft. wide. Ore is chalcopyrite in quartzite. Method of mining is quarrying, glory-hole and caving. No timber is used. At quarry ore-body 150 ft. wide. Ore is direct smelting and is shipped by boat to Tacoma smelter. Ore is excellent one to smelt, carries excess silica. Smelting rates are reasonable, from $1 to $2, depending on character of ore. Freight rates Prince Williams Sound to Tacoma $3 per ton, 1400 miles.

KENNICOTT MINES CO.

COPPER RIVER DISTRICT, ALASKA, U. S. A.

Year Ended Dec. 31	1912
Copper contents per ton:	
Ore shipped, per cent. copper	60.35
Ounces silver	12
Costs per ton:	
Ore breaking	$1.22
Tramming	.12
Mine maintenance	.05
Mine slide	.64
Aerial tram	.44
Sacking and shipping	2.03
General maintenance	.39
General expense	.96
	$5.85
Costs per pound:	
Mining	1.03¢
Freight, incl. R.R. and steamship	2.03
Smelt. ref. and selling	2.08
Marine insurance	.09
General expense	.09
	5.32
Crediting gold and silver	.89
Total costs per pound	4.43¢

Remarks.—The Bonanza mine is located 198 miles by railroad from the coast. The ore occurs in fissures and in bedding planes in limestone. The mineralized area varies from 14 ft. to 120 ft. At one place there is a stope 40 ft. wide of solid chalcocite ore averaging approximately 70 per cent. copper.

The property is developed by tunnel and incline, no hoisting being done. The mine is opened to a depth of 400 ft. The method of working the ore is by open quarry and square-set system; also, some caving is done. The aerial tram line from mine to railroad is 15,000 ft. in length.

The ore is shipped by rail to the coast and thence by boat to the Tacoma smelter. The property has a concentrating mill, but only a very small proportion of concentrates are made. The ore is practically smelted direct.

ARIZONA

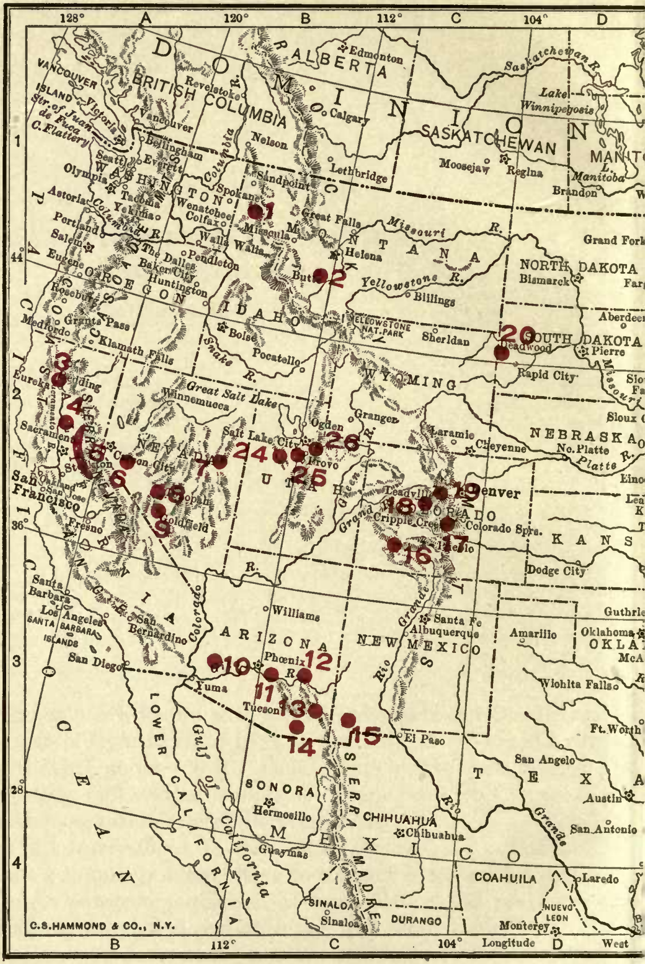
TOM REED GOLD MINES CO.

OATMAN, MOJAVE CO., ARIZ., U. S. A.

Year Ended April 1	1912
Production	$802,598.71
Mill:	
Tons ore milled	39,447
Average value per ton recovered	$19.53
Tons tailings milled	4,477
Average value per ton recovered	$7.25
Mill extraction, per cent	94.85
Costs per ton:	
Development	$1.85
Mining	3.27
Milling	1.46
Cyaniding	1.42
Miscellaneous	1.37
General expense	.384
	$9.754

Note.—The vein is a fissure with a filling of quartz and silicified andesite. A stoping width of from 10 ft. to 15 ft. is maintained. Worked by inclined shaft; present depth about 700 ft. Gold occurs in free state mainly. Mill is 20 stamps, tube mill regrind sliming the whole product. Cyanide treatment in Pachuca agitation tanks follows crushing.

The mine is located about 18 miles from the railroad. The hauling of supplies is not a simple problem owing to a heavy grade over one mountain range. Electric power is purchased at from $10 to $12 per horse-power month. Water is scarce and cost of timber and supplies high.



1. Wallace 2. Butte 3. Copper Be
6. Mason 7. Ely District 8. Tonc
12. Globe 13. Clifton-Morenci 14.
17. Cripple Creek 18. Leadville
22. Lake Superior District 23. Duckto

4. Dredging Section 5. Mother Lode (gold)

9. Goldfield 10. Kingman 11. Ray

sbee 15. Chino 16. San Juan District

9. Breckenridge 20. Lead 21. Joplin

24. Tintic 25. Bingham 26. Park City

YUMA GOLD MINE

YUMA COUNTY, ARIZONA, U. S. A.

Period One Month

Production bullion:				
Precipitation, ounces gold	1,968		1,450	
Amalgam, ounces gold	833.5		667	
Precipitation product valued at	$24,963		$17,534	
Amalgamation product valued at	12,162		9,902	
Total value	$37,125		$27,437	
Operating expenses	17,363		18,756	
Operating profit	$19,762		$8,681	
Tonnage and values:				
Tons treated	2,458		2,166	
Total value per ton recovered	$15.10		$12.66	
Operating profit per ton	$8.04		$4.00	
Cost per ton:				
Administration	.....	$0.68	.....	$0.73
Mining:				
Ore breaking	.665	.....	.86	.....
Hauling and mucking	.265	.....	.33	.....
Hoisting, pumping, timbering, assaying, blacksmith, air drills, etc.	2.03	.....	2.61	.....
Total mining	$2.96	$2.96	$3.80	$3.80
Milling:				
Crushers	$ .282	.....	$ .33	.....
Rolls	.432	.....	.57	.....
Tube mills	.944	.....	.99	.....
Amalgamation and agitation	.568	.....	.72	.....
Filter press	.695	.....	.92	.....
Precipitation	.210	.....	.25	.....
Refinery	.123	.....	.12	.....
Assaying	.087	.....	.11	.....
	$3.34		$4.02	
Total milling	.....	$3.34	.....	$4.02
Company buildings	.....	.07	.....	.10
Total costs	.....	$7.064	.....	$8.66

Remarks.—The above costs are for a gold mine situated in southwestern Arizona. Mine is located 50 miles from railroad by good wagon road. Mine is developed by two shafts, depth 250 to 300 ft. Ore occurs in shoots in silicified zone in porphyry near contact of porphyry and shale. Zone is 25 to 75 ft. wide. The high-grade ore varies from 2 to 7 ft. Ore consists of quartz and silicified brecciated pieces of porphyry. The gold occurs to a large extent free. The method of treatment is amalgamation and cyanide. The wage scale and cost of supplies is about the same as Arizona camps. Hauling to railroad cost $13 per ton. Water is pumped from wells 1000 ft. deep.

THE BISBEE CAMP

ARIZONA, U. S. A.

(See Appendix, page 347)

CALUMET AND ARIZONA (NEW)

REPRESENTING A MERGER OF THE CALUMET & ARIZONA AND SUPERIOR & PITTSBURG, BISBEE, ARIZONA, U. S. A.

Year ended Dec. 31	1913	1912	1911
Production:			
Pounds copper	52,987,383	53,108,628	49,945,905
Ounces silver	880,915	594,319	453,947
Ounces gold	18,989	22,881	18,114
Gross income:			
Copper, silver and gold	$9,181,995	$9,131,967	$6,842,683
Expenses	4,960,528	4,547,973	4,270,441
Net earnings on production	$4,221,467	$4,583,994	$2,572,242
Exploration outside properties	146,830	43,111	46,920
Net income	$4,074,637	$4,540,883	$4,525,321
Smelter:			
Tons ore smelted	476,937[1]	477,496	457,435
Pounds recovered per ton	111	111	109
Cost per ton smelted (calculated):			
Expenses at mine and smelter	$8.05	$7.82	$7.67
Sal. office and general expenses	.14	.14	.18
Frt. refining and market	1.54	1.58	1.49
Construction	.69[2]	.....	.08
Total	$10.42	$9.54	$9.42
Value precious metal per ton refined copper	$24.36	$30.86	$24.15
Net cost prod. copper per lb. crediting gold and silver, as given in report	7.65¢	7.02¢	7.34¢

[1] No tonnage figures are given. This figure is taken from the detailed operating sheets of the Calumet and Arizona and Superior and Pittsburg properties. It is for total tons sampled.

[2] State and Federal tax.

The above represent the combined operations of the Calumet & Arizona and the Superior & Pittsburg properties. For more detailed information see cost data given under Calumet & Arizona and Superior & Pittsburg properties.

CALUMET & ARIZONA MINING CO.

BISBEE, ARIZONA, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Copper, pounds	(1)	16,490,229	21,476,739	28,029,506
Silver, ounces	.....	233,092	216,987	.....
Gold, ounces	.....	9,066	9,329	.....
Income: Value gold and silver	.....	$323,252	$301,309	$265,364
Recpt. copper, gold and silver	.....	2,897,024	$2.983,665	$4,106,396
Prof. smelt. custom ore	.....	.....	.....	144,687
Total	$2,424,428	$2,897,024	$2,983,665	$4,251,084
Total with miscellaneous	.....	2,925,302	2,983,665	4,251,084
Expenditures	$1,405,285	1,734,926	2,080,025	2,815,625
Net earnings on production	$1,019,142	$1,190,375	$893,639	$1,435,459
Mine and smelter: Dry tons mined	102,892	179,788	244,067	315,081
Dry tons shipped	104,177	176,049	244,772	315,128
Dry tons smelted	107,701[6]	159,513	212,370	281,043[7]
Flux ore smelted	.....	17,054	38,831	34,324
Pounds copper recovered dry	89.69	92.129	97.677	92.285
Per cent. copper recovered	4.485	4.606	4.884	4.614
Average price copper	.....	(2)	12.4922¢	12.9316¢
Gold and silver per ton refined copper	.....	$39.20	$28.07	$18.93
Cost per ton smelted (calculated):				
Exp. mining and smelting	$7.80	$7.65[4]	$7.16	$6.81
Construction	.....	.....	.04	.21
Sales office and gen'l exp	.26	.20	.16	.15
Frt. ref. and mkt	1.37	1.31	1.15	1.23
Total cost per ton	$10.42[5]	$9.16	$8.51	$8.40
Less gold and silver per ton	.....	1.71	1.40	.79
Total		$7.45	$7.11[3]	$7.61
Cost per pound (as given in report):				
Cost per pound crediting gold and silver	.....	8.56¢	8.33¢	9.07¢
General: Development, feet	15,635	25,787	26,196	30,848
Tons mined per ft, developed	.....	7.4	16.1	9.11
No. men employed mine and smelter	.....	1,347	1,038	1,161

[1] Production not given. An approximate figure may be had by multiplying the tons by pounds recovered. [2] Not given. Copper for year E. & M. J. quotation was 16.3¢. [3] Assuming a recovery of 85.5 lb. Tonnage Courtland ore not given in 1911 report. [4] Approximately 12,500 tons of Courtland ore as reported shipped in the 1912 annual report have been added. This gives an assumed average recovery of 87.2 lb. per dry ton on all ores treated. [5] Including $.79 Federal and State tax and $.20 interest. [6] Tons sampled. In addition to this tonnage the Courtland camp produced the following: Tons mined wet, 29,391; tons sampled dry, 26,935; pounds copper rec. per ton, 98.60; per cent. assay per dry ton, 5.4 per cent. [7] In addition 17,624 tons of Courtland flux ore was smelted. This gives a recovery of 83.9 lbs.

See also Appendix, page 348

PHELPS-DODGE & CO.

Operating the Copper Queen, Detroit, Moctezuma and other properties Arizona, New Mexico and Mexico

This company owns and operates the Copper Queen Mine at Bisbee, Arizona; the Detroit property at Morenci, Arizona; the Moctezuma, at Nacozari, Mexico; Burro Mountain, Leopold, N. M.; Stag Canon Fuel Co., and Phelps-Dodge Mercantile Co.

The net profits of these properties are as follows:

	1913		1912	
Copper Queen:				
Net earnings	$6,916,900		$6,977,378	
Depreciation	642,958		780,612	
Net profits	$6,273,942	$6,273,942	$6,196,766	$6,196,766
Detroit:				
Net earnings	$1,112,870		$1,406,170	
Depreciation	149,899		146,484	
Net profits	$962,971	$962,971	$1,259,686	1,259,686
Moctezuma:				
Net earnings	$2,402,447		$2,735,061	
Depreciation	400,037		790,655	
Net profits	$2,002,410	$2,002,410	$1,944,406	1,944,406
Burro Mountain:				
Deficit	$199,235	$199,235	$84,105	less def.
Stag Canon:		def.		
Net earnings	$362,564		$346,350	
Depreciation	274,858		59,436	
Net profits	$87,706[1]	$87,706	$286,913	286,913
P-D Mercantile Co.:				
Net earnings	$649,518		$575,694	
Depreciation	20,746		23,566	
Net profits	$628,772	$628,772	552,128	552,128
Total net profits				$10,155,794
Commissions and miscellaneous earnings		$471,494		$406,077
Less expenses, taxes, etc		173,785		126,350
		$297,709		$279,727
Net profit:				
Final net profit		$10,054,275		$10.435,521
Production, company's ores, pounds, copper		147,498,580		140,628,798
Ounces, silver				1,104,510
Ounces, gold				16,002
Production including custom ores:				
Copper		155,665,712		148,678,889
Ounces, silver				1,689,152
Ounces, gold				27,687
Price received for copper		15.37¢		15.51¢

[1] After paying $179,404 losses paid account explosion.

COPPER QUEEN CONSOLIDATED MINING CO.

BISBEE, ARIZONA, U. S. A.
Owned by Phelps-Dodge Co.

Period, Year Ended Dec. 31	1913	1912	1911
Production, reduction works:			
Ores and precipitates, pounds, copper	82,355,137	79,856,168	75,200,392
Lease ores, Copper Queen	3,250,490	1,899,170	460,766
Moctezuma ore and concentrate	36,598,132	31,739,748	25,511,582
Custom ore	8,167,132	8,050,091	10,272,489
Old dump slag and cleanings	3,039,691	21,330,923	.....
Total copper, pounds	133,410,582	123,876,100	111,445,229
Total silver, ounces	1,870,162	1,689,152	1,794,895
Total gold, ounces	31,141	27,687	27,154
Silver custom ore included in above	717,088	584,642	598,941
Profit:			
Net earnings	$6,916,900	$6,977,378	$4,155,010
Depreciation plant and mines	642,958	780,612	1,388,575
Net profit	$6,273,942	$6,196,766	$2,766,435
Tons treated:			
Copper Queen ore and precipitate	692,897	672,280	623,474
Lease ores, Copper Queen	21,287	9,027	5,794
Moctezuma ore and concentrate	140,134	124,083	111,462
Custom ore	82,874	97,574	106,751
Old dump slag and cleanings	97,165	59,840	.....
Total tons	1,034,357	962,914	847,481
Smelter:			
Total charge	1,193,726	1,151,949	1,135,646
Bullion produced	134,513,330	124,915,708	111,445,229
Blast furnaces:			
Tons charge treated	1,013,767	1,095,861	.....
Of which was ore	822,283	845,885	854,463
Per cent. coke per ton charge	12.4	12.78	.....
Tons matte	154,472	180,522	.....
Matte fall per cent	18.79	20.97	.....
Reverberatory Department:[1]			
Tons roasted	123,099	.....	.....
Tons calcines	102,630	.....	.....
Tons smelted	179,958	56,086	.....
Matte produced	.....	15,163	.....
Matte fall per cent	.....	29.84	.....
Converter Department:			
Tons matte treated	206,493	195,685	.....
Average stands operating day	6.5	6.16	5.78
Tons bullion produced	67,256	62,458	.....
General:			
Development ft. at mine	105,937	78,135	62,150
Timber used per ton mined	.....	14.9	16.6

[1] Was placed in commission in June, 1912.

STOPING COSTS PER TON 1913

Four methods of stoping are practised, the choice depending on local conditions. The comparative costs are:

	Tonnage	Labor	Timber	Explosives	Total per ton
In square setting.....	612,299	$1.555	$.473	$.085	$2.113
In top slicing.....	20,582	1.010	.210	.080	1.300
In cut and fill.....	58,239	1.170	.110	.120	1.400
In shrinkage.....	3,822	.....	.....	.....	.....
Total.....	694,942	$1.506	$.434	$.088	$2.028

Analysis of all ore smelted in 1910 was: SiO_2, 19.7; Fe, 26.3; CaO, 2.06; Al_2O_3, 8.9; S, 17.85; Cu, 7.76.

The report of the Copper Queen Co. contains no figures which permit of cost computations.

Remarks.—(See General Remarks, Bisbee.)

Property is developed by seven large shafts, *i.e.*, Czar 400 ft. deep, Holbrook 600 ft., Spray 900 ft., Gardner 1000 ft., Dalles (new) 1409 ft., Lowell 1400 ft., and Sacramento 1600 ft. Mines have electric haulage. Pumping not heavy. The ores are both oxides and sulphides of copper. Ore is hand-sorted underground. The grade shipped is in the neighborhood of 7 per cent. The method of mining is principally square set, though some top slicing, cutting and filling is used. A considerable saving is said to have been made in timber cost in past few years. Was 25 to 30¢ per ton, while in 1912 it was down to 18¢. Formerly used 10×12 and 12×12. Now using smaller timbers, 8×8, and filling closer.

An estimate of the cost per ton would be something as follows:

Mining.....	$4.00	
Smelting.....	3.00	
Freight.....	.25	
Converting, mkt., ship., ref. and selling	2.20	
	$9.45	From this to $9 per ton.

The ores are smelted direct. Smelter is located at Douglas, 25 to 30 miles from mines. Rail connection, mines to reduction plants. Blister copper shipped to Atlantic seaboard for refining. Company employs 4000 men, 2500 at mine and 1500 at smelter.

The limestone ore reserves Dec. 31 1913, amounted to 2,356,729 tons.

SHATTUCK-ARIZONA COPPER CO.

BISBEE, ARIZONA, U. S. A.

Period:	Year ending	August 1 to
Production:	Dec. 31, 1913	Dec. 31, 1912
Copper, pounds recovered	13,219,756	1,746,493
Silver, ounces recovered	236,000	15,165
Gold, ounces recovered	2,033	16
Lead, pounds recovered	1,483,956	.....
	17 mos., Aug. 1, 1912 to Dec. 31, 1913	
Gross income (Aug. 1, 1912 to Dec. 31, 1913):		
Gross value copper, gold, silver and lead	$2,545,007	
Total receipts after interest and miscellaneous	2,562,668	
Total disbursements	1,411,788	
Net profit	$1,150,879	
Mine:		
Copper ore:		
Stoped wet, tons	94,095	7,754[1]
Shipped wet, tons	99,075	12,806
Smelted wet, tons	99,089	12,244
Smelted dry, tons	89,343	10,913
Pounds recovered per ton dry	147.96	160.52
Lead ore:		
Stoped wet, tons	4,822	
Shipped wet, tons	5,090	
Smelted wet, tons	5,090	No production
Smelted dry, tons	4,874	
Pounds recovered per ton dry	304.48	
Cost per ton smelted dry:		
Development	$1.43	
Mining and delivery to smelter	5.41	
Smelting, refining and selling	6.29	Costs not representative. Ore obtained from development.
General and depreciation	.52	
Total cost	$13.65	
Credit gold, silver and lead	2.95	
Net total	$10.70	
Cost per pound:		
Refined copper, deducting credits	7.22¢	Not available
General:		
Value gold and silver recovered per ton ore smelted	$2.03	.....
Precious metal values per ton refined copper	27.49	.....
Lead ore credit per ton refined copper	12.37	.....
Total credit per ton refined	$39.86	.....
Gross price received per pound delivered refined copper.	15.4298¢	.....
Average price equal New York delivery	15.3081¢	.....
Development, ft	20,147	.....

[1] Mined. In addition, 5052 tons came from the stock pile.

See also Appendix, page 348

SUPERIOR & PITTSBURG COPPER COMPANY

BISBEE, ARIZONA, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Copper, pounds	(2)	36,618,399	28,469,166	26,133,790
Value, gold and silver		$496,254	$301,785	$234,998
Income:				
Sales bullion	$6,737,521	$6,186,964	$3,859,018	$3,444,757
Miscellaneous income	47,881	19,701		410
Total income	6,785,402	6,206,665	3,859,018	3,445,167
Expenses	3,583,077	2,813,046	2,180,415	2,509,725
Net earnings	$3,202,324	$3,393,619	$1,678,602	$935,442
Mine and smelter:				
Tons ore mined dry	359,333	292,874	205,603	227,857
Tons ore shipped dry	342,160	288,845	205,675	227,756
Tons ore smelted dry	342,301[3]	288,429	206,234	227,114
Pounds copper recovered	115.698	127.2	138.3	115.3
Per cent. copper recovered	5.785[4]	6.36	6.917	5.76
Val. gold and silver per ton refined copper		$27.10	$21.20	$17.98
Cost per ton smelted (calculated):				
Mining and smelting	$8.12	$7.896	$8.35	$9.05
Sales office general expense	.10	.108	.19	.25
Frt., ref. and mkt	1.59	1.75	1.92	1.57
Construction	.65[5]		.13	.22
Total	$10.47	$9.754	$10.59	$11.09
Cost per pound (as given in report):				
Cost per lb. cr. gold and sil.		6.33¢	6.60¢	8.7¢
Price rec'd for copper		(1)	12.49¢	12.93¢
Development	47,201	29,547	25,322	27,847
Men employed		485	344	536
Amt. water pumped, gal.	1,566,756,779	1,620,218,296	1,579,255,906	1,516,014,750
Depth deepest shaft		1,837	1,837 ft.	1,774 ft.

Remarks.—Property adjoins the Calumet and Arizona. Mine developed by four large shafts. Depth is greater at this mine, 1800 ft. having been attained. The ore-bodies occur in limestone near the porphyry as is the case at the C and A mine, Copper Queen and others. At this mine the sulphide ores predominate though considerable oxides are found. Ore consists of chalcocite, chalcopyrite, also with various carbonates and oxides. At the Junction shaft the sulphide ores are mined by top slicing. At the other shafts the method is principally square-setting. The ore-bodies are often very large. One has been opened for 800 ft. in length, 50 ft. wide and for 300 ft. in depth of continuous ore. The mine is very wet as will be seen from the amount of water pumped. Water is handled for the Copper Queen and also for the C and A mines. The figures given are the total quantity pumped. The ore is treated at C and A smelter at Douglas, 25 miles by rail. Freight rate favorable. Plant contains smelting and converter departments. Blister is shipped east for refining.

[1] Not given—the average for the year was 16.3¢. [2] Production not given. An approximate figure may be obtained by multiplying the tons and pounds recovered. [3] Tons sampled. [4] The assay of the dry ore was 6.272 per cent. [5] State and Federal tax.

Clifton–Morenci District

ARIZONA COPPER COMPANY, LTD.

CLIFTON ARIZONA, U. S. A.

Year Ended Sept. 30	1912	1911	1910	1909
Production:				
Pounds Bessimer copper	38,150,000	34,569,019	32,161,205	32,017,487
Income:				
Income copper and bluestone	£1,184,051	£866,863	£832,291	£841,509
Expenses	753,076	654,499	663,910	638,583
Working profit	£430,985	£212,364	£168,381	£202,926
Balance after inc. other Co's	£504,108	£285,488	£254,471	£333,479
Profit after int., debentures, etc	£480,775	£262,340	£227,646	£302,435
Mine:				
Tons mined dry	927,116	744,746	788,986	741,068
Yield per ton, pounds	41.15	46.4	42.64	43
Per cent. conc. ore of total	96	94	96	.....
Per cent. smelted ore of total	4	6	4	.....
Tons ore treated to 1 ton copper prod.	.....	.....	46.9	43.04
Concentrator:				
Sulphide ore treated	782,100	582,335	559,250	565,085
Ratio of conc	6.74 to 1	5.6 to 1	5.14 to 1	5.8 to 1
Oxide conc. and leacher:				
Tons treated dry	108,230	104,754	115,223	111,513
Tailing leached	89,890	90,526	102,831	101,921
Copper prod., per cent. of total copper	9.71	11.5	11.3	9.52
Tons sulphuric used	3,998	3,778	2,971	3,365
Smelting department:				
Ore and conc. smelted	158,529	153,991	158,532	142,409
Total with fluxes	236,035	230,833	.....	.....
Yield ore and conc., per cent. copper	12.03	11.22	10.14	11.24
Total copper prod. as finally adjusted.	38,132,000	34,584,000	32,210,000	31,962,000
Cost per ton mined, calculated (approximations):				
Mining, conc. and leaching	$2.19	$2.25	$2.12	$2.25
Smelting, conv., shipping and R.R.	1.46	1.82	1.77	1.79
General expense	.29	.19	.18	.14
Total	$3.94	$4.26	$4.07	$4.18
Cost per pound:				
Approximate cost per pound	9.5¢	9.2¢	9.5¢	9.7¢

Remarks.—Properties are situated at Morenci, Metcalf and Coronado, Clifton District, Arizona. The ore-bodies have the following characteristics.

Morenci: Very soft altered porphyry, necessitating close timbering. Width irregular, from less than 50 ft. to over 200 ft. Property opened by

adits and shafts. Method of mining square-setting, block-caving and top-slicing. Tendency to do away with square-setting. Probably top-slicing will be principal system employed.

Metcalf: Ore depth somewhat less than at Morenci. Harder porphyry and less timbering required. Width similar to Morenci. Mines opened by adits. Method of mining is modified block-caving and shrinkage stopes—some square-setting.

Corondo: Vein formation with firm foot and hanging of granite. Width 10 to 50 ft., average about 15 to 25 ft. Mine opened by shaft.

Character of Ore: At Morenci and Metcalf, chalcocite and cupiferous pyrite, both as disseminations and as a network of interlacing veins in a thoroughly altered soft monzonite porphyry, resembling in appearance the ore of Ely, Nevada. Associated with this ore are strong high-grade veins of chalcocite and cupiferous pyrite varying from 6 in. to 2 ft. Grade of ore is around 3 per cent. to 3¼ per cent. A small amount of ore is still being mined from oxidised limestone deposits. This is treated by the leaching process. The Coronado ore occurs in altered granite. Mineral chiefly chalcocite. Grade 4 to 4½ per cent. Approximately 350 tons per day are coming from this property. This may be largely increased on completion of Coronado haulage tunnel.

Depth: The depth of the mines varies greatly. Some ore is mined near the surface, while the maximum depth obtained is from 700 ft. to 900 ft.

Reduction Plants: The property is equipped with concentrators at Morenci and Clifton, and with a smelter at Clifton. Two products are mined, *i.e.*, concentrating ore and direct-smelting ore, the latter a small proportion. Concentrates are smelted. The finished product is blister copper which is placed on the market. The Company owns the Arizona and New Mexico Railway connecting mines, mills and reduction plant; also Clifton and Morenci with through trunk lines.

General Conditions.—The labor is good, mostly Mexicans paid $2 to $2.50 for eight hours. Skilled white labour $2.50 to $4.00. Supplies are slightly above average for Arizona. Limestone for flux is obtained in district. No additional iron needed. Water is pumped and is expensive. Topography very rugged. Climate favourable.

DETROIT COPPER MINING OF ARIZONA

MORENCI, ARIZONA, U. S. A.

Owned by Phelps-Dodge & Co.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Copper, pounds	22,255,130	24,802,789	22,704,398	23,056,292
Net earnings	$1,112,870	$1,406,170	$930,495	$1,079,547
Depreciation, plant and mine	149,899	146,484	267,709	120,000
Net after depreciation	$962,971	$1,259,686	$662,786	$959,547
Tons ore mined:				
Concentrating ore	518,718	501,451	501,093	474,027
Smelting ore	5,330	6,190	7,904	7,473
Silicious (convert.)	8,380	11,990	7,745	11,093
Total ore mined	533,563	519,631	516,742	492,593
Tons ore treated	537,324	520,272	517,087	494,286
Yield per ton, lbs	41.42	47.67	45.9	46.64
Grade ore mined, per cent	2.9	3.25	.....	.....
Concentrator:				
Tons concentrated	517,518	501,928	500,000	474,073
Assay value	2.785	3.08	2.869	2.977
Concentrates tons	66,928	70,438	66,012	69,906
Assay value, per cent	15.834	16.69	15.876	15.426
Recovery, per cent	74.76	76.12	73.05	76.42
Tailings assay	.79	.811	.848	.82
Ratio of conc	7.3–1	7.1–1	7.57–1	6.78–1
Water consumpt. per ton milled	555	511 gal.	522	554
Actual running time, per cent	95.46	95.11	95.32	95.36
Ore milled, twenty-four hours, tons	1,485	1,442	1,437	1,362
Smelter operations:				
Total ore treated (Detroit)			516,153	
Assay value, per cent. copper			3.098	
Yield, per cent			2.179	
Production lbs. copper			22,481,238	
Custom ore, tons	Not	Not	933	Not
Assay value, per cent	available	available	11.95	available
Total ore treated			517,086	
Assay value, per cent. copper			3.116	
Yield			2.195	
Total production, lbs. copper			22,704,398	
Saving, smelt. and conv., per cent		93.86	92.6	90.945
Average price, copper, cents	15.37	15.51	12.36	12.826

See also Appendix, page 349.

SHANNON COPPER COMPANY

CLIFTON, ARIZONA, U. S. A.

Year Ended Aug. 31	16 mo. Dec. 31–13	1912	1911	1910
Prod. (Sold):				
Copper, oz. fine	18,793,724	16,406,336	15,630,090	17,924,198
Gold, oz	3,412	2,615	1,690	1,813
Silver, oz	169,197	170,690	91,955	116,280
INCOME				
Value, copper	$2,982,492	$2,440,586	$1,931,099	$2,321,163
Value, silver	68,247	52,300	33,817	36,269
Value, gold	102,673	101,979	49,302	60,638
Total value	$3,153,412	$2,594,866	$2,014,219	$2,418,070
Total expenses	2,532,631	1,910,637	1,815,605	2,131,157
Profit	$620,781	$684,229	$198,613	$286,913
Deduct int. dev. and taxes	181,206	123,615	79,759	96,427
Net profit	$439,574	$560,614	$118,554	$190,487
Other income inclu R.R.	36,866	20,400	9,856	4,718
Total income	$476,440	$596,738	$128,710	$195,205
MINE				
Tons of ore mined	434,307 [1]	285,210	263,975	311,456
Tons of ore concentrated				
Extraction Shannon ores, lb. cu. per ton	46.78 [2]	57.5	56.9	53.56
Prod. Shannon property, lb.		16,306,947	14,944,933	16,565,032
Prod. custom ore		79,184	223,169	1,045,236
Total production	18,793,724	16,326,134	15,168,108	17,600,268
Price rec'd. for copper	15.87¢	14.875¢	12.352¢	12.839¢
Cost per ton mined wet (calculated)				
Operation	$5.194 [3]	$5.886	$6.05	$6.00
Frt. ref. and eastern exp.	.636	.813	.85	.82
Dev. explor. int. etc.	.417	.433	30	31
Total cost	$6.247	$7.133	$7.20	$7.13
Cost per ton wet:				
Min. ton mined Metcalf.	$2.12	$1.89	$1.97	$1.97
Conc. per ton conc.	.95	.84	.92	.91
Smelt. ton Burden & flux	$2.73	$2.76	$2.69	$2.73
Cost per pound:				
At mine		9.94¢	9.92¢	10.02¢
At N. Y. refined	13.5¢	11.42¢	11.58¢	11.75¢
Development	13,600 ft.	11,031 ft.	7,645 ft.	7,373 ft.

[1] Treated. [2] 73,223 tons of outside ore were treated with a recovery of 22 lbs.

[2] Including the mining of 437,807 tons and the treatment of 434,307 tons. There was mined at Metcalf 364,584 tons.

Remarks.—The Shannon mine is located at Metcalf, 5 miles northwest of Clifton, Ariz. The mill and smelter are situated 1 mile below Clifton, or 6 miles from the property. The company owns its own railroad connecting mines with reduction works.

The Shannon mine is situated at the top of Shannon mountain, 1200 ft. above canon. Tramway conveys ore to railroad located in canon. The workings at the mine aggregate 15 miles. Property is developed entirely by tunnels. The Shannon mine has very extensive surface ores. The ore-bodies are worked by two methods, open cut and square-set stoping. The surface ores are sorted up to smelting mixture of 4 per cent. grade. The underground ores, about half of which go to the mill and half to the smelter, are silicious sulphides. The formation is limestone and porphyry, the ore occurring in each formation and also on the contact. The ore-bodies occur in very irregular deposits which necessitates mining by the square-set method. The surface ores are worked cheaply. About one-half of the ore shipped is concentrating ore. This averages about 3 per cent. copper. The smelting ore varies from 4 per cent. to 5 per cent.

The concentrator is of 500 tons capacity. The saving is said to be from 72 to 78 per cent. with a grade concentrate of 13 per cent. The ratio of concentration is around 5 into 1.

The smelter is of 1800 tons capacity. It does a custom business, treating principally sulphide ore which is needed. Barren limestone is used in fluxing. The matte averages around 45 to 48 per cent. copper. This is converted at the plant and blister shipped to Atlantic seaboard for refining.

Shannon has been a high-cost producer. This is due to low grade of ore and necessity to mine by square-set. Timber is very expensive. The company employs Mexican labour.

UNITED VERDE COPPER CO.

JEROME, ARIZONA, U. S. A.

Year Ended Dec. 31	1912	1911
Production:		
Copper (fine), pounds	31,570,085	33,164,520
Silver, ounces	480,518	461,168
Gold, ounces	15,069	15,239
Mine:		
Tons mined (part of 1911 sent Humboldt)	351,816	327,133
Tons fed	354,437	294,600
Grade ore and recovery:		
Copper fed, per ton, per cent	7.01	7.7
Silver fed, ounce per ton (recovered)	1.356	1.456
Gold fed, ounce per ton (recovered)	.043	.048
Recovery of fine copper including custom ores fed, but exclusive of custom ores sold, pounds.	33,358,878	31,831,431
Recovery, per cent	67.18	67.26
Cost per ton:		
Cost of mining (per ton mined)	$2.715	$2.87
Cost of smelting and converting (per ton fed including cost of silicious ores used for flux).	$2.835[1]	$4.066
Cost per pound:		
Shipping, refining, etc. (New York expenses)	$.01456	$.01523
Miscellaneous costs:		
Cost of coke per ton	$11.61	$11.61
Cost of coal per ton	$5.36	$4.91
Cost of horse-power per annum	$190.96	$234.45[2]
Income:[3]		
Copper sold	$5,279,442	$4,174,478
Silver sold	298,155	246,665
Gold sold	321,860	315,691
Total gross proceeds	$5,899,860	$4,736,834
Metal prices:[3]		
Copper per pound, cents	16.725	12.586
Silver per ounce, cents	61.57	53.49
Gold per ounce	$20.34	$20.72
Dividends paid	$1,800,000	$2,475,000

[1] Exclusive of cost of silicious ores used as flux.

[2] Horse-power based on evaporation, the high cost due to wreckage of power house.

[3] From Boston News Bureau.

Remarks.—The United Verde mine and smelter are located at Jerome, Arizona. Company owns narrow-gauge line 26 miles in length connecting the property with a branch of the Santa Fe Ry. The ore-bodies occur as lenticular or irregular-shaped masses, dipping about 70 deg. in a shear zone of schist and diorite. Some of these bodies are several hundred feet

in length; one is said to be continuous for nearly 700 ft. and the ore-body to average 6 per cent. copper and $2 in gold and silver. On the 500-ft. level one of the stopes is 200 by 100 ft. Some of the smaller stopes average as high as 10 per cent. to 14 per cent. copper. The method of mining formerly employed was square-setting and this system is still used in the upper workings. A greater part of the ore is now mined by the bottom-slicing method. Filling is done from the side walls and from the surface. Some of the oxide ores at the surface are mined by open cut.

The ore is principally sulphide, chalcopyrite predominating, though many others are present. The ores carry a heavy excess of iron and sulphur. The mine is developed by vertical shaft to 1500 ft. It is opened by tunnel to a depth of 1000 ft.

The ores are smelted direct. Very little flux is used. A small amount of limerock is employed. About 7 per cent. coke is used on the charge. The smeltery, which is situated at the mine, has a capacity of from 1000 to 1200 tons per day. Equipment consists of four blast furnaces with converter department. As a result of the caving of the ground at the smelter, which is located at the mine over the ore-bodies, it has been found necessary to erect an entirely new smelting plant. The new smelter is located five miles from the mine, situated on a new broad-gauge railroad connecting with the main line of the Santa Fe. This road should effect a great saving over the present narrow-gauge road. The plant will be of 2500 tons capacity and composed of six roasters, three oil-fired reverberatories and four blast furnaces. The new smelter should be operating in 1915. Mine and smelter have electric power, 1500 h.p. being furnished by the Arizona Power Co. at a cost of one cent per kilowatt-hour.

Ray District

RAY CENTRAL COPPER MINING CO.

RAY, ARIZONA, U. S. A.

(Now Owned and Operated by Ray Consolidated)

At this property two ore-bodies exist: (a) low-grade disseminated ore, of which there existed in 1912 6,711,000 tons, averaging 2.19 per cent. copper; and (b) high-grade disseminated ore-body, containing 673,000 tons, averaging 5.83 per cent. copper.

The following are the estimated costs on the two grades of ore.

HIGH GRADE

Grade: 5.83 per cent.
Extraction, mill: 75 per cent., may equal 80 per cent.
Ratio concentration 6, into 1.
Smelting $6 per ton concentrates.
Custom smelter to pay for 95 per cent. of contained copper less 2¼ cents., N. Y. quotation.

COSTS PER TON

Mining (Filling method)	$2.00
Milling	.70
Transportation	.15
General expenses	.05
Smelt. ref. and marketing	2.85
Total	$5.75

Cost producing copper 7¢ exclusive of amortization and interest.
Profit 13¢ copper equals $5.00 per ton.

LOW GRADE

At the time the low-grade estimate was made the ore averaged 2.15 per cent. copper.

Assuming a 70 per cent. extraction in the concentrator and 5 per cent. loss in smelting, ore should yield 28.6 lb. per ton.

COSTS PER TON

Tons treated daily	1000	3000
Mining	$1.25	$ .90
Transportation		.15
Developing	.10	.....
Milling	.70	.60
Smelting	.35	.35
Ref. and mar. 2¢ per unit	.57	.57
Total	$2.97	$2.57
Cost per pound	10.38¢	9¢

Since the above estimates were made, the Ray Central property has been merged with the Ray Consolidated.

Remarks.—The Ray Central property adjoins the Ray Consolidated. The companies were merged in 1911. The above estimates give the costs which should be obtained when treating daily a comparatively small tonnage of porphyry ore.

The porphyry ore would be mined by shrinkage stope method in the low-grade portion of the mine and by square-setting in the high-grade portion. The concentrator site was at a distance of 10 miles from the mine. Concentrates were to have been smelted at the A. S. & R. plant at Hayden. (For more complete data on these ores and costs actually being obtained see Ray Consolidated.)

RAY CONSOLIDATED COPPER CO.

RAY, ARIZONA, U. S. A.

Year Ended Dec. 31	1913	1912	1911 (9 mos.)
Production:			
Copper, pounds net	52,341,029	34,674,275	14,935,047
Silver, ounces	42,458	13,439	1,733
Income:			
Gross income	$7,899,721	$5,475,565	$1,954,553
Operating expenses	5,402,502	3,661,359	1,807,009
Net operating profit	2,497,218	$1,814,206	147,545
Total after miscl. inc	2,874,316	$2,110,962	365,048
Net for year after int	$2,675,193	$1,929,262	$298,640
Concentrator:			
Tons ore concentrated	2,365,296	1,565,875	681,519
Average copper contents, per cent	1.719	1.677	1.83
Recovery in conc., per cent	66.09	68.278	63.01
Recovery, pounds copper	2.723	22.9	22
Copper in concentrates, lbs	53,745,937[3]	35,861,496	15,721,520
Grade concentrates, per cent		18.944	22.44
Price received for copper	15.201¢	15.762¢	13.08¢
Price received for silver	60.112¢	61.525¢	53.46¢
Costs per ton (calculaed from financial statement):			
Mining	$.732	.775[4]	.816
Milling	.519	.468	.5945
Taxes	.003[1]	.026	.....
Freight and treatment	.871	.930	.83
Selling commission	.033	.035	.029
Mine development and extinguishment[2]	.125	.100	.....
Freight on ore	.....	.....	.36
Bullion tax	.....	.....	.02
Total	$2.284	$2.334	$2.65
Costs per pound (as given in report):			
Not including ore extinguishment (prepaid development)	.....	9.3723¢	10.765¢[5]
Prepaid development	.....	.4557	.....
After crediting earnings R. R., but not mis. inc.	9.783¢	9.828¢	10.765
Miscellaneous costs per ton:			
Mining last quarter 1912, not incl. 12½ cents dev. retirement charge.	.....	71.05¢	76¢[6]
Mining and milling excl. of trans., but 12½ cents charge last three quarters.	.....	$1.345	.....
Average No. tons treated daily	6,480	4278	.....

[1] Estimated. [2] Beginning April 1, 1912, a charge of 12½¢ per ton was made for the purpose of extinguishing the prepaid development expense account. [3] In addition, 412,372 pounds were produced from high-grade and smelted direct. [4] Direct mining cost incl. crushing 1-in. mesh and placing on cars with prop. of general expense. [5] Crediting div. R. R., but not charging prepaid devel. [6] Not including 12½ cents charge.

See also Appendix, page 349.

Globe District

INSPIRATION CONSOLIDATED COPPER CO.

GLOBE, ARIZONA, U. S. A.

This company represents a consolidation of the Inspiration Copper Co. and the Live Oak Development Co. The properties which adjoin are located 5 miles west of Globe on the Pinal Schist belt. The property also adjoins the Miami situated on the same belt. Inspiration is one of the large so-called low-grade porphyry mines. The property is not yet producing, but we give below the estimated costs and other data in connection with the ore.

The company's engineers estimate the following on the basis of 12,000 tons concentrated daily:

Tons treated per year	4,200,000
Average grade ore reserves	1.71 per cent.
Pounds refined copper recovered	25
Annual production pounds, 350 days' operation	105,000,000
Ratio concentration 23 to 25 into 1	

Costs per ton:	
Mining	$.60
Milling	.50
General expense	.10
Trans. ore to mill	.03
Pumping water to mill	.08
	$1.31
Smeltg. refg., sellg., frt. on concentrates and copper at 2¾ cents per pound	.69
Total cost per ton	$2.00
Cost per pound	.08

Remarks.—The ore-body at Inspiration is in two sections, the Inspiration and Live Oak. Total distance outside boundaries about 2 miles. Largest area Inspiration ore-body 1600×1300 ft. Other sections over 1000 ft. in length by several hundred in width. Live Oak 2500 from 200 to 1000 ft.

The depth of ore and capping is as follows:[1]

	Inspiration ore-body	Live Oak ore-body
Average thickness capping	354	435
Average thickness ore	142	114

Owing to thickness of capping to ore, property will be worked by underground method of mining. Ohio or shrinkage stope method will be employed. This system is cheaper than that at the adjoining Miami, which accounts for the lower estimate for mining.

[1] As of Jan. 1, 1913 Ore Reserves amounted to 45,000,000 tons averaging 2% copper.

Inspiration railroad 4½ miles in length connects mine and concentrator with Arizona Eastern Ry. and through trunk lines. Concentrator 12,000 tons daily capacity located 1½ miles from mine. Should start production in spring of 1915. Hydro-electric and steam power used. Concentrates will be smelted at new International Smelter near mine and refined on the Atlantic Seaboard.

Water concentration and oil flotation will be used, and exhaustive tests conducted in the 600 ton daily capacity experimental mill indicate that copper recovery of over 80% will be made.

Inspiration's ore reserves were estimated as follows, Dec. 31, 1913:—

73,322,000 tons sulphide ore averaging 1.71 per cent. copper, and 16,321,000 tons oxidized and semi-oxidized ore averaging 1.3 per cent. copper.

MIAMI COPPER COMPANY

GLOBE, ARIZONA, U. S. A.

Year Ended Dec. 31	1913	1912	1911
Production:			
Refined copper pounds	32,867,666	32,832,609	15,385,783
Income:			
Gross including copper sales	$5,049,807	$5,385,501	$1,950,669
Operating expenses	3,515,121	3,114,115	1,362,819
Operating profit	$1,534,685	$2,271,386	$587,849
Int. loans, bonds and deprec	229,286	241,622[1]	98,246
Profit for year	$1,305,397[2]	$2,094,804	$489,603
Price received for copper	15.2404¢	16.582¢	13.03¢
Mine and Mill:			
Tons treated	1,058,784	1,040,744	445,036
Per cent. copper	2.30	2.393	2.48
Concentrate produced tons	45,410	46,683	20,065
Per cent. copper	38.09	37.020	40.36
Copper in conc., pounds	34,597,568	34,560,665	16,195,561
Copper per ton, pounds	32.68	33.21	36.39
Mill extraction, per cent	71.06	69.39	73.37
Net copper per ton, pounds	31.04	31.54	34.57

MIAMI COPPER COMPANY—*Continued*

COSTS	Per ton	Per pound	Per ton	Per pound	Per ton	Per pound
Mining	$1.6030	.05145¢	$1.2032	.03813¢	$1.2134	.03500¢
Milling	.5722	.01837	.6586	.02087	.6274	.01810
General expense	.2817	.00900	.1802	.00577	.2514	.00714
Freight on concentrates	.2057	.00663	.2173	.00689	.2174	.00629
Smelting, refining, etc	.6235	.02008	.7323	.02321	.8041	.02326
Selling	.0631	.00203	.0405	.00128	.0591	.00171
N. Y. Office	.0544	.00174	.0386	.00122	.0605	.00175
Total	3.4036	.10930	3.0707	.09739	3.2333	.09325
Ag, Au, etc	.1006	.00322	.0477	.00151	.0767	.00222
Net cost	$3.3030	.10608¢	$3.0230	.09588¢	$3.1566	.09103¢
Miscellaneous:						
Development, feet		37,697		54,929		32,925
Ore handled, tons		1,055,284		1,041,769		450,036
Derived from following sources:						
Stock pile		101,888		118,130		43,437
Development		124,784		244,504		152,074
Square-sets and slicing		418,722		450,209		204,362
Shrinkage stopes		409,890		228,926		50,163

[1] Includes depreciation charge of $169,096. [2] After depreciation of $223,874.

Remarks.—Property located on the Pinal Schist belt a few miles west of Globe. The Inspiration Consolidated adjoins Miami on the west. The ores are disseminated in character, being generally termed "porphyry." The minerals consist of secondary chalcocite. The ore-body is several hundred feet in thickness. The total tonnage in the main body, December 31, 1913, is placed at 20,300,000 tons assaying 2.45 per cent. copper; also mixed oxides and sulphides 6,000,000 tons, 2 per cent. and 17,200,000 tons, 1.21 per cent.

The mine has two extraction levels, 420 ft. and 570 ft. Electric haulage is employed throughout. The method of mining in the upper levels, 370 ft. and above, has been done by square-setting and sub-level caving. A shrinkage method, however, is being employed below this depth. This method differs from certain of the other porphyry mines in that machine men do not set up on the broken ore but "side swipe" the ore from the cross-cuts in the pillars. This has resulted in greater safety to men. It is estimated that a saving of 40¢ per ton will be shown by shrinking over the square-setting and caving.

The concentrator is situated at the mine. Capacity 3000 tons per day. Water is obtained from the Old Dominion mine, 2,000,000 gal. per day being pumped. Concentrates are shipped to Cananea, Mexico, for smelting and converting, and blister copper shipped to Atlantic seaboard for refining.

OLD DOMINION COPPER MINING AND SMELTING CO.

(United Globe Mines)

GLOBE, ARIZONA, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Pounds copper incl. custom....	31,061,645	27,353,243	26,482,019	27,742,332
Ounces silver.....	193,845	143,011	137,722	146,400
Ounces gold.....	4,254	3,202	2,830	2,123
Copper O. D. Mine, pounds...	18,945,153	16,533,999	19,195,181	17,712,755
Silver O. D. Mine, ounces.....	51,316	42,750	42,050	36,743
Gold O. D. Mine, ounces.....	419	583	935	487
Income expenses and profit:				
Value realized.....	$2,919,821	$2,751,899	$2,419,946	$2,284,201
Profit custom ore and miscl.....	137,286	136,304	33,732	31,256
Total income.....	3,057,107	2,888,203	$2,453,679	2,315,458
Total expenses.....	2,013,314	1,884,017	1,831,714	1,860,175
Net profit.....	$1,043,793	$1,004,186	$621,964	$455,281
Ore extraction:				
Smelting ore, tons.....	120,257	93,592	96,187	.....
Smelt. ore, grade copper, per cent.....	6.85	6.43	7.75	7.85
Concentration ore, tons.....	47,785	106,232	78,059	86,060
Concentration ore, grade, per cent.	3.56	3.15	3.50	3.49
Aveg. grade all ore incl. silica lining, per cent.	5.88	4.67	5.84	5.70
Total ore mined.....	169,961	201,181	.....	.....
Concentrating:				
Custom ore treated, tons.....	102,231	60,638	62,171	19,339
Grade ore, per cent.....	3.76	3.75	4.61	4.18
Total O. D. and custom, tons..	150,203	166,870	140,230	105,399
Aveg. grade, per cent.....	3.70	3.37	3.99	3.62
Extraction, per cent.....	.....	.....	78.59	76.79
Ratio of concentration.....	.....	.....	3.397–1	3.582–1
Smelting:				
Tons charge smelted.....	300,926	306,086	231,603	239,162
Blister copper prod., pounds...	30,811,441	27,573,423	26,696,305	28,018,900
Cost per ton:[2]				
Mining.....	$4.78	$4.55[1]	$4.18	$5.171
Concentrating.....	.....	.....	.....	.405
Smelting tons charge.....	2.629	2.304	2.568	2.926
Smelting and converting.....	.....	.....	.....	3.101
Total cost.....	.....	.....	.....	$8.677
Concentrating (per ton conc.)..	.878	$.753	$1.012	$.975
Convert. per ton cop. in bullion	$9.19	$9.45	$8.26	.....

OLD DOMINION COPPER MINING & SMELTING CO.—*Continued*

Year Ended Dec. 31	1913	1912	1911	1910
Cost per pound:				
Fine copper at Globe, deduct. gold and silver, profit custom ore and miscl. earnings.	8.19	8.85¢	7.65¢	8.60¢
Refining, com., trans., int., taxes and Boston exp.	1.51	1.49¢	1.50¢	1.56¢
Total cost per pound.....	9.70¢	10.34¢	9.15¢	10.16¢
Cost smelt. and convert. incl. in above, ¢ per pound:				
Smelting.....	.....	.....	.....	.0252
Converting.....	.....	.....	.0041	.00484
Total.....		.....	.....	.03004¢
General:				
Price rec'd for copper.....	15.21	16.42¢	12.39¢	12.73¢
Development, feet.....	17,783	15,259	10,447	18,468
Cost horse-power-year.....	$71.02	$64.04	$83.77	$96.18
Water pumped, gallons.....	1,284,000,000	1,441,480,000	1,277,000,000	.....
Aveg. flow in mine, 24 hours...	3,518,221	3,938,474	.....	.....

[1] Incl. expendit. for extra improvements of $26,288.
[2] Cost per ton treating new copper bearing material from own mines.

Remarks.—The ore-bodies at the mine occur along what is known as the Old Dominion fault between limestone and diabase. The ore-bodies are lenticular. Some of the ore-bodies are very large, varying up to several hundred feet in length by over a hundred feet in width. Both oxide and sulphide ores found. The large ore-bodies are mainly oxides and are composed of cuprite, malachite, azurite and chrysocolla. Bodies of sulphide ore occur in depth, the copper being in the form of chalcocite, chalcopyrite, with considerable quantities of pyrite. The ores are in general silicious, and the company has to obtain custom iron ores. The sulphides, however, which have been developed in depth, have improved this situation.

The mine is developed by four important vertical shafts and opened to depth of 1800 ft. Mine is equipped with electric haulage. The ore-bodies are worked principally by square-set method, though many different systems are used, depending upon the occurrence. A slicing system similar to that used at Morenci was started in 1910. Very heavy timbering is required. The mine is very wet and pumping a great expense to the company, though this is lessened by sale of 2,000,000 gallons daily to the Miami Copper Co. The property is equipped with a 500-ton concentrator and a smelter situated at the mine. Smelter has converter department. The property has railway connections.

MAGMA COPPER COMPANY

Superior, Arizona

The Magma Copper Company operates what was known as the Queen mine, located at Superior, Arizona. No work was performed in the old days below the 500-ft. level. During the past three years present owners have been carrying on development work, which has now extended to the 1000-ft. level. There have been shipped from the mine 9913 tons of ore and concentrates which realized gross $58.08 per ton.

Average grade shipping ore:

Copper	18.35 per cent.
Silver	20.3 oz.
Gold	.072 oz.
Iron	13.2 per cent.
Insoluble	46.1 per cent.

Cost per ton:

Mining	$3.50
Development	1.50
Sorting and milling	1.50
Tramming	.15
Total	$6.65

Remarks.—The ore occurs as lenses through a porphyry-filled fissure through limestones, quartzites and diabase. Above the 500-ft. level large bodies of carbonate ores containing about 5 per cent. copper have been exposed. On the 650-ft. level two shoots of chalcocite ore have been developed. On the 800-ft. level there is a shoot 345 ft. long, averaging 6.8-ft. wide, containing copper 12%, silver 14 ounces. A winze has been sunk from the 800-ft. level and a crosscut run at the 1000-ft. level which encountered a 60-ft. vein in which there was a 5-ft. streak of zinc ore containing zinc 22% and silver 22 ounces; also a copper shoot on which east and west drifts are being run, both of which still had ore in the faces and had averaged for 150 ft. copper 20%, silver 19.5 ounces and $1.60 in gold per ton for the full width of the drift. There was also found in the crosscut a great deal of low grade chalcopyrite ore containing from 3% to 4% copper, the extent of which is unknown.

A 14-mile power line from the Inspiration Mine has been completed and it will transmit Roosevelt Hydro-electric power from Miami.

A 150-ton concentrator has been started which uses a combination of water concentration and oil flotation. Total recoveries, including the mineral being sorted by hand, are over 85%. The crude ore and concentrates are being hauled a distance of 32 miles to Florence, a station on the Arizona Eastern Railroad. Surveys and plans have been completed for the construction of a narrow gauge road from Superior to Webster on the Arizona Eastern Railroad.

CALIFORNIA

ARGONAUT MINING COMPANY

Amador County, California

Following from Annual Report, Jan., 1911.—Construction was exceptional and included a large electric hoist, new change house and additions to the mill.

Mining per ton: Stoping	$1.407	.929 labour .478 supplies	
Develop	.835	.497 labour .338 supplies	
Hoisting	.391	.227 labour .164 supplies	
Surface	.162	.129 labour .033 supplies	
Total mining	$2.795		
Milling: Labour	$.194	Total milling	$.555
Supplies	.176	Office and general	.096
Frt. and treatment	.185		
Office and general	.096	Total operating	$3.446
Construction: Labour	$.074	Construction	.341
Supplies	.267		
		Grand total	$3.787

Remarks.—Accessibility.—Mine 1 mile from terminus of Amador Central Ry. *Character of ore*—Gold quartz, yielding in the mill about $5.50 in free gold per ton and $1.50 in concentrates or a total of $7 per ton. *Character of ore body*—Soft shattered white quartz 5 ft. to 35 ft. wide, one wall always very soft black slate, other wall same or greenstone schist. *Ground exceedingly heavy*—Width 5–38 ft., average probably 15 ft. *Method of opening*—Main shaft 4000 ft. deep with levels at 150-ft. intervals and raises every 150 ft. *Method of mining*—Square-sets and waste filling combined, filling kept close as possible to the back. *Depth of mine*—Bottom level 3900 and no ore coming from above 2760 level. *Amount water pumped*—30,000 gal. per day, most of which comes from 1800 level and but little below 2900. *Method of ore reduction*—40-stamp mill—stamps 1000 lb. with average duty of 5 tons per working day, followed by vanners. *General conditions*—Power $4.50 per h.p. month. Lumber $19 to $20 per M. delivery. Average miner's wages about $2.75 per day, great majority Slavs and Italians who are well suited for the heat of deep workings. Ground breaks very easily in the vein; an average of 15 men break all the stope ore and put in their own timber. Drifts are slow to drive on account of caving ground and expensive to maintain. Nearly half the total force underground are timbermen. Mill capacity about 200 tons per day. (Costs and data by R. S. Rainsford, Gen'l. Mgr.)

MELONES MINING COMPANY

MELONES, CALIFORNIA, U. S. A.

Period 15 months	1912	1911	1910
Production:			
Gold bullion	$273,307	$238,613	$258,612
Tons mined	127,800	130,000	142,400
Tons milled	195,181	141,000	148,900
Average val. per ton	$1.75	$2.00	$1.98
Per cent. recovered	82.1	85.5	86
Cost per ton:	$1.55	$1.609	$1.436
Mining and development	.559	.55	.46
Haulage	.062	.057	.048
Milling	.212	.277	.273
Marketing concentrates and bullion expense.	.243	.316	.364
General expense	.224	.229	.219
Construction and maintenance	.25	.18	.072
	1.550	1.609	1.436
Development, feet:			
Raises	512	177	214
Drifts	1,491	960	1,060
Shafts	372	270	None

Remarks.—*Accessibility*—On the Angels Branch of Sierra Railway at Melones, Calaveras Co., Calif.

Character of Ore-bodies—Schist and slate impregnated with quartz.

General Dimensions Ore-bodies—400 ft. × 40 ft.

Method of Mining—Shrinkage stoping.

Depth of Mine—1600 ft.

Method of Reduction—Stamp milling, amalgamation and concentration.

Distance Mill from Mines—Mill at the mine.

General Remarks—Increase of costs in 1911–12 due to new construction and equipment incidental to mining below 1100 adit level and extensive repairs to water-power system. Excess tonnage milled over that mined obtained from reserves of broken ore in completed stopes.—Data by William G. Devereux.

NATOMAS CONSOLIDATED OF CALIFORNIA

NEAR FOLSOM, AMERICAN RIVER AND OROVILLE FEATHER RIVER, CALIFORNIA, U. S. A.

	Natoma division		Feather River division	
	1912	1911	1912	1911
General:				
Ground worked, cubic yards	16,806,582	18,983,670	5,349,070	3,286,916
Days dredging	2,766	2,954	1,016.5	831
Hours and minutes dredging	53,057:25	57,331:50	21,686:20	17,135:20
Average per day	19:11	19:24	21:20	20:37
Yards worked per day	6,076	6,425	5,262	3,955
Cost per yard:				
Running expenses:				
Labour, cents	.83¢	.779¢	.85¢	.997¢
Material	.20	.120	.06	.088
Electric power	.76	.719	.78	.765
Water	.11	.101	.....	.....
Repairs:				
Labour	.24	.201	.04	.066
Material	1.75	1.335	1.21	1.422
General expenses	.58	.405	.50	.621
Taxes and insurance	.19	.154	.28	.305
Smelting and express	.03	.031	.03	.041
Total, cents	4.69	3.845	3.75	4.305

BOTH DIVISIONS

	1912	1911
General:		
Ground worked, cubic yards	22,155,652	22,270,586
Days dredged	3,782.5	3,785.5
Hours and minutes dredged	74,743:45	74,467:10
Average hours and minutes per day	19:46	19:40
Average yards worked per day	5,858	5,883
Cost per yard:		
Running expenses:		
Labour	.83¢	.811¢
Material	.17	.115
Electric power	.77	.726
Water	.08	.087
Repairs:		
Labour	.19	.181
Material	1.62	1.348
General expense	.56	.437
Taxes and insurance	.21	.176
Smelting and express	.03	.032
Total, cents	4.46	3.913

DISSECTED COSTS DREDGING OPERATIONS

DREDGE NO. 1

Capacity 13½ cu. ft. Constructed by Yuba Const. Co.

	1912	1911	1910	1909
General:				
Ground worked, cubic yards	3,089,057	3,233,693	3,341,902	3,048,254
Days dredged	364	364	363	365
Hours and minutes dredged	7,159:00	7,319:20	7,213:00	6,969:13
Average hours and minutes per day	19:40	20:07	19:52	19:06
Average yards worked per day	8,486	8,884	9,206	8,351
Cost per yard:				
Running expenses:				
Labour, cents	.65¢	.619¢	.526¢	.60¢
Material	.21	.097	.106	.15
Electric power	.60	.562	.527	.54
Water	.13	.134	.105	.08
Repairs:				
Labour	.14	.114	.119	.10
Material	1.56	.799	1.241	.70
General expense	.42	.284	.239	.14
Taxes and insurance	.14	.118	.091	.06
Smelting and express	.02	.029	.028	.04
Total, cents	3.87	2.756	2.982	2.41

DREDGE NO. 3

Capacity 8 cu. ft. Mississippi Bar, 1908 Constructed by Yuba Const. Co.

	1912	1911	1910	1909
General:				
Ground worked, cubic yards	1,987,907	2,287,704	1,843,375	1,604,369
Days dredged	365	364.5	363	366
Hours and minutes dredged	7,084:40	7,234:45	6,930:30	6,886:40
Average hours and minutes per day	19:24	19:51	19:05	18:48
Average yards worked per day	5,446	6,276	5,078	4,383
Cost per yard:				
Running expenses:				
Labour, cents	1.00	.879	.919	1.01
Material	.22	.153	.171	.15
Electric power	.65	.593	.683	.74
Water	.10	.073	.098	.11
Repairs:				
Labour	.19	.202	.272	.26
Material	2.28	1.092	1.677	1.34
General expense	.65	.401	.433	.27
Taxes and insurance	.19	.152	.162	.12
Smelting and express	.03	.037	.045	.05
Total, cents	5.31	3.582	4.460	4.05

DREDGE NO. 6

Capacity 9 cu. ft. Section 12 Constructed by Western Eng. Co.

	1912	1911	1910	1909[1]
General:				
Ground worked, cubic yards	1,394,421	1,587,347	1,197,428	1,565,598
Days dredged	364	363	363	361
Hours and minutes dredged	6,269:50	6,529:15	5,512:20	6,594:25
Average hours and minutes per day	17:50	17:59	15:11	18:16
Average yards worked per day	3,831	4,373	3,299	4,336
Cost per yard:				
Running expenses:				
Labour, cents	1.11	.927	1.202	.88
Material	.24	.081	.144	.15
Electric power	1.06	.956	1.066	1.05
Water	.09	.076	.117	.09
Repairs:				
Labour	.53	.419	.705	.57
Material	3.02	2.518	3.178	2.21
General expense	.92	.578	.917	.58
Taxes and insurance	.27	.241	.397	.26
Smelting and express	.03	.044	.049	.05
Total, cents	7.27	5.840	7.775	5.84

[1] Folsom Division.

DREDGE NO. 9

Capacity 15 cu. ft. Built by Yuba Const. Co.

	1912	1911	1910	1909
General:				
Ground worked, cubic yards	2,651,514	946,929	.....	.....
Days dredged	364	143	.....	.....
Hours and minutes dredged	7,498:05	2,974:10	.....	.....
Average hours and minutes per day	20:36	20:48	.....	.....
Average yards worked per day	7,284	6,622	.....	.....
Cost per yard:				
Running expenses:				
Labour, cents	.72	1.005	.....	.....
Material	.22	.380	.....	.....
Electric power	1.16	1.201	.....	.....
Water	.13	.111	.....	.....
Repairs:				
Labour	.18	.140	.....	.....
Material	1.50	.789	.....	.....
General expense	.48	.490	.....	.....
Taxes and insurance	.24	.207	.....	.....
Smelting and express	.04	.035	.....	.....
Total, cents	4.67	4.358	.....	.....

NATOMAS CONSOLIDATED OF CALIFORNIA

Result of dredging operations, 1909

Dredge No.	Where operating	Bucket capacity, cu. ft.	Actual dredging days	Dredging hours per actual day	Cu. yd. per actual dredging day	Running expenses	Repair expenses	Other expenses	Total cost
						Per cubic yard			
Nat. 1	Synd. and X grnd.	13.5	290.38	19:12	10,497	1.37	.80	.24	2.41
Nat. 2	Sac bar and cox...	8	285.38	18:52	6,877	1.78	.98	.35	3.11
Nat. 3	Mississippi	8	286.94	18:58	5,591	2.01	1.60	.44	4.05
Nat. 4	Nuttal	12	277.47	18:33	9,849	1.24	1.02	.51	2.77
Nat. 5	Sec. 14	9	240.15	[1]18:06	5,577	2.21	2.26	1.04	5.51
Nat. 6	Secs. 11 and 12...	9	274.77	18:22	5,698	2.17	2.78	.89	5.84
Nat. 7	Creek bottoms....	9	293.23	19:36	5,873	2.01	1.47	.85	4.33
F.R. 1 (new)		7.5	277.16	18:19	4,535	2.08	2.10	.60	4.78
F.R. 2 (new)		7.5	293.67	19:25	4,010	1.90	1.47	.66	4.03

[1] Allowance made for 40 days extraordinary repairs to ladder.

NATOMAS CONSOLIDATED OF CALIFORNIA

Result of dredging operations, 1910

Dredge No.	Where operating	Bucket capacity, cu. ft.	Actual dredging days	Dredging hours per actual day	Cu. yd. per actual dredging day	Running expenses	Repair expenses	Other expenses	Total cost
						Per cubic yard			
Nat. 1	Synd. and X grnd.	13.5	300.54	19:52	11,113	1.264	1.360	.358	2.982
Nat. 2	Sac. bar and cox..	8	303.92	20:05	5,889	2.047	1.280	.632	3.959
Nat. 3	Mississippi	8	288.77	19:05	6,383	1.871	1.949	.640	4.460
Nat. 4	Nuttal	12	238.63	[1]17:56	10,813	1.390	1.785	.605	3.780
Nat. 5	Sec. 14	9	298.00	19:40	4,756	2.539	2.012	1.122	5.673
Nat. 6	Secs. 11 and 12..	9	229.72	[1]18:43	5,212	2.529	3.883	1.363	7.775
Nat. 7	Creek bottoms...	9	291.48	19:13	4,815	2.459	2.336	1.129	5.924
F.R. 1 (new)		7.5	300.86	19:48	3,534	2.350	1.984	1.271	5.605
F.R. 2 (new)		7.5	285.01	18:50	4,772	1.793	1.400	1.019	4.212

[1] Allowance has been made for extraordinary loss of time in the case of dredge No. 4 of 43.666 days and in the case of dredge No. 6 of 68.5 days.

FEATHER RIVER DIVISION

DREDGE NO. 1.

Capacity 7½ cu. ft. Constructed by Yuba Const. Co. Dec. 22, 1906

	1912	1911	1910	1909
General:				
Ground worked, cubic yards	1,358,948	1,229,318	1,063,387	1,257,055
Days dredged	364	363	363	365
Hours and minutes dredged	7,925:55	7,699:20	7,221:35	6,651:55
Average hours and minutes per day	21:46	21:21	19:48	18:13
Average yards worked per day	3,733	3,386	2,929	3,444
Cost per yard:				
Running expenses:				
Labour, cents	1.03	1.161	1.373	1.28
Material	.06	.052	.059	.06
Electric power	.71	.857	.918	.74
Repairs:				
Labour	.05	.073	.104	.28
Material	1.07	1.766	1.880	1.82
General expense	.65	.723	.821	.37
Taxes and insurance	.25	.273	.398	.19
Smelting and express	.02	.041	.052	.04
Total, cents	3.84	4.946	5.605	4.78

DREDGE NO. 2

Capacity 7½ cu. ft. Constructed by Yuba Const. Co. Mar. 26, 1908

	1912	1911	1910	1909
General:				
Ground worked, cubic yards	1,589,041	1,369,224	1,360,229	1,177,772
Days dredged	364	363	363	365
Hours and minutes dredged	7,842:35	7,493:20	6,840:10	7,048:10
Average hours and minutes per day	21:33	20:39	18:50	19:25
Average yards worked per day	4,365	3,772	3,747	3,227
Cost per yard:				
Running expenses:				
Labour, cents	.84	.934	1.117	1.12
Material	.04	.062	.049	.05
Electric power	.60	.658	.627	.68
Repairs:				
Labour	.05	.067	.111	.33
Material	.95	1.389	1.289	1.14
General expense	.55	.649	.642	.40
Taxes and insurance	.31	.363	.324	.21
Smelting and express	.05	.051	.053	.05
Total, cents	3.39	4.173	4.212	4.03

DREDGE NO. 3

Capacity 15 cu. ft. Constructed by Yuba Const. Co. Sept., 1911

	1912	1911	1910	1909
General:				
Ground worked, cubic yards	2,401,081	688,374		
Days dredged	288.5	105		
Hours and minutes dredged	5,917:50	1,942:40		
Average hours and minutes per day	20:30	18:30		
Average yards worked per day	8,323	6,556		
Cost per yard:				
Running expenses:				
Labour, cents	.75	.827	Not operating.	Not operating.
Material	.08	.202		
Electric power	.94	.814		
Repairs:				
Labour	.04	.051		
Material	1.45	.873		
General expense	.37	.383		
Taxes and insurance	.28	.250		
Smelting and express	.03	.025		
Total, cents	3.94	3.425		

The above data are furnished by F. W. Griffin.

Remarks. *No.* 1. *Nutal.*—Formation is loose sandy gravel with a covering in places of a very silty soil. The formation varies from 10 to 20 ft. The bedrock is lava ash and not hard. The gravel caves well ahead of the dredge, and with the exception of the disposition of the sand, the conditions for cheap operation are excellent.

No. 2. *Sacramento Bar.*—Conditions are similar to No. 1. The formation is a loose sandy gravel. The bedrock is lava ash and uniform in depth. The depth of the formation is approximately 20 to 25 ft.

No. 3. *Mississippi Bar.*—The formation is approximately 30 ft. deep and consists of sandy gravel, which contains strata of gravel mixed with clay which prevents the natural caving. The bedrock is lava ash. The formation may be designated as loose, making the conditions for cheap operation excellent.

No. 4. *Kendall Tract.*—Formation is loose sandy gravel with strata containing a little clay with a covering of fine silty soil, in places, varying to several feet in depth. The bedrock is lava ash and is irregular in depth. Where shallow bedrock is encountered difficulties are encountered in the disposition of sand. The conditions for cheap operation are excellent.

No. 5. *Rebel Hill.*—The formation consists of gravel held tightly together with clay. In places the gravel is cemented. The formation will not cave, excepting where the banks are high and large pieces break off. The formation is covered with a fine silty sticky soil. Bedrock is lava ash. The formation is approximately 60 ft. deep to bedrock. The conditions for operating cheaply are unfavorable. The digging is hard, and the clay makes the washing of the gravel difficult.

No. 6. *Sulky Flat.*—The formation is similar to Rebel Hill, a very tight, and in places a cemented gravel.

No. 8 and *No.* 9. *Rebel Hill.*—See above.

No. 10. *Hill Below Cottage.*—Firm, tight gravel with clay matrix. The formation contains large boulders. The bedrock is lava ash. The operating conditions are against cheap costs, as the dredge is working up a grade, necessitating construction of dams to raise the water level. The digging is hard and it is difficult to thoroughly wash the material on account of clay particles.

No. 7. *Blue Ravine.*—The formation is about 60 ft. deep and consists of a tight gravel from surface to bedrock. Strata of gravel in the formation contains considerable clay. The bedrock is lava ash. The digging is hard, and difficulties are experienced in holding up the water levels in the dredge ponds on account of bedrock tunnels formerly used in mining the formation.

NORTH STAR MINES CO.

GRASS VALLEY, CALIFORNIA, U. S. A.

Year Ended Dec. 31	1912	1911	1910
Gross product	$1,042,024.52	$1,025,087	$1,232,933.99
Operating cost	501,153.92	509,925	505,792.03
Development cost	57,738.00	46,481	50,068.00
Total cost	$558,891.92	$556,406	$555,860.03
Cincinnati mine expense	41,533.56	58,064	60,050.48
Balance	437,946.24	410,616	617,023.45
Int. div. rec'd	37,199.76	42,273	44,631.05
Total earnings	$475,146.	$452,889	$661,654.50
Mill:			
Tons milled	101,181	95,401	90,110
Yield per ton	$10.263	$10.745	$13.683
Per cent. rec'd. amalgamation	77.45	77.1	.....
Per cent. rec'd. cyanide treat	22.55	22.9	.....
Concen. cyanided, tons	1923	1978	2049
Val. tails from cyanide plant	26¢	24¢	.....
Costs per ton:			
Mining	$3.069	$3.317	$3.477
Milling	.490	.526	.549
Concentrate expense	.141	.138	.144
Cyaniding	.503	.541	.532
Bullion	.029	.031	
Miscellaneous	.273	.311	
General expense N. Y. office	.154	.163	.944
Taxes	.238	.282	
Accident and benefit	.075	.064	
	$4.972	$5.373	$5.646
Less sundry receipts	.019	.028	.033
Total operating expenses	$4.953	$5.345	$5.613
Development expenses	.571	.487	.556
Total expense	$5.524	$5.832	$6.169
Profit per ton	$4.739	4.913	7.514

The vein is a fissure varying in width from 12 ft. to 17 ft. The mine is operated by inclined shaft to a depth of 6000 ft. The ores are stamped, amalgamated, concentrated and cyanided. Transportation fair; a narrow-gauge railroad connects with main line of Southern Pacific. General conditions are favorable for low costs.

OPERATING COSTS OF CALIFORNIA GOLD MINES

(MOTHER LODE SECTION)

From article in *Mining and Scientific Press*, by Chas. Janin, Oct. 26, 1912

Mine	Year	Tonnage	Mng. cost	Milling cost	Develop. cost	Gen'l exp.	Concen. Trtmt.	Total costs
Oneida	1905	56,680	.....	.....	.....	.....	.....	$2.61[1]
Fremont con	1910	72,000[2]	$1.66	0.50	0.363	0.116	.....	2.66
Lightner	1908	53,622	2.14	0.24	.....	0.42	.....	2.80
Gwin	07–08	80,634	1.078	0.301	0.251	0.24[3]	.....	2.50[4]
Cent. Eureka	1903	43,545	1.79	0.49	0.519	.....	.....	2.80
Cent. Eureka	1911	42,747	2.85[5]	0.55	.....	.....	.....	3.37
Melones	1910	148,900	0.51	0.27	.....	0.31	.....	1.09[6]
Royal con	1903	93,155	2.93	2.93	.....	.....	0.42	3.35
Erie ½	1910	13,587	.....	.....	.....	.....	.....	3.00
Trinity ½	1911	.....	0.57	1.00	0.10	0.52	.....	2.19

[1] Ross E. Browne. [2] Approx. [3] Concentrate charges. [4] Cost including depreciation and proportion of general. [5] Total mining, including prospecting.

[6] Exclusive of freight and treatment of concentrate, approximately 35 cents per ton additional.

These mines are located on the so-called Mother Lode which is a mineralized section about 20 miles wide by 100 miles long.

The veins are mainly fissures cutting schists. They are strong to depths of 3000 ft. and over. The ores are quartz with gold values in the native state and in iron pyrites. Mines are operated through shafts.

The main gold content is recovered by amalgamation with a subsequent treatment of concentration and cyanidation.

The ores are low grade, ranging from $2.50 to $5.00 per ton. The costs are very low, due to regularity of ore and values and to excellent conditions for cheap operations.

No annual reports are available from these mines and it is difficult to obtain reliable data. Labor wage scale: Miners, $2.75, 8-hour shift. Millmen, $2.50 to $3.50, 8-hour shift. Surface labor, $2.00 to $2.50, 8-hour shift. Electric power ranges from $4.50 to $5 per horse-power month.

OROVILLE DREDGING CO., LTD.

OROVILLE, CALIFORNIA

Combined Operations at Four Properties

Boston & Oroville Co. Boston & California Co. Oroville Exploration Co. Bear River Mining Co.

Year Ended July 31	18 mos., Aug. 1, '11 to Jan. 31, '13		1911	Per cent. of total cost
Gross returns	$726,302		$462,285	.....
Total expenses	358,543		261,832	.....
Net revenue	$367,758		$200,454	.....
After adding miscl. earnings	383,238		206,881	.....
Miscl. exp. not chargeable to operating	2,365		8,881	.....
General experiments adm. N. Y. and London.	23,469		29,333	.....
Written off for dismantlement of dredges	.....		97,570	.....
Net profits	$357,403		$70,400	.....
Cubic yards excavated	7,062,528		4,433,262	.....
Actual depth	30.5		34.6	.....
Dredging time average daily	20 hrs. .06 min.		19 hr. 36 min.	.....
Total cost per yard	5.07¢		5.90¢	.....
Returns per yard	10.28¢		10.42¢	.....
Net revenue per yard	5.21		4.52¢	.....
Costs per yard:				
Labour and material	1.35¢	26.6%	1.45¢	24.6
Electric power	.75	14.8	.77	13.
Water	.10	2.1	.08	1.8
Repairs	1.89	37.1	2.63	44.4
Smelting and express	.04	.8	.05	.6
General expenses	.67	13.2	.65	11.0
Taxes and insurance	.27	5.4	.27	4.6
	5.07¢	100%	5.90¢	100

Operations year July 31, 1914: Working profit, $129,691; after depreciation, etc., $73,903; yards, 2,897,557; returns, 8.68¢; cost, 4.04¢.

ALL COMPANIES WITH EXCEPTION OF BEAR RIVER MINING CO.

	1911	1910
Gross returns	$456,788	$514,633
Cost of dredging	254,044	224,033
Net operating profit	202,744	290,599
Yardage hauled	4,362,922	4,666,736
Returns per yard	10.24¢	11.03¢
Cost per yard	5.82¢	4.80¢
Profit per yard	4.42¢	6.23¢

BOSTON & OROVILLE CO.

Year Ended July 31, 1911	18 mos., Aug. 1, '11 to Jan. 31, '13	1911
Refined bullion returns	$158,604	$108,643
Total expense	84,608	65,389
Net revenue	$73,996	$43,254
Cubic yards excavated	1,769,112	1,163,884
Average depth, feet	35.8	37
Dredging time, hours	10,744	7,215
Total cost per yard	4.78¢	5.61¢
Returns per yard	8.96¢	9.33¢
Net revenue, cubic yards	4.18¢	3.72¢
Costs per yard:		
Labour and material	1.190	1.293¢
Electric power	.748	.775
Water	.067	.069
Repairs	1.850	2.650
Smelting and experiment charges	.033	.038
General expense	.512	.477
Taxes and insurance	.373	.307
Total	4.78¢	5.61¢
Area dredged, acres	30.62	19.46
No. of dredges operating	.....	1.

BOSTON & CALIFORNIA CO.

	Aug. 1, 1911 to Jan. 31, 1913	1911
Gross returns	$77,968	$62,949
Total expenses	72,805	50,917
Net revenue	$5,162	$12,031
Cubic yards excavated	766,763	548,451
Average depth, feet	35.7	39
Dredging time, hours	10,912	7,183
Total cost per yard	9.49¢	9.28¢
Returns per yard	10.16	11.47¢
Net revenue per cubic yard	.67¢	2.19¢
Costs per yard:		
Labor and material	2.52	2.48
Electric power	1.43	1.23
Water	.47	.43
Repairs	3.31	3.69
Smelting and express charges	.04	.03
General expense	1.27	1.05
Taxes and insurance	.44	.33
Total cost	9.49	9.28¢
Area dredged	13.55	8.70 acres
No. dredges operating	.....	1

OROVILLE EXPLORATION CO.

	Aug. 1, 1911 to Jan. 31, 1913	1911
Gross returns	$489,728	$285,195
Total expenses	201,129	137,737
Net revenue	$288,599	$147,458
Cubic yards excavated	4,526,653	2,650,587
Average depth, feet	28.3	28.7
Dredging time, hours	33,650	21,555
Total cost per yard	4.44¢	5.19¢
Returns per yard	10.81¢	10.75¢
Net revenue per yard	6.37¢	5.56¢
Cost per yard:		
Labor and material	1.21	1.3
Electric power	.64	.66
Water	.05	.06
Repairs	1.66	2.25
Smelting and express charges	.04	.045
General expenses	.62	.635
Taxes and insurance	.21	.24
Total	4.44¢	5.19¢
Area dredged	99.06	57.15 acres
No. dredges operating	.....	3

BEAR RIVER MINING CO.

	1911
Gross returns	$5,497
Total expenses	7,787
Net revenue	$2,290 loss
Cubic yards excavated	70,340
Average depth, feet	61.8
Dredging time, hours	529
Total cost per yard	11.07¢
Returns per yard	7.81
Net revenue per cubic yard	3.25 loss
Costs per yard:	
Labor and material	1.32
Electric power	1.18
Repairs	7.16
Smelting and express charges	.06
General expense	.91
Taxes and insurance	.44
Water	.....
Total cost	11.07¢
Area dredged	73 acres
Dredges operating	1

PACIFIC GOLD DREDGING COMPANY

FEATHER RIVER, OROVILLE DISTRICT, CALIFORNIA, U. S. A.

DREDGE NO. 1. OPERATING COSTS PER CUBIC YARD

Covering full period of operation—June, 1906 to June, 1913 (7 years 1 month)
Total cubic yards worked..... 9,506,219

Operating expenses:			
Labor	.011	Depreciation	.007
Power	.007	Total	.044
Repairs and supplies	.015	Less depreciation	.007
Taxes and insurance	.002	Total cost per yard	$.037
Miscellaneous expenses	.002		

Remarks.—The mining season in the Oroville district is continuous, 365 days in the year.

The minimum winter temperature is seldom lower than 30° F.; snow and ice are both very uncommon, lasting only a few hours. The summer season is dry, as no rain falls from May 1 until September 1. There is plenty of water in the ground and in the streams for mining purposes. The climatic conditions are ideal for dredging work.

The Feather River, along which the placer deposit of the Oroville district occurs, flows through a broad valley the surface of which is covered with gold-bearing gravels and sands of varying richness and thickness. The gold has been carried down from the gold-bearing quartz veins, and old gold-bearing gravels in the mountainous region of the river's upper course, and has been redeposited along with the coarse gravels and sands of the river's lower course in the neighborhood of Oroville. The gold-bearing gravels below the town of Oroville, which is at the lower end of the river's canyon, cover an area of about 5000 acres.

The average formation of ground on the property which the Pacific dredges have been handling for the past 7 years, is composed of a top layer of sand or sandy loam, averaging about 12 ft. in thickness. This is underlain by a mixed strata of gravel and sand, and sometimes by well-defined stratas of sand between which occur other stratas of coarse or fine gravel and sand. The size of the gravel varies from that of a pea to occasional boulders as large as 18 in. in diameter. Beneath this mixture of gravel and sand, which averages 18 ft. in thickness, lies the bed-rock, a volcanic ash, fairly smooth and regular in contour, and soft enough to dig with the dredge buckets.

There is no cemented gravel in the formation, which is as a rule fairly loose. In places, however, the sand and gravel is very compact, which makes it hard to dig.

STANDARD CONSOLIDATED MINING CO.

BODIE, CALIFORNIA, U. S. A.

Year Ended Jan. 31	1913	1912	1911
Bullion realised	$188,902	$235,476	$267,935
Total mine expenses	178,741	222,945	235,405
Tons mined wet	.....	9,465	14,527
Tons mined dry	8,150	8,798	13,486
Value per ton	$11.72	$14.74	$14.38
Total value ore mined	$95,507	$129,696	$194,013
Mill: Dry tons milled	8,150	8,798	13,486
Value per ton	$11.72	$14.74	$14.38
Value saved by mill	$48,252	$59,381	$80,390
Recovery, per cent	50.5	45.8	41.44
Stamp duty, tons	2.3	2.8	.....
Slimes Plant: Tailings from mine ore	46,503	$70,314	$113,622
Per ton	$5.80	$7.99	$8.42
Dry tons from ponds	16,568	15,916	21,073
Value per ton	$5.63	$4.48	$4.79
Total tons day	24,593	24,715	34,559
Average value	$5.69	$5.73	$6.21
Tails	.75	.75	1.01
Extraction, per cent	86.7	86.8	83.75
Entire Plant: Indicated recovery	$169,541	$182,283	$259,984
Bullion recovery	188,902	235,476	267,935
Indicated extraction	89.7	90.7	88.25
Actual extraction, per cent	100.0	117.1	90.87
Cost per ton:	Dry Weight	Wet Weight	Wet Weight
Mining	$10.718	$11.781	$7.554
Milling	1.922	1.878	1.284
Cyaniding	2.100	2.395	2.014
Administration	.974	1.053	.798
Total	$15.714	$17.107	$11.647
Over cost all material	$7.231	$8.212	$6.178
Development feet	6,216	6,254	.....
Cost development: Labour per foot	$4.854	Not available	.....
Supplies per foot	1.428	Not available	.....
Powder per foot	.088	Not available	.....
Total	$6.370	$7.02	.....
Per ton	$4.86	$5.42	.....
Cost stoping: Labour per ton	$5.45	.....	.....
Supplies	1.82	Not available	.....
Powder	.098	.....	.....
Total	$7.368	.....	.....

Remarks.—Property is very old, mine having been worked for 33 years. Work has been confined to above water level. Operations are now being carried on in stringers and in reworking the old veins. Stoping was done on 20 different veins in year ending Jan. 31, 1913.

YUBA CONSOLIDATED GOLD FIELDS

CALIFORNIA, U. S. A.

Year Ended Feb. 28	1912	1911
Revenue gold	$2,657,681	$2,927,245
Miscl. receipts	7,425	71,463
Total income	$2,665,106	$2,998,708
Operating expenses	737,496	755,800
Total expenses after eng., develop., prospecting, deprec. Boston exp., franchise, government tax.	804,651	817,372
Profit	$1,860,454	$2,181,336
Net after miscl	$1,887,431	2,181,336
Area dredged, acres	157.4	127.04
Returns per acre	$16,878	$22,709
Average depth, feet	62.1	61.5
Cubic yards, worked	15,778,083	12,726,277
Av. ground dredged daily, yards	3,806	3,187
Gross returns per cubic yard	16.86¢	22.67¢
Av. cost per cubic yard	4.67¢	5.38
Net revenue per cubic yard	12.19¢	17.29¢

Year end Feb. 28, 1914: Profit, $1,286,519; yield, 13.17¢.; cost, 4.87c.; profit, 8.30¢.

(See also Appendix page 350)

PENN MINING CO.,

CAMPO SECO, CALAVERAS COUNTY, CALIFORNIA, U. S. A.

Year Ended Dec. 31, 1912

Production:	
Pounds copper	6,058,449.0
Ounces gold	2,867.5
Ounces silver	112,020.8
Tons mined	52,178.8
Tons smelted	51,162.7
Contents per ton:	
Copper, per cent	5.805
Gold, oz	0.055
Silver, oz	2.148

See also Appendix, page 350.

CALAVERAS COPPER CO.

COPPEROPOLIS, CALIF.

The following are average costs at the Calaveras mine on the basis of shipping the crude ore direct to a custom smelter.

Analysis of Ore.—Copper, 10 per cent.; SiO_2, 11 per cent.; FeO, 45 per cent.; S, 33 per cent.; Al_2O_3, 7 per cent.; CaO, 1 per cent.; MgO, 4 per cent.

Basis of settlement at Selby smelter of American Smelting & Refining Co. at San Francisco: Pay for 95 per cent. of the gold and 95 per cent. of the silver. Copper paid for less 1 per cent. and settlement at 3 cents off the New York quotations. Treatment, $3 a ton.

Ten per cent. copper ore. Pay for 9 per cent., 180 lb. Copper 15 cents less 3 cents = 12 cents = $21.60.

Cost per ton:	
Mining	$2.00
Sorting	1.75
Haulage to railroad	3.00
Freight to San Francisco	1.25
Treatment	3.00
Total cost	$11.00
Profit	$10.60

Basis settlement at Mammoth Smelter of U. S. Smelting Co. Pay for 95 per cent. of both gold and silver contents. Copper paid for less 1.3 per cent. and settlement at 3 cents off the New York quotations. Treatment $1 per ton.

Ten per cent. copper = 8.7 per cent. paid for = 174 lb.

Copper at 15 cents − 3 cents = 12 cents = $20.88.

Cost per ton:	
Mining	$2.00
Sorting	1.75
Haulage to railroad	3.00
Freight to Kenneth, California	2.75
Treatment	1.00
Total cost	$10.50
Profit	$10.38

Remarks.—Location 15 miles from Milton, Calaveras County, California. Nearest railway connection Milton. All supplies, provisions, etc., are hauled by mule-team to railway.

Ore Occurrence.—Ore is chalcopyrite interstratified with layers of schist, occurring in more or less of a lenticular formation throughout the schist

zone. The average of the ore is about 4 per cent. copper. It carries no values in gold and silver. The ores are hand-sorted and two products made, *i.e.*, high-grade 8 per cent. and low-grade 3 per cent., about one-fifth of the tonnage being high-grade and four-fifths low-grade.

Geology.—Mines are situated on a schist belt, striking in a general north and south direction. This rock, which is the ore-bearing formation and averages in the neighborhood of 100 ft. thick, is a chloride or amphibolite schist. Hanging-wall, slate, foot-wall, diorite slate. The formation has many characteristics in common with the Mother Lode, which lies on a parallel belt 12 miles to the east.

Vein.—The mineralized portion of the vein varies up to 40 ft. in width. The bulk of the ore is of a concentrating character, with occasional areas of high-grade ore often consisting of clean chalcopyrite. These are sometimes several feet in extent. The oxidation has extended to only shallow depths, sulphides often coming to within 25 to 30 ft. of the surface. Apparently there is no perceptible change in character of the ores in depth.

Development.—Mine is developed by shafts to a depth of 800 ft. The method of mining is overhand-stoping and square-setting.

Plants.—Property has a concentrating mill of 250 to 300 tons per day; also a smelter. Both mill and smelter are located one-half mile below mine.

At the time the above cost data was compiled the mill and smelter were not operating and the costs shown are those for crude ore shipped.

General.—Power is furnished by electricity from the Sierra & San Francisco Power Co., also by steam-plant using oil as fuel. Oil costs at the property $1.25 per barrel and coke (for smelting) $13 per ton. The cost of electric power is $60 per horse-power per year. Haulage is done at a cost of $3 per ton. The Calaveras ore contains a considerable quantity of alumina, as will be seen from the analyses, and in the smelting operations which were carried on 10 per cent. silica was required. Timber costs $20 per thousand.

Data and Remarks by Josiah H. Trerise.

FIRST NATIONAL COPPER CO.

CORAM, SHASTA COUNTY, CALIFORNIA, U. S. A.

Period Month of August, 1909

The First National Copper Co. began operations at the Balaklala Mine in 1908 and in that year the smelter was in commission for 52 days. The year 1909 was one of development rather than of operating. During the 18 months ended June 30, 1911, the smelter was closed three different times pending the installation of a process for elimination of sulphur fumes and for balance of year operations were at one-third capacity. The property finally was forced to close down in July, 1911, owing to fume trouble.

We give below figures taken from the company's report for a given period in 1909 together with other data on the company's operations.

Production:	Month of August
Tons blister, shipped	701
Copper, pounds	1,288,421
Silver, ounces	74,144
Gold, ounces	1,764

PROFIT BALAKLALA ORE

Income:			
Copper 1,681,862 lb. × 82 per cent. recovered = 1,506,948 lb.	sold at 13¢ =		$195,903
Silver 89,564.5 oz. × 93 per cent. recovered = 83,295 oz.	sold at 51¢ =		42,480
Gold 2,106.6 oz. × 98 per cent. recovered = 2,064.4 oz.	sold at $20.25 =		41,806
Total selling value			$280,189
Expenses:			
Total cost of ore at smelter		$116,484	
Total smelter operating expense		83,035	
Freight on 762.6 tons bullion (98.8 per cent. Cu) @ $16		12,202	
Refining charges on 762.6 tons @ $15		11,439	
Selling commission 1 per cent. of copper sold		1,959	
Interest and insurance, etc		2,591	
Administration expense		1,000	
Total expenses		$228,710	$228,710
Profit			$51,479

Profit per ton of Balaklala ore treated $1.966.

1,230,192 lb. copper from Balaklala ore cost sold in New York 8.82¢ per pound.

Mine and smelter:	
Tons ore mined	28,401
Tons ore delivered to smelter	28,351

Tons ore smelted, Balaklala ore 26,186 tons and custom flue dust 1,661 tons or a total of 27,847.

The total charge smelted was 45,128 tons and the total copper produced 653 tons.

Grade of ore treated:	
Per cent. contents per ton:	
Copper, per cent	2.65
Silver, oz.	1.04
Gold, oz.	.029

Costs per ton, mine operating:

The following costs are for the month of November.

	November	Per ton
Summary:		
General expense	$1,180.47	.042
Mining	28,156.73	.994
Diamond drilling	2,208.99	.077
Mine timbering	2,330.04	.082
Air compressors	269.78	.009
Air drills	527.09	.020
Steel sharpening	584.37	.021
Tramming	1,636.08	.057
Power	1,090.35	.035
Shop expense	80.62	.003
Mine stable	180.23	.006
Surface and road repairs	140.94	.005
Building repairs	87.09	.003
	$38,471.78	$1.354
Operating cost wet excl. diam. drilling		$1.277
Tramway expense, mine to smelter		.102

SMELTER OPERATING COST

	Amount	Cost per ton of charge	Cost per ton of ore and custom flue dust
Pay roll	$22,909.21	$0.508	$0.823
Salaries	1,040.15	.023	.037
Supplies	6,472.27	.143	.232
Coke, 2,883 tons @ $11.88	34,250.00	.759	1.229
Lime rock, 7,003 tons @ $1.325	9,278.98	.206	.333
Fuel oil, 292,180 gals. @ .022	6,472.96	.142	.231
Converter clay, 105.71 tons @ $3.667	387.64	.009	.014
Electric power	1,926.00	.043	.069
Taxes, legal and miscellaneous	1,064.02	.023	.038
	$83,756.23	$1.856	$3.006
Less sundry credits	721.28	.016	.026
	$83,034.95	$1.840	$2.980
Total cost per ton			$4.43

During the month 5884 tons of silicious ore were received and 3172 tons were used.

The mining cost for October, November, and December, 1908, was $1.593. Including development and general expenses, it was $2.424. Smelt., $2.92.

See also Appendix, page 350.

COLORADO

Cripple Creek District

THE ELKTON CONSOLIDATED MINING & MILLING COMPANY

CRIPPLE CREEK, COLORADO, U. S. A.

Period, Year Ended Dec. 31	1911
Gross value ore mined and shipped	$342,328
Net cost of operation	274,475
Net profit of operation	$67,853
The above profit does not include deprec. charge of	$98,139

	Mine	Dump	Total
Production (Lessee's work): Gross tonnage	2,847	1,659	4,506
Net tonnage	2,720	1,629	4,349
Total gross value	$49,253	$12,282	$61,536
Total freight and treatment	14,288	6,524	20,722
Total net return	$34,964	$5,758	$40,722
Average per ton gross	$18.10	$7.54	$14.15
Average per ton freight and treatment	5.25	4.00	4.79
Average per ton net	$12.85	$3.54	$9.36

Company work	Elkton	R. & BH. lease	Entire property Grand total
Gross tonnage	17,001	180	21,687
Net tonnage	16,504	173	21,026
Total gross value	$278,575	$2,242	$342,353
Total freight and treatment	87,424	$1,073[1]	$109,310
Total net returns	$191,150	$1,169	$232,042
Average per ton gross	$16.88	$12.92	$16.28
Average per ton freight and treatment	5.30	5.03	5.20
Average per ton net	$11.58	$6.89	$11.08

Tons hoisted, total	29,565
Tons shipped	16,951
Per cent. waste in ore broken	42⅞%

Costs per ton: Breaking ore per ton	$.785	(labor only)
Breaking waste per ton	1.143	(labor only)
Breaking ore and waste	.814	(labor only)
Total cost ore hoisted	$1.36	(Total underground labor and powder)
Total cost ore shipped	2.32	(Total underground labor and powder)
Sorting and sampling	3.37	per ton ore hoisted
Sorting and sampling	.67	per ton ore shipped
Average wages per shift, underground	3.51	
Development cost: Cost upraising	$4.62	per ft.
Cost shaft sinking	15.38	per ft.
Drifting	4.02	per ft.
Drifting contract	5.97	per ft.
Sinking winze 82 ft	12.51	per ft.

[1] Royalty $870.

EL PASO CONSOLIDATED GOLD MINING CO.

CRIPPLE CREEK, COLO.

Year ending Dec. 31	1913
Ore sales	$600,011.59
Miscellaneous earnings	17,754.78
Total earnings	$617,766.37
Total operating expenses	547,838.83
Operating profit	$69,927.54
Less depreciation, drainage, amortization, accrued taxes, etc.	78,947.18
Loss	$9,019.64

Tonnage:	Company ore	Leasers
Tons ore shipped	28,523	9,121
Average gross value	$15.263	$18.053
Average treatment and transportation charges	$5.65	$6.14
Average mining cost	$6.744	.....
Average net value per ton	$2.83	$3.08

Costs per ton shipped:	
Mining	$6.212
Maintenance	.442
Maintenance mine residence	.037
Grading railroad track	.053
Total mine cost	$6.744
Treatment and transportation	5.650
Miscellaneous general expense	1.784
	$14.178

PORTLAND GOLD MINING CO.

Cripple Creek, Colorado, U. S. A.

Year ending Dec. 31	1913	1912	1911	1910
Gross production	$1,604,443	$1,413,765	$1,485,622	$1,354,421
Total expenses	.....	$1,091,020	$1,114,708	$987,042
Total profits	.....	$322,745	$380,579	$372,424
Tonnage:				
Tonnage shipped	53,245	44,562	50,258	67,515
Average gross value	$25.93	$22.16	$22.68	$18.32
Tons milled (low grade)	178,162	173,361	120,961	46,237
Mill saving, per cent	.....	.....	81.4	.....
Average gross value	$2.95	$3.15	$3.51	$2.45
Average profit per ton	.....	$1.17	.....	.....
Total costs per ton	.....	$5.006	$6.51	$8.67
Development, feet	12,443	7,680	9,520	7,914
Total development, feet	257,186	244,743	237,062	.....

Totals to 1913	Tons mined	Gross value	Dividends
	1,549,668	$36,268,796	$9,457,080

Remarks.—The ores of the Cripple Creek district are tellurides of gold occurring as fissures in phonolite. At first only the rich ores were mined but in the last few years mills have been built to treat the low-grade ores left in the stopes and surface dumps.

The Portland now makes two products, the higher grade ore being shipped to its Colorado Springs plant and the low-grade ores being cyanided at its Victor Mill.

The mine is opened by shafts to a depth of about 1200 to 1400 ft. Large quantities of water have been handled but the mines are now drained to a considerable depth by a long district tunnel.

STRATTON'S INDEPENDENCE, LTD.

CRIPPLE CREEK, COLORADO, U. S. A.

Year ended June 30	1913	1912
Milling operation:		
Dump ore milled tons	104,111	.....
Mine ore milled tons	25,999	.....
Total	130,110	112,391
Total ounces gold	20,013	17,428
Ounces gold per ton ore	0.1538	0.155
Total ounces gold recovered	15,707	12,833
Per cent. recovered in concentrates	34.43	42.19
Per cent. recovered in bullion	44.05	31.44
Per cent. recovered	78.48	73.63
Milling cost per ton:		
Coarse crushing and sorting	$0.173537	Not available
Fine crushing conc. and treatment conc	.517619	Not available
Cyaniding and chemicals	.500490	Not available
Miscellaneous expenses	.126211	Not available
Total milling	$1.317857	$1.271
Mining dump ore	.122176	0.095[1]
Treating conc	.....	0.136
Total	$1.440033	$1.503

[1] Including transportation to mill.

1913 Operations.—During the year the net production from lessees decreased $127,264. The production of shipping ore decreased $20,072 over the previous fiscal year.

1912 Operations.—The following are the different sources of production with gross and net value.

Production	Tons	Gross value	Net value	Royalty
Lease:				
Surface ore	1,567	$35,735	$24,724	5,565
Washington	1,922	48,599	35,343	14,245
Independence	10,455	304,464	230,456	88,941
Company:				
Independence Co	4,550	116,518	87,156	.....
Total	18,495	505,318	377,681	.....
Mine ore milled	13,019	67,887	20,784	.....
Total	31,514	$573,205	$398,465	$108,751

	Gross tons	Net tons	Value per ton
Ore from mine to mill	19,435	13,019	$5.21

	Tons	Gross value	Frt. and treat.	Net value
Lessee ore	13,945	$27.88	$7.05	$20.83
Company ore	4,550	$25.60	$6.45	$19.15

Net after paying mine for low-grade ore	$68,282
Mine and mill earnings	174,511
After deducting for depreciation mine and mill	17,000
Com. and adjust. leaves net profit	$145,322

1904 Operations, Year Ending July 1.—The costs of this year were quite representative of that time. The rich ore-bodies were about gone and the leasing system was recommended by Mr. John Hays Hammond, Consulting Engineer for the Company. The ore was sorted at the surface and shipped to the smelter. No scheme of milling was practised.

Gross value	$949,331
Total revenue	992,949
Expenses	1,058,287
Loss	$65,338
Tons ore mined	171,573
Average value	$5.533
Tons ore sorted out and shipped	43,758
Average value	$21.695

Costs per ton shipped:		Per ton mined
Freight and treatment	$7.758	$1.9787
Repairs and improvements	.267	.....
Mine development	4.140	1.0557
Mining	9.613	2.4516
Shipping and selling	.177	.4652
General expense	1.380	
	$23.335	$5.9512

Remarks.—The ores occur in fissures in phonolite. The phonolite is sometimes seamed with mineral. The gold occurs in the form of sylvanite (gold-telluride) in seams and bunches. The first ore mined was very high grade but as this was exhausted the lower grade ores were worked.

The mine is operated through a shaft to a depth of 1400 ft. At first all ores were sampled in car lots and shipped to smelters but later mills were erected and the ores are now cyanided.

The flow of mine water is heavy. Transportation and smelting facilities are good.

VINDICATOR GOLD MINING CO.

CRIPPLE CREEK, COLORADO, U S. A.

Year ending Dec. 31	1911
Gross products	$647,710.19
Less smelting and transportating	$118,361.14
Operating expense	$412,238.05
Operating profit	$243,272.21

	Main shaft	Hull City shaft
Crude ore hoisted, tons	82,160	12,364
Ore shipped, tons	16,161	3,071
Average yield per ton	$34.50	$29.13

Costs per ton ore shipped:	
Mining and development	$13.192
Sampling	.595
General office expense	1.701
Legal expense	.538
Taxes	.485
Total	$16.511
Development, feet	7,210.5
Total, feet	175,159.6

Remarks.—The ore and veins are typical of the district, being tellurides of gold in fissure veins. The ore is sorted on the surface, the poorest ore and waste being discarded. The shipping ore is sent to a sampling plant and thence to the smelter. No milling operations are practised.

The mine is operated through shafts to a depth of 1600 ft. About 27,000,000 gal. water were pumped during the year.

San Juan District

BUTTERFLY-TERRIBLE GOLD MINING CO.

AMES, COLORADO, U. S. A.

Year Ended March 31	1912
Gross. prod	$40,122.85
Total expense	$37,529.99
Profit	$2,592.86
Profit per ton	$0.156
Mill:	
Tons ore milled	16,620.9
Ave. value per ton gross	$2.992
Ave. value tails	0.578
Ave. value recovered	2.414
Mill extraction, per cent	80.7
Costs per ton milled:	
Mining and development	$1.127
Milling	.504
Bullion and concentrate expense	.146
Superintendence	.258
General expense	.035
Royalty	.230
	$2.300
Miscellaneous earnings	.042
Total	$2.258

Remarks.—The vein is a practically vertical fissure vein of quartz carrying gold in finely disseminated particles and iron pyrites. Mine opened by adit.

The mill has thirty 1050-lb. stamps and nine Frue Vanners. The concentrates are shipped to the smelter. Water power is available for 7 months of the year. Mining conditions very favorable. Transportation facilities good.

CAMP BIRD, LIMITED

OURAY, COLORADO, U. S. A.

Year Ended April 30	1912	1911	1910	1909
Total recovered	$1,742,040.64	$1,812,571.89	$2,645,620.88	$2,269,622.24
Mill:				
Tons ore milled	66,505	79,186	70,714	80,157
Ave. value recovered	$26.178	$22.89	$33.18	$28.31
Mill saving, per cent	94.68	94.87	95.5	94.08
Profit per ton	$16.476	$13.49	$23.77	$19.55
Costs per ton ore:				
Mining	$ 3.01	$ 3.316	$ 3.56	$ 3.52
Tramway	.206	.188	0.18	.17
Stamp milling	1.174	1.134	1.15	1.10
Cyaniding tails	.662	.584	0.61	.58
Shipping and selling	2.108	1.796	1.73	1.31
Gen. expense	1.962	1.926	1.69	1.56
Depreciation	.580	.460	0.49	.52
Total	$ 9.702	$ 9.404	$ 9.41	$ 8.76

See also Appendix, page 351.

LIBERTY BELL GOLD MINING COMPANY

TELLURIDE, COLORADO, U. S. A.

Year Ended Sept. 30	1912	1911	1910	1909	1908
Gross production	.....	$1,399,636.15	$959,873.70	$702,834.67	$844,226.05
Mill:					
Tons ore treated	170,000	155,950	133,899	125,681	116,353
Ave. assay value	.....	$10.06	$8.34	$6.78	$9.616
Ave. mill recovery, per cent.	89	89	86	82	79
Costs per ton:					
Mining	1.62	$1.67	$2.32	$2.36	$2.50
Development	.15	.10	.29	.49	.63
Transportation	.15	.16	.19	.29	.36
Milling	1.50	1.55	1.73	1.67	1.88
Marketing prod	.31	.31	.32	.19	.24
Gen. expense	.....	.62	.33	.32	.37
Taxes	.....	.09	.08	.07	.10
Total	.....	$4.50	$5.26	$5.39	$6.08

See also Appendix, page 351

TOMBOY GOLD MINES CO., LIMITED

TELLURIDE, COLORADO, U. S. A.

Year Ended June 30	1913	1912	1911	1910
Production	$1,049,166	$962,061.60	$818,431.11	$838,720.65
Total expenses	569,011	$594,040.45	$509,057.42	$530,383.32
Tons ore milled	129,618	107,577	116,222	110,560
Average yield per ton	$8.02	$8.87	$6.72	$7.38
Profit per ton	$3.63	$4.18	$2.34	$2.58
Costs per ton:				
Mining	1.45	$1.37	$1.42	$2.71
Development	.74	.83	.83	
Milling	.52	.67	.63	
Concentrating	1.03	1.00	.82	1.56
Water supply	.1¢	.19	.17	
Assay office	.04	.04	.03	
General expense	.30	.42	.32	.53
Taxes	.15	.17	.16	
	$4.39	$4.69	$4.38	$4.80

Résumé for 1909.—Production $832,560. Expenses $480,527. Tons milled 102,844. Average value $7.98. Costs per ton $4.67.

Remarks.—In gross production for each year is included a small boarding-house profit.

The vein occurs as a fissure which is mined by back-stoping. The ore is stamped, amalgamated and concentrated, the concentrates being shipped to the smelter.

The mine is about 3 miles from railroad by good wagon road. Smelter is about 50 to 60 miles away. Winter conditions are very severe and operations sometimes held up.

The profit in 1913 was $471,346. The ore reserves are estimated at 426,000 tons.

The cost of concentration, $1.03, may be dividied into $.64 for concentration and $.39 for freight on concentrates to railroad.

In the 1913 report the analysis of battery feed from Montana Mine of the company, which produced 54,000 tons or 41 per cent. of total ore milled, shows character of ore treated. It is as follows: Gold, oz. 0.48; silver, oz. 4.51; lead, per cent. 1.03; zinc, per cent. 2.18; iron, per cent. 4.13 and copper, per cent. 0.28.

Leadville District

IRON SILVER MINING CO.

LEADVILLE, COLORADO, U. S. A.

Period Year Ended Dec. 31	1913	1912	1911
From sales of ore	$356,492	.....	.....
Income from all sources	386,600	548,119	440,530
Gross expenses	262,673	270,089	252,175
Net operating profit	$123,926	$278,030	$188,355
Mine:			
Tons crude ore mined	55,326	53,618	.....
Net tons after sorting	47,668	46,410	17,663
Ore shipped	47,668	46,410	17,663
Gross value	.....	$1,848,298	.....
Net return after freight and treatment	$365,492	$523,904	$428,588
Lessees operations:			
Tons produced	23,844	16,294	4,142
Net return	$123,079	$112,704	$22,418
Received by company in Royalties	14,509	15,106	3,008
Received by company in other charges	3,199	2,785	.....
Mine development	8,343	4,980	9,451

The metal contents of the ore produced in 1913 was as follows:

	Moyer mine	Tucson mine	Leases
Gold, ounces	67.67	70.07	371.83
Silver, ounces	156,363.75	105,738.87	129,500.91
Lead, pounds	6,254,054	3,924,411	1,927,456
Zinc, pounds	12,043,592	6,126,050	7,489,271
Copper, pounds	.....	7,230	.....
Iron, pounds	509,160	254,227	1,982,124

ORE PRODUCTION

The following tables show the tonnage of the various classes of ore shipped from each mine, and by the Lessees in 1913 together with net values:

Class of ore	Moyer mine		Tucson mine	
	Tons	Net value	Tons	Net value
Zinc-lead sulphide	25,753.79	$186,594.00	10,847.47	$75,153.22
Lead carbonate	72.31	451.45	5,981.59	46,393.75
Zinc carbonate	.....	.....	1,315.35	8,064.97
Iron sulphide	376.82	1,637.90	456.16	3,521.36
Copper sulphide	.....	.....	255.41	2,216.48
Silicious sulphide	.....	.....	159.65	9,253.56
Zinc sulphide	641.64	4,119.66	.....	.....
Lead sulphide	1,807.76	19,085.84	.....	.....
Totals	28,652.32	$211,888.85	19,015.63	$144,603.34

LEASES

Class of ore	Tons	Net value
Zinc-lead sulphide	10,328.67	$59,187.78
Zinc carbonate	7,122.80	34,366.20
Iron sulphide	1,505.81	9,703.33
Iron oxide	726.49	2,380.66
Zinc sulphide	184.05	1,280.39
Lead sulphide	361.67	4,858.95
Lead carbonate	3,447.33	9,373.53
Silicious sulphide	167.25	1,928.28
Totals	23,844.07	$123,079.12

See also Appendix, page 352

THE YAK MINING, MILLING & TUNNEL CO.

LEADVILLE, COLORADO, U. S. A.

Year Ended Dec. 31	1910
Net profit from mining	$103,294
From other sources	70,380
Total profit	$173,674
Remote exploration work	12,166
Net income	$161,508
Tonnage:	
Ore and waste mined (tons)	160,000

Average value ore shipped considerably less than $4 per ton, and the cost of mining was less than $2.50 per ton.

The following figures, based on foregoing and prior years, are given as representative of the grade of ore and cost of production at the Yak property:

Value of ore, gross		$6.00
Average treatment charge	$8.00	
Credit, 35 per cent. iron at 15¢ per unit	5.25	
Net treatment charge	$2.75	
Cost per ton:		
Mining	$2.00	
Tramming	.50	
Smelting	2.75	5.25
Profit per ton		$ .75

Profit varies usually between 50¢ and $1.00 per ton.

See also Appendix, page 352

COLORADO GOLD DREDGING COMPANY

BRECKENRIDGE, COLORADO, U. S. A.

Year	1913	1912	1911	1910	1909	1908
Yards dredged	1,269,738	1,270,476	1,287,988	1,385,771	1,404,347	1,124,823
Detailed costs:						
Labour	$.0089	$.0084	$.0079	$.0071	$.0127	$.0129
Repairs and renewals	.0227	.0190	.0284	.0219	.0164	.0102
Power	.0112	.0117	.0111	.0108	.0186	.0180
Fuel	.0003	.0004	.0003	.0004	.0004	.0009
Superintendence	.0033	.0033	.0023	.0017	.0015	.0037
Taxes and insurance	.0057	.0051	.0051	.0056	.0069	.0026
General expenses	.0054	.0056	.0049	.0051	.0059	.0079
Total per yard	.0575	.0535	.0600	.0526	.0624	.0562
Yield per yard	.1741	.1639	.0856	.0990	.0862	.0936
Total yield	$221,115.87	$208,248.59	$110,269.89	$125,940.82	$121,044.11	$105,304.51
Total expenses	72,974.89	67,944.75	77,259.42	72,850.75	87,593.52	63,160.38
Gross profit	$148,140.98	$140,303.84	$33,010.47	$53,090.07	$33,450.59	$42,144.13

Remarks.—The following is a description of the Colorado Gold Dredging Company's operations in the Swan Valley, in the vicinity of Breckenridge, Colorado, one dredge only being employed.

Season—about eight months, from April 1 to December 1.

Altitude—9600 ft. above sea-level.

Gravel is glacial, fairly coarse, with occasional boulders, 3 or 4 ft. in length. Gravel caves freely.

Boat operates up stream, consequently carrying a bank of average depth of about 13 ft., average depth below water being 26 ft. Total gravel about 39 ft.

Bulk of gold in size is from fine to the size of shot, with occasional nuggets. Gold occurs mainly just above and within a few feet of bed-rock, in an old river channel, same not conforming to present river channel. A width of 250 ft. across valley will include old channel. Constant panning while the buckets are just above bed-rock is required in order to follow the pay streak.

Dredge is of Bucyrus type, with a capacity of 6000 yd. per day. Main dimensions as follows:

Hull—width 43 ft. 10 in., length 120 ft. 2 in., depth 8 ft. 10 in.

Ladder—length 92 ft., designed to dig 38 ft. below water line.

Bucket-line—continuous, consists of seventy-six $8\frac{1}{2}$ ft. capacity buckets. Speed about $17\frac{1}{2}$ buckets per minute.

Screen—cylindrical, length 37 ft. 6 in., diameter 6 ft. 1 in., pitch $1\frac{5}{8}$ in. to 1 ft.

Stacker—rubber belt type, length 115 ft., belt 32 in. wide. Speed 300 ft. per minute.

Pumps—Screen 12 in. discharge, auxiliary 5 in. discharge, primer 3 in. discharge.

Motors—440 volt, 3 phase. Main drive 200 h.p., screen drive 50 h.p., stacker drive 35 h.p., winch drive 20 h.p., pump (12 in. and 5 in.) 75 h.p., pump (priming) 15 h.p.

Transformers—three 100-kw. transforming from 13,000 to 440 volts.

Tables—total surface area of 1523 sq. ft. Slope of $1\frac{1}{2}$ in. to 1 ft.

Power cost—$.0165 per kw.-hour straight meter reading.

Labour—common $3.00 for 8 hours, winchmen $4.00 for 8 hours, motormen $3.50 for 8 hours, oilers $3.00 for eight hours.

IDAHO

BUNKER HILL & SULLIVAN MINING & CONCENTRATING CO.

KELLOGG, IDAHO

Year Ended June 1	1912[1]	1911	1910	1909
Gross production	$5,396,915	$3,307,393	$3,307,825	$3,199,975
Less smelting and freight	1,980,230	1,255,729	1,318,296	1,343,043
Net value	3,416,684	2,051,664	1,989,529	1,856,932
Operating expenses	1,580,814	941,350	788,978	761,374
Operating profit	1,835,869	1,110,314	1,200,551	1,095,558
Tons ore mined	702,520	.....	.....	.....
Mill:				
Tons ore milled	697,560	436,940	376,200	341,700
Average lead content	9.58%	9.49%	11.21%	11.40%
Average silver content, ounces	3.72	3.78	4.25	4.19
Tons concentrates shipped	96,267.2	.....	.....	.....
Tons crude ore shipped	3,430.7	1,350	1,330	3,570
Average lead content	49.87%	42.08	42.26	44.16
Average silver content, ounces	16.94	16.39	15.21	17.63
Mill extraction, per cent	78.5	77.33	77.01	80.56
Ratio concentration	7.26–1	6.74–1	5.89–1	5.05–1
Feet mine development	11,050	.....	.....	.....
Cost per foot	$7.15	.....	.....	.....
Cost per ton at mines:				
Stoping	$1.602	$1.423	$1.45	$1.563
Tramming	.074	.069	.07	.083
Concentrating	.374	.371	.405	.386
Shipping	.034	.....	.....	.....
Superintendent and office	.073	.....	.....	.....
Contingent expenses	.086	.....	.....	.....
Legal expenses	.007	.....	.....	.....
All other Wardner expenses	.....	.166	.164	.182
Miscellaneous expenses	.....	.007	.....	.....
Total	$2.250	$2.036	$2.09	$2.214
Average value mill ore	$9.63	$9.67	$11.32	$11.17
Average value shipped ore	$47.92	$41.44	$40.42	$34.02

[1] Period from June 1, 1911, to Dec. 31, 1912.

PRODUCTION SINCE 1886 TO DEC. 31, 1912

Tons ore mined	5,585,988	Operatng profit	$17,747,666
Gross value	$52,978,903	Dividends paid	$13,911,750
Net smelter returns	$31,480,913		

Remarks.—The mine is located in an accessible country with good railroad connections. The ore occures as large masses in a quartzite formation. The ore is galena and iron pyrites carrying silver values. The widths vary from 1 ft. to 300 ft. The mine is operated through tunnels and shafts to a maximum depth of 2000 ft. The milling method is simple concentration and shipment of concentrates to smelters. This property is one of the large lead mines of the country.

FEDERAL MINING & SMELTING CO.,

WALLACE, IDAHO, U. S. A.

Operating the Wardner, Mace, and Morning Mines.

Year Ended Aug. 31	1913	1912	1911
Total value production	$3,553,325	$4,911,996	$5,338,653
Total expenses	2,993,815	4,053,731	4,191,732
Operating profit	$559,510	$858,265	$1,145,921
After adding rents, int., div., miscl. invest	1,126,974	966,941	1,270,900
Deduct construction and betterments	33,331	98,106	141,363
Deducting general expenses, taxes, etc	260,194[1]	71,512	29,785
Net profit to profit and loss	$833,448	$797,323	$1,099,752
Mine:			
Tons mined wet	691,487	836,947	
Of which first class was	30,726	46,087	784,600
Mill:			32,609
Tons milled dry	637,900	762,550	
Production:			726,499
Lead marketed, pounds	.....	.....	94,086,800
Lead conc. and shipping ore, tons combined	84,533	118,734	118,315
Average silver oz. per ton	15.9	20.8	27.93
Average lead per cent. per ton	43.4	42.9	44.18
Zinc conc. prod., tons	6,494	2,532	531
Average per cent. zinc	45.9	46.93	46.9
First-class ore, tons	30,726	46,087	32,609
Average per cent. lead	33.7	33.7	36.07
Omaha lease prod., tons[2]	.....	1,869	7,895
Average lead contents	.....	26.6	28.5
Average silver contents	.....	47.7	69.14
Average copper contents	.....	.....	80,042
Profits Omaha lease	.....	$13,545	$68,645
Cost per ton mined (approx.) wet:			
Cost of production[3]	$2.430	$2.790	$3.050
Development	.....	.....	.049
Smelter, freight and treatment	1.870	2.060	2.250
General expense	.108	.085	.039
New construction	.048	.117	.179
Total	$4.456	$5.052	$5.567
Green Hill lease not included	.035	.....	.....
Price received for silver, oz., cents	61.0	58.33	58 approx.
Price received for lead, lb., cents	4.49	4.38	4.45
Development, feet	16,224	18,947	17,152
Number men employed	.....	.....	1,088
Cost per ton shipped:			
Lead conc. and shipping ore.			
Smelt-freight and treatment	$15.25	$14.51	$14.89
Tons shipped	84,533	118,734	118,315

Remarks.—Company operates the Wardner, Mace, Morning and Green Hill-Cleveland properties, situated near Wardner, Idaho. The mines are principally lead-silver properties, but some zinc is produced. Ore extraction at the Mace mine ceased in October, 1912, the ore-bodies having become exhausted. The Green Hill-Cleveland Co., of which the Federal owns one-half interest, leased the Mace mill. The Mace property is developed to 2250 ft. in depth. The Morning property has reached a depth of 1650 ft. by shaft. The ore varies from 2 to 40 ft. in width and from 6 per cent. to 12 per cent. lead. The Morning property formerly was operated at a loss, but now it is making a profit. The ore has been very difficult to mill. An improvement has been made through sorting. In connection with the mill, Macquisten plant has been installed and is employed on zinc ores. The Green Hill-Cleveland property is developed to the 2050-ft. level.

In working the ores, the elimination of the waste, both underground and at the sorting plants, has required more and more attention on account of conditions at depth to win the largest amount of profit from the veins. In the 1911 report, some comparative figures are given showing the percentages of rock eliminated as waste before milling of the total rock broken in the stopes, as compared with former operations. Below we give this comparison: Wardner, 35 per cent. as against 22 per cent. formerly; Mace, 32 per cent., compared with 18 per cent. formerly, and Morning, 18 per cent., is now eliminated where formerly very little was possible.

In the 1913 year the company experienced the worst winter in years. The report on August 31, 1913, stated that the Federal property at Mace has reached the end of profitable operation, and that the Wardner properties are approaching it. The combined ore reserves at the different properties at close of year, compared with 1912, were as follows:

	Milling ore (tons)	Concentrates (tons)	First-class ore (tons)
Sept. 1, 1913	1,050,300	96,410	54,300
Sept. 1, 1912	802,870	76,114	47,550

No grade is given for different classes of ore. The average number of men employed at different plants in 1913 year was 775 at an average cost per shift of $3.603. The concentrates and first-class ore are shipped to the Tacoma smelter of the American Smelting & Refining Co.

[1] In addition to General Expense which alone is shown for the other years there is included $19,874 corporation excise tax and $165,422 written off for Green Hill-Cleveland investment. [2] Not incl. in first class above. [3] Includes the cost of mining. for wet tons shown and the milling for dry tonnage given.

STEWART MINING COMPANY

KELLOGG, IDAHO, U. S. A.

	6 mo. Ended June 30, 1913	6 mo. Ended Dec. 31, 1912	Yr. Ended June 30, 1912	15 mo. Ended June 30, 1911
Sales, concentrates	$466,466	$485,164	$633,039	$523,443
Sales, ore	74,644	105,960	113,999	21,805
Total	$541,110	$591,124	$747,038	$545,248
Miscell. receipts	.....	.....	1,881	57
	541,110	591,124	$748,919	$545,306
Expenses	294,248	368,501[1]	473,738	381,149
Profit before interest	$246,862	$222,623	$275,181	$164,156
Interest	38,791[2]	.....	.....	11,597
Profit	$208,070	$222,623	$275,181	$152,558
Tons mined	89,246	100,043	160,510	96,848
Dump ore treated	.....	.....	.....	100,000
Total tons dry	89,246	100,043	160,510	106,848
Tons smelted (sold)	1,963	2,753	3,489	581
Tons milled	87,283	97,290	157,021	106,267
Assay value ore mined:				
Silver, ounces	657,416	.....	.....	.....
Lead, pounds	13,545,300	.....	.....	.....
Cost per ton:				
Mining and development	2.28	$2.15	$1.99	$2.39
Transport mine to mill	.15	.15	.19	.29
Sorting	.04	.04	.....	.....
Taxes	.10	.11	.06	.03
Milling expense	.37	.31	.39	.53
Administration and gen'l	.31	.31	.30	.31
Depreciation	.05	.04	.02	.01
Total cost	$3.30	$3.11	$2.95	$3.56
Total receipts per ton	$6.06	$5.91	$4.66	$5.10
Profit per ton after interest, litigation and miscl.	$2.33	$2.23	$1.71	$1.43

[1] Includes item of $58,113 for litigation and miscl. expenses.

[2] Includes litigation.

See also Appendix, page 353

SNOWSTORM MINING CO.

LARSON, SHOSHONE COUNTY, IDAHO, U. S. A.

Year Ended July 1	1912	1911	1910
Production, gross:			
Pounds copper	2,029,474	2,653,036	7,125,105
Ounces silver	202,583	267,263	605,075
Ounces gold	.....	.....	.....
Income:			
Gross income	$177,939.67	$171,384.43	$455,470.75
Total expenses	162,161.08	145,693.36	264,210.68
Net profit	$15,778.59	$25,691.07	$191,260.07
Mine:			
Tons mined	32,282	34,464	91,368
Tons treated	2,050	.....	.....
Aver. per cent. copper per ton	3.54	3.96	4.07
Cost per ton:			
Mining	$1.585	$1.868	$1.417
Development	.502	.832	.543
Haulage	.075	.120	.051
Smelting, Converting, Freight, refining and selling	7.201	7.887	7.797
General expense	.714	.764	.455
Total	$10.077	$11.471	$10.263
Cost per pound:	18.902¢	16.585¢	14.406¢
Crediting gold and silver	5.811¢	5.390¢	4.434¢
Development work, feet	1,495	3,171	5,960
Price received for copper metal	14.892¢	12.263¢	12.954¢

Remarks.—*Accessibility*—On Northern Pacific R. R. *Character of ore*—Copper sulphides and carbonates. *Character of ore-body*—Impregnated beds in quartzite. *Width of ore-body*—30 ft. to 60 ft. *Method of opening*—Cross-cut tunnels. *Method of mining*—Square-set. *Depth of mine*—1700 ft. *Amount water pumped*—Two cu. ft. per second—approximate. *Method of ore reduction*—Gravity concentration. Started in summer of 1912. *General conditions*—Concentrates are smelted at various smelters, Trail, Tacoma, Butte and Salt Lake.

MICHIGAN

BRIEF DESCRIPTION OF THE LAKE SUPERIOR COPPER DISTRICT

The Lake Superior Copper belt is situated on Keweenaw Peninsula in northwestern Michigan. The Peninsula which extends into Lake Superior for a distance of about 80 miles is from 15 to 20 miles in width where the principal copper properties occur. The peninsula is intersected at the towns of Houghton and Hancock by Portage Lake, which is connected both east and west with Lake Superior by canals, thus affording passage to large lake steamers. Most of the large mines and mills and all of the smelters are situated on this inland water-way. Some of the stamp-mills, however, are located on Lake Superior on either side of the peninsula.

The central portion of this peninsula is made up of a series of lava flows including beds of conglomerate and sandstone. The entire formation is flanked on either side by sandstone. The general strike of the formation is parallel to long axis of the peninsula, the producing mines extending over a total distance of approximately 40 miles. The beds dip westward from 30 to 72 deg. The lava flows are composed of a dark basaltic rock with the texture of diabase. The beds have an amygdaloidal structure, the native copper occurring in the amygdules with calcite quartz and other minerals. The conglomerate beds are worked, but only one has been operated profitably, the Calumet Conglomerate. The Tamarack is the Calumet Conglomerate on the dip.

The various lodes, both amygdaloid and conglomerate vary from a few feet to 25 ft. in width. The mines are low grade, the greatest yield in the district being 28 to 30 pounds per ton. The lodes show decreasing copper contents with depth, particularly where this exceeds one-half mile. The mines are usually developed by inclined shafts, following the beds from the surface, or in the footwall and cross-cuts made to the lode. The trap being firmer, this method insures the permanency of the shaft. Some vertical shafts have been sunk for the purpose of developing very deep portions of the lodes. The Tamarack holds the distinction of having the deepest shaft in the world, its No. 5 vertical shaft being slightly over a mile in depth. The copper occurs in the native state scattered throughout the amygdaloid or conglomerate beds. It is usually found in fine particles, but in certain of the mines very large pieces or "mass copper" are encountered. These have weighed as much as 500 to 600 tons.

For the method of mining employed, reference should be made to the respective properties. In brief, the system used at the Copper Range properties differs from that at the other mines, this being one using a waste filling as against the usual back or overhand stoping with no filling or broken copper rock as the case may be. The conglomerate lodes are more expensive to mine than the amygdaloid, owing to the weak hanging wall necessitating heavy timbering. These lodes are also much harder.

The copper rock after mining is sent to the different stamp mills for concentration. These mills are situated at various points on the lake and are assured an abundant supply of water and tailings area. The mills usually employ steam power generated from coal. Steam stamps are used throughout the district. Some of these are operated by compound engines. The process usually employed is crushing in stamps followed by jigs and concentrating tables, buddles, etc.

Recently considerable attention has been given to retreating the tailings at several of the mills by finer grinding and further concentration. This work has been meeting with success and the increased extraction is resulting in greater profits to the companies. The enormous tonnage of tailings at the Calumet & Hecla mills—the accumulation of years—are also being retreated.

The concentrates from the mills which are termed "mineral," together with the mass and barrel copper sorted out at the mine, are sent to the smelters. These average from 60 per cent. to 75 per cent. copper. Certain of the companies here have their own smelters. A majority, however, smelt at one of the custom plants. The various products are treated in reverberatory furnaces. Before the copper is drawn, it is subjected to poling following which it is cast. The slag from the reverberatories is retreated in blast furnaces.

The conditions at Lake Superior are such as to permit of low costs. Steamers plying the Great Lakes afford cheap transportation to and from the various markets. There is an abundance of timber and water, the lodes are uniform, the copper occurs in the native state thus simplifying the method of treatment, the stamp mills and smelters are well situated, all of which make for cheap operation. The climate is severe in winter. Labor under normal conditions is good. Severe labor troubles were experienced in the last six months of 1913 and during this period the greater part of the mines were shut down. As a result of this 1913's operations are not representative of the mines.

AHMEEK MINING COMPANY

CALUMET, MICHIGAN, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Copper, pounds	9,220,874	16,455,769	15,196,127	11,844,954
Income				
Gr. val. incl. silver sales	$1,433,695	$2,757,576	$1,960,513	$1,538,003
Total expenditures	1,226,275	1,292,179	1,083,186	1,295,615
Net profit	$207,419	$1,465,396	$ 877,327	$242,387
Net profit after int	176,919[2]	1,465,396	870,273	229,320
Mine and mill:				
Rock broken		.....	617,204	568,935
Discard, per cent		.....	3.0	6.8
Rock hoisted	385,450	666,647	610,236	551,965
Discard, per cent	.4	2.2	1.9	3.9
Tons stamped	383,749	652,260	598,549	530,365
Lb. mineral	13,742,140	23,945,315	21,917,925	16,758,521
Lb. refined copper	9,220,874	16,455,769	15,196,127	11,844,954
Per cent. copper in mineral	67.10	68.72	69.33	70.68
Ref. copper per ton lb	24.0	25.2	25.4	22.3
Cost per ton, treated (calculated):				
Min. trans. stamp and tax	$1.77	$1.39	$1.42	$1.42
Construction	1.09	.30	.08	1.76
Smelt., frt., and comm	.33	.29	.30	.26
Total	$3.20	$1.98	$1.80	$2.44
Cost per pound cents:—				
At mine	7.38	5.51	5.61	7.93
Construction	4.53	1.20	.32	1.85
Smelt., frt., comm	1.39	1.14	1.19	1.16
Total inc. int., cents	13.30	7.85	7.17	11.05
General:				
Dev. drifting and crosscutting, feet		9808	11691	9107
Development, sinking		1336	1284	1983
Price copper sold, cents	15.40	16.56	12.85	12.94

[1] Incl. $184,725 sinking and equip. shafts. [2] After land purchase of $30,500.

See also Appendix, page 353

ALLOUEZ MINING COMPANY

CALUMET, MICHIGAN, U. S. A.

Year ended Dec. 31	1913	1912	1911	1910
Production:				
Copper, pounds	4,091,129	5,525,455	4,780,494	4,655,702
Income:				
Gross value	$650,205	$918,435	$629,229	$609,858
Total expenditures	485,119	729,824	617,376	521,345
Operating profit	165,086	188,852	11,852	88,513
Interest	9,358	17,346	18,231	17,416
Net profit	$155,728	$171,264	$6,379 loss	$71,096
Mine and mill:				
Rock broken, tons	239,704	339,970	294,646	253,018
Per cent. discard	1.269	1.868	2.049	2.33
Tons stamped	236,663	333,618	288,610	247,119
Lb. mineral	6,640,000	8,877,120	7,532,190	4,655,702
Pounds copper per ton stamped	17.29	16.56	16.56	18.84
Copper in mineral, per cent	61.61	62.88	63.47	62.86
Cost per ton treated (calculated):				
Expenses at mine	$1.69	$1.61	$1.67	$1.77
Smelt., frt., comm., eastern office	.33	.31	.32	.34
Construction	.03	.26	.15	.....
Total	$2.05	$2.18	$2.14	$2.11
Cost per pound (cents):				
At mine exc. construction, cents	9.76	9.74	10.07	9.39
Construction	.16	1.60	.90	.00
Smelting, frt., comm	1.94	1.87	1.95	1.81
Cost interest pd	.23	.31	.38	.37
Total cost per pound, cents	12.09	13.52	13.30	11.57
Price received for copper, cents	15.627	16.318	12.895	12.7

See also Appendix, page 354

BALTIC MINING COMPANY

HOUGHTON, MICHIGAN, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Pounds copper	7,736,124	13,373,961	15,370,449	17,549,762
Income:				
Gross receipts	$1,152,026	$2,165,350	$1,927,036	$2,235,273
Expense at mine	792,170	1,278,764	1,194,089	1,231,923
Smelting, freighting, marketing and selling	80,745	127,915	139,464	159,472
Total expense	$872,915	$1,406,679	$1,333,553	$1,391,394
Taxes and interest	48,900	61,276	63,268	75,939
Net profit	$230,211	$697,393	$530,215	$767,939
Mine:				
Tons hoisted	364,466	705,281	760,473	823,352
Tons stamped	333,289	652,433	696,795	781,419
Per cent. hoisted waste	8.5	7.49	8.37	5.09
Mill:				
Mineral produced, pounds	13,282,825	22,444,810	25,254,160	28,067,300
Yield rock, pounds	23.21	20.50	22.06	22.46
Per cent. rock	1.16	1.025	1.103	1.123
Price copper, cents	14.89	16.16	12.54	12.74
Cost per ton stamped, (calculated):				
Mining	$1.64	$1.422	$1.28	$1.165
Milling	.27	.214	.187	.205
Transportation	.14	.136	.143	.141
General mine	.35	.204	.117	.077
Less rents	.02	.013	.013	.0112
Total working expense	$2.38	$1.96	$1.714	$1.576
Total working exp. inc. taxes	2.53	2.05	1.80	1.668
Smelt., frt., mrkt., general	.24	.196	.20	.204
Total	$2.77	$2.246	$2.00	$1.872
Cost min., trans. and stamp per ton treated	$2.377	$1.82	$1.65	$1.54
Cost min., etc., incl. tax. and extra expense	$2.522	$2.05	$1.80	$1.67
Cost per pound:				
Mining	$.087	$.0889	$.0746	$.0686
Construction	.015	.0068	.0031	.0015
Taxes	. 007	.0050	.0042	.0041
Smelt., frt., ref., etc	.010	.0087	.0090	.0090
Total	$.1191	$.1094	$.0909	$.0832
Development:				
Total shaft sinking, feet	248	464	609	780
Total drifting, feet	6,441	10,547	9,923	11,218
Total crosscutting, feet	629	679	589	465

See also Appendix, page 354

CALUMET & HECLA MINING CO.

CALUMET, MICH., U. S. A.

Year Ended Dec. 31	1912	1911	1910	1909
Production:				
Copper, pounds	67,856,429	74,130,977	72,059,545	80,096,995
Smelting production	.....	72,861,925	72,672,469	74,593,553
Tons stamped	2,806,610	2,909,972	2,795,514	2,842,880
Copper per ton rock, pounds	24.18	25.47	25.77	28.18
Price received for copper, cents	16.65	12.82	13.20	13.61
Costs:				
Mine cost (excl. const. per ton)	$1.91	$1.84	$1.92	$1.93
Total cost per pound, cents	9.86	8.52	8.96	8.28

CONGLOMERATE LODE

Production:				
Copper, pounds	51,935,245	58,469,399	58,739,509	66,285,684
Tons stamped	1,746,960	1,924,480	1,950,040	1,999,880
Pounds copper per ton	29.73	30.38	30.12	33.14
Costs:				
Mine cost per ton (ex. const.)	$2.23	$2.07	$2.13	$2.11
Total cost per pound, cents	8.87	8.25	8.55	7.77
Development:				
Shaft sinking, feet	523	546	464	556
Drifting and cross-cutting	10,662	8,814	9,840	8,918
Deepest shaft, feet	7,995	7,995	.....	.....

OSCEOLA LODE

Production:				
Copper, pounds	15,692,199	15,661,578	13,150,427	13,752,276
Tons stamped	1,040,600	985,492	831,194	838,200
Pounds copper per ton	15.08	15.89	15.82	16.40
Costs:				
Mine cost per ton (ex. const.)	$1.36	$1.34	$1.41	$1.42
Total cost per pound, cents	10.36	9.95	10.53	10.41
Development:				
Shaft sinking, feet	451	837	506	2,567
Drifting and cross-cutting	18,000	19,000	17,700	22,000
Deepest shaft, feet	3,232	3,232	.....	.....

KEARSARGE LODE

Production:				
Copper, pounds	228,985	0	169,609	59,035
Tons rock stamped	19,050	0	14,280	4,800
Shaft sinking, feet	20	194	169	382
Drifting and cross-cutting	2,120	1,814	1,243	1,810
Deepest shaft, feet	2,291	2,271	.....	.....

STAMP MILLS

Recrushing Plant Treating Coarse Conglomerate Tailings

Pounds copper	2,155,292	2,152,110	1,951,378	1,251,300
Tons coarse tailings crushed	481,320	477,794	441,920	278,175
Pounds copper per ton treated	12.86	12.66	12.60	12.96
Pounds saved per ton	4.48	4.50	4.42	4.50
Costs:				
Per pound exclusive of smelting and selling, cents.	4.99	5.01	5.08	4.81

For more recent operations, see Appendix, page 399.

Remarks.—The Calumet & Hecla has been one of the largest and most important producers of copper in the world. It long held the distinction of being the world's greatest producer. Its dividend record to December 31, 1912, was $120,050,000.

The Calumet & Hecla mine is opened on the Calumet conglomerate, Osceola Amygdaloid and Kearsarge Amygdaloid, all parallel beds. The conglomerate lode has a dip of 38 deg., averages about 15 ft. in width. The bed is worked by means of four mines, the Calumet, Red Jacket, Hecla, and South Hecla. The total distance on the lode occupied by these properties is about 2 miles. The mines are opened by eleven inclined shafts and by the Red Jacket vertical shaft which intersects the lode at great depth. This shaft is approximately 5000 ft. deep. The conglomerate lode has a weak hanging wall and owing to this and the great pressure which exists in the deep workings, an enormous quantity of timber is required. Iron pillars and rails are also used. The copper rock of the conglomerate lode is harder to drill than the amygdaloid lodes and also tougher and more difficult to crush. The conglomerate bed is richer than the amygdaloid lodes. It has, however, shown a marked falling off in copper contents with depth. In 1900 the yield from this lode averaged nearly 60 lb. per ton. (See accompanying table of ten years, operations at Calumet & Hecla.)

The Osceola Amygdaloid bed parallels the main conglomerate lode several hundred feet southeast. The property is developed by six shafts, the maximum depth being approximately 3232 ft. The lode which dips

about 40 deg. is wide averaging from 30 to 40 ft. The best rock, however, is adjacent to the walls of the lode.

The Kearsarge Lode (amygdaloid) parallels the other two beds mentioned above, and lies 3000 ft. to the southeast of Calumet conglomerate. This property is one of the newer mines of the C. & H. Company to be developed. The property is opened by three shafts and to a maximum depth of 2291 ft. The mining method employed on the three lodes is the usual backstoping used in the Lake District.

The Calumet & Hecla mills are located on Lake Linden, 4 or 5 miles from the mine. The mills which are divided into two sections, contain a total of 28 steam stamps having an average crushing capacity of 350 tons for conglomerate and 500 for amygdaloid. The plant is equipped with a regrinding mill. In addition to the revenue derived from the treatment of tailings from present operations, there is an enormous profit to be won from the old tailings area at the mills, estimated at many millions of tons. The recoveries and cost per pound now being made on the recrushing and treatment of the coarse conglomerate tails are shown in the accompanying cost data sheets. The Calumet & Hecla Company owns and operates the railroad connecting the mines with the reduction works. Electric power is used at the mines, mills and smelters.

The smelter is located at Torch Lake near the mills. The plant has several reverberatory furnaces. The Company also owns and operates the Buffalo Smelting works, situated near Buffalo, N. Y. Connected with this plant is an electrolytic refinery.

In addition to the Calumet and Hecla properties of the company, it owns the following shares of various other companies in the Lake district. These different properties being also operated by the Calumet & Hecla Company.

24,200 shares Ahmeek Mining Company	50,000 shares issued
41,000 shares Allouez Mining Company	100,000 shares issued
41,500 shares Centennial Copper Mining Company	90,000 shares issued
19,400 shares Cliff Mining Company	60,000 shares issued
50,100 shares Gratiot Mining Company	100,000 shares issued
30,500 shares Isle Royale Copper Company	150,000 shares issued
152,977 shares La Salle Copper Company	302,977 shares issued
37,550 shares Laurium Mining Company	40,000 shares issued
32,750 shares Osceola Consolidated Mining Company	96,150 shares issued
11,207 shares Seneca Mining Company	20,000 shares issued
50,100 shares Superior Copper Company	100,000 shares issued
19,400 shares Tamarack Mining Company	60,000 shares issued
43,202 shares White Pine Copper Company, common	85,320 shares issued
6,092 shares White Pine Copper Company, preferred	6,092 shares issued

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

COMPARISON OF CALUMET & HECLA'S CONDI-

Exact accuracy in detail is not claimed for the following table, except in proximations and are given only to show comparative conditions. The

	1910	1909	1908	1907
Production:				
Tons rock daily	9,175	8,670	8,025	8,325
Tons rock monthly	238,500	224,900	208,200	216,350
Tons yearly, congl	2,026,680	1,952,541	1,894,176	2,237,118
Tons yearly, amyg	834,420	747,378	603,891	362,765
Lb. in ton, congl	32.25	35.03	39.68	41.90
Lb. in ton, amyg	15.85	17.06	18.45	19.00
Lb. copper monthly	6,009,045	6,901,350	6,581,700	7,824,900
Lb. copper per share	721	828	789	938
Total lb. copper	72,108,577	83,816,230	78,980,466	93,898,963
Income:				
Avg. per lb., copper, cents	13.33	13.59	17.18	22.15
Total income	$ 9,614,213	$11,201,591	$13,563,428	$20,791,546
Expenditures:				
Lb. cop. mine and mill, cents	6.55	7.33	7.65	7.05
Lb. cop. sm'l. and east, cents	1.10	1.10	1.10	1.10
Lb. cop. con. and expansion	.35	.12	5.04	9.82
Total per lb. copper	8.00	8.55	13.79	17.99
Total expenditures	$ 5,768,683	$ 7,080,787	$10,891,406	$16,892,423
Profit:				
Profit	$ 3,845,530	$ 4,120,804	$ 2,672,022	$ 3,899,123
As'ts bro't for'd	6,821,768	4,700,964	7,028,942	10,629,819
Total quick assets	10,667,298	8,821,768	9,700,964	14,528,942
Dividends	3,000,000	2,000,000	5,000,000	7,500,000
Balance quick assets	7,667,298	6,821,768	4,700,964	7,028,942
Dividends per share	$30.00	$20.00	$50.00	$75.00
Profit per share	$38.44	$41.20	$26.72	$38.99
Profit per lb. copper, cents	5.33	5.04	3.39	4.16
Profit per ton rock	$1.34	$1.52	$1.07	$1.33

TIONS, COVERING AN 11-YEAR PERIOD[1]

such items as appear in the annual reports. All other items are aplimitation of official figures prevents an accurate analysis.

1906	1905	1904	1903	1902	1901	1900
7,475	5,445	4,740	4,720	4,880	4,160	4,690
194,300	144,500	123,160	122,500	126,910	107,910	122,050
2,021,544	1,622,465	1,478,000	1,470,000	1,523,000	1,295,000	1,464,697
312,000	74,235	.....	.....	.....	.....	.....
46.96	51.77	51.95	52.20	52.44	56.25	59.93
19.51	22.00	.....	.....	.....	.....	.....
8,420,000	7,112,000	6,384,160	6,386,000	6,663,700	6,054,450	8,218,700
1,010	856	766	766	799	726	986
101,031,799	85,644,401	76,610,145	76,632,912	79,964,066	72,653,332	98,624,789
17.24	14.09	13.38	12.65	16.19	16.83	17.55
$18,376,643	$12,058,298	$10,246,758	$9,677,168	$12,139,626	$12,232,035	$17,310,568
7.64	6.62	6.59	4.65	5.42	8.38	6.22
1.10	1.10	1.10	1.10	1.10	1.10	1.10
1.05	.45	.43	.40	.89	1.29	2.26
9.79	8.17	8.12	6.15	8.41	10.77	9.58
$ 9,891,013	$6,997,147	$6,220,743	$4,712,924	$6,714,977	$7,824,763	$9,448,254
$8,485,630	$5,061,151	$4,026,015	$4,964,244	$5,424,649	$4,407,272	$7,862,314
7,144,189	6,583,038	6,557,023	3,592,779	2,168,130	4,260,858	4,398,544
15,629,819	11,644,189	10,583,038	8,557,023	7,592,779	8,668,130	12,260,858
5,000,000	4,500,000	4,000,000	2,000,000	4,000,000	6,500,000	8,000,000
10,629,819	7,144,189	6,583,038	6,557,023	3,592,779	2,168,130	4,260,858
$50.00	$45.00	$40.00	$20.00	$40.00	$65.00	$80.00
$84.85	$50.61	$40.26	$49.64	$54.24	$44.07	$78.62
7.45	5.92	5.26	6.48	6.78	6.06	7.97
$3.64	$2.99	$2.73	$3.38	$3.56	$3.41	$5.27

[1] Published with permission of Gay & Sturgis, Boston, Mass.

CENTENNIAL COPPER MINING COMPANY

Calumet, Michigan, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910	1909
Production:					
Copper, lb.	1,612,262	1,742,338	1,493,834	2,572,566	2,583,793
Income:					
Gross value	$247,120	$285,075	$195,557	$206,951	$345,653
Total expend.	215,722	234,562	183,145	222,281	399,343
Net profit	$31,397	$50,511[1]	$12,412	$15,330 loss	$53,690 loss
Mine and mill:					
Rock broken, tons	90,883	107,638	86,729	106,095	199,918
Discard, per cent.	5.986	.01041	.00214	3.734	1.7
Tons stamped	85,443	106,517	86,543	102,133	196,525
Lb. mineral	2,324,040	2,567,385	2,321,200	2,380,820	3,941,820
Per cent. copper in mineral.	69.37	67.86	64.36	66.05	65.55
Lb. refined per ton stamped.	18.87	16.36	17.26	15.40	13.15
Cost per ton treated (calculated):					
Exp. at mine	$2.179	$1.92	$1.869	$1.947	$1.818
Smelt., frt., market, etc.	.26	.21	.24	.23	.20
Constr. and equipment					.01
Total not incl. interest	$2.439	$2.13	$2.109	$2.177	$2.028
Cost per pound, cents:					
At mine excl. construction.	11.55	11.74	10.83	12.65	13.82
Construction	.00	.00	.00	.00	.08
Smelt., frt., and comm.	1.37	1.32	1.43	1.49	1.56
Cost per lb., int.	.46	.40	.43	.34	.15
Total, cents	13.38	13.46	12.69	14.48	15.61
General:					
Price rec'd for copper, cents	15.301	16.36	12.92	13.0	13.277
Development:					
Sinking, ft.		203	0	13	589
Openings, ft.	14.61	2,607	2,639	2,852	3,516

[1] After $7039 interest.

See also Appendix, page 355

CHAMPION COPPER COMPANY

HOUGHTON, MICH., U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Pounds, copper	12,080,594	17,225,508	15,639,426	19,224,174
Income:				
Gross receipts	$1,802,530	$2,785,411	$1,962,729	$2,450,366
Expenses at mines	1,047,524	1,304,043	1,280,156	1,269,249
Smelting, frt., mkt., and sell	121,548	167,549	138,881	168,638
Total	$1,169,072	$1,471,592	$1,419,037	$1,437,887
Taxes and interest	128,691	62,199	89,103	73,273
Net profit	$504,767	$1,251,619	$454,588	$939,205
Mine and mill:				
Tons hoisted	437,797	804,994	787,416	778,702
Tons stamped	421,849	765,306	734,392	722,051
Per cent. waste hoisted	3.6	4.9	6.7	7.2
Mineral produced, pounds	19,251,470	28,460,500	26,137,007	30,508,690
Yield rock pounds	28.64	22.510	21.296	26.62
Per cent. rock	1.432	1.1254	1.0648	1.331
Price received, copper, cents	14.89	16.16	12.54	12.74
Cost per ton stamped (calculated):				
Mining	$1.62	$1.244	$1.28	$1.35
Milling	.28	.202	.23	.215
Transportation	.14	.137	.137	.138
General expenses	.47	.141	.115	.071
Less rents received	.03	.019	.020	.019
Total working cost	$2.48	$1.704	$1.743	$1.758
Smelt., frt., mkt. and general	.29	.22	.19	.234
Total	$2.77	1.924	1.933	1.992
Taxes	.30	.081	.121	.101
Total, including taxes	$3.07	$2.005	$2.054	$2.093
Cost of min., trans., and stamp per ton treated	.....	$1.62	$1.68	$1.74
Cost min., etc., per ton incl. tax and ext. exp	.....	$1.79	$1.86	$1.86
Cost per pound (cents):				
Mining expense	7.01	7.22	7.87	6.53
Construction	1.65	.35	.32	.07
Taxes	1.05	.39	.58	.38
Smelting, freighting and selling	1.00	.92	.86	.87
Total	10.71	8.88	9.63	7.85
Development:				
Total shaft sinking, ft	263	429	686	912
Total drifting, ft	4778	9,343	9,746	12,262
Total cross-cutting, ft	83	1,209	1,334	1,145

See also Appendix, page 356

COPPER RANGE CONSOLIDATED CO.

HOUGHTON, MICHIGAN, U. S. A.

Company owns one-half Champion, all of Baltic and all of Trimountain.

Year Ended Dec. 31	1913	1912	1911	1910
Production and profit:				
Copper production, pounds	18,767,359	28,967,428	29,310,579	32,856,692
Total profit Baltic	$230,212	$697,394	$530,215	$767,939
Total profit Champion	252,383	625,809	227,294	469,602
Total profit Trimountain	113,363	308,472	60,370	32,250
Grand total profit	$595,958	$1,631,676	$817,879	$1,269,791
Mines:				
Production Baltic copper, pounds	7,736,124	13,373,961	15,370,449	17,549,762
Production Champion copper, pounds	6,040,297	8,612,754	7,819,713	9,612,062
Production Trimountain copper, pounds	4,990,938	6,980,713	6,120,417	5,694,868
Average yield all mines copper	25.24	21.07	20.87	23.32
Cost per pound, cents	11.71	10.51	9.74	8.78

CONSOLIDATED STATEMENT OF COPPER RANGE (ALL THREE COMPANIES)

	1913	1912	1911	1910
Production and profit:				
Production copper, pounds	24,852,026	37,584,647	37,130,292	42,468,754
Income	$3,707,091	$6,071,095	$4,655,647	$5,413,845
Min. exp., smelt., frt., mkt	2,652,580	3,648,730	3,447,099	3,490,741
Taxes	201,233	164,157	163,373	179,209
Income from mining	$853,278	$2,258,207	$1,045,174	$1,743,894
Net from C.R.R.R.	17,046	103,775	53,531	75,176
Total income	$836,232	$2,361,982	$1,098,705	$1,819,062
General expense and ½ Champion	345,699	709,801	294,145	518,204
Net income	$490,533	$1,692,566[1]	$804,561	$1,300,857
Mine:				
Tons stamped	984,287	1,784,402	1,779,072	1,820,769
Yield, pounds	25.24	21.07	20.87	23.32
Price copper, cents	14.89	16.16	12.54	12.74

[1] After profit $40,385 from Atlantic Mining Co.

Remarks.—The Copper Range Consolidated Company owns the stock of the Baltic Mining Co., all the stock of the Trimountain Mining Co., and one-half the stock of the Champion Copper Company. The company also owns and operates the Copper Range R.R. During the year 1912 the Atlantic Mining Co. was acquired and earned $40,385 mostly from operations of its stamp mill. The Champion, Baltic and Trimountain mines all operate on the Baltic lode. These are contiguous. For detailed costs see data on the separate companies.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

THE ISLE ROYALE COPPER CO. OF N. J.

HOUGHTON, MICHIGAN, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Copper	4,158,548	8,186,957	7,490,120	7,567 399
Income:				
Gr. val. cop	$635,068	$1,357,510	$949,029	$957,017
Gr. val. sil	14,878	$38,126	$20,336	$23,216
Total	$649,946	$1,395,636	$969,365	$980,233
Total expenditures	$778,259	965,591	790,825	869,868
Oper. profit	($128,313) (loss)	$430,045	$178,540	$110,364
Mine and mill:				
Rock broken, tons	.....	.....	564,410	610,080
Rock discarded, per cent	.....	.....	19	14.6
Rock hoisted, tons	371,774	622,485	562,890	608,230
Per cent. discarded	15.4	14.7	18.7	14.3
Rock stamped, tons	314,679	531,105	457,440	520,860
Lbs. mineral production	5,887,000	11,461,410	10,339,171	10,433,060
Per cent. ref. copper in mineral.	70.64	71.43	72.44	72.53
Lbs. refined copper per ton, per cent.	13.2	15.4	16.4	14.5
Price rec'd for cop., cents	15.27	16.6	12.67	12.65
Cost per pound:				
At mine,	16.07	10.01	8.97	9.75
Construction,	.73	.20	.25	.16
Exploratory & equip. shaft "A"	.28	.20	.07	.33
Unwatering old workings	.10	.08	.06	.....
Smelt., freight, commission, etc.	1.53	1.31	1.21	1.26
Interest paid	.10	.09	.29	.34
Total cost, cents	18.81	11.89	10.85	11.84
Cost per ton stamped (calculated):				
Tot. min. trans., stamp and taxes.	$2.12	$1.54	$1.47	$1.42
Smelt., frt., comm., eastern office.	.203	.20	.20	.18
Construction	.13	.03	.04	.02
Exploration and equipment	.013[1]	.01	.02	.05
Total	$2.47	$1.78	$1.73	$1.67
General:				
Shaft sinking, feet	.....	941	897	511
Driftg. and cross-cutting	.....	19,106	15,366	15,919
Depth, feet	.....	3,162	3,162	.....

[1] Includes unwatering Huron Mine.

See also Appendix, page 356

LAKE COPPER COMPANY

Lake Mine, Ontonagon County, Michigan, U. S. A.

Year Ended Apr. 30	1913
Production:	
Copper, refined, pounds	1,300,562
Income:	
Gross value production	$219,442
Total receipts	$224,156
Expenses	236,588
Operating loss	$12,432
County taxes	18,439
	$30,871
New construction	21,570
Total excess expenses over receipts	$52,441
Mine and mill:	
Tons rock stamped, tons	83,109
Mineral produced, pounds	1,982,080
Mass produced, pounds	171,048
Total mineral and mass, pounds	2,153,128
Pounds mineral, per ton, rock stamped	25.907
Copper, per ton, stamped, per cent	60.382
Pounds copper, per ton, stamped	15.64
Average price per pound	16.87¢
Cost per ton (calculated):	
Mining	$2.52
Smelting, freight, marketing and general	.32
Taxes	.22
Total	$3.06
Cost per pound:	
Not including construction	19.5¢
Development, feet	5439

See also Appendix, page 356

MOHAWK MINING COMPANY

CALUMET, MICHIGAN, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Copper, pounds	5,778,235	11,995,598	12,091,056	11,412,066
Income:				
Gross recpts	$887,618	$1,929,428	$1,527,107	1,493,817
Exp. at mines	601,890	1,159,851	1,128,333	1,149,883
Smelt., ref., mkt. and all exp.	67,263	104,326	97,989	101,482
Total expenses	$669,154	$1,264,177	$1,226,322	$1,251,365
Construction	94,625[1]	8,815	31,279	54,368
Net profit	$123,839	$656,435	$269,506	$188,083
Mine and mill:				
Tons hoisted	395,100	868,641	902,859	906,243
Tons discarded	28,642	80,700	100,311	103,886
Tons stamped	366,458	787,941	802,548	802,537
Prod. mineral, lb	8,018,000	15,901,500	15,760,700	15,013,500
Per cent. cop. in mineral	72.06	75.44	76.71	76.01
Pounds cop. per ton	15.76	15.22	15.07	14.22
Per cent. rock discard	7.2	9.29	11.11	11.46
Price rec'd. for copper	15.36¢	16.08¢	12.63¢	13.09¢
Cost per ton (calculated):*				
Mining	$1.01	$.959	$.92	$.945
Transportation	.12	.121	.121	.119
Rock house	.08	.086	.075	.08
Milling	.29	.222	.219	.204
General	.13	.082	.074	.083
Total per ton stamped	$1.64	$1.47	$1.406	$1.433
Total per ton hoisted	$1.53	$1.34	$1.294	$1.267
Total stamp. incl. smelt	.....	$1.60	$1.53	$1.56
Cost per pound:				
At mine	10.42	9.67¢	9.33¢	10.076¢
Smelting, etc	1.16	.87	.81	.889
Construction	1.64[1]	.07	.259	.476
Total	13.22¢	10.61¢	10.399¢	11.441¢
Miscellaneous:				
Development, feet	5,736	15,402	15,458	14,978
Stoping, fathoms	.....	48,887	49,249	52,401
Yield cop. per ton hoisted, lb.	14.62	13.81	13.39	12.59

* Does not incl. construction smelting or freight. [1] Of this $27,653 was strike expense.

Remarks.—The main development is confined to the Kearsarge Lode. The property is opened by six shafts all inclined following the lode from the surface. The vein varies from 15 to 18 ft. in width and dips about 42 deg. The deepest shaft is approx. 2200 ft. All shafts are connected by drifts. The method of mining is overhead stoping. The copper occurs in the native state in the amygdaloid. Rock is treated at the Mohawk mill, composed of four heads—800 tons. The mills located at Gay Michigan, 9 miles from the mine. Concentrates are treated at the Michigan Smelting Co., 25 miles from the mill. Mine, mill and smelter are connected by rail.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

THE MASS CONSOLIDATED MINING CO.

MASS, MICHIGAN, U. S. A.

Year Ended Dec. 31	1912	1911
Production:		
Copper, pounds	2,045,006	1,326,898
Income:		
Total income	$349,354	$169,590
Expenses	$335,673	253,503
Balance working profit	$13,681	$83,913[1]
Mine and mill:		
Rock hoisted, tons	180,613	99,362
Rock stamped, tons	132,891	73,475
Mineral produced, pounds	2,985,335	1,949,720
Refined copper produced, pounds	2,045,006	1,326,898
Percentage of mineral in rock	1.123	1.292
Percentage of copper in mineral	68.502	68.055
Pounds refined copper per ton, rock stamped	15.39	17.58
Cost per ton stamped (calculated):		
Mining and developing	$1.35	$1.85[2]
Surface	.30	.41
Stamp mill	.35	.47
Freight on rock and mineral	.175	.18
Office and general expense	.028	.15
Insurance	.028	.04
Taxes	.06	.08
Smelting, brokerage, freight on copper	.145	.16
Interest		.04
General eastern expense	.084	.05
Total approximate working cost	$2.520	$3.43
Cost per pound, cents	16.35	19.5
Expended on mine construction	$21,100	$25,551
Expended on mill construction	$10,647	
(These are not included in above costs.)		
Development, feet	4,892	7,166
Price received, copper, cents	17.0205	12.76

[1] Working loss includes remodelling shafts and rock house, also heavy underground development. [2] Mining cost alone was $1.18.

See also Appendix, page 357

OSCEOLA CONSOLIDATED MINING CO.

CALUMET, MICHIGAN, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Copper, pounds	11,325.010	18,413,387	18,388,193	19,346,566
Income:				
Gross value	$1,774.810	$3,071,818	$2,371,373	$2,514,583
Total expenditures	1,392.843	$1,908,530	$1,706,745	$1,813,279
Miscellaneous income				57,281
Net profit	$381,967	$1,163,288	$664,628	$758,586
Mine and mill:				
Rock broken	752,428 (1)	1,271,408(1)	1,276,790	1,262,168
Per cent. discarded	2.310 (1)	1.955(1)	2.365	3.522
Tons stamped	735,044	1,246,557	1,246,596	1,217,720
Lb. mineral	14,945,645	24,282,312	24,452,912	25,669,913
Lb. copper in mineral	11,325,010	18,413,387	18,388,193	19,346,566
Per cent. copper in mineral	75.775	75.83	75.198	75.367
Lb. per ton stamped	15.4	14.8	14.8	15.9
Cost per pound:				
At mine, excluding const.	10.39	8.34	7.73	8.04
Construction	.77	0.95	0.49	.35
Smelting, freight, com	1.14	1.07	1.06	.98
Total cost per pound, cents	12.30	10.36	9.28	9.37
Cost per ton treated (calculated):				
Ming., trans., stamp and taxes.	$1.60	$1.23	$1.14	$1.28
Construction	.12	.14	.073	.055
Smelting, frt., com. and eastern office.	.18	.16	.157	.156
Total	$1.90	$1.53	$1.37	$1.491
Price copper sold, cents	15.48	16.52	12.79	13.00

[1] For 1912 and 1913 the figures are for rock hoisted.

OSCEOLA BRANCH

	1913	1912
Rock treated, tons	177,908	115,564
Cost per ton	$1.97	$1.65
Copper produced, pounds	1,952,010	1,479,642
Copper per ton of rock, pound	10.97	12.80
Cost per pound copper, excluding mill construction	20.79¢	14.55¢

NORTH KEARSARGE BRANCH

	1913	1912
Rock treated, tons	300,903	672,248
Cost per ton	$1.59	$1.25
Copper produced, pound	4,369,000	8,611,720
Copper per ton of rock, pound	14.52	12.81
Cost per pound copper, excluding mill construction	12.46¢	11.44¢

SOUTH KEARSARGE BRANCH

	1913	1912
Rock treated, tons	256,233	458,745
Cost per ton	$1.36	$1.04
Copper produced, pound	5,004,000	8,322,025
Copper per ton of rock, pound	19.53	18.15
Cost per pound copper, excluding mill construction	8.11¢	6.79¢

OSCEOLA CONSOLIDATED

Remarks.—Company owns four mines, *i.e.*, Osceola, North Kearsarge, South Kearsarge and Tamarack Junior. Maximum depth developed 4623 ft. The Osceola property is opened by six shafts, 2 in use. A very small proportion of rock is rejected. In 1912, despite increase in wages of 10 per cent., the cost per ton for seven months was 11 cents less than in 1909 when last operated. Electric power is used for pumping and crushing and in the shops.

The North Kearsarge lode averages about 12 ft. in width. Copper values are bunchy, but average is fair. Deepest shaft 3873 ft.

The South Kearsarge property has two main shafts, deepest is 2820 ft. Workings have practically reached the boundary.

Tamarack Junior mine developed by two vertical shafts, deepest being 3360 ft. This property is not worked.

In 1912, after two years' experience with various types of drills, the Leyner-Ingersoll drill was adopted, and these machines are being introduced as fast as possible. The results are an increase in the wages of the miners and a decrease in the cost of drifting and stoping.

The Osceola operates its own mill located at Torch Lake. Plant is equipped with seven Nordberg compound stamps.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

QUINCY MINING COMPANY

CALUMET, MICHIGAN, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Pounds refined copper	12,184,128	20,634,800	22,252,943	22,517,014
Income:				
Income from copper	$1,900,365	$3,351,359	$2,831,799	$2,974,086
Profit on silver	20,832	30,227	23,005	.....
Total income	$1,921,198	$3,381,587	$2,854,804	$2,974,086
Expenses	1,663,358	2,291,913	2,258,486	2,248,215
Mining profit	$257,840	$1,089,673	$596,319	$725,871
Int. recpt. real estate	18,929	15,245	17,859	28,732
Total	$276,769	$1,104,918	$614,178	$754,603
Construction	172,774	110,049	106,581	111,910
Business profit	$76,160[1]	$960,778[1]	$507,596	$642,693
Tonnage:				
Sent to mill	804,645	1,309,253	.....	.....
Stamped	.....	.....	1,382,524	.....
Hoisted	.....	.....	.....	1,373,124
Pounds refined copper per ton	15.11	15.8	16.1	16.4
Pounds mineral produced	18,161,575	30,040,360	32,550,440	34,177,380
Price received for copper	.....	16.24¢	12.725¢	.....
Cost per ton for tons given (calculated):				
Mining expense	$1.462	$1.358	$1.292	$1.276
Opening mine expense	.143	.204	.161	.159
Smelting, transportation, etc.	.189	.139	.143	.153
Taxes	.099	.048	.036	.042
Construction	.21	.0848	.077	.082
Strike exp.	.173	.....	.....	.....
Total	$2.28	$1.833	$1.709	$1.712
Cost per pound (approximate):				
Mining	9.67¢	8.62¢	8.03¢	7.85¢
Opening mine	.95	1.29	1.03	.975
Smelting, transportation, etc.	1.25	.88	.89	.985
Taxes	.65	.30	.22	.25
Strike	1.14	.....	.....	.....
Total cost	13.69¢	11.09¢	10.17¢	9.98¢
Cost including construction	15.08¢	11.6	10.62¢	10.47¢

[1] After accident account.

See also Appendix, page 357

SUPERIOR COPPER COMPANY

HOUGHTON, MICHIGAN, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Copper, lbs	2,992,765	3,921,974	3,236,233	3,181,041
Income:				
Gross value	$458,498	$646,771	$411,267	.....
Miscl. receipts	20,478	26,261	19,617	.....
Total income	$478,977	$673,032	$430,884	.....
Total expend	380,788	490,559	482,873	.....
Oper. profit	$98,189	$182,472	$51,989	.....
			loss	.....
Net after int	$93,912	$172,873	$64,516	.....
			loss	.....
Mine and mill:				
Tons stamped	130,826	172,322	162,599	140,514
Lb. per ton stamped	22.87	22.76	19.90	22.64
Cost per pound:				
At mine	10.31¢	10.23	12.01	11.88
Construction	.39	.31	.89	.29
Smelt, freight and commission	2.02	1.97	2.02	1.83
Interest paid	.14	.24	.39	.29
Total cost per pound, cents	12.86	12.75	15.31	14.29
Cost per ton treated (calculated):				
Expenses at mine	$2.358	$2.33	$2.39	$2.69
Smelting, freight, etc	.462	.45	.41	.....
Constr. at mine	.089	.07	.17	.....
Total	$2.909	$2.85	$2.97	
General:				
Price recd. for copper, cents	15.387	16.45	12.70	12.63
Depth shaft No. 1, feet	.....	2,014	1,763	.....
Depth shaft No. 2, feet	.....	1,341	1,210	.....
Total sinking, feet	.....	.....	532	.....
Total drifting and crosscutting, feet.	6,127	15,428	8,052	.....

See also Appendix, page 358

TAMARACK MINING COMPANY OF MICHIGAN

CALUMET, MICHIGAN, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Product pounds copper	4,168,743	7,908,745	7,494,077	11,063,606
Income:				
Received from copper	$642,713	$1,300,238	$957,111	$1,431,298
Miscellaneous income	853	.....	$805	$3,737
Total	$643,566	$1,300,238	$967,916	$1,435,035
Total expenditures	693,490	1,028,613	$1,151,115	$1,607,282
Net operating profit	$49,924 loss	$271,625	$193,198 loss	$172,246 loss
Mine and mill:				
Rock broken	.....	.....	478,674	674,380
Rock discarded, per cent	.....	.....	18	22.1
Rock hoisted, tons	230,677	428,568	422,081	571,393
Per cent. of discard	1.3	1.7	7.0	8.0
Tons stamped	227,563	421,385	392,338	525,554
Pounds mineral	6,206,295	12,118,038	12,793,430	22,053,840
Ref. copper per ton rock stamp	18.3	18.8	19.1	21.1
Price copper per pound, cents	.....	16.44 approx.	12.77	12.93
Cost per pound, cents:				
At mine, expense, construction	15.35	11.90	14.07	12.66
Cost construction	.00	.00	.06	.57
Smelt., frt., comm., eastern office	1.25	1.11	1.23	1.30
Interest paid	.00	.14	.20	.17
Total costs, cents	16.60	13.15	15.56	14.70
Cost per ton treated (calculated):				
Mining, trans., taxes and stamp. per ton.	$2.81	$2.23	$2.69	$2.67
Smelt., frt., comm., eastern office	.23	.21	.23	.27
New construction	.00	.00	.01	.12
Total	$3.04	$2.44	$2.94	$3.06
Development, feet	1,113	2,646	8,912	5,501

See also Appendix, page 358

TRIMOUNTAIN MINING COMPANY

HOUGHTON, MICH., U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Pounds, copper	4,990,938	6,980,713	6,120,417	5,694,868
Income:				
Gross receipts	$746,529	$1,132,718	$768,595	$728,206
Expenses at mine	552,767	713,546	632,848	602,389
Smelting, frt., mkt., sell.	56,154	70,018	61,661	59,069
Total	$608,922	$783,564	$694,509	$661,459
Taxes and interest	24,244	40,681	13,715	34,496
Net profit	$113,363	$308,472	$60,370	$32,250
Mine and mill:				
Tons hoisted	240,386	403,089	392,832	365,521
Tons stamped	229,149	366,663	347,885	317,299
Per cent. waste hoisted	11.237	9.0	11.4	13.2
Mineral production, pounds	8,546,070	12,417,575	10,705,685	9,598,900
Yield rock, pounds	21.78	19.04	17.59	17.95
Per cent. rock	1.089	.952	.88	.90
Price received, copper, cents	14.89	16.16	12.54	12.74
Cost per ton stamped (calculated):				
Mining	$1.63	$1.42	$1.385	$1.495
Transportation	.13	.112	.112	.1135
Milling	.27	.187	.173	.177
General expenses	.42	.251	.175	.1435
Less rents received	.04	.0235	.0284	.0326
Total working costs	$2.41	$1.946	$1.8191	$1.89
Smelt., frt., mkt. and general	.24	.190	.177	.186
Total cost	$2.65	$2.136	$1.9961	$2.076
Taxes	.10	.110	.0394	.108
Total including taxes	$2.75	$2.246	$2.0355	$2.184
Cost of min. trans. and stamp per ton treated.	.....	$1.77	$1.72	$1.85
Cost of min., etc., incl. taxes	.....	$2.06	$1.86	$2.00
Cost per pound (cents, calculated):				
Mining	9.1	9.32	9.79	10.29
Construction	1.9	.90	.55	.29
Taxes	.5	.59	.23	.61
Smelt., frt., sell., and general	1.1	.92	.98	.98
Total	12.62	11.73	11.55	12.17
Development:				
Total shaft sinking, feet	343	263	525	872
Total drifting, feet	4,468	7,746	7,842	8,728
Total cross-cutting, feet	272	401	344	752

[1] Deficit.

See also Appendix, page 359

VICTORIA COPPER MINING COMPANY

VICTORIA, MICHIGAN, U. S. A.

Year Ended Dec. 31	1912	1911
Production:		
Copper, pounds	1,224,911	1,303,331
Income:		
Gross income, copper	$202,169	$164,624
Miscellaneous earnings	11,597	8,384
Total	$213,766	$173,008
Expenditures	213,338	170,808
Mining profit	$428	$2,200
Balance receipts over expenditures	$36,420[1]	$62,349
Mine and Mill:		
Amount ground, stoped tons	6,448	5,437
Rock hoisted, tons	152,666	145,764
Rock discarded, tons	20,711	18,870
Rock stamped, tons	131,955	126,894
Mineral products, pounds	2,033,509	2,128,245
Pounds copper recovered per ton	9.3	10.2
Cost per ton stamped (calculated):		
Working expense at mine	$1.44	$1.16
Smelting, freight, marketing and office	.17	.19
Total working cost	$1.61	$1.35
Cost per pound, cents	17.3	13.2
Development, foot	4,870	3,676

[1] Expenditures over receipts.

Remarks.—Conditions at the Victoria property are much the same as at the other Michigan Copper mines, situated at Houghton or Calumet. The copper occurs as native. Property is developed to twenty-third level.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

WOLVERINE MINING COMPANY

CALUMET, MICHIGAN, U. S. A.

Year Ended June 30	1913	1912	1911	1910
Production:				
Pounds refined copper	8,350,312	9,408,960	9,617,168	9,757,101
Gross receipts	$1,326,500	$1,327,030	$1,209,747	$1,294,199
Total expenses	724,986	713,850	723,123	720,394
Mining profit	$601,514	$613,180	$487,896	$573,805
Construction			2,191	2,939
Net profit	$601,514	$613,180	$485,705	$570,866
Tons hoisted	403,514	414,544	400,296	405,790
Per cent. discard	3.7	3.19	2.95	
Tons stamped	388,502	401,308	388,476	390,837
Per cent. copper in min	77.44	77.35	78.65	
Prod. mineral, pounds	10,782,405	12,164,780	12,227,500	12,359,000
Yield per ton, pounds	21.49	23.45	24.75	24.96
Per cent. copper yield	1.074	1.172	1.237	1.248
Price rec'd for copper	15.89¢	14.10¢	12.58¢	13.24¢
Cost per ton stamped (calculated):				
Mining	$.995	$.956	$.998	$.940
Rock house	.050	.049	.053	.058
Stamp mill	.400	.404	.397	.389
General	.170	.171	.193	.223
Cost per ton stamped	$1.62	$1.58	$1.64	$1.61
Cost per ton hoisted	$1.53	$1.53	$1.59	$1.55
Cost per pound:				
At mine	7.550¢	6.750¢	6.628¢	6.453¢
Freight, smelt., etc	1.115	.836	.891	.93
Cost exlucs. constr			7.519	7.383
Total cost	8.665¢	7.586¢	7.542¢	7.413¢
Yield cop. per ton hoisted, lbs.		22.70	24.02	24.04

Development:	Ft.	Cost	Ft.	Cost	Ft.	Cost	Ft.	Cost
Sinking	386	$16.67	541	$15.34	435	$17.15	191	$18.52
Drifting	3,894	6.21	4,293	$6.12	4,638	5.92	4,949	5.99
Stoping per fathom	25,097	7.83	25,845	$8.15	26,140	8.06	25,439	8.33

See also Appendix, page 360

MONTANA

BRIEF DESCRIPTION OF THE BUTTE CAMP

Butte is the greatest copper-producing camp in the world. In normal years it turns out annually one-seventh of the world's total copper output. Mining was begun in the district in the early 60's. The camp was worked first for its gold placer deposits. This was followed by silver mining. In 1882 rich copper ores were encountered at a depth of a few hundred feet, and from that date on the camp became an active producer of the metal. To the close of 1912 it had turned out approximately 6,000,000,000 lbs. of copper, while its silver production had exceeded 250,000,000 oz.

The Butte veins, which are of the fissure vein type, occur in granite. The principal rock is a quartz-monzonite called the "Butte granite." This rock is cut by aplite dikes. Quartz-porphyry dikes are also closely associated with the veins. Separate periods of fissuring took place. The oldest veins run in an easterly and westerly direction. These are the principal lodes of the camp. Another series striking northwest and southeast have displaced the earlier lodes, while a third series in a northeasterly and southwesterly direction displaced the two earlier systems. The veins show great persistence in depth. The ore-bodies vary from a few feet up to 400 ft. in width (stock-work) and probably average from 10 to 30 ft. The ore-bodies are often continuous for over 1000 ft. in length. The principal copper ores found at Butte are chalcocite, enargite, bornite, chalcopyrite and covellite. In many of the veins, solid chalcocite or enargite occur over considerable widths. Chalcocite is now being encountered in the deepest levels of the camp. This ore, which is believed to be primary, is dense solid glance and differs from the soft chalcocite found in the secondary enrichment zone above.

The Butte copper deposits are developed by a large number of vertical shafts. The maximum depth thus far obtained is 3200 ft. at the High Ore shaft of the Anaconda Company. A great number of shafts are between 2500 and 2800 ft. deep. The new Anaconda Company operates 22 shafts and over 13,000 tons of copper ore are hoisted daily. The total underground development of this company aggregates 1800 miles and approximately 34 miles of new work is done annually underground.

The method of mining generally employed in the Butte camp is square-setting. This expensive method contributes to the high cost of mining.

Also, the walls of the veins are soft and the ground is heavy, requiring constant timbering. Rock-filling is always used in the stopes. This is obtained from the exploring drifts and shafts. As a result of the heavy ground, laterals are driven parallel to the vein and crosscuts run to the lodes. This makes for high development expense. Montana pine and fir are used in timbering at a cost of $14 per thousand ft. After breaking the ore, a separation is made in the stopes into a smelting grade of 5 per cent. and over, and a concentrating grade of from 2½ per cent. to 3½ per cent. copper per ton. Of the total Butte ore treated, approximately 10 per cent. is first-class and 90 per cent. second-class.

Great improvements have been made in recent years in efficiency of operation, particularly by the Anaconda Company. Among these may be mentioned: Supplanting steam hoisting by compressed-air hoisting in centrally located shafts, the compressed air generated from electricity transmitted from hydro-electric plants; electric haulage underground; pumping by electricity; ventilation of the mines by fans and blowers electrically driven, thus applying cool and fresh air to the deep workings. In 1913 the Butte, Anaconda & Pacific Railway, connecting the Butte camp with the Washoe Reduction Works at Anaconda, was electrified.

The labor cost at Butte is high, the men being paid $3.50 per day. An agreement, however, exists between the Anaconda Company and the men that when the price of electrolytic copper is 15 cents and over, and under 17 cents per pound, the wages of all men employed underground shall be increased 25 cents above the minimum wage of $3.50 per day, and an additional 25 cents if copper is over 17 cents per pound.

The Reduction Works, the Washoe and Great Falls plants, are located respectively at Anaconda and Great Falls, the former 26 miles and the latter 172 miles from Butte. The Butte, Anaconda & Pacific Railway connects the mines with the Washoe plant, and the Great Northern Railway, extends from Butte to the Great Falls plant. Both of these reduction works are equipped with concentrators and smelting departments. The mill at Washoe, which is the larger plant, has a capacity of 12,000 tons per day. The method of treatment is direct-smelting for the high-grade ores, and concentration for the low-grade ores, with the smelting of concentrates in reverberatory furnaces and converting to blister copper. This is sent to the Atlantic seaboard for refining.

The saving effected in concentration on the average milling ore is approximately 78 per cent. The ratio of concentration is roughly 3½ tons into one. The smelting departments are equipped with both reverberatory and blast furnaces.

ANACONDA COPPER MINING COMPANY

(Amalgamated Copper Company)

BUTTE, MONTANA, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production (Anaconda and Great Falls Smelters):[1]				
Copper, pounds	270,301,644[2]	294,474,161	259,407,093	266,608,461
Silver, ounces	10,321,296	11,014,737	9,731,561	9,534,888
Gold, ounces	64,898	61,314	48,949	57,259
Income:				
Income, metal sales	$45,281,877	$52,275,260	$38,525,289	$32,277,063
Other income	1,121,766	703,251	628,681	711,114
Total income	46,403,643	52,978,511	39,153,970	32,988,177
Expenses	35,080,145	37,122,177	31,110,251	27,267,275
Profit	$11,323,498	$15,856,334	$8,043,719	$5,720,902
Mines (Anaconda):				
Tons mined	4,644,201	4,576,289	3,844,070	3,326,227
Tons precipitates	7,243	3,667	4,602	4,413
Total tons	4,651,444	4,579,956	3,848,672	3,330,640
Reduction works (tons):				
Treated dry company and custom	5,186,839	5,069,224	4,255,813	4,337,688
From company's mines	4,566,450	4,486,873	3,756,235	3,253,345
From custom ores	619,894	581,032	499,077	385,200
Precipitates	524	1,337	501	129
Slimes	.....	.....	.....	13,688
Cost per ton (approximations):[3]				
Mining incl. dev. per ton wet	$3.98	$3.69	$3.77	$3.80
Trans. mines to reduct. plant wet	.31	.30	.32	.28
Reduction expense per ton dry	1.68	1.75	1.82	1.66
Frt. refining and sell. per ton dry	.67	.74	.81	.69
Adm. ex. corp. and taxes per ton dry	.05	.08	.07	.07
Dep. mines, plants and smelter	.14	.20	.....	.....
Total cost	$6.83	$6.76	$6.80	$6.50
Ore purchased and transportion exp.	.38	.95	.85	.69
	$7.21	$7.71	$7.65	$7.19
Average price copper for year, *E. and M. Journal.*	15.26¢	16.3¢	12.376¢	12.738¢
Average price, silver	59.8¢	60.835¢	53.304¢	53.486¢
Development during year, miles	35.3	34.1	30.7	33.1
Total shaft sinking, feet	3,841	4,736	3,711	3,765

[1] Produced by company 241,983,323 lbs. [2] Includes custom ore. [3] These are merely rough approximations calculated from data given.

Cost Per Pound.—It is impossible to give the actual cost of producing copper per pound. An approximate cost per pound can be obtained by getting the pounds copper recovered per ton and calculating from the cost per ton assuming credits from silver and gold production. The reports do not give the average price obtained for copper.

OPERATIONS FOR YEAR ENDING JUNE 1

Year Ended June 1	1913	1912	1911
Production:			
Gross yield	$43,130,733	$38,277,753	$32,767,642
Total expenditures	31,683,832	27,752,023	27,670,211
Net proceeds	$11,446,901	$10,525,729	$5,097,432
Mine:			
Tons of ore mined	4,531,640	4,319,994	3,711,671
Yield per ton	$9.517	$8.86	$8.82
Costs per ton mined:			
Mining	$4.035	$3.70	$4.11
Reduction	1.875	1.67	2.13
Freight	.300	.31	.32
Marketing, refining and selling	.779	.74	.89
	$6.989	$6.41	$7.35
Paid for labor	$15,059,333	$13,440,836	$12,521,947
Paid for machinery and supplies	11,722,963	9,809,629	10,628,455
Freight	1,369,843	1,332,464	1,196,940
Marketing, refining and selling	3,531,692	3,168,993	3,322,867

Note.—It is exceedingly difficult to obtain cost data on the Amalgamated-Anaconda properties, as it is against the policy of the management to make same public. It has been necessary to compute all figures on costs, and as the data from which these computations have been made, were limited and not of such a nature as to permit of giving exact results, the figures on "costs per ton" should be regarded as merely rough approximations.

AMALGAMATED-ANACONDA PROPERTIES

In 1910 the Anaconda Company absorbed the various Butte mining companies controlled by the Amalgamated Copper Co. The following companies were taken over:

Boston & Montana Consolidated Copper & Silver Co. Butte & Boston Consolidated Mining Co. The Red Metal Mining Co. (Butte Coalition). Washoe Copper Co. Trenton Mining & Development Co. Parrot Silver & Copper Co. Alice Gold & Silver Mining Co. Diamond Coal & Coke Co. Big Blackfoot Lumber Co.

Since the merging of the Butte companies, no reports have been issued on the respective properties.

Remarks.—The Anaconda Company at the time of the merger was one of the largest copper producers in the world, the production then being obtained from one mine only. For general operating conditions, see "Brief Description of Butte Camp."

DAVIS DALY COPPER COMPANY

BUTTE, MONTANA, U. S. A.

Period Ended June 30	1913	1912
Expenditures:		
Development and mining expenses	$279,855	$199,029
General expenses	17,568	41,638
Total	$297,423	$240,667
Receipts:		
Ore sales, etc	$191,942	$106,299
Interest		7,029
Total	$200,080	$113,329
Excess expenditures	$97,343	$127,338
		10 months
Net returns		$114,789
Tons treated	33,353	16,803
Cost per ton (approx.):		
Mining		$3.64
Development		2.44
Fixed		4.34
General		.25
	$8.67	$10.71
Net returns per ton	$5.73	$6.82

The following data is given on shipments. The period in question was from May 1 to Dec. 1, 1909.

Tons shipped	15,698
Weight, pounds	30,613,998
Silver, ounces per ton	5.24
Returns	$93,910
Net returns	$44,819
Tons treated, dry	15,306
Per cent. copper, per ton	2.78
Ounces, gold per ton	.0076
Treatment and freight	$49,061

Remarks.—The Davis Daly mine is developed to a depth of 1900 ft. Ore-bodies vary from 3 to 20 ft. wide. Company formerly sent ore to its own concentrator. The above returns are shipments sent to the Washoe Reduction Plant. The Davis Daly is still a development proposition. The figures given are of interest more as showing the value of the ore when treated in a custom plant rather than what the mine should do when operating under normal conditions.

EAST BUTTE COPPER COMPANY

BUTTE, MONTANA

Year Ended	Dec. 31, 1913	Dec. 31, 1912	Mar. 31, 1912	Mar. 31, 1911
Production:				
Copper lbs	14,401,108	14,709,460	12,167,363	11,417,409
Ounces silver	506,897	370,675	396,524	432,218
Ounces gold	8,803	16,920	17,959	13,119
Income:				
Gross value shipped	$2,471,551	$2,841,204	$2,184,758	$1,904,514
Other income	174,016	314,271	.....	.....
Total income	2,645,568	$3,155,475	$2,184,758	$1,904,514
Costs and custom ore purchases	1,821,054	$1,821,059	$1,728,563	$1,635,863
Miscellaneous operations	60,057	54,678	.....	.....
Surplus on operations	$764,455	$1,279,737	$456,194	.....
Int. and equipment	232,,683	296,037	199,550	.....
Net surplus on operations	$531,772	$983,700	$256,643	$268,651
Mine:				
Tons mined wet	105,071	99,458	95,910	85,876
Average per cent. copper	5.16	5.78	5.62	5.51
Tons Co. ore treated dry	101,924	96,601	95,910	.....
Tons custom ore treated dry	84,891	85,173	47,135	.....
Total ore treated	186,815	181,774	143,045	.....
Cost per ton (treated):				
Mining, treatment, freight, sell. ref. and cost custom ore purchased.	$9.75	$10.01	$12.08	.....
Mining cost per ton, incl. devel.	$5.08[1]	$4.88	4.14	Not available
Milling cost (est.)	.....	.65	.....	.....
Cost per pound	11.04	9.698¢	9.46¢	9.91¢
Miscellaneous:				
Development	2710	7130 ft.	7865 ft.	4639 ft.
Of tonnage mined				
First-class tons	71,569	72,865	65,038	.....
Grade, per cent. copper	6.31	6.98	6.9	.....
Second-class tons	33,502	26,593	30,872	.....
Grade, per cent. copper	2.7	2.48	2.86	.....
Prices received metals:				
Copper	15.085	16.692¢	13.21¢	12.35¢
Silver	59.246	61.482¢	51.016¢	53.603¢
Gold	$20.00	$20.00	$20.00	$20.00

[1] Cost of mining as compared with other years was $4.75, the extra cost being for greater development.

See also Appendix page 360

NORTH BUTTE MINING CO.

BUTTE, MONTANA, U. S. A.

Year Ended Dec. 31	1913	1912	1911	1910
Production:				
Pounds copper	28,318,321	26,480,123	24,816,669	25,267,092
Ounces silver	1,602,163	1,377,468	1,134,300	988,190
Ounces gold	1,567	1,367	1,281	1,195
Income:				
Total receipts	$5,182,674	$5,120,321	$3,752,160	$3,790,991
Expenses	$3,744,896	3,449,603	$3,110,302	$3,230,103
Net profits	$1,437,777	$1,670,718	$641,858	$560,888
Mine:				
Dry tons treated	462,799	434,854	410,694	408,528
Of which first class ore was	26.8%	10.7%	6.6%	9.3%
Of which second class ore was	73.2%	89.3%	93.4%	90.7%
Aver. fine cop. per dry ton	.....	60.8 lb.	60.5 lb.	61.9 lb.
Price rec'd for copper	15.086¢	16.369¢	12.561¢	12.771¢
Credit Gold and Silver:				
Total expenses	$3,744,896	$3,449,603	$3,110,300	$3,179,151
Less value Au and Ag	980,823	893,569	634,850	562,515
	$2,764,073	$2,556,033	$2,475,450	$2,616,635
Cost per ton:				
Mining and development	$3.967	$4.2480	$3.7989	$3.7094
Freight on ore	.120	.1202	.1203	.1202
Smelting, refining, selling	3.903	3.4636	3.3614	3.6300
Construction	.....	.0486	.0177	.0154
Total mining cost	7.990	7.8804	7.2983	7.4750
General expense, including income and personal taxes.	.101	.0509	.1019	.0968
Total cost	$8.091	$7.9313	$7.4002	$7.5718
Cost per pound:				
Min. and dev	$.06484	$ .06977	$.06434	$.06164
Freight on ore	.00196	.00197	.00204	.00200
Conc., smelt., frt., ref. and sell	.06378	.05689	.05693	.06032
Construction	.....	.0008	.00029	.00025
Total mining cost	$.13058	.12943	.12360	.12421
Genl. disb., incl. inc. and personal taxes.	.00165	.00083	.00173	.00161
Total cost	.13223	.13026	.12533	.12582
Less value gold and silver	.03463	.03374	.02558	.02226
Total	$.09760	$.09652	$.09975	$.10356
Miscellaneous:				
Grade ore reserved copper, silver	.....	4.5%4.5oz	4.5%4.25oz	.....
Development, feet	19,449	18,140	17,700	.....

See also Appendix, page 361

TUOLUMNE COPPER MINING COMPANY

BUTTE, MONTANA, U. S. A.

Year Ended Dec. 31	1913	1912
Production:		
Copper pounds received after smelting deducted	1,880,514	.....
Silver, ounces	77,571	.....
Gold, ounces	140	.....
Gross value copper, gold and silver	.....	$739,196
Freight and smelter charges	.....	323,667
Net after freight and smelting	$200,217	$415,528
Interest	.....	3,139
Total	$200,217	$418,667
Expenses at mine	233,222	281,250
Net profit	$30,625 (Loss)	$137,417
Tons mined	34,276	46,683
Tons 1st class	930	14,011
Tons 2nd class	33,346	32,672
Total pounds copper	2,633,651	4,716,047
Total ounces silver	109,705	131,867
Average copper per cent. for year	3.84	5.05
Average silver ounces for year	3.2	2.83
Cost per ton at mine:		
Mining and development	$6.24[1]	$4.02
Timber, fuel, supplies, etc	.....	1.40
General expense	.42	.23
Equipment and construction	.14	.36
Total	$6.80	$6.01
Development, feet	3,913	3,354
Depth sunk, feet	412	205

[1] Including timber, fuel, supplies, etc.

Remarks.—This is one of the smaller and newer copper properties at Butte. Holdings consist of one fractional claim of 6 acres. Adjoins North Butte and is working the extension of the Jessie Vein in that property. Mine is developed to 2240 ft. Property said to contain three veins. General conditions are the same as North Butte. Ore, which is of two kinds, first and second class, is shipped to Anaconda and concentrated and smelted. This is one of the few copper properties at Butte not owned by the Anaconda.

BUTTE & SUPERIOR COPPER CO., LTD.

BUTTE, MONTANA, U. S. A.

Period, month of March:	1913
Tons ore treated	20,140
Per cent. zinc	20.9838
Tons concentrates	7071.89
Grade concentrates	46.067
Ratio concentration	2.848 into 1
Profit (approximate)	$60,000
Price spelter, pound	6¢
Value 46 per cent. concentrates per ton, Butte[1]	$31.40
Value 46 per cent. concentrates per ton, Bartlesville	$23.40
Costs per ton concentrate:	
Freight	$7.00
Allow moisture	1.00
	$8.00
Value per ton concentrates:	
Value per ton crude ore	8.21
Residues, Lead conc. } equal to $2 per ton of concentrates	.70
Total value	$8.91
Cost per ton:	
Mining	$2.907
Milling	2.880
Total	$5.933
Profit per ton	$2.98

The above costs are not representative of the property. The period given is one during the equipment stage, and with but one unit of the concentrator in commission.

Remarks.—Although situated in Butte, a copper camp, the Butte & Superior property is one of the country's largest zinc producers. Mine is developed by shaft to 1600-ft. level. Black Rock vein has been developed for entire length of claim disclosing practically continuous orebody varying from a few feet to over 100 ft. wide. The ore is sphalerite or zinc sulphide, carries high values in silver and low percentage iron, making it an unusually desirable product. Mine is equipped for minimum capacity of 1500 tons a day. Mill is 1200 tons nominal capacity. The entire plant may develop 1400 tons. Ore is concentrated, tables, classifiers and jigs being used. The tailings are re-ground and treated by flotation process. An extraction of 90 per cent. has been made. Concentrates are shipped to Bartlesville, Okla., for smelting.

[1] The company receives $28 for 50 per cent. concentrate at 5¢ spelter and $35 at 6¢ with a deduction of 90¢ a unit for each per cent. below 50.

For more recent operations, see Appendix, page 399

MISSOURI

CONTINENTAL ZINC COMPANY

JOPLIN, MO., U. S. A.

Production	1911	1910	1909	1908
Tons crude ore hoisted	173,000	152,164	108,728	83,603
Tons concentrates recovered	4,663	4,331	3,048	2,029
Cost per ton crude:				
Mining	$.604	.672	.802	.800
Milling	.221	.224	.258	.272
General expense	.050	.055	.055	.058
	$.875	$.951	$1.115	$1.130

These figures do not include amortization charge or royalty and merely represent operating and maintenance. The amortization charge would be about 15 cents per ton of crude ore hoisted. (Above data by L. D. Huntoon.)

The cost of mining distributed departmentally for the best years' operations are about as follows:

Drainage	3 ¢ per ton.
Drilling and breaking ground (including explosives)	34 ¢ per ton.
Shovelling and tramming	20 ¢ per ton.
Caging and hoisting	4 ¢ per ton.
Total mining	61 ¢ per ton.
Milling	21 ¢ per ton.
General expenses	5 ¢ per ton.
Total operating	87 ¢ per ton.
Amortization of mining and milling	7 ¢ per ton.
Total	94 ¢ per ton.

Character of Sheet Ground in the Joplin District.—There is no development work of any consequence necessary in this operation, as it consists of mining the sheet or blanket formation about 18 ft. thick at a depth of about 210 ft. below the surface with about 10 per cent. of the area and volume left in the shape of pillars to support the roof. Practically no timbering is required and the ramifications of the ore-body are very simple. The rock is very hard and is very difficult drilling ground, requiring lots of powder to break. The water pumped from the mine is strongly acid, making some additional cost for pumping and in milling operations. Outside of these two

disadvantages, however, there is very little that could be desired to make more favorable mining conditions.

Remarks.—The mines of the Continental Zinc Co. are readily accessible. The character of the ore-bodies are sheet or blanket formation dipping 1 per cent. The widths of the ore-bodies are 500 to 800 ft. The ores are sphalerite and galena in chert. The mines are not deep, the shafts varying from 210 to 220 ft. in depth. The method of mining is large opening with pillars 15 ft. in diameter and about 40 to 50 ft. apart. The amount of water pumped is 250 gal. per minute (strongly acid). The method of treatment is wet concentration. (Above Data by J. L. Bruce.)

Zinc Issues Company

Mines at Neck City, Mo., Duenweg, Mo., Galena, Kas., Miami, Okla.

Production, 1912:

Tons ore milled		144,780
Tons concentrates produced		7,448 zinc 940 lead
Ratio of concentration, 17.3 into 1		
		Per ton
Total value of concentrates	$436,935	$51.68 Zn $55.28 Pb
	Zn	Fe
Approximate assay zinc concentrates.	57 per cent.	2.5 per cent

Mining and milling costs vary according to local conditions from $1.25 to $2.50 per ton of ore.

Note.—Nearly all properties in this district are operated on a royalty basis. Royalties range from 5 per cent. to 25 per cent.

REPRESENTATIVE COSTS, WEBB CITY DISTRICT

Webb City, Missouri, U. S. A.

Below we give cost data of two typical mines of the Webb City zone in the southwest Missouri zinc district.

A. Operating Conditions.—Ore face is 25 to 35 ft. in height, with ore disseminated through hard flint and limestone; the pumping is 400 gallons per minute; a gas engine drives the mill, while steam is used for the compressor, pump and hoist. The costs are for a six months period, with an average daily tonnage of 185 tons. The cost is divided as follows:

Cost per ton:	
Labor	$0.398
Explosives	0.120
Hard iron supplies	0.089
Fuel gas	0.124
Oil and waste	0.015
Fire insurance	0.005
Liability insurance	0.014
Interest on investment	0.019
Total operating expense	$0.784
Amortization charge	0.112
Grand total	$0.896

B. Operating Conditions.—This mine has ore faces in hard flint, 18 ft. high; does no pumping; gas engines drive both mill and compressor. The costs are for a six months period during which time 179 tons of rock were handled daily. The cost is divided as follows:

Cost per ton:	
Labor	$0.502
Explosives	0.131
Hard iron supplies	0.120
Fuel gas	0.073
Oil and waste	0.012
Fire insurance	0.004
Liability insurance	0.017
Interest 6 per cent. on investment	0.017
Total operating expense	$0.876
Amortization charge	0.106
Grand total	$0.982

Data by T. F. Lennan, Webb City, Mo.

FOUR ZINC MINES OF JOPLIN, MO., DISTRICT

MISSOURI, U. S. A.

Following are four mines slightly different in character and working under different conditions. The costs cover a period of six months and may be taken as representative.

No. 1.—Mine classed as soft ground, disseminated deposit.

Drifts 12 ft. to 14 ft. high. Roof soft requiring heavy timbering; 2-in. pump handles water. Calculated life of mine three years with production of 95 tons per day.

CASH OUTLAY LOST WHEN MINE IS FINISHED

Loss on mill	$6,600	Hardware and supplies	.098
Cost of shafts	3,200	Fuel	.085
Preliminary work	1,800	Oil and waste	.012
Drilling	2,000	Fire insurance	.005
		Liability insurance	.015
	$13,600	Interest	.026
Costs per ton:			
Supt.	$ .021		$ .875
Surface labor	.157	Loss on cash outlay	.159
Mine labor	.34		
Explosives	.049		$1.034
Timber	.067		

With zinc selling at average price of $41.70 per ton, the grade of ore would have to be as follows for the mine to break even: When no royalty is charged, 2.4 per cent. zinc. When 10 per cent. royalty is charged, 2.7 per cent. zinc. When 20 per cent. royalty is charged, 3.0 per cent. zinc.

No. 2.—Disseminated ore lease on 10 acres. Face of drifts 25 ft. to 35 ft. Five-inch pump needed to handle mine water. Mill capacity 200 tons per 10-hour day. Drilling has shown mine will last 4 years at the above rate.

CASH OUTLAY LOST WHEN MINE IS FINISHED

Mill	$14,500	Iron and supplies	.089
Two shafts	6,600	Fuel	.124
Preliminary work	3,000	Oil and waste	.015
Drilling	2,000	Fire insurance	.005
		Liability insurance	.014
	$26,100	Interest	.019
Costs per ton:			
Supt.	$ .009		.784
Surface labor	.147	Loss on cash outlay	.112
Underground labor	.242		
Explosives	.12		$ .896

This mine would have to make the following saving to break even:
When paying 10 per cent. royalty, 2.5 per cent. zinc ore.
When paying 20 per cent. royalty, 2.8 per cent. zinc ore.

No. 3.—This is a sheet ground mine with 16 ft. face of ore. The ore is made up of 4 tons zinc to 1 ton lead. Mill has capacity of 203 tons per 10-hour shift. Life of mine is 5 years.

CASH OUTLAY LOST WHEN MINE IS FINISHED

Cost of two shafts	$9,800	Iron and supplies	.162
Preliminary work	4,000	Fuel	.083
Mill	16,500	Oil and waste	.014
Drilling	1,620	Fire insurance	.004
	$31,920	Liability insurance	.016
		Interest	.019
Costs per ton:			$ .958
Supt.	$ .01	Loss cash outlay	.101
Surface labor	.176		$1.059
Underground labor	.337		
Explosives	.137		

The following grades of ore would be required to break even.
No royalty to be paid, 2.4 per cent. zinc ore.
10 per cent. royalty to be paid, 2.6 per cent. zinc ore.
20 per cent. royalty to be paid, 2.9 per cent. zinc ore.

No. 4.—This is a sheet ground mine with 18-ft. face of ore. Ore is 2 tons zinc to 1 ton lead. No pumping. Mill capacity 179 tons per shift. Life of mine 5 years.

CASH OUTLAY LOST WHEN MINE IS FINISHED

Cost of two shafts	$8,600	Iron and supplies	.12
Preliminary work	4,500	Fuel	.073
Drilling	1,800	Oil and waste	.012
Mill	12,500	Fire insurance	.004
	$27,400	Liability insurance	.017
		Interest	.017
Costs per ton:			$ .876
Supt.	$ .012	Loss cash outlay	.106
Surface labor	.16		$ .982
Underground labor	.33		
Explosives	.131		

To break even the following grade ores would be required:
With 10 per cent. royalty, 2.4 per cent. ore.
With 20 per cent. royalty, 2.7 per cent. ore.

The calculations in mines 3 and 4 are based upon zinc at $41.70 and lead at $59.13 per ton which is an average over a period of 5 years. (This data by W. A. Christy.)

FEDERAL LEAD COMPANY

FLAT RIVER, MISSOURI, U. S. A.

	Cost per ton of ore
Prospecting	$.12
Development	.04
Ore breaking	.46
Mine to mine-bins	.23
Mine-bins to mill	.04
Milling	.22
General expense	.14
Total	$1.25

The above data given by H. A. Guess.

Remarks: Ore occurs more or less horizontally disseminated in limestone formation at depths of only a few hundred feet below the surface. Thickness varies from 6 to 75 feet. Pillars are left in mining. Prospecting done entirely by drilling. Cost varies from 50¢ to $1 per foot. Ores are concentrated. The flotation process is now used on tailings. Concentrates are smelted at plants near St. Louis.

THE ST. JOSEPH LEAD CO.

RIVERMINES, MO.

Year ending April 30, 1914. Net profit from operations St. Joe Lead Co. $906,853. The Doe Run Lead Co., $1,073,668. Total for Consolidated Companies $2,240,132. Net after income charges $1,583,938. Total production 114,971,751 lbs. of dry concentrates containing 75,824,944 lbs. or 37,912 tons of metallic lead.

The following operating results were obtained:

	Bonne Terre District	Leadwood District
Mill crushed tons	475,133	489,745
Lbs. lead produced	33,041,587	42,782,357
Yield per ton	69.53	87.3
Cost per ton		
Mining	86.5¢	78¢
Milling	35.38¢	29.92¢
Rr. and Freight	6.18¢	4.45¢
Total	$1.28	$1.1237
Tons mined per acre	70,641	56,072

NEVADA

FLORENCE GOLDFIELD MIN. CO.

GOLDFIELD, NEVADA

Year ended Dec. 31	1911	1910	1909
Total gross	$252,821	$552,051	$641,030
Tons milled	48,847	52,027	34,824
Average value	$6.10	$11.38	$18.42
Mill saving, per cent	83.96	92.11	92.12
Tons shipped	.....	.....	173.86
Average value	.....	.....	$287.54
Costs per ton:—Mining	$1.242	$1.491	$4.387
Development	1.744	1.688	
Milling	2.595	2.985	3.861
Marketing	.047	.904	
General expense	.381	.425	3.590
Taxes	.080	.127	
	$6.089	$7.620	$11.838

See also Appendix, page 361.

ROUND MOUNTAIN MINING CO.

ROUND MOUNTAIN, NEVADA, U. S. A.

Year Ended Mar. 31

	1912	1911	1910
Production	$342,996.62	$302,680.29	$393,305.59
Total oper. cost	$268,166.44	$218,367.51	$200,500.08
Mill:—Net profit	$74,830.18	$84,312.78	$194,049.25
Tons ore milled	54,915	36,252	33,860
Ave. value recov	$6.24	$8.34	$11.63
Mill recovery, per cent	88	89.64	.....
Profit per ton	$1.36	$2.32	$5.713
Costs per ton:—Mining	$2.00	$2.39	$2.318
Development	.90	1.47	1.738
Milling	1.16	1.28	1.51
Bullion tax and expense	.07	.13	.....
General expense	.32	.34	.353
	$4.45	$5.61	$5.919
Depreciation	.31	.....	.....
Litigation	.20	.56	.....
	$4.96	$6.17	.....
Miscell. earnings	.08	.15	.....
Total	$4.88	$6.02	.....

See also Appendix, page 361

GOLDFIELD CONSOLIDATED M. CO.

GOLDFIELD, NEVADA, U. S. A.

Year Ended Dec. 31	1912	1911	1910
Total production	$7,652,045.63	$10,163,127.46	$10,273,934.17
Net profit	$4,886,399.55	$7,526,846.04	$7,347,691.81
Mill:			
Ore milled	415,786	330,062	265,352
Average value per ton	$19.77	$32.08	$40.72
Average recovery	18.40	30.74	38.50
Average recovery, per cent	.....	95.51	94.54
Costs per ton ore:			
Stoping and developing	$3.39	$3.35	3.86
Transportation	.08	.09	.14
Milling	1.61	1.89	2.11
Concentrate treated	.38	.38	.31
Marketing concentrates	.13	.74	.83
Marketing bullion	.07	.15	.23
Marketing shipping ore	.19	.05	.34
General exp. office, legal, etc	.45	.55	.89
Bullion tax	.13	.38	.49
Income tax	.08	.08	.....
Total	$6.51	$7.66	$9.20
Miscellaneous earnings	.07	.11	.18
	$6.44	$7.55	$9.02
Operating profits per ton	$11.96	$23.19	$29.48
Less construction, etc	.21	.42	1.95
Net per ton ore	$11.75	22.77	27.53
Feet development	48,146	46,739	.....
Cost per foot developed	.....	$7.51	$9.05
Ave. duty per stamp, tons	9.44	.....	.....

TOTALS: PRIOR TO 1908 TO 1912 INCLUSIVE

Tons	Average value	Total gross
1,428,839	$37.82	$54,036,347

TOTALS: NOV. 1, 1908, TO DEC. 31, 1912

Tons	Ave. recovered per ton	Ave. total costs	Ave. net per ton
1,207,681	$28.85	$8.32	$20.53

See also Appendix, pages 362 and 399

MONTANA-TONOPAH MINING CO.

TONOPAH, NEVADA, U. S. A.

Year Ended Aug. 31

Year Ended Aug. 31	1912	1911	1910
Production	$779,732	$659,912.26	$650,405.11
Expenses	$502,054	488,830.79	515,689.71
Profit	$277,678	171,081.47	134,715.40
Mill:			
Tons ore milled	53,874	59,092	50,245
Ave. value recovered	$13.808	$12.66	$12.94
Profit per ton	$ 5.15	$ 3.28	$ 2.68
Gross val. of ore	$15.341	.....	$15.22
Val. in tails	$ 1.533	$ 1.35	$ 1.43
Mill extraction, per cent	90.0	90.7	90.8
Costs per ton milled:			
Mining	$ 2.976	$ 3.36	3.414
Development	1.427	1.55	1.814
Gen. expense	1.431	.....	.543
Shipping and selling	1.776	1.38	.054
Genl. maintenance	1.201	.....	.296
Milling	2.96	3.09	3.734
Indirect charges	.548	.....	.408
	$ 9.319	$ 9.38	$10.263
Tons concentrates	710.93	882.09	1,076.6
Gross value per ton	$387.10	$303.66	$253.52
Pounds bullion shipped	.....	39,028	39,981
Average fineness, gold	.....	.....	11.6
Average fineness, silver	.....	.....	890.6
			902.2
Development, feet	10,076	9,932	10,681
Average cost per ft.	$5.23	$6.14	$6.255
Diamond drill cost per ft.	$3.95		
Mineral cont. of ore, gold	.....	.....	.206 oz.
Mineral cont. of ore, silver	.....	.....	21.139 oz.
Mineral cont. in tails, gold	.....	.....	.0146 oz.
Mineral cont. in tails, silver	.....	.....	2.168 oz.

Remarks.—The mine is developed by shaft to depth of 765 ft. (1910). The veins are fissures. The ore is quartz carrying gold and silver-bearing pyrites; also, native gold and silver sulphides. The mill has 40 stamps. Each stamp has a capacity of 3.92 tons per 24 hours. The ore is concentrated, re-ground in tube mills, and cyanided by agitation.

NEVADA HILLS MINING CO.

FAIRVIEW, NEVADA, U. S. A.

Year ended Dec. 31	1913	9 mo., 1912	1911[2]
Production	$510,413.59	$726,664.52	.....
Miscl. earnings	4,165.56	4,485.01	.....
Total	$514,579.15	$713,149.53	$293,043
Operating expenses	337,613.31	292,239.87	.....
Operating profit	$176,965.84	$438,909.66	.....
Depreciation fund	195,000.00	120,000.00	.....
Net profit	$18,034.16[1]	$318,909.66	.....
Mill:			
Tons milled	41,919	29,976	10,948
Gross value per ton	$13.776	$26.84	$27.03
Recovered per ton	12.176	24.24	24.02
Ave. mill recy., per cent	88.3	90.2	88.86
Loss in tails per ton	1.60	$2.60	3.01
Costs per ton:			
Stoping	$3.810	$1.76	1.71
Development		2.07	2.30
Moving dump ore	.....	.12	.45
Milling	2.839	3.07	4.88
Marketing products	.598	1.03	1.31
General expense		.71	1.09
Interest	.795	.63	1.41
Bullion tax		.21	.15
Property tax		.04	.04
	$8.033	$9.64	$13.43
Miscl. earnings	.099	.15	.06
	$7.934	$9.49	$13.37
Current construction	.021	.11	.....
Total costs	$7.955	$9.60	.....
Operating profit per ton	4.221	14.64	10.65
Depreciation	4.652	4.00	.....
Net profit per ton	.431[1]	$10.64	.....
Development	.....	5,866 ft.	.....

[1] Loss.

[2] Period Sept. 10, 1911, to Jan. 13, 1912. Milling operations did not commence until Sept., 1911.

See also Appendix, page 362

TONOPAH-BELMONT DEVELOPMENT CO.

TONOPAH, NEVADA

Year Ended Feb. 28	1913	1912	1911
Revenue	$2,940,612	$3,271,588	$2,831,727
Expenses	1,160,912	1,469,507	.....
Operating profit	1,779,700	1,802,080	.....
Mill:			
Tons ore milled	127,920	87,952	59,159
Average assay value	$24.21	$20.84	$27.58
Tons ore shipped to smelter	562	27,611	21,907
Average assay value	$70.71	$61.35	$54.76
Total tons treated	129,537	115,563	81,066
Average assay value	$24.34	$30.51	$34.93
Average value recovered	22.70	28.31	.....
Mill tail loss per ton	$1.47	$1.54	.....
Smelting loss; concentrates and slags	.18	.23	.....
Smelting loss; ore shipped	$4.12	$3.60	.....
Total treatment loss	$1.64	$2.20	.....
New mill recovery, per cent	94.43	.....	.....
Old mill recovery, per cent	92.94	92.54	89.4
Mine development, feet	12,513	.....	.....
Costs per ton treated:			
Mining	$3.25	$3.94	$6.145
Development	.87	.78	
Transportation	.28	2.12	
Milling	2.96	3.13	4.086
Marketing products	.49	1.03	
General expense	1.11	1.28	3.03
Total operating expense	$8.96	$12.28	$13.261
Operating profit per ton	13.74	16.03	.....

The company will ship very little high-grade ore to the smelters in the future. A material saving is expected from the direct treatment at the mill.

Some interesting mill data for 1913 is as follows:

	Average stamps	Duty per stamp	Power per ton
New mill	51.9	7.5 tons	.586 h.p.
Old mill	36.0	4.2 tons	.....

Year ending Feb. 28, 1914. Revenue, $3,416,976. Profit, $2,006,091. Tons milled, 172,398. Value, $21.07. Recovered, $19.79. New Mill rec., 94.45 per cent. Cost per ton treated: Min., $3.01; Dev., $1.10; Mill, $2.55; Markt. prod., $.43; Genl., $1.07; Total, $8.17. Profit per ton, $11.62.

See also Appendix, page 362

TONOPAH EXTENSION MINING CO.

TONOPAH, NEVADA, U. S. A.

Year Ended Mar. 31	1913	1912	1911
Receipts sale bullion	$724,873	$590,418	$501,322
Expenses	487,449	417,409	320,202
Profit	$237,423	$173,008	$181,120
Net profit after all expenditures[1]	$236,292	$115,912	$131,800
Production:			
Ounces silver	890,764	759,382	.....
Ounces gold	9,199	8,414	.....
Mill:			
Tons mined	54,618	50,900	44,524[2]
Gold contents	957,674	848,407	
Silver contents	9,758	9,011	.....
Average per ton gold	0.179 oz.	0.177 oz.	.....
Average per ton silver	17.534 oz.	16.667 oz.	.....
Gross value ore milled	$14.469	$12.80	12.96
Tons milled	54,618	50,900	44,524
Mill extraction, per cent	93.33	90.61	90.67
Costs per ton:			
Mining and development	$5.331	$4.725	$3.541
Milling	3.290	3.247	3.650
Metal loss in mills	.964	1.200	1.210
Marketing	.233	.227	.491
Total cost	$9.818	$9.399	$8.892
Profit per ton	$4.651	$3.401	$4.068
Stamp duty	5.18	4.83	.....
Development	11,172	10,156	5,637
Price silver, cents	61.448	54.844	53.725

[1] Allows for bond interest and all expenses.

[2] Of this 10,053 came from the dumps.

Note.—These costs do not include administration costs and bond interest, etc., handled through the New York office.

Remarks:—The mine is operated by shaft to a depth of about 1000 ft. The veins vary in width and value. They are fissures in andesite. The values are silver and gold, mainly the former metal. A 30 stamp mill was installed in 1910. The ore is treated by cyanide solution in agitation tanks.

WEST END CONSOLIDATED MINING CO.

TONOPAH, NEVADA, U. S. A.

Year Ended Mar. 31	1913	Year Ended Mar. 31	1913
Profit mining operations.....	$179,599	Gold content, ounces.....	9,357
Earnings of Nevada Milling Co.	152,787	Silver content, ounces.....	933,372
		Gross value per ton.....	$17.09
Miscellaneous earnings.....	461	Gross value recovered.....	15.44
		Gross value tailings.....	1.65
Net profit.....	$332,847	Recovery, gold, ounces.....	8,817
		Recovery, silver, ounces...	830,893
Tons ore and waste mined....	75,352	Extraction, gold, per cent..	94.24
		Extraction, silver, per cent.	89.02
Shipped (tons):			
To smelter[1].....	129	**There was obtained from the**	Gold Silver
To mill[2].....	44,511	**metallic contents of the ore:**	
		By cyanidation, per cent...	87.38 73.49
Total tons shipped.....	44,640	By concentration, per cent.	6.85 15.53
		Loss in tailings, per cent...	5.77 10.98
Smelter:		Net profit from milling..	$152,787
Gross value.....	$11,792		
Value per ton.....	$91.41	**Cost per ton:**	
Freight and treatment.....	21.99	Mining (direct).....	$3.608
		Mining (indirect).....	.554
Total.....	$69.42	Total mining.....	4.162
Mining expenses.....	4.24	Milling (direct).....	3.288
		Milling (indirect).....	.341
Profit per ton.....	$65.18		
Total profit.....	$8407.	Total milling.....	$3.629
Mill:		**Costs and profit, all ore, per ton:**	
Gross value.....	$759,084	Gross value ore shipped...	$17.27
Value per ton.....	$17.05	Freight and treatment cost	9.09
Frt. and treatment.....	9.04		
Total.....	8.01	Net returns.....	8.18
Mining expense.....	4.16	Mining cost.....	4.16
Profit per ton.....	$3.85	Mining profit.....	$4.02
Total profit.....	$171,191		
		General:	
Operations of Milling Co.:		Stamp duty, tons per day..	6.12
Tonsore treated, dry.....	44,756		

See also Appendix, page 363

TONOPAH MINING COMPANY

TONOPAH, NEVADA, U. S. A.

Year Ended Feb. 28	1913	1912	1911	1910
Gross production	$3,148,668	$3,503,255.21	$3,906,835.10	$3,478,021.82
Ounces silver produced	3,367,958	4,120,832	4,702,765	4,270,069
Grade ore, silver, ounces	21.75	26.05	28.65	28.05
Grade ore, gold, ounces	.23	.286	.320	.313
Total net earnings and income.[1]	$1,586,313	$1,763,018	$2,011,422	$1,639,602
Mill: Tons ore milled	173,336	174,685	177,745	166,174
Average assay value	18.16	$19.97	$21.98	$20.93
Mill extraction, per cent.	89.34	90.56	92.4	91.7
Costs per ton:				
Mining and development	$3.27	$3.71	$3.95	$4.17
Milling	2.67	2.74	2.94	3.18
Mill loss	1.85	1.89	1.82	1.78
Freight on ore	.74	.72	.63	.60
Marketing product	.51	.57	.73	.78
	$9.04	$9.63	$10.07	$10.51
Profit per ton	$9.12	$10.34	$11.91	$10.42

[1] Represents combined earnings of Tonopah Mining Co. of Nevada and Desert Power and Milling Co.

Year ending Feb. 28, 1914. Gross prod., $2,918,417. Grade silver, 21.61 oz. Grade gold, oz. .247. Net earn., $1,363,441. Tons milled, 163,389. Av. value, $17.79. Rec. per cent., 87.52. Costs: Min. and dev., $3.28; Mill., $2.81; Mill loss, $1.96; Frt., $.74; Markt., $.58; Total, $9.37. Profit, $8.42

See also Appendix, page 363

PITTSBURGH SILVER PEAK MINING CO.

BLAIR, NEVADA, U. S. A.

The following on the Pittsburgh Silver Peak has been taken from the Mining and Scientific Press, and issued with their permission. The data is taken from articles by Edmund Juessen, S. J. Kidder and Henry Hansom. Below are given the costs obtained for three months of the years 1910 and 1909:

TOTAL COSTS

Classification	Labor	Material	Total	Average cost per ton for the months of		
				Dec., 10	Nov., 10	Dec., 09
Mining	$9,293.10	2,548.94	$14,716.38	$.951	$.997	$1.250
Development	3,156.43	2,548.94	5,706.37	.369	.369	.399
Crushing	743.92	413.26	1,157.18	.075	.079	.065
Tramming	1,337.98	1,233.15	2,571.13	.166	.216	.227
Milling	2,297.02	5,342.52	7,639.54	.496	.520	.572
Cyaniding	2,579.24	4,365.05	6,044.27	.451	.429	.580
Assaying	334.64	271.42	606.06	.039	.043	.071
Refining	415.00	471.85	886.85	.057	.038	.066
	$20,157.33	$20,070.45	$40,227.78	$2.604	$2.628	$3.240

PITTSBURGH SILVER PEAK MINING CO.—*Continued*

Milling cost	1911
Stamping	$.298
Amalgamating	.047
Neutralizing and settling	.074
Leaching and sluicing	.145
Filtering and pressing	.104
Precipitating	.036
Refining	.048
Assaying	.033
Water service	.070
Heating	.007
Superintendent and foreman	.053
Total direct operating	.915
Pro.-general	.079
Suspense account	.046
Total operating	$1.040

Operating results	1911	1910
Running time, per cent	96.2	96.8
Stamp duty, tons per 24 hours	4.32	4.20
Average tons milled per month	15,170	14,468
Value per ton milled	$5.437	$5.237
Cost per ton milled:		
Labor	.377	.338
Supplies	.447	.557
Power	.186	.167
Total	$1.040	$1.062
Leaching sand:		
Recovery, per cent	75.9	70.4
Sand heads	$3.154	$2.660
Sand residues	.760	.788
Filter pressing slimes:		
Recovery, per cent	92.2	88.5
Slime heads	$1.546	$1.543
Slime residues	.121	.176
Recovery:		
Amalgamation	53.36	53.6
Cyanidation, per cent	37.14	31.3
Total, per cent	90.50	84.9

See also Appendix, page 363

GIROUX CONSOLDIATED MINES CO.

ELY, NEVADA

(Taken over by Consolidated Copper Mines Co.)

Year Ending Dec. 31.	1912.
Production:	
Total prod. copper, pounds	3,817,083
Total gold, ounces	1,232
Total silver, ounces	3,031
Profit during August, September and December	$150,000
Cost per pound excl. extraordinary dev. and construct	10.8¢

The company gives the following in the annual report:

CONCENTRATION AND RECOVERY

	Per cent. moisture	Dry tons concentrated	Per cent. copper	Per cent. recovery on copper	Net lb. copper	Net oz. gold	Net oz. silver
Total[1]	...4.62	133,933	1.975	71.1	3,768,521	1,214.065	2,862.13
Smelting ore:							
Taylor ore, Steptoe.	5.95	179.626	4.27	95.00	14,573	17.962	167.05
Alpha ore, Steptoe .	10.00	78.276	9.38	95.00	13,951	.....	.....
Alpha ore, International.	10.30	152.090	8.16	90.00	20.038	.....	2.46
Grand total.....	.....	.....	.....	.....	3,817,083	1,232.027	3,031.64

[1] Produced in months of June, July, August, September and December. In October and November operations were tied up owing to labour strike.

Shipments of Concentrating Ore (May to Dec. Incl.).—Shipments were started May 1, 1912, to the Concentrator of the Steptoe Valley Smelting and Mining Co. of McGill, Nevada (Nevada Consolidated plant) and production was gradually increased until the maximum of 1200 tons per day was obtained. Total tons, 140,877; copper, 2.15 per cent.

SHIPMENTS OF SMELTING ORE

To Steptoe Smelter, McGill, Nevada:

179.626 tons Taylor ore..... 4.27 per cent. copper. 10 oz. gold. .93 oz. silver.
78.276 tons Alpha ore..... 9.38 per cent. copper.

To International Smelter, Tooele, Utah:

152.09 tons Alpha ore..... 8.16 per cent. copper.

TOTAL SHIPMENTS

Concentrating ore	140,877 tons.
Smelting ore	410 tons.
Total	141,287 tons.

As August, September and December were the only months in which production came entirely from underground mining and not from the stock-piles these are the only months on which any estimate of cost can be made.

Cost Per Ton.—No data is given on costs per ton nor is it possible to compute same. Mining costs were probably very high owing to the fact that in starting the mining system square-setting was employed The freight from the mine to the Steptoe plant 25 miles distance amounted to 25¢ per ton. Development amounted to 18,333 ft. in 1912.

Remarks.—Company owns two mines— a low-grade disseminated copper property and a mine containing high-grade smelting ore situated on the lime porphyry contact. The latter property is developed to 1400 ft. It is not yet producing. The porphyry mine operated in 1912. We have given above the results obtained at this property.

The Giroux porphyry ore is practically the same as that of the adjoining Nevada Consolidated, both mines being located on the same porphyry belt. The ore-body at the Giroux mine, however, has not been worked by steam-shovel, owing to the excessive thickness of overburden.

The Company's contract with the Nevada Consolidated (Steptoe Valley Mining & Smelting Co.) covers a period of five years, commencing May 1, 1912, and provides for the treatment of from 900 to 1200 tons a day. The contract refers to the ore in the Morris Bunker Hill section. This contract was discontinued during 1914.

The ore reserves in this portion of the property are placed at 4,010,000 tons, averaging 2.14 per cent. copper, in addition to which there are several million tons of an average of at least 1.73 per cent. copper.

The Giroux management estimates under the contract given above—whereby the Steptoe Company receives the ores at the Giroux mine, transports them 25 miles to the reduction works where they are concentrated, then smelted, shipped as blister copper to the Atlantic seaboard, and refined—that the cost of refined copper per pound will be about 9½¢.

In the summer of 1913 the Giroux property was taken over by the Consolidated Copper Mines Co.

NEVADA CONSOLIDATED COPPER COMPANY

ELY, NEVADA, U. S. A.

Year ended	Dec. 31, 1913	Dec. 31, 1912	15 mo, ended Dec. 31, 1911	Year ended Sept. 30, 1910	First year operating, 1909
Production:					
Pounds copper	64,972,829	63,063,261	78,541,270	62,772,342	34,527,823
Value copper	$9,667,506	$10,076,872	$9,818,262	$8,008,146	Not available
Gold and silver	557,987	521,278	595,185	472,982	Not available
Total receipts	10,225,493	$10,598,150	$10,413,447	$8,481,129	Not available
Total expense	8,212,050	7,316,231	7,693,492	6,135,747	Not available
Net operating profit	$2,013,443	$3,281,919	$2,719,955	$2,345,382	$1,646,062
Miscellaneous income	1,476,443	1,541,920	1,624,162	1,263,925	590,599
Total income	$3,483,886	$4,823,839	$4,344,117	$3,609,307	$2,236,661
Ore:					
Dry tons treated	3,139,137	2,852,515	3,338,242	2,237,028	1,065,387
Average copper assay, per cent.	1.599	1.692	1.80	2.06	2.34
Per cent. extract. copper.	68.52	68.25	67.59	69.59	70.73
Ratio concentration	6.94	9.09	11.34	10.6	10.04 to 1
Assay gold, ounces	.013	.016	.013	.0181	.019
Assay silver, ounces	.034	.049	.079	.0879	.072
Per cent. extract. gold.	43.87	45.84	57.72	49.78	55.26
Per cent. extraction silver.	57.83	50.11	45.92	48.36	56.62
Average recovered, per ton.	12.32¢	16.48¢	17.35¢	21.14¢	23.12¢
Average copper in concentrates.	7.61	10.49	13.80	15.21	16.62
Price of copper	14.879¢	15.979¢	12.50¢	12.75¢	.....
Miscellaneous costs per ton:					
Mining per ton[1] (steam-shovel).	$.1775	$.1735	$.157	$.154	$.153
Stripping Eureka	.....	.15	.15	.150	.435 cu. yd.
Stripping Hecla	.....	.30	.....	.....	.....
Stripping Liberty	.....	.22	.22	.....	.....
Cost per ton (calculated from financial statements).					
Min. and strip	$.526	$.503	$.324	$.323	.303
Freight on ore	.269	.267	.268	.268	Not available
Milling	.536	.496	.458	.617	Not available
Smelting	.583	.52	.445	.594	Not available
Frt. and ref	.306	.322	.343	.44	Not available
Selling commission	.031	.036	.029	.0365	Not available
Total operating exp.	$2.251	$2.144	$1.867	$2.278	.....

Year ended	Dec. 31, 1913	Dec. 31, 1912	15 mo. ended Dec. 31, 1911	Year ended Sept. 30, 1910	First year operating, 1909
Rent mill and smelting incl. depreciation.	.....	.422	.44	.465	Not available
Cost per pound (as given in report):					
Total cost per pound..	9.99¢	8.86¢	7.17¢	7.37¢	7.47¢
Cost including fund to cover improvements and deprec. and deducting miscl. earnings.	9.51¢	8.33¢	6.97¢	7.05¢	7.14¢
Miscellaneous costs:					
Stripping cost per yd.	.....	33.64¢	.....	40.60¢	.....
Frt. on ore per ton wet.	26.72 dry	25.0¢	.....	25.0	.....

Total stripping done to Jan. 1, 1914, cubic yards	11,872,320
Stripping done in 1913, cubic yards	3,100,661
Veteran Mine[2] production	258,896
Grade ore, per cent	2.588

[1] Includes charges of every description such as labor, supplies, repairs, management taxes, proportion general and New York expenses.

[2] This ore-body is worked underground by slicing. Operating this property in 1912 and 1913 had a decided effect in raising the cost for the year. The cost in 1913 was $2.00 per ton.

Remarks.—Mines are located on branch from through trunk line. Company owns three mines—the most important is a steam-shovel property. The other two are underground mines. Operations to date have been principally on steam-shovel property.

The formation is monzonite porphyry. Ore is secondary chalcocite disseminated through rock. The main shovel pit is 2000 ft. in length by 1800 ft. in width. Average thickness underlying ore 250 ft. In the steam-shovel pit, shovels dump ore directly into standard gauge cars which are hauled to reduction plant 25 miles distant over company's railroad.

At the underground mines only a small amount of ore has been extracted and costs given represent steam-shovel operations. The grade of the underground ore is 2½ to 3½ per cent. The ores are mined by one of the caving methods.

The ore reserves Dec. 31-13 were 39,108,590 tons assaying 1.65 per cent copper.

Company owns 10,000-ton concentrator and smelter. The method of treatment is concentration and smelting of concentrates. Concentrates are roasted in McDougal furnaces. No direct smelting is done. A 40 per cent. matte is made. Company adopted oil for fuel in 1912 in reverberatory

furnaces. Smelter has converter department. Blister copper is shipped to Atlantic seaboard for refining.

See also Appendix, page 364

CHURN DRILL COSTS, ELY, NEVADA, U. S. A.

Hole	Depth, ft.	Total cost	Cost per ft.	Remarks
1	525	$588.00	$1.12	
2	470	507.60	1.08	
3	510	499.80	0.98	
4	615	738.00	1.20	
5	620	812.20	1.31	
6	450	288.00	0.64	Fine drilling ground; no trouble.
7	575	304.75	0.53	Ideal conditions; no casing needed.
8	300	330.00	1.10	
9	285	227.55	0.80	
10	555	530.91	0.95	
11	505	726.43	1.44	Lost tools in hole; heavy supply exp.
12	620	865.32	1.38	
13	705	1072.98	1.52	
14	505	933.80	1.85	
15	600	732.90	1.22	
16	570	741.32	1.30	Very cold weather, water freezing, etc.
17	155	152.87	0.98	
18	145	161.20	1.11	
Totals.	8710	$10,213.63	$1.17	Average.

ITEMIZED COSTS, DRILL HOLES, ELY DISTRICT

	Hole 11	Hole 13	Hole 15
Wages:			
Runner $5 for 12 hours	$127.70	$267.50	$152.50
Helper $4 for 12 hours	101.14	215.70	120.00
Roustabout $3 for 10 hours	65.52	108.15	70.70
Fuel:			
Wood at $2.50 per cord	110.25	100.00	.....
Coal at $5.75 per ton	.....	.....	51.75
Water:			
$1 per thousand gal	15.69	28.40	22.50
Teaming	34.63	35.80	41.45
Miscellaneous supplies	39.57	38.60	.....
Casing / Equipment	115.72	67.83 / 82.80	139.88
Assaying and surveying and sampling / Entire time of mine engineer $125 per month	116.20	128.20	104.10
Total	$726.43	$1072.98	$732.90
Cost per foot	$1.44	$1.52	$1.22

See also Appendix, page 364

MASON VALLEY MINES COMPANY

MINE, MASON, NEVADA; SMELTER, THOMPSON, NEVADA, U. S. A.

The following costs are representative of the Mason or Yerington District, Nevada.

Average copper contents, per cent	3.1
Recovery in smelting, per cent	2.7
Per cent. recovery (approximate)	87
Pounds copper recovered per ton	54
Period year:	1912.
Tons mined	98,798
Tons smelted	241,871
Cost per ton:	
Mining	$1.56
Freight	.45
Smelting	2.52
Total	$4.53

Mining and smelting costs given do not include any allowance for depreciation or interest charges.

Frt. converting, refining and marketing at 3¢ a pound, say 54 pounds	1.62
Total	$6.15
Cost per pound of copper	11.4¢

These figures represent the cost of producing copper from the company's mine only. The average assay of the ore shipments was considerably reduced on account of having included a large quantity of low-grade ore which is desirable in smelting custom ore. The figures given therefore indicate a higher cost per pound of copper than would be shown were these low-grade ores not included.

The Mason Valley Mines Co. is now operating a 2000-ton smelter which not only treats the ores of the Mason Valley mine, but also does a custom smelting business. Operations did not begin until January, 1912.

The ores of Mason Valley property are of the contact type. They are not adapted to concentration owing to the garnet epidote minerals which they contain. The copper generally occurs as chalcopyrite. The ore occurs in big bodies varying up to 40 ft. in width, several hundred feet in length. The dip is nearly vertical. The composition of the Mason Valley ore is as follows, approximately: Cu, 3 per cent.; Fe, 18 per cent.; SiO_2, 32 per cent.; CaO, 21 per cent.; S, 8 per cent.

The method of working is by shrinkage stope. The property is developed by several tunnels and all ore is dropped by gravity to the main haulage level. An aerial tramway 1½ miles long transports the ore to the Copper Belt Railway which hauls it to the smelter at Wabuska, 16 miles distant.

NEVADA-DOUGLAS COPPER CO.

MASON, NEVADA, U. S. A.

Period Jan. to Aug. inclusive,		1912
Production:		
Copper produced, pounds		6,054,990
Gross value		$832,778.33
Deduct:		
Treatment	$237,907.24	
Freight	$134,138.80	$372,046.04
Net value		$460,732.29
Operating expense:		
76,525 tons @ $3.08		$235,697.00
Net profit		$225,035.29
Mine:		
Tons mined, wet weight		76,525
Tons mined, dry weight		73,127
Average assay copper %		4.43
Cost per ton, mined dry		$3.24
Cost per ton, mined wet		$3.08
Costs per wet ton:		
Breaking ore		$.907
Tramming and mucking		.243
Timbering		.245
Power for machines		.0707
Drill repairs and steel		.0571
Hoisting		.0590
Air		.0243
Loading railroad cars		.0579
Development		.773
Maintenance		.125
General expense		.518
Total		$3.080
Average value per ton:		
Gross value		$11.38
Treatment		4.49
Freight		.61
Net value		$6.28
Operating expenses:		
76,525 tons at $3.08		$235,697.00
73,127 tons at $4.49		328,340.23
76,525 tons at $ .61		46,680.25
		$610,717.48
Cost per pound:		
Total cost per pound, cents		10.09

See also Appendix, page 364

YELLOW PINE MINING CO.

JEAN, CLARK COUNTY, NEVADA, U. S. A.

Year Ended Dec. 31.	1912
Total receipts	$371,975
Operating expenses	143,840
Net profits	$228,135
Mine production, tons	20,082
Of which there were milled	19,463
Of which there were shipped	518
Contents mill ore:	
Per cent. lead	15.51
Per cent. zinc	30.2
Ounces, silver	10.83
Lead concentrates produced, tons	3,270
Per cent. lead of concentrates	57.6
Per cent. zinc of concentrates	11.0
Ounces silver of concentrates	36.0
Price received for lead concentrate at Salt Lake smelters after deducting freight and treatment.	$160,977
Per ton	$49.20
Zinc product, tons	16,811
Per cent. zinc	34.2
Ounces silver	5.0
Per cent. lead	6.0
Price received at smelter after deducting freight of $8	$200,998
Per ton	$12.00
Net receipts per ton	18.50
Profit per ton	11.33

COST PER TON

The total cost of mining, milling and marketing a ton of ore was $7.07 distributed as follows:

Assessment and property patent	$.05
Construction	.85
Transportation	.60
Taxes	.17
Assaying	1.98
Stoping	.55
Timbering	.26
Development	.26
Loading at Jean	.20
Milling	2.15
Total	$7.07

See also Appendix, page 365.

CHINO COPPER CO.

SANTA RITA, NEW MEXICO, U. S. A.

Year Ended Dec. 31	1913	1912
Production:		
Net pounds	50,511,661	27,776,088
Income:		
Gross income	$7,621,419	$4,344,261
Operating expenses	4,431,126	2,132,092
Net operating profit	$3,190,293	$2,212,169
Total after miscellaneous income	3,327,826	2,337,302
Net after bond interest	3,234,033	$2,176,904
Mine and Mill:		
Total material moved cu. yds.	4,033,832	2,850,454
Of which waste was cu. yds.	3,082,174	2,223,678
Of which ore mined was tons	1,976,572	1,301,463
Tons treated mill tons	1,942,700	1,120,375
Per cent. copper	2.033	2.077
Recovery concentration, per cent	67.31	61.63
Recovery concentration, pounds	27.37	25.68
Total copper in conc	53,170,145	28,684,208
Copper in shipping ore	.....	553,75
Concentrates:		
Total gross copper, pounds	53,170,145	29,237,966
Grade concentrate, per cent	14.518	21.2
Ratio concentration	10.61 to 1	16.56 into 1
Price received for metal, cents	15.322	15.64
Cost per ton: (Calculated from financial statements:)		
Stripping	$.30	$.257
Mining and milling	.842	.767
Treatment, ref. and freight	1.10	.840
Selling	.04	.039
Total	$2.28	$1.903
Cost per pound copper: (As given in report:)		
Concentrating ore	8.787¢	7.69¢
Crude ore shipments	.....	6.98¢
Total credit miscellaneous earnings	8.49	7.23¢
Miscellaneous costs:		
Average cost steam-shoveling per yard[1]	36.77¢	29.14¢
Average cost steam-shoveling per ton	.....	14.03¢
Waste alone per yard	33.43¢	27.61¢
Waste alone per ton	16¢	13.29¢
Ore production alone per ton	23.13	16.52¢
Milling cost per ton	61.08¢	58.57¢

[1] Includes prop. charges every nature. *Note.*—Since beginning of second quarter of year 30 cents a ton has been charged to cover stripping expense.

See also Appendix, page 365.

SOUTH DAKOTA

HOMESTAKE MINING CO.

LEAD, SO. DAKOTA

	1913	1912	1911	1910
Production	$6,186,651	$6,600,953	$5,251,453	$6,623,780
Miscellaneous earnings	132,717	189,943	123,611	.....
Total	$6,319,368	$6,790,896	$5,375,064	.....
Expenses (calculated)	$4,200,853	$4,074,579	$3,945,663	.....
Profit (calculated)	$2,118,515	$2,716,317	$1,429,401	.....
Milling: Tons ore milled	1,540,961	1,528,923	1,468,263	1,824,623
Average value recovered	$4.0148	$4.3174	$3.5766	$3.6357
Profit per ton	$1.4674	$1.6528	$.8893	$.7637
Costs per ton: Mining	$1.6728	$1.7355	$1.8570	$1.738
Cyaniding	.1042	.1268	.1390	.148
Regrinding	.0097	.0208	.0142	.015
Milling	.3728	.3080	.2797	.219
Slimes treatment	.0862	.1034	.1056	.126
Gen. expense	.3017	.3705	.2910	.626
Total operations	$2.5474	$2.6650	$2.6873	$2.872
Spearfish electric constr. and operation.	.....	.1639	.....	.....
Land purchase and building	.1784	.....	.....	.....
	$2.7258	$2.8289	.....	.....

See also Appendix, page 366

WASP NO. 2 MINING CO.

LEAD, SOUTH DAKOTA

Year ending Dec. 31	1913	1912
Production gold, ounce	9,708.927	.....
Production Ag, ounce	31,510.74	.....
Metal value	$219,334.64	$279,265.68
Operating expenses	167,392.03	195,851.56
Operating profit	52,942.61	83,414.12
Milling data: Tons ore milled	127,680	158,800
Gross value gold	$2.0306	$2.3376
Net value recovered gold	1.5248	1.7586
Value in mill tails gold	.5058	.579
Calculated extraction per cent. gold	75.09	75.23
Actual extraction per cent. gold	77.39	.....
Average heads silver, ounce	.6250	.....
Average tails silver, ounce	.4165	.....
Net silver, ounce	.2085	.....
Calculated extract silver, per cent	33.36	.....
Actual extract, per cent	39.48	.....

WASP NO. 2 MINING CO.—*Continued*

Year ending Dec. 31	1913	1912
Costs per ton:		
Mining:		
Coal	$0.0081	$0.0085
Labor	.2965	.2746
Stripping overburden	.1404	.1405
Supplies	.0409	.0432
Expense	.0155	.0062
Explosives	.0720	.0403
Stable	.0194	.0138
Assay office	.....	.0049
Superintendent	.0196	.0158
Power	.0199	.0181
Tools	.0040	.0012
Mining total	$0.6363	$0.5671
Milling:		
Labor	$0.2022	$0.2057
Supplies	.0809	.0600
Repairs	.0902	.0910
Coal	.0087	.0085
Cyanide	.0782	.0806
Expense	.0087	.0062
Stable	.....	.0090
Assay office	.0106	.0069
Superintendent	.0196	.0158
Lime	.0077	.0136
Cleanup	.....	.0087
Zinc	.0332	.0364
Power	.0905	.0828
Tools	.....	.0013
Milling total	$0.6305	$0.6265
Forward, mining total	$0.6363	$0.5671
Forward, milling total	0.6305	0.6265
General expense:		
Surveying	$0.0012	.....
Repairs, buildings	.0006	.....
Bullion expense	.0074	.0119
Insurance	.0207	.0161
Taxes	.0140	.0113
Interest and exchange	.0003	.0008
General total	$0.0442	$0.0401
Total expense	$1.3110	$1.2337

See also Appendix, page 367

TENNESSEE

TENNESSEE COPPER CO.

COPPERHILL, TENN., U. S. A.

Year ended Dec. 31.	1912	1911	1910	1909
Pounds copper Tenn. ore	13,252,634	13,808,940	12,429,009	14,058,954
Pounds copper custom ore	4,427,583	3,832,972	4,147,326	2,415,734
Total	17,680,217	17,641,912	16,576,335	16,474,688
Silver recovered, ounces	50,622	90,011	.....	24,753
Gold recovered, ounces	337	608	.....	217
Profit copper, acid and custom ore	$1,303,873	$577,927	$547,157	$4,276
Int. bonds and discounts account	107,998	110,878	61,750	63,250
Profit for year	$1,195,875	467,049	485,387	364,406
Depreciation	100,000	60,000	40,000	25,000
Net profit	$1,095,875	$407,049	$445,387	$339,406
Profit acid included above	.....	.....	.....	82,832
Tons ore mined	443,038	444,625	405,463	441,906
Tons Tenn. ore treated	444,289	436,285	424,197	439,265
Tons custom ore treated	36,980	34,768	31,536	20,438
Pounds copper Tennessee ore	.....	.....	.....	39.40
Pounds Tennessee ore recovered	29.8	31.6	29.3	32.00
Pounds custom ore recovered	119.7	110.2	131.	.....
Per cent. recovered Tennessee ore	.....	.....	.....	81.2
Copper electrolytically refined	.....	.....	.....	4,095,848
Costs per ton: Mine development	$.0500	$.15600	$.2106	$.122
Mining proper	1.0845	1.06599	.9677	1.097
Railroad expense	.0879	.08338	.0678	.058
General expense	.1860	.12455	.1080	.155
Smelting	1.3106	1.38326	1.2271	1.311
Converting	.1583	.22454	.1556	.147
Engineering and laboratory	.....	.....	.0516	.038
Total cost pig copper	$2.8774[1]	$3.03772	$2.7887	$2.928
Equal in cents per pound	.09654	.09599	.09518	.0915
Total cost per ton refined	$3.2797	$3.4428	$3.1175	$3.417
After adding freight, refining, selling, comm., taxes, legal and crediting gold and silver.	11¢	10.88¢	10.64¢	10.68¢

[1] Crediting miscellaneous investment, $2.8529.

Resume of 1913 Operations.—Production 13,493,140 lbs. copper Tennessee ore. Profit, $1,087,503; profit after bond int. and dep. $987,503. Tons ore treated, 470,135. Pounds copper recovered, 28.70. Cost per ton at mine, $2.9346. Total cost per ton, $3.255. Cost per pound at property, 10.214¢. After ref. and credit gold and silver, 11.34. Ore reserves, Dec. 31, 1913, 5,534,984 tons.

See also Appendix, page 367

UTAH

CONSOLIDATED MERCUR GOLD MINES CO.

MERCUR, UTAH, U. S. A.

Year Ended June 30

U. S. Currency

	1912	1911
Gross value gold	$494,133	$550,695.70
Total revenue inc. misc	498,104	558,629.19
Oper. expenses	487,307	558,133.06
Net earnings	$10,797	$496.13
Tons treated	201,652[1]	239,190
Average value	$3.27	$3.21
Recovery per ton	$2.45	$2.32
Production, ounces gold	23,931	26,674.78
Cost per ounce	$20.36	$20.92
Mint val. per ounce	$20.67	$20.67
Profit per ounce	$.31	.2499[2]
Costs per ton:		
Framing, timbering, compression hoisting, etc.	.569	
Ore breaking	.753	$1.29
General exp., prop. of mining	.084	
Millg., crushg., roastg., cyandg., (Refining assaying.)	$1.032	
Gen'l. exp., prop. mill	.065	$1.04
Tailing dumps	.17	
Total	$2.42	$2.33
Development	3,657 ft.	5,558
Cost of development	$17,497	$24,484

[1] Seven per cent. of this was tailings. [2] Loss.

The ores are gold. The ores mined are of two qualities "oxidized" and "base," of which 59 per cent. are oxidized and 34 per cent. are base. The remaining 7 per cent. of ore milled were tailings. The ore is crushed, sized and cyanided. The base ore is first roasted, the roasters treating 67,816 tons in 1912.

During 1912 the mill consumed the following chemicals:

Cyanide	147,230 lb. or	.73 lb. per ton ore.
Lime	3,078,600 lb. or	15.27 lb. per ton ore.
Zinc dust	100,648 lb. or	.5 lb. per ton ore.

BECK TUNNEL CONSOLIDATED MINING COMPANY

EUREKA, UTAH, U. S. A.

Year ended June 1	1912
Production:	
Gold, ounces	840.28
Silver, ounces	68,381.07
Lead, pounds	1,299,431
Receipts from ore sales	$46,141
Dry tons mined	4,241.57
Cost per ton, operating:	
Mining and development	$3.429
Tramming	.216
Hoisting	.890
Surface expense	.302
Surveying and assaying	.230
General expense	.244
Total operating	$5.311
Exploration	.707
Total	$6.018
To this should be added,	
Freight	1.04
Plant	.068
Taxes, legal, etc	.13
	$7.256

Notes.—The ore deposits of the mines of this section are replacements of limestone. The bodies vary in width from small streaks to large masses. The ore is a silver-lead product which is shipped to the custom smelters at or near Salt Lake. The camp is connected by railroad with the smelters. Labor conditions, power and supplies are favourable for cheap operations.

UTAH APEX MINING COMPANY

BINGHAM, UTAH, U. S. A.

See Appendix, page 396

BINGHAM MINES COMPANY

BINGHAM, UTAH, U. S. A.

Year ending Dec. 31	1912	1911
Production	$426,052.87	$465,658.67
Total costs	$287,939.64	$350,721.56
Net profit	$138,113.23	$109,248.31
Tons ore treated	49,986.8	46,083.031
Gross value per ton	$8.523	$10.104
Total metal contents:		
Gold, ounces	3,731	3980.73
Silver, ounces	225,763	354,855.06
Lead, pounds	3,777,320	5,792,441
Copper, pounds	1,427,780	790,818
Cost per ton:		
Mine operations	$2.211	$2.128
Smelting, frt., etc	2.721	3.964
Prospecting and devel	.503	.866
Commercial mine acct	.....	.320
Gen. expense	.226	.451
	$5.661	$7.729

See also Appendix, page 368

CHIEF CONSOLIDATED MINING CO.

TINTIC DISTRICT, EUREKA, UTAH, U. S. A.

Year ending Dec. 31	1912	1911
Receipts ore after smelting, transportation and sampling.	$481,473	$104,522
Net profit after all charges	323,037	13,929
Total shipments, tons	30,028	6,703
Assay value of ore:		
Gold, ounces per ton	.2557	.048
Silver, ounces per ton	29.825	39.584
Lead, per cent. per ton	1.36	5.277
Gross value of ore	$24.15	$25.55
Smelting, frt. and sampling	8.12	9.96
Net value per ton	$16.03	$15.59
Cost per ton (calculated)	5.28	13.51
Profit per ton (calculated)	$10.75	$ 2.07
Costs per ton:		
Mining	$4.42	$ 8.26
Development	.86	5.25
Freight, smelting, and sampling		
Total	$5.28	$13.51
Profit per ton	$10.75	.....

See also Appendix, page 368

DALY-JUDGE MINING COMPANY

PARK CITY, UTAH, U. S. A.

Year ended Jan. 1.	1912	1911
Ore sales:—Crude	$110,493	$217,772
Concentrates	469,787	329,130
Zinc middlings	148,100	30,137
Total	$728,381	$577,040
Interest	19,013	18,838
Total sales and earnings	747,394	$595,879
Total expenditures	429,536	435,474
Profit	$317,858	$160,405
Production:—Ounces, silver	683,892	560,699
Ounces, gold	682	1,080
Pounds, lead	9,973,646	10,027,070
Pounds, zinc	9,158,261	7,431,176
Pounds, copper	513,646	311,832
Crude ore sold, tons	3,655	7,586
Ore concentrated	58,951	51,875
Ore extracted	62,606	59,461
Development, feet	9,784	7,497
Working costs per ton:—Extraction	$3.33	$3.09
Concentration cost	.72	.79
General expenses	.315	.25
Marketing cost	1.08	1.03
Prospecting and dead work	1.88	2.38
Total cost	$7.325	$7.54

	1912				1911			
	Tons	Oz. silver	Oz. gold	Per cent. lead	Tons	Oz. silver	Oz. gold	Per cent. lead
Aveg. ore values per ton:								
Crude	3,655	34.83	.045	19.72	7,586	32.44	.077	23.56
Concentrates	13,419	32.27	.031	29.71	12,237	23.37	.036	24.74
Zinc middlings	5,425	22.58	.019	5.16	2,783	10.19	.02	6.84
Iron middlings	.....	.....	.....	.....	.....	.....	.....	.....

	Per cent. cu.	Per cent. Zn	Per cent. Fe	Total sold for	Per cent. copper	Per cent. zinc	Per cent. iron	Total sold for
Crude	1.75	19.89	11.28	$30.23	1.09	12.92	11.20	$28.71
Concentrates	1.60	15.30	14.50	35.09	.60	14.63	16.56	26.91
Zinc middlings	.....	40.46	8.17	27.29	.....	34.04	9.41	10.83
Iron middlings	.....	.....	.....	.....	.....	.....	.....	.....

See also Appendix, page 368

DALY-WEST MINING COMPANY

PARK CITY, UTAH

U. S. Currency

	1912	1911	1910	1909
Production	$587,960.90	$841,951.65	$794,016.99	$521,681.65
Total expenses	$454,099.07	$535,938.19	$567,721.36	$555,073.53
Tons ore milled	42,891	79,921	83,119	48,373
Average value recovered	$6.64	$9.28	$8.27	$5.90
Tons ore shipped	17,497	7,083	4,363	12,019
Average value returned	$17.33	$12.75	$21.65	$19.02
Mill saving { silver, per cent.	81.1	88.42	88.9	74.6
Mill saving { lead, per cent.	98.7	97.21	99.7	99.8
Mill saving { zinc, per cent.	.....	.....	72.3	.....
Average metal content mill ore:				
Silver, ounce	8.0	10.9	8.93	9.9
Lead, per cent	5.5	9.68	7.95	5.78
Zinc, per cent	5.2	9.30	8.39	.....
Costs per ton:				
Mining and developing	$5.600	$3.184	$3.797	$5.399
Milling	1.047	1.994	2.03	1.656
Ore expense	0.314	.163	.....	.....
General expense	.557	.358	.386	.533
	$7.518	$5.699	$6.213	$7.588
Ontario tunnel expense	.....	.622	.376	1.93
	$7.518	$6.321	$6.589	$9.518

Note.—The ores are a complex of silver-lead-zinc and iron sulphides occurring in fissures and as replacements in limestone. Mining conditions normal.

The mill saving of the lead as given in Annual Reports appears to be very high. The ore is crushed by rolls and concentrated. The concentrates shipped to nearby smelters.

Owing to a freeze-up of the water in 1912 the mill was shut down during one-third of January and all of Feb., March, April and May. During this time the tonnage of shipping ore was increased to hold up production. Costs were naturally high.

Résumé 1908 Operations.—Production, $378,790; expenses, $376,182; tons ore milled, 24,511; average value recovered, $6.14; total cost, $9.229; Ontario tunnel expense, $1.47, making a grand total expense per ton of $10.699.

EAGLE & BLUE BELL MINING COMPANY

TINTIC, UTAH, U. S. A.

Period Ended Dec. 31

U. S. Currency

	1912	1911
Gross value ore shipments	$346,403.13	$109,962
Ded. frt. smelting, sampling and assaying	138,991.96	48,944
Net receipts, ore	$207,411.17	61,017
Miscl. earnings, rents, etc	6.00	8,507
Gross earnings at property	$207,417.17	$69,524
Expenses	117,541.73	29,096
Net from property operations	.....	$40,427
Net after prospecting and dev	.....	22,477
Net after all expenses	$ 89,875.44	$21,241
Production:		
Total yield gold, ounces	5,833	1,995
Total yield silver, ounces	341,164	98,739
Total yield lead, pounds	1,303,294	726,796
Total yield copper, pounds	50,913	9,747
Dry tons produced	22,341	5,831
Gross value per ton	$15.50	$18.85
Operating cost per ton:		
Mining and dev	4,893	7.30
Frt. and smelting	$6.262	8.39
Genl. exp	.276	.80
Total	$11.431	$16.49
Development, feet	3,009 ft.	1,686

The property is developed by shaft to a depth of 1350 ft. An ore-body here has been opened for length of 140 ft., is 10 to 50 ft. in width. The ore-bodies are irregular replacements of the country rock. Owing to the great dimensions the square-set system is adopted in mining. In 1912 a heavy development expense brought mining costs up. At close of year output averaged 1250 tons a month. Judging from the report the ore probably is high in lime. All ore is smelted direct, going to the Salt Lake Smelters.

IRON BLOSSOM CONSOLIDATED MINING CO.

TINTIC, UTAH, U. S. A.

Year Ended Dec. 31

U. S. Currency

Production	1912	
	No. 1 workings	No. 3 workings
Gross value	$709,173	$789,963
Smelt. frt. and sampling	308,186	283,820
Net	$400,996	$506,143
Tons treated wet	35,279	31,044
Tons treated dry	31,855	27,612
Grade per ton gold	.2136 oz.	.2156
Grade per ton silver	27.674 oz.	38.3268
Grade per ton lead	7.084 per cent.	8.9621 per cent.
Metal contents:		
Gold ounces	6806	5960
Silver ounces	881,564	1,058,279
Lead pounds	2,256,892	2,474,612
Copper pounds	153,719	none
Gross and net per ton:		
Gross	$22.262	$28.609
Smelt. frt. and sampling	9.674	10.278
Net	$12.588	$18.330
Cost per ton (entire property):		
Development	$ .086	.....
Stoping	2.579	.....
Tramming	.117	.....
Hoisting	.261	.....
Surface	.072	.....
Surveying and assaying	.079	.....
General expense	.128	.....
Pumps (credit item)	.009	.....
Accident	.018	.....
		.....
Total	$3.331	.....
Exploring	.373	.....
	$3.704	.....
Development for year, feet	7,518	.....
Total development to Dec. 31, 1912	31,953	.....

See also Appendix, page 368

SILVER KING COALITION MINES CO.

PARK CITY, UTAH, U. S. A.

Year Ended April 30

U. S. Currency

	1912
Production	$1,277,427.71
Total expenses	$694,410.46
Operating profit	$583,017.25
Tons ore shipped, first class	21,506
Aver. value Lead	28.35
Aver. value Silver	50.06 oz.
Aver. value Gold	.0551 oz.
Tons ore milled	86,387
Tons concentrates made	14,106
Aver. value concentrates Lead	34.24
Aver. value concentrates Silver	50.71 oz.
Aver. value concentrates Gold	.0833 oz.
Ratio of concentration	6.12 into 1
Costs per ton milled:	
Mining and development	$4.756
Milling	.688
Marketing	.204
General expense	.639
Legal expense	.284
Total	$6.571

Mine has produced since 1892 a total gross of nearly $25,000,000.

The company is a consolidation of several properties in the district.

The ore-bodies vary in character from small fissures to large replacements of the limestone.

The method of entry is by shaft. The quantity of water to be handled is generally large. Depth of mine 1300 ft.

The ore is a silver-lead-zinc sulphide.

Transportation and smelting facilities are favourable.

The milling practice is straight concentration.

During the year 13,000 ft. of development were performed.

BOSTON CONSOLIDATED COPPER AND GOLD MINING COMPANY

SULPHIDE MINE, BINGHAM, UTAH, U. S. A.

U. S. Currency

(Now owned and operated by the Utah Copper Co.)

The Boston Consolidated formerly operated two properties—one a porphyry, another a sulphide. Since the taking over of the property by the Utah Copper Co., costs for the sulphide mine have not been given. We give below the costs at this mine before the consolidation.

Period, year ended Sept. 30	1908	1907
Production, net after smelter:		
Copper, pounds	3,210,031	6,146,925
Silver, ounces	49,131	78,129
Gold, ounces	7,446	12,642
Tons shipped:	79,300	134,305
Copper recovery per ton	40.5 lb.	45.8 lb.
Total contents ore		
Copper	3,459,911	
Silver	55,704	
Gold	7,446	
Cost per ton (calculated):		
Mining (including development)	$2.32	$2.34
Transportation to smelter	.55	.505
Smelting	2.76	2.65
Frt. and ref. on bullion	.76	.73
Total costs	$6.39	$6.225
Crediting gold and silver:		
Gold	1.88	1.88
Silver	.36	.374
Credit per ton	$2.24	$2.254
Net cost production applied to copper	$4.15	$3.97
Cost of copper per pound	10.22¢	8.65¢
Development	4,861 ft.	7,799 ft.
Total development	43,160 ft.	38,299 ft.

The erratic and inadequate railway service kept shipments below tonnage expected.

MINING COSTS AT SULPHIDE MINE FOR FIVE-YEAR PERIOD 1904 TO 1908, INCLUSIVE

Wet tons treated	385,973
Moisture tons	8,853
Per cent. moisture	2.3
Dry tons ore	377,120
Cost f.o.b. smelter	$984,109
Cost per ton net	2.55

See also Appendix, page 369

OHIO COPPER COMPANY

BINGHAM, UTAH, U. S. A.

U. S. Currency

Period Six Months Ended March 31, 1912

Production	1912
Pounds copper	3,754,866
Gross value	$556,517
Credit gold and silver	10,671
Smelter charges	46,149
Freight concentrates	7,938
Freight, refining, selling, interest	78,198
Total	$132,285
Operating expenses	251,049
Operating profit crediting gold and silver	$184,346
Interest on debt, taxes, legal expenses	74,869
Net profit	$109,476
Mine and mill:	
Tons ore mined dry	311,067
Crude ore contents, per cent	1.176
Concentrates produced dry, tons	9,219
Copper contents, per cent	22.179
Ratio of concentration	33.74 into 1
Copper loss, per cent	44.13
Costs per ton:	
Mining, per ton dry	$0.267
Transportation, per ton dry	.160
Milling	.370
Freight concentrates	.025
Smelting	.148
Freight, refining and selling commissions	.251
Total cost per ton	$1.221
Cost per pound:	
Mining, per pound copper	2.215¢
Transportation, per pound copper	1.328
Milling, per pound copper	3.067
Freight concentrates	.211
Smelting	1.23
Freight, refining and selling commissions	2.08
Total cost per pound	10.131¢
Credit gold and silver	.284
Net cost per pound	9.847¢

See also Appendix, page 369

SOUTH UTAH MINES AND SMELTERS

NEWHOUSE, UTAH, U. S. A.

Period, Sept. 1–10 to June 30, 1912

U. S. Currency

Production:		
Total pounds copper	5,527,810	
Total ounces silver	43,691	
Total ounces gold	2,450	($48,999)
Net operating loss	$118,353	
Tons milled	426,002	
Average per cent. copper	1.142	
Tons concentrates shipped	34,062	
Average per cent. copper and iron	8.438	(28.86)
Average ratio concentration	12.51	into 1
Average mill recovery	59.09	
Concentrates contents:		
Copper	5,747,983	
Silver	47,002	
Gold	2,412	
Crude ore shipped, tons	701	
Contents, per cent.:—Copper	12.39	
Silver, oz.	2.201	
Gold, oz.	.0533	
Iron	27.58	
Total tons shipped	34,763	
Pounds copper shipped	5,921,864	
Ounces silver shipped	48,546	
Ounces gold shipped	2,450	
Cost per ton:—Exploration	$.0461	
Development	.0387	
Mining and tramming	.7497	
Milling	.6723	
Smelting	.2424	
Freight and refining	.2267	
Miscellaneous including taxes, conc. and ore freight, legal exp.	.2496	
Total cost	$2.225	
Credits, gold, silver, iron, etc	.216	
Net operating cost	$2.009	
Cost per pound:		
Total operating before credits	17.17¢	
Credits	1.67	
Net cost per pound	15.50¢	
Development, feet	5,082	

See also Appendix, page 370

UNITED STATES SMELTING, REFINING & MINING COMPANY

Year Ended Dec. 31

U. S. Currency

Among the mines which the company owns and operates are the following: Mammoth Copper Mining Co., Kenneth, Calif.; Centennial Eureka Mining Co., Eureka, Utah; Compania de Real del Monte y Pachuca, Pachuca, Mex.; Gold Roads Mines Co., near Needles, Calif.

In addition to the above there are smelting, refining companies, etc.

	1912	1911	1910
Earn. after costs, sell exp. and repairs	$5,497,965	$3,961,102	$3,738,541
Deprec., improv. and reserve	1,265,000	1,120,689	1,067,069
Administrative and legal	.....	.....	187,154
Profit	$4,232,965	$2,840,413	$2,484,318
Copper, pounds	21,152,620	22,199,141	28,430,425
Lead, pounds	56,385,769	49,022,791	51,450,985
Silver, ounces	12,059,829	10,285,150	10,776,465
Gold, ounces	140,183	118,703	113,246
Copper, per cent. in value	21.81	21.48	25.90
Lead, per cent. in value	15.38	16.81	16.33
Silver, per cent. in value	45.29	42.72	41.14
Gold, per cent. in value	17.52	18.99	16.63
Average price copper	16.237¢	12.459¢	12.828¢
Average price lead	4.529¢	4.428¢	4.478¢
Average price silver	61.291¢	53.815¢	54.003¢
Tonnage ore produced	1,198,251	1,037,685	777,355
Value copper, per cent	34	38	40
Value lead, per cent	3	6	6
Value silver, per cent	42	35	36
Value gold, per cent	21	21	18

1913 Operations: Profit, $3,585,586. Tons produced 1,294,934. Copper, lb. 20,239,973; lead, 58,116,504 lb.; silver, oz. 13,089,708. Price copper, 15.443¢.

See also Appendix, page 370

UTAH CONSOLIDATED MINING CO.

BINGHAM, UTAH, U. S. A.

Year Ended Dec. 31

	1912	1911	1910	1909
Sales metal, allowing bullion on hand, beginning and end yr. incl. interest.	$1,730,677	$1,677,989	$1,331,243	$1,906,759
Sundry receipts	4,226	7,091	3,779	3,044
Total income	$1,734,903	$1,684,880	$1,335,022	$1,909,799
Expenses	1,170,980	1,286,450	1,309,673	1,770,536
Operating profit	$563,923	$398,430	$25,349	$139,263
Dividends received	40,000	40,000	40,000	15,000
Profit for year	$603,923	$438,430	$65,349	$154,263
Production:				
Copper, pounds	6,506,814	9,162,023	7,489,471	10,043,900
Lead, pounds	8,734,398	3,311,939	None	None
Silver, ounces	230,004	160,367	154,322	298,167
Gold, ounces	14,042	16,730	14,805	21,569
Tons mined and shipped dry	183,386	170,827	177,044[2]	280,637
Mine shipments:				
Copper ore, dry tons	159,143	162,522	179,224	280,637
Per cent. copper	2.146	2.89	2.458	Not available
Gold, ounce	.077	.093	.0843	Not available
Silver, ounce	.828	.981	.9627	Not available
Lead ore, dry tons[1]	23,713	7,793	None	None
Per cent. lead	19.974	22.164	None	None
Silver, ounces	4.189	5.41	None	None
Lead concentrates, dry tons[1]	530	512	None	None
Per cent. lead	21.872	21.984	None	None
Silver, ounces	5.432	5.038	None	None
Prod. from furnace bottoms:				
Copper, pounds	.....	.....	222,780	.....
Gold, ounces	.....	.....	383	.....
Silver, ounces	.....	.....	5,117	.....
Costs per ton mined and shipped	(approx.):			
Mining and tramway	$2.52	$2.37	$2.22	$1.71
Exploring and development	.68	1.06	.67	.39
Trans. and smelting	2.46	2.84	3.42	3.50
Gen'l exp. east. office, int., etc.	.19	.23	.40[3]	.15
Ref., frt., sell and insurance	.53	1.02	.68	.56
Total cost	$6.38[4]	$7.51[4]	$7.39	$6.31
Development, ft	12,320	18,799	11,433	8,950

[1] Contains small values gold and copper not given. [2] Mined. [3] Includes item 7 cents per ton written off to "mine plant." [4] Concentrates included in tonnage. Results approximate.

See also Appendix, 370 and 400

UTAH COPPER CO.

BINGHAM, UTAH, U. S. A.

Year Ended Dec. 31

	1913	1912	1911
Pounds copper	113,942,834	91,366,337	93,514,419
Ounces silver	285,589	311,391	366,907
Ounces gold	28,121	34,255	40,203
Operating revenue	$17,797,564	$15,345,953	$12,825,953
Operation expense	11,494,341	9,038,711	8,324,053
Net operating profit	$6,303,223	$6,307,242	$4,501,899
Miscellaneous income	2,270,200	$2,222,562	1,766,995
Total income	$8,573,423	$8,529,804	$6,268,894
Net after interest	$8,513,105	$8,449,272	$6,237,928
Yards capping removed	4,835,479	4,676,568	5,450,604
Ore treated, tons	7,519,392	5,315,321	4,680,801
Average grade ore, per cent	1.25*	1.3642	1.51
Recovery, per cent	63.95	66.32	69.53
Pounds recovered	15.95	18.09	21.03
Gross prod. concentrates	119,939,809	96,175,090	98,436,224
Grade concentrates	17.31	20.75	25.62
Price copper, cents	15.167	15.839	12.646
Per cent. ore mined by shovel	91.02	77.81	74
Per cent. underground, Utah mine	8.98†	4.33	4
Per cent. underground, Boston mine	..	17.86	22
Cost per ton: calculated			
Mining and milling	$.606	$.73	$.743
Treatment, frt. and ref	.809	.83	.886
Selling com	.022	.03	.025
Stripping ore	.075	.07	.075
Mine development	.016	.03	.046
	$1.528	$1.70	$1.775[1]
Miscellaneous costs:			
Steam shovel with prop. gen'l exp	20.94	26.35¢	24.61
Stripping and prospecting	8.32	8.84	.....
Total	29.26	35.19	.....
Underground mining	51.80	51.77	52.69
Underground development	17.72	15.62	15.66
Average mining cost, all ore	23.04	30.32	31.98
Prosp. dev. and stripping	9.84	12.01	12.81
Total mining cost	32.88	42.33¢	44.79¢
Milling	36.76	41.58	41.68
Milling in July and August	.....	31.09	.....
Freight to concentrator	.....	.....	30.07

UTAH COPPER CO.—*Continued.*

	1913	1912	1911
Cost per ton, dry:			
Mining	$.3288	$.4233	$.4479
Transportation	.2797	.2848	.3078
Milling	.3676	.4158	.4168
Total	$.9761	$1.1239	$1.1725
Cost per pound, cents, from reports:			
Credit gold and silver	9.498¢	9.024¢	7.8655¢
Credit miscl. earn., R.R. and income in Utah	8.642	8.459	.....
Credit miscl. income, Utah and B. and G. Ry.	.....	8.781	.....
Value gold and silver rec. per pound, ¢	.643	.957	1.07

[1] Includes $149,000 taxes. * Trifle under this. † Includes Boston Mine.

Résumé 1910 Operations.—Prod. 84,502,475 lbs.; net income $5,401,775; grade ore 1.54%; costs per ton $1.80, per lb. 8.069¢.

Résumé 1909 Operations.—Prod. 51,749,233 net pounds; total income $7,227,348; total cost $5,067,258; operating profit $2,160,090; cost per pound 8.787¢; price copper 12.96¢; costs per ton not given.

Résumé 18 Months Ending Dec. 31, 1908.—Prod. 54,051,212; income $7,682,569; costs $5,280,416; profit $2,402,153; cost per pound 8.85¢; price copper 13.20¢.

Remarks.—The mines are located in Bingham Cañon, Utah, 20 miles southwest of Salt Lake City. The formation is monzonite porphyry. Ore consists of secondary chalcocite disseminated through rock. The average grade of the ore based on last estimate Jan. 1, 1914, was 1.470 per cent. copper. The average thickness of capping corresponds to 177,467 cu. yds. of stripping per acre. The average thickness of the ore is 424 ft. The ore-bodies lie both sides of the cañon. Mining operations are carried on in benches one above another on the mountain side. Standard gauge railroad tracks run to the various ore faces. Mining is principally by steam shovel, twenty-two steam shovels operating. Ore and over-burden are dumped into standard gauge cars.

Concentrator is situated at Garfield, 20 miles from mine. Utah Copper Co. owns railroad. (B. & G. Ry.) Concentrator has working capacity of 22,000 tons a day. Concentrates are smelted at Garfield smelter of the A. S. & R., 4 miles from mill. Company has low smelting rate. Blister copper is sent to Atlantic seaboard for refining. Electric power generated from coal at mill is used at mine and concentrator. Some electric power is now obtained from the Utah Power & Light Co.'s plant. This is expected to be reflected in low cost for mining and milling.

Ore reserves, January 1, 1914—332,500,000 tons, 1.47 %.

TABLE OF WAGE SCALE

U. S. Currency

Camp	Machine-men	Hand miners	Muckers	Hoist Engineers	Timber-men	Pumpmen	Nippers	Motor-men	Machin-ists
British Columbia	$3.50–4.00	$3.25–3.50	$3.00–3.25	$3.50–4.00	$3.50–4.00	$4.00	$3.25	$4.00	$4.00
Idaho	3.50	3.50	3.00–3.50	4.00–4.50	4.00	3.50–4.00	3.50	4.00	4.00
Utah	3.00–3.25	2.75–3.00	2.50–3.00	3.00–3.50	3.00–4.00	3.50	2.50–3.00	3.00–3.25	3.50–4.00
Colorado	3.50–4.00	3.00	3.00	4.00–4.50	3.50–4.00	3.50–4.00	2.50–3.00	3.25–3.50	4.00–5.00
Butte, Montana	3.50	3.50	3.50	3.50	3.50	.....	3.50	3.50	.....
Alaska	3.25–3.50	3.50	3.00	.....	3.50–4.50	3.50–4.00	3.00	.....	4.00–5.00
Washington	3.50	3.50	3.50	4.00	4.00	4.00	.....	.....	4.00
Nevada	3.75–4.50	3.75–4.00	3.25–4.00	4.25–5.00	3.75–4.50	4.00–5.00	3.75–400	.....	5.00
Arizona	3.50	3.50	3.00–3.50	3.50–4.00	3.50–4.00	4.00–4.25	3.50	3.75–4.00	4.00–4.25
California	3.00–3.25	2.75–3.00	2.50–2.75 Millmen (12 hours)	3.00	3.00–3.25	3.00	2.50–3.00	.....	3.00–3.50
Cobalt, Canada	3.25	.....	2.50	3.50	3.25	3.50	.....	.....	.....
Porcupine, Canada	3.50	.....	2.75	3.75	3.50	3.75	.....	.....	.....

Camp	Blacksmiths	Helpers	Tool-sharpener	Carpenters	Ore sorter	Surface labor	Cost of board
British Columbia	$4.00–4.50	$3.50	$4.00	$3.50–4.00	$3.00–3.50	$3.00	$1 per day.
Idaho	4.00	3.50	4.00	3.50–4.00	3.00	3.00	$1 per day.
Utah	4.00	2.75–3.00	3.50	3.00–3.25	3.00	2.50–3.00	$1 per day.
Colorado	4.00–5.00	3.00–3.50	3.50–5.00	4.00–4.50	3.00	2.50–3.00	$1 per day.
Butte, Montana	.....	3.00–3.25	.....	3.50	.....	3.00	.....
Alaska	4.00–6.00	3.00–3.25	4.50	3.50	.....	3.00	$28 per month Alaska Treadwell group.
Washington	4.00	3.50	.....	4.00	3.50	3.00	$1 per day.
Nevada	4.75–5.00	3.75–4.00	4.25–5.00	.....	.....	2.20–3.50	$25–$40 per month. Foreign labor is $2.20 to $2.50 for 8 hours.
Arizona	4.00–4.25	3.00–3.50	4.00	.....	.....	2.50–2.75	$1 per day.
California	3.75–4.00	2.50–2.75	3.50–4.00	3.50–4.00	2.50	2.25–2.75	$25 per month.
Cobalt, Canada	4.25	3.00	.....	.....	.....	2.75	$.60 per day.
Porcupine, Canada	4.50	3.25	.....	.....	.....	3.00	$.75 per day.

Note.—The 8-hour day underground has been generally adopted throughout the western United States; surface labor generally from 8 to 10 hours per day.

DOMINION OF CANADA

U. S. CURRENCY TON = 2000 LBS.

BRITISH COLUMBIA

HEDLEY GOLD MINING COMPANY

HEDLEY, BRITISH COLUMBIA, CANADA

Year Ended Dec. 31

U. S. Currency

	1912	1911	1910
Receipts	$748,133	$679,616	$519,356
Expenditures	362,253	370,814	255,370
Profit	$385,880	$308,802	$263,986
Interest on cash	.....	9,350	7,781
Total profit	$385,880[1]	$318,152	$271,767
Tons milled	70,455	57,815	46,828
Average value	$11.19	$11.19	$12.31
Extraction conc., per cent	81	75	54
Extraction cyanide, per cent	73	76	71
Total extraction, per cent	95	94	90
Value recovered	$10.63	$11.99	$11.07
Costs per ton:			
Mining	$1.91	$2.11	$1.95
Transportation	.26	.27	.32
Milling	.58	.76	.64
Cyaniding	.41	.65	.58
Shipping and smelting concentrates	.94	.94	.70
Shipping and refining bullion	.01	.01	.03
Total cost	$4.11	$4.74	$4.22
Development, feet	1340	1315	1700
Diamond drilling, feet	6380	3160	.....

[1] Including interest of $9834.

Operations were carried on during 4 months of 1909, but as figures are not representative, they have been omitted.

See also Appendix, page 371

MOTHERLODE SHEEP CREEK MINING COMPANY

SALMO, SHEEP CREEK, WEST KOOTENAY DISTRICT, BRITISH COLUMBIA, CANADA

Period, Month of May, 1913

U. S. Currency

Production:	
Gross ounces, Troy	3,339.21
Fine ounces gold	1,493.96
Fine ounces silver	611.32
Bullion receipts	$31,244.00
Miscellaneous interest	71.00
Total income	$31,315.00
Total expenses	14,816.00
Operating profit	$16,499.00
Tons ore milled	2,156
Recovery per ton	$14.49
Total income per ton	14.52
Total expenses per ton	6.872
Operating profit per ton	$7.653
Estimated extraction, per cent	95.4
Cost per ton:	
Mining	$4.259
Milling	1.604
General expense	.683
Marketing bullion	.326
Total	$6.872

Remarks.—Property is located at Salmo, British Columbia. Mine is reached by 12-mile wagon haul. Property is developed by several tunnels to depth of 450 ft. and a shaft is sinking below this level. Ore occurs in vein 2 ft. to 30 in. in width. Ore averages about $20 per ton, 95 per cent. of the values are gold.

Mining is over-hand stoping. A 4-foot width is stoped. Property has 70-ton mill-stamp, tube mill and cyanide. Mill is operated by Pelton water wheels direct connected. Mill started Sept., 1912. Property has not been operated sufficiently long to give yearly figures.

BRITISH COLUMBIA COPPER COMPANY

GREENWOOD, BRITISH COLUMBIA, DOMINION OF CANADA

Year Ended	Dec. 31, 1912	Nov. 30, 1911	Nov. 30, 1910	Nov. 30, 1909
Copper, pounds	11,146,811	9,944,987	7,143,456	6,325,000
Gold, ounces	25,862	31,144	24,962	18,244
Silver, ounces	142,025	134,266	84,180	64,234
Proceeds metal shipped	$2,483,664	$1,968,158	$1,466,749	$1,324,957
Min.smelt. sell. gen'l office expense	1,570,205	1,533,263	1,158,294	985,216
Custom ore purchased	495,087	300,966	51,893	58,780
Profit[1]	$425,985	$133,929	$256,561	$204,973
Tons treated:				
B. C. copper ore	443,022	385,829	399,353	362,423
Custom ore	284,575	212,927	36,575	6,964
Converter slag	12,992	10,189	5,744	3,949
Total	740,589	608,945	441,672	373,336
Yield B. C. ores:				
Copper, pounds per ton	13.6	16.4	18.0	17.7
Gold and silver, val. per ton	$.762	$1.133	$1.23	$1.03¢
Price rec'd for copper	16.664¢	12.33¢	12.778¢	13.08
Blister copper produced	11,259,140	10,044,093	7,199,034	6,366,318
Costs:—Cost per ton (total)	$2.459	$2.882	$2.730	$2.683
Cost per pound, crediting gold and silver	12.855¢	11.635¢	9.048¢	9.829¢
Coke consumption, tons	103,154	.....	.....	.....
Miscellaneous costs:—Mining and crushing at mine, per ton.	56.58¢	.....	.....	.....

Detailed costs for the various years are not available. We give below, however, costs for one month in each year with certain other data:

	December, 1912	April, 1911	August, 1910	March, 1909
Tonnage	64,807	58,441	37,512	49,182
Fine copper, production, pounds.	893,492	952,284	638,165	888,569
Costs:				
Mining and freight per ton	$0.7406	$0.9583	$0.9854	$0.8866
Smelting per ton	1.2486	1.106	1.2386	1.0192
Converting per pound	.0065662¢	.00437¢	.005435¢	.0041233¢
Frt., ref., sell. comm. per pound	.025¢	.025¢	.025¢	.025¢
Shipment, tons:	1912	1911	1910	1909
Mother Lode	410,686	340,029	359,502	338,639
Wellington Camp	9,935	27,361	15,591	.....
Lone Star & Washington	2,101	3,064	.....	11,950
Napoleon	17,118	14,134	11,774	16,614
Queen Victoria	1,080	.....	.....	.....
Orodenoro	.....	.....	13,337	11,771

[1] After miscellaneous earnings.

See also Appendix, page 371

BRITANNIA MINING AND SMELTING CO., LTD.

BRITANNIA BEACH, HOWE SOUND, BRITISH COLUMBIA, CANADA

Year Ended Dec. 31

U. S. Currency

	1912	1911
Production, lb. copper	14,300,000	8,685,000
Production, ounces silver	76,500	46,000
Tons treated	193,000	118,900
Average copper value	$11.10	
Average silver value	$ .33	
Total value	$11.43	
Costs (estimated):		
Mining	$1.00	
Transportation	.30	
Treatment	1.625	
Total	$2.925	

Remarks.—The mine is developed by tunnels. A long main haulage tunnel is now being driven 1200 ft. deeper than the lowest workings. Ore is now transported by aerial tramway from upper workings. Tram is 3½ miles long to concentrator situated at Britannia Beach, Howe Sound. Ore-bodies originally developed were large but low grade. Owing to zinc and iron in the ore, difficulties were met with in concentration. Grade concentrate was very low.

In 1909 in some new work which was being carried on a vein was encountered which carried better values with less iron and zinc. A considerable tonnage of 2½ to 3 per cent. copper ore was developed here. The ore carries about $\frac{1}{10}$ oz. of silver to the per cent. copper. The copper occurs as chalcopyrite. The concentrates are shipped to Tacoma for smelting. The concentrates as shipped now run about 14 per cent. copper and 1.4 oz. silver per ton. The mine is 4 miles from the sea. Elevation of mine, 3500 ft.

Mining method is glory hole and tunnel. Mine and mill have hydro-electric power. The ore-bodies are very wide, occurring as lenses in big mineralized zone.

Some of the above has been taken from the Annual Report of the Minister of Mines in British Columbia.

THE CONSOLIDATED MINING AND SMELTING CO. OF CANADA, LTD.

TRAIL, BRITISH COLUMBIA, CANADA

	15 Months, ended Sept. 30, 1913	Year ended June 30, 1912	Year ended June 30, 1911
Receipts:			
Income sales smelter product ore, etc.	$8,018,485	$4,911,231	$4,462,077
Product on hand end of year	1,109,770	868,112	888,597
Total	9,128,255	5,779,343	5,350,674
Prod. on hand beginning of year	868,112	888,597	812,933
Total	8,260,143	4,890,746	4,537,741
Rents and sundry income	20,459	7,499	2,109
Total income	$8,280,602	$4,898,245	$4,539,850
Expenses:			
Custom ore purchased	$3,151,325	$1,805,275	$1,197,343
Freight, ore from company's mines	71,046	55,413	172,322
Min., smelt. and general expense	3,110,794	2,162,227	2,269,892
Development	598,239	319,548	438,354
Development written off	146,019	43,120	.....
Deprec. of plant	193,256	185,120	193,342
Royalties, director's fees and sundry	11,554	17,192	66,317
Total expenses	$7,282,235	$4,587,899	$4,337,572
Profit	$998,367	$310,346	$202,278

PRODUCTION, JULY 1, 1912, TO SEPTEMBER 30, 1913

	Weight in tons	Gold in ounces	Silver in ounces	Lead in pounds	Copper in pounds	Gross value
Center Star—ore	193,293	.....	.....	.....	.....	.....
Center Star — concentrates.	42	129,713	62,210	.....	1,843,642	$2,995,514
LeRoi—ore	66,113	.....	.....	.....	.....	.....
—concentrates	475	27,876	29,376	.....	1,276,826	814,469
Sullivan—ore	41,284	.....	448,379	23,411,667	.....	1,281,150
St. Eugene—ore	1,826	.....	46,082	1,690,885	.....	98,623
Number seven—ore	4,526	803	26,832	39,612	.....	34,451
Molly Gibson—ore	1,635	.....	120,932	421,517	.....	93,506
Silver King—ore	(1,207)	(26)	(7,859)	.....	(48,071)	(12,316)
Number One—ore	3,027	.....	114,431	98,868	.....	72,534
Highland — concentrates.	146	.....	2,248	162,497	.....	8,444
Maestro—ore	157	.....	2,916	144,300	.....	8,190
Richmond-Eureka—ore	1,368	.....	47,383	320,976	.....	42,124
Smelted—Trail smelter	407,124	186,017	3,224,408	48,325,252	3,454,814	8,335,668

CONS. MINING & SMELTING CO. OF CANADA, LTD. — *Continued*

1912	Tons	Gold in ounces	Silver in ounces	Lead in pounds	Copper in pounds	Gross value
Center Star group	170,082	83,946	46,208	.....	1,859,894	$2,005,356
Le Roi	39,345	15,016	17,633	.....	764,502	428,964
St. Eugene—ore	13,460	.....	59,673	2,538,163	.....	133,465
—concentrates	2,288	.....	.....	.....	.....	.....
Richmond Eureka	1,626	.....	56,747	278,079	.....	42,875
Molly Gibson—conc	2,144	.....	118,511	652,669	.....	90,993
Number One	436	.....	41,738	27,154	.....	25,753
Sullivan	(21,189) Smelted	.....	(205,654)	(10,569,211)	.....	(517,206)
Trail smelter	296,458	129,789	1,765,992	26,072,074	2,914,181	$5,083,078

1911	Tons ore	Gold in ounces	Silver in ounces	Lead in pounds	Copper in pounds	Gross value
Center Star group	193,223	81,348	60,200	.....	2,318,456	$1,980,112
St. Eugene—ore	47,705	.....	.....	.....	.....	.....
—concentrates	7,708	.....	204,044	9,012,152	.....	429,044
Richmond-Eureka	3,168	.....	115,656	720,306	.....	87,638
Phoenix amalgamated	2,244	46	379	.....	6,195	1,885
Snowshoe (leased)	85,627	5,335	22,450	.....	2,001,700	363,702
Sullivan (leased)	34,065	.....	258,376	14,187,354	.....	635,223
Number Seven group	1,776	445	20,052	49,674	.....	19,339
Queen Victoria	1,985	13	744	.....	59,210	7,977
Molly Gibson	733 Smelted	.....	31,043	197,634	.....	23,435
Trail smelter	388,785	119,067	1,458,758	24,026,015	4,421,988	4,437,901

1894 to date	Weight in tons	Gold in ounces	Silver in ounces	Lead in pounds	Copper in pounds	Gross value
Center Star	2,033,964	1,016,643	1,019,368	.....	34,261,009	$26,489,615
Le Roi—ore	1,601,738	764,912	1,109,298	.....	44,634,008	22,462,640
—concentrates	475	.....	.....	.....	.....	.....
Sullivan	188,648	.....	1,694,402	86,821,629	.....	4,364,805
St. Eugene—ore	1,017,106	.....	5,365,232	229,305,721	.....	10,626,608
Number Seven	7,388	1,472	58,395	89,286	.....	64,898
[1] Molly Gibson	4,512	.....	270,486	1,271,820	.....	207,934
[1] Silver King	(1,207)	(26)	(7,859)	.....	(48,071)	(12,316)
[1] Number One	3,463	.....	156,169	126,022	.....	98,287
[1] Highland	146	.....	2,248	162,497	.....	8,444
[1] Maestro	157	.....	2,916	144,300	.....	8,190
Richmond-Eureka	14,120	.....	663,769	4,168,104	.....	507,285
Phoenix amalgamated.	2,493	53	423	.....	8,409	2,336
Smelted — Trail smelter.	3,551,051	1,332,929	23,449,031	299,295,896	54,244,797	60,502,672

Note.—Production given above includes that of previous owners.

[1] Since Company acquired property only. Previous records not available.

See also Appendix, page 372

CENTRE STAR MINE

ROSSLAND, BRITISH COLUMBIA, CANADA

Production	1911–12	1910–11
Pounds Cu	1,859,894	2,318,456
Ounces Ag	46,208	60,200
Ounces Au	83,946	81,348
Total income	$1,703,132.30	$1,673,184.49
Total exp	1,301,434.66	1,415,734.93
Working profit	$401,697.64	$257,449.56
Tons mined	170,082	193,223
Av. grade per ton	Au .494 Ag .27 Cu .53%	Au .421 Ag .31 Cu .60%
Costs per ton:—Mining	$4.53	$4.14
Hauling	.20	.20
Smelting	2.91	2.98
Total cost per ton	$7.64	$7.32

APPROXIMATE ANALYSIS OF ORE

Fe	15 per cent.
SiO_2	44 per cent.
CaO	5 per cent.
Al_2O_3	15 per cent.
S	8 per cent.

Remarks. Accessibility.—Within half mile of town of Rossland, B. C. Altitude about 3800 ft. Railroad connection by Canadian Pacific Ry. to within 10 ft. of shaft house. Smelter 10 miles distant by railway, at Trail, B. C. Also connection to Great Northern Ry.

Character of Ore.—Variable amounts of pyrrhotite and chalcopyrite, carrying gold and silver in silicious gangue.

Ore-body.—Deposition and replacement in shear zones and intersecting fissures in monzonite and porphyry cut by numerous dykes. Dip 45° to 75°.

Width.—Variable from few inches to 10 ft.

Method of Opening.—By inclined shaft with levels at intervals of 100 to 150 ft.

Method of Mining.—Overhead stoping on square sets, stulls, or by shrinkage system.

Depth of Mine.—2000 ft

Amount of Water.—250,000 to 500,000 gal. per 24 hours.

Method of Ore Reduction.—Hand sorting and smelting.

General Conditions.—Country rock and ore both very hard; ore-bodies erratic in distribution and values, requiring large amount of development and exploratory work, often 35 per cent. to 40 per cent. of total cost of mining.

CANADA COPPER CORPORATION

YALE DISTRICT, BRITISH COLUMBIA, CANADA

This company owns the Copper Mountain property. An extensive development campaign was carried on at the property in 1913.

ESTIMATED COST PER TON

Mining	$1.00	
Milling and transportation	1.00	(Flotation methods)
Smelting and freight	.90	(Ratio of conct. 16 : 1)
General	.15	
	$3.05	
Credit, Au, Ag	.25	
Per ton	$2.80	

On yield of 28 lb. per ton, cost per pound is $.10.

See also Appendix, page 372

VOIGT'S CAMP

YALE DISTRICT, BRITISH COLUMBIA, CANADA

The following estimated cost and other data are given on Voigt's Camp, located near Princeton, B. C. This camp came into prominence in 1912 and 1913 through the development work carried on in that section by the British Columbia Company.

ESTIMATED COST PER TON

Mining	$1.10
Smelting	1.65
Selling, refining, etc	.75
General	.20
	$3.70
Credit, Au, Ag	.80
Cost per ton	$2.90

On yield of 24 lb., cost per pound will be 12 cents.

Remarks.—Location.—Property is situated 12 miles from Princeton, B. C., which is on the Great Northern Railway.

Accessibility.—Same as Copper Mt., B. C.

Character Ore and Geology.—Ore occurs as disseminated chalcopyrite associated with hematite and magnetite in lenticular bodies of varying size. The ore carries about 80 cents gold and is self fluxing except for a small sulphur deficiency. The country rock is diorite and granite.

Mining.—Same as for Copper Mt., B. C.

Smelting.—For economical utilization of these ores, smelter will have to be erected in vicinity of the mine, and railroad connections made to base of supplies.

General Conditions.—Same as for Copper Mt., B. C.

GRANBY CONSOLIDATED MINING, SMELTING AND POWER CO., LTD.

GRAND FORKS, BRITISH COLUMBIA, CANADA

Year Ending June 30	1913	1912	1911	1910
Copper, pounds	22,688,614	13,231,121	17,858,860	22,750,111
Silver, ounces	324,336	225,305	343,178	355,749
Gold, ounces	47,266	33,932	41,707	48,804
Income, expenses and profit:				
Total gross value	$4,782,691	$2,874,759	$3,219,271	$4,099,925
Expenses, mine, smelt. frt., ref., sell., and gen. expenses.	$3,402,972	$2,128,211	$2,710,073	$3,343,150
Foreign ore purchased	165,119	163,169	291,783	191,828
Total expenses	$3,568,092	$2,291,380	$3,001,856	$3,534,978
Net profit	$1,214,599	$583,378[1]	$217,415	$564,946
Costs per ton:				7 months
Mng. and dev	$0.754	$0.771		$0.87
Ft. on ore				.254
Smelt. and convert		1.340		1.361
Gen. exp. and int				.11
Total cost per ton	$2.65	$2.90	$2.77	$2.595[2]
Cost per ton excl. of marketing blister.				$2.50
Cost of smelting	$1.214	$1.256		
Cost per pound:				
Cred., gold and silver	10.6¢	11.1¢	11.1¢	10.3¢
Ore smelted, tons:				
Granby	1,264,690	721,719	959,563	1,175,548
Foreign	15,179	17,800	24,783	21,829
Mine dev., feet	11,517	6,365	9,894	13,267
Price, copper	16.039¢	15.58¢	12.32¢	12.912¢
Metal recovered per ton:				
Copper, pounds	17.68			18.70
Silver, ounces	.208			.2281
Gold, ounces	.0326			.370
Grade matte, per cent	32.9	33.9		35.7
Average Value of Ore in Mine:				
Copper, per cent				1.25
Silver, ounces				.25
Gold, ounces				.043

[1] Depreciation not included, $600,562. [2] Cost per ton for year, $2.79.

Notes on 1912 Operations.—Per cent. coke used 1912 per ton ore 13.0 per cent. Smelting cost for 1912 was $1.256 and for the last five months was $1.20. Converting cost was $.084 per ton ore. Converting cost last five months was $.0637 ton ore. The copper lost in slags in 1912 was 4.2 lb. The average grade of ore treated in 1912 was: copper 1.25 per cent., silver .29 oz., and gold .043. Coke at close of 1912 was obtained from Pennsylvania at a cost of $10.55 per ton. The average cost per ton of smelting alone for 1912 was $1.256—1911, $1.172, and 1910, $1.187.

Remarks.—Mine is developed by shaft to approximately 1000 ft. Ore-bodies occur as large lenses. Two important ore-bodies one 2500 ft. long, by 40 to 125 ft. thick, by 370 to 900 ft. wide; other lense apparently not so large. The surface ores are worked by glory-hole or quarrying. Underground ores are worked by pillar and room method. The ores are principally chalcopyrite, though some carry pyrite and pyrrhotite. The average analysis of the ore is as follows: SiO_2 35 per cent., Fe 13 per cent., CaO 17 per cent., Al_2O_3 8 per cent., and MgO 3 per cent.

The underground workings are very extensive, aggregating 15 miles. Haulage is by electricity. Cars of large capacity. Trains dump automatically into the ore pockets without stopping. Many such labor saving devices as these have been installed. The mine is situated 24 miles from the smelter by railroad. Capacity of plant, 4500 tons. Smelting operations have been severely interfered with, owing to shortage of coke due to labour strikes. This has necessitated numerous shut downs at the plant.

The recovery from the ore is about 85 per cent. Slags vary from .2 per cent. to .25 per cent. The matte averages from 35 per cent. to 40 per cent. copper.

Granby is an extremely low cost direct smelting proposition. The conditions are very favourable, the ore though extremely low in copper is a good smelting mixture and this together with the large tonnage handled and the great efficiency employed make possible the costs obtained.

Some of the above data under "Remarks" has been taken from the Canadian Department of Mines.

RÉSUMÉ OF OPERATIONS, 1900 TO 1910, INCL.

Year	1901	1902	1903	1904	1905	1906	1907	1908	1909	1910
Dry tons shipped.	172,258	296,162	290,133	514,387	551,304	796,528	644,549	865,030	963,510	1,178,853
Pounds cop. rec. per ton.	31.49	27.23	24.58	22.87	24.68	24.30	24.43	23.42	21.90	18.70
Cost per ton.	$4.77	$4.08	$3.75	$3.35	$3.14	$2.87	$3.28	$3.11	$2.85	$2.59

HIDDEN CREEK COPPER COMPANY

GRANBY BAY, OBSERVATION INLET, BRITISH COLUMBIA, CANADA

(Owned by the Granby Consolidated Mining, Smelting, & Power Co.)

Although no actual costs have yet been made at this property, as the mine is still in the equipment stage, we believe that the data at hand of the estimated cost may be of interest. The property is now being equipped with a 2000-ton smelter by the Granby Consolidated M. S. & P. Co., and it is estimated that production will begin early in 1914.

The mine is located at Anyox, British Columbia, near the Alaska line, in the foothills of the Burniston Mountains. The elevation of the mine is from 500 to 900 ft. above sea level. The smelter site is situated on tide water only a short distance from the mine. The natural advantages for water transportation, mining and smelting are very good.

The rock formation is schist and the ore is a massive iron pyrite with some chalcopyrite and pyrrhotite and a little bornite, with small values in gold and silver. The ore-bodies apparently occur in lenses; one of these is opened for 750 ft. in length and is 180 ft. in width. Another ore-body is in chimney formation, roughly, 500 ft. in diameter.

Estimated Cost per ton:

Mining	$ .93		
Smelting	1.75	Credit Gold and Silver	$ .20
Sell. Mkt., etc.	.70	Total cost	3.30
General	0.12	Cost per lb.	8.4¢
		Yield per ton	39 lbs.
Total	$3.50		

Average analysis of the ore is: Silica, 26.4%; iron, 27.6%; lime, 4%; sulphur, 24.3%; alumina, 6.00%; magnesium, 2.4%.

Ore reserves Dec. 31, 1913, 9,000,000 tons; 2.3% copper.

The ores are direct smelting. Plant has converters.

Note.—Since the above was written the smelter has been placed in commission—the first furnace having been blown in in March, 1914.

NEW DOMINION COPPER CO., LTD.

GREENWOOD, BRITISH COLUMBIA, CANADA

Year ended March 31	1913	1912	1911
Ore sales	$392,203	Property closed	
Total inc. miscl	398,172	from Nov. 5,	
Min. dev., admin. and legal exp	281,223	11, to Feb. 1, 12	
Operating profit	$116,949	$11,810 loss	$3,045 loss[2]
Production:			
Copper, pounds	5,317,424		1,611,880
Silver, ounces	79,450		22,430
Gold, ounces	10,762		3,828
Tons ore treated, gross	292,187		90,858
Tons ore treated, dry	283,898	179,605[1]	88,613
Gross value	$1,149,913		$287,527
Total deductions	684,663		209,632
Net value	$465,250		$ 77,895
Less freight, 25¢ ton	73,047		22,722
	$392,203		$55,172
Average assay ore:			
Copper, per cent	1.2865		
Silver, ounces	.27985		
Gold, ounces	.03799		
Cost per ton:			
Mining	$.6539		
Development	.1271	Data not available	Data not available
Construction	.0280		
Crushing	.0255		
Genl. surface and office	.0621		
Total f.o.b. cars	$.8966		
Treatment	$1.85		
General operations:			
No. working days	338		
Men employed (av.)	138.7		
Av. tons per month	24,363		
Av. tons per man per day	6.144		
Tons broken per machine drill per shift.	92.8		
Development, feet	2873		
Price rec'd for copper, cents per lb	16.655		
Price rec'd for silver, cents per oz	61.743		

[1] Shipped. [2] Deficit on preliminary ore shipments.

See also Appendix, page 373.

SNOWSHOE MINE

PHOENIX CAMP, BRITISH COLUMBIA, CANADA

Production	1910–11	1909–10
Pounds Cu	2,001,700	4,029,902
Ounces Ag	22,450	42,561
Ounces Au	5,335	12,413
Total income	$234,818.19	$523,407.67
Total expense	265,495.34	551,252.38
Loss	$30,677.15	$37,844.71
Tons mined	85,628	182,383
Av. grade per ton	Au .062 Ag .262 Cu 1.168%	Au .068 Ag .233 Cu 1.10
Costs per ton:		
Mining	$1.00	$ .92
Hauling	.60	.60
Smelting	1.50	1.50
Total cost per ton	$3.10	$3.02

APPROXIMATE ANALYSIS

Fe	12	per cent.
CaO	17	per cent.
SiO_2	41	per cent.
Sul	2.5	per cent.

Remarks. Accessibility.—Branch of Canadian Pacific Railway crosses the property.

Character of Ore.—Chalcopyrite in gangue of lime silicates, calcite, hematite, etc. Copper 1 to 1½ per cent. with $1 to $2 in gold and silver.

Character of Ore-body.—Impregnation deposit in altered bedded calcareous rocks.

Width.—Thickness varies from nothing to 80 ft.

Method of Opening.—Shaft and levels, large proportion of ore comes from open quarry workings.

Method of Mining.—Chamber and pillars, small pillars and large chambers, worked on shrinkage system, where possibly running suitable chute raises.

Depth of Mine.—200 ft. from surface at deepest point.

Amount of Water Pumped.—Usually small.

Method of Ore Reduction.—Straight smelting without roasting, owing to low sulphur content.

General Conditions.—Altitude 4500 ft. Fairly heavy snowfall. Electric power used. Ground good; hence, practically no timber required and mining costs less than $1 per ton. Ore practically self-fluxing. Conditions generally favourable.

SULLIVAN MINE

EAST KOOTENAY, BRITISH COLUMBIA, CANADA

U. S. Currency

Production	1911–12	1910–11
Pounds lead	10,569,211	14,187,354
Ounces silver	205,654	258,376
Total income	$408,104.38	$470,854.82
Total expense	311,323.53	400,317.35
Profit	$96,780.85	$70,537.47
Tons mined	20,159	34,063
Av. grade per ton	Ag 10.0	Ag 7.6
	Pb 26.2	Pb 20.9
Costs per ton:		
Mining	$5.86	$4.04
Hauling	1.60	1.60
Smelting	7.98	6.12
Total cost per ton	$15.44	$11.76

APPROXIMATE ANALYSIS OF THE ORE

Pb	25 per cent.
Fe	16 per cent.
SiO_2	8 per cent.
Al_2O_3	2 per cent.
Sul	21 per cent.
Zn	17 per cent.

Remarks. Accessibility.—Branch of C. P. Ry. to 1½ miles from mine reached by aerial tramway from mouth of tunnel.

Character of Ore.—Complex zinc-lead-silver ore, sulphides of lead and zinc, with pyrrhotite variable in analysis. Massive and little gangue. Ore-body thick, flat, lying, deposit probably replacement of quartzites. Forms more or less lenticular.

Width.—Few feet to 100 ft.

Method of Opening.—Drifts and raises and winzes from adit levels.

Depth of Mine.—100 ft. below adit tunnel.

Amount of Water Pumped.—Practically none.

Method of Ore Reduction.—Hand-sorting and smelting for lead and silver values.

General Conditions.—Favourable for cheap production provided whole deposit could be worked. At present only ore high in lead can be mined, leaving the more zincy ore standing. Water power used to operate compressor and electric plant. Climate: cold winters, fairly heavy fall of snow. Altitude 4800 ft. Fine dry summers.

ONTARIO

DOME MINES COMPANY, LIMITED

SOUTH PORCUPINE, ONTARIO, CANADA

Year Ended Mar. 31

U. S. Currency

	1913
Gross proceeds ore	$1,043,995
Working expenses	534,039
Net earnings	$509,956
Transferred to balance sheet after dev. gen'l charge and fire loss	$371,228
Tons ore mined	128,015
Tons ore sent to mill	102,838
Of ore sent to mill from open pits there were, tons	93,581
Ore from development	9,255
Tons ore milled	101,812
Yield by amalgamation	$560,481
Yield by cyanidation	483,513
Total value	$1,043,995
Value per ton yield	$10.25
Recovery amalgamation and cyaniding, per cent	95.63
Cost per ton:	
Mining	$1.31
Crushing	0.24
Milling	2.11
General	1.29
Total	$4.95

Operating costs, given in detail above, are high and considerable reduction may be expected for the forthcoming year, especially in power, superintendence and general.

MISCELLANEOUS DATA ON DEVELOPMENT

	Drifts and crosscuts	Raises
Linear development:		
Footage drilled per machine shift	36	16.5
Footage advanced per machine shift	1.68	.62
Stoping:		
Holes drilled per machine shift	3.4[1]	5.0[2]
Footage drilled per machine shift	30	38.7
Tons broken per machine shift	43.7	43.7
Tramming from boxes:		
Average tons per man shift	22.7	
Tramming and Development:		
Average tons per man shift	6.1	

[1] Rand No. 43. [2] Rand Hand Hammer.

See also Appendix, pages 373 and 399

HOLLINGER GOLD MINES, LTD.

PORCUPINE, ONTARIO, CANADA

YEAR ENDED DECEMBER 31, 1912

Profit	$600,664
Ore hoisted, tons	36,446
Ore milled, tons	45,195
Gross value	$970,304
Value recovered	933,681
Of which gold was	927,134
Of which silver was	6,547
Average value ore treated	$21.44

Costs.—The costs for the year would be meaningless as work was badly deranged. Operations did not start until the middle of the year, and in November and December production fell off owing to strike at the mine. Costs for February are given, although they are inordinately high. They are indicative of what may be expected.

COSTS PER TON, FOUR WEEKS ENDED FEBRUARY 25, 1913

Mining	$3.588
Milling	1.493
Administration, management and insurance	.407
General charges	.209
Clearing roads	.015
Operating camp	.261
	$5.973
Alteration mill, strike, etc	.771
Total	$6.744

DATA FOR FOUR WEEKS ENDING MAY 20, 1913

	Per ton of ore milled
Administration, management, taxes, insurance, etc	$.705
General charges	.300
Clearing surface, roads, etc	.174
Mining	4.478
Milling	2.280
Marketing bullion	.229
Operating camp	.366
Alterations to general plant	.103
Fire protection	.044
	$8.679
Extraordinary expenditures:	
Loss on temporary boarding houses	.367
Strike expenses	.237
	$9.283

Tons mined, 6596 tons. Average value all ore hoisted, $17.53. The mill ran 49 per cent. of possible running time treating a total of 6550 tons. Average value of ore treated, $17.53. Approximate extraction, 95 per cent. The mining cost may be divided as follows, per ton milled: Exploration, $.227., development, $.745; production, $3.506; total, $4.478. During the above period the mill was shut down 12 days owing to mishaps at power plants.

The report states that profit from January 1 to May 20, 1913, was $598,505.

FROM REPORT NOVEMBER 2, 1912

Capacity of mill with 40 stamps (450 to 500 tons per day)	
Maximum stamp capacity per day	12 tons
Capacity cyanide plant	600 tons
Mill handling in November, 1912	300 tons per day.
Ore averaging in November, 1912	$30
Extraction	97 per cent.

The report states that operations in the mill have been satisfactory, the the only changes being in the cyanide plant where Dorr thickeners will be substituted in place of Trent agitators.

Notes.—Ore occurs in quartz veins in schist. Gold is free and with pyrite. Numerous parallel veins are under development. Development carried on to depth of 300 ft. The main vein is from 8 to 9 ft. wide. The method of treatment in the mill is as follows:

Coarse grinding, stamping in cyanide solution, tube milling, concentration, and cyanide treatment of both gangue and concentrates.

Porcupine and the mine have railway connection with the through lines.

Labor:—Skilled $3.25 to $3.75; unskilled $2.50 to $3. 500 men employed. Mine and mill have electric power generated from water power.

1913 Operations:—Income, $2,471,273; Gross Profit, $1,628,113. Tons milled, 140,131. Value: Hollinger ore, $18.56; Acme Ore, $12.49; Tails, $0.723. Mill extraction, 96.085%; Stamp duty, 11.51 tons. Cost per ton: Min., $1.961; Dev. and exp., $1.128; Mill, $1.753; Genl., $1.267; Total, $6.108. Total aft. Acme charge and deprec., $6.973. Ore reserves, 845,300 tons. Value, $13.71 per ton.

PORCUPINE CROWN MINES, LIMITED

PORCUPINE, ONTARIO, CANADA

Six Months Ended December 31, 1913

Production of gold	$300,000.00
Gross income	.....
Expenses	$150,000.00
Working profit	.....
Net profit	$150,000.00

Mine and mill:

Tons mined	30,000
Tons waste sorted	10,000
Tons milled	20,000
Average value per ton	$20.50
Per cent. recovered amalgamation	85
Tons cyanided	5000[1]
Per cent. recovered	96[1]
Total recovery	.....

[1] Six weeks, ended Dec. 31.

Cost per ton:

Mining	$2.11
Development	$1.17
Prospecting	.60
Milling	1.64
General	1.50
Administration and head office	.77
Total	$7.79

General Data.—Average tonnage, 75 per day; development, etc., 5000 ft.; ore shoot, 600 ft. long. Location and accessibility, Porcupine district. Geology and ore occurrence; width, vein, 4 ft.; method of development, shaft; depth of shaft, 500 ft.; method of mining, overhead stoping and shrinking; method of milling, present continuous decantation stamps to 4 mesh, tube mill to 120 mesh, then thickened to 40 per cent. moisture in five tanks.

General.—Strike in progress for first few months. No regular work carried on until June. Extra cost in winter due to heating. In 1914 operating on 100 tons per day at total cost of $7 per ton and extraction of over 96 per cent. on $20 heads.

COBALT, ONTARIO, CANADA

The mines of Cobalt are very much alike in every particular. The veins are narrow fissures varying in width from 1 in. to 1.5 ft. to 2 ft. The ores are mainly native silver, argentite and silver-bearing niccolite and smaltite with calcite gangue. They are very rich, as a rule, but the veins are irregular both in length and depth. A depth of 250 ft. for the district is probably a fair average.

The mines first worked only the narrow streaks of rich ore but are now going after the ore carrying 20 oz. silver and milling it. There is quite a tonnage of this ore in the mines and surface dumps.

The high-grade ores are shipped to the smelters.

The mills vary materially as to character of machinery and methods. (See Mine Notes.)

Owing to the narrow width and irregularity of the veins the costs per ton are very high, but owing to the high silver content the cost per ounce silver produced is low.

The camp is located on the Temiskaming and Northern Ontario Railroad, consequently transportation facilities are very good. The flow of mine water is not great.

THE BUFFALO MINES, LTD.

COBALT, CANADA

Year Ended April 30

	1912	1911	1910	1909
Production	$853,807.58	$829,337.39	$785,034.05	$479,482.67
Profit	$451,154.19	$412,888.90	$402,013.05	$204,289.16
Silver, ounces	1,525,262.23	1,540,782.69	1,491,750	931,991.28
Mill ore, tons	46,801	41,484	33,708	13,005
Average silver, ounces gross	32.35	36.07	40.0	43.5
Mill recovery, per cent	83.88	86.98	82.67	86.
Ore shipped, tons	113.0	126.5	115.5	150.0
Average silver, ounces	2,425.0	2,221.0	3,126.0	3,000.0
Costs per ounce, silver:—Mining	$.0846	$.0897	$.0857	$.1136
Milling	.0500	.0412	.0391	.0300
Cyaniding	.0151	.0237	.0188	.....
Installation and repairs	.0061	.0184	.0300	.0406
Depreciation	.0159	.0206	.0218	.0397
Boarding house	.0032	.0048	.0034	.0033
Transportation and treatment	.0527	.0487	.0359	.0343
Administration	.0384	.0242	.0229	.0335
	$.2660	$.2713	$.2576	$.2950

See also Appendix, page 399

COBALT LAKE MINING CO., LTD.

COBALT, CANADA

Year Ended Dec. 31

U. S. Currency

	1912
Production, silver, ounces	1,123,147
Total income	$649,180.51
Total expenses	229,080.19
Profit	$420,100.32
Tons ore hoisted	24,647.50
Average gross value per ton	$26.27
Tons ore milled	23,410.40
Average silver contents, ounces	28
Tons concentrates produced	664.1
Silver in concentrates, ounces	541,540.5
Ounces silver rec'd per ton	22.2
Ounces silver in tails	5.7
Cost per ton milling	$1.83
Mill recovery approximate, per cent	80
Cost per ounce, silver:	
General office expense	$.04237
Depreciation, maintenance, mill operation	.07107
Development	.03076
Ore extraction	.02983
Exploration	.02881
Total	$.20284

The ores of this property are characteristic of the district, though there is evidently a greater proportion of lower grade milling ore than in the veins of its neighbors. The milling practice is one of concentration entirely. The ore is first picked over. Next, passed to a Blake Crusher, sized by trommels, jigged, stamped, sized and concentrated on Wilfley and Deister tables, the Wilfley tails being re-ground in a tube-mill. This product and the Deister tails are classified and reconcentrated on Frue vanners, James slimers and canvas plant. An addition to the present plant will have twenty 1250-lb. stamps and one 5×16-ft. tube mill with Deister sand tables and Frue vanners.

CROWN RESERVE MINING CO., LTD.

COBALT, CANADA

Year Ended Dec. 31

U. S. Currency

Production	1912	1911	1910	1909
Gross production	$1,692,060	$1,833,516	$1,757,824	$2,080,156
Expenses, smelter charges, etc.	556,050	553,777	572,724	643,758
Profit	1,136,010	1,279,739	1,185,100	1,436,398
Silver, ounces	2,714,766	3,430,902	3,248,196	4,034,325
Tons ore, high-grade	519.3	644.561	818.95	756.94
Aver. silver, ounces	4224	4641.0	3611.0	4784.0
Tons ore, low-grade	Included with	390.256	1930.4	2332.28
Aver. silver, ounces	mill ore	165.0	103.4	184.0
Tons mill ore	15,704	6402.5	.....	.....
Aver. silver, ounces	21.41	23.96	.....	.....
Total tons	16,223	.....	2753.0	3093.
Aver silver, ounces	172.87	.....	.....	1304.6

Costs		Per oz.	Per ton	Per oz	Per oz.
Mine exp	3.811¢	.0642	$78.04	.0656	.0530
Smelter, frt., etc	1.981¢	.0249	45.72	.0389	.0455
Office, deprec., etc	1.604	.0155	17.78	.0152	.0046
Milling	2.554	.....	.....	.....	.....
Mine gen'l	4.077	.....	.....	.....	.....
Total	14.027¢	$.1046	$141.54	$.1197	$.1031
Average price rec'd	62.328¢	.....	.....	.....	.....
Cost as above	14.027	.....	.....	.....	.....
Net profit	48.301¢	.....	.....	.....	.....

Note.—Increased cost of production in 1912, due to decrease in tonnage of high-grade ore shipped and increase of ore milled.

1913 Operations:—Prod. 1,776,678 oz. silver. Gross, $1,056,273. Operating profit, $528,287. Cost per oz., 23.81¢. Dev. 5345 ft.

KERR LAKE MINING COMPANY, LTD.

COBALT, CANADA

U. S. Currency

Year Ended August 31

Production and profit	1913	1912	1911	1910	
Production of silver	2,109,975	1,855,495	2,269,680	3,046,295	
Gross income	$1,182,493	$1,044,417	$1,231,245	$1,542,194	
Expenses and smelter deductions	345,178	275,242	293,866	343,974	
Profit	$837,315	$769,175	$937,379	$1,198,220	
First and second-class ore:					
Ore shipped, tons	735	831.75	1936.37[1]	4,277.19	
First-class ore, tons	384.5	425.0	481.37	655.56	
Average silver, ounces per ton	3347	3416	3577.42	3,775	
Second-class ore, tons	161.5	245.7	1270.57	1,179.93	
Average silver, ounces per ton	450.6	308	362.14	362	
Mill results:					
Mill ore tons	18,252.3	3988.4	.....	.....	
Average ounces silver per ton	29.29	28.5	.....	.....	
Concentrates, tons	191.51	162.04	.....	.....	
Average ounces silver per ton	959.10	1253	.....	.....	
Dump ore, tons	.....	.....	184.43	2,441.7	
Average ounces silver per ton	.....	.....	.....	92	
Cost per ounce:	Per oz., cents	Per oz., cents	Per oz., cents	Per oz., cents	Per ton,
Mining and development	10.38	12.1	9.71	7.54	$53.077
Shipping and treatnent	10.45	5.55	4.59	2.29	$16.315
Metal deduction	.....	.....	.....	2.71	$19.307
General expense	.56	.65	.39	.73	5.20
	21.39	18.30	14.69	13.27	$93.899
Tons of rock hoisted	43,134	.....	.....	.....	.....
Of which was ore	33,738	.....	.....	.....	.....
Of which was waste	9,396	.....	.....	.....	.....
Cost mining per ton, 43,134 tons	$5.07	.....	.....	.....	.....

[1] Includes jig concentrates and metallic slimes as follows: Tons, 30.5, 153.93; oz. silver, 928, 75.8.

LA ROSE CONSOLIDATED MINES CO.

COBALT, CANADA

Year Ended Dec. 31

U. S. Currency

	1912	1911	1910	1909
Prod. silver, ounces	2,816,597	3,691,797	2,569,905	3,170,028
Gross income	$1,753,494	$2,008,126	$1,408,255	$1,691,099
Total expenses	$730,351	739,041	498,848	748,003
Profit	$1,023,143	$1,269,085	$909,407	$943,096
Tons ore and concentrates produced	3452.1	3429.5	2500.9	6333.3
Ave. silver, ounce content	839.7	897.25	889.9	491
Tons ore milled	33,984	36,264	19,398	18,423
Ave. ounce, silver	16.38	22.04	29.23	28.58
Tons concentrates	1173.52	1146.17	543.17	628.02
Ave. ounce, silver	415	526	739	663
Extraction, per cent	.....	75.37	74.61	79.12
Av. pr. rec'd per ounce, silver	61.66¢	53.55¢	53.95¢	52.26¢
Profit on production, per cent	58.35	64.17	64.94	56.10

Costs per ounce, silver				Cost per ton, ore	Cost per ounce, silver
Mining	$.1179	$.1151	$.1146	$70.76	$.1414
Concentration	.0362	.0297	.0236	9.69	.0193
Depreciation	.0047	.0037	.0043	1.49	.0030
Marketing	.0587	.0509	.0510	34.25	.0684
Corporation exp	.0013	.0007	.0005	.36	.0007
University mine exp	.....	.0001	.0002	1.56	.0031
	.2768	$.2002	.1942	118.11	.2359
Less rents, etc	.0175	.0082	.0031	1.61	.0032
Total	$.2593	$.1920	$.1911	$116.50	$.2327

Year ending Dec. 31, 1913:—Silver, 2,636,696 oz. Income, $1,556,631. Profit, $955,418. Ore and conc. prod., 3,274 tons. Ave. silver, oz., 791.8. Tons milled, 37,556. Average silver, oz., 13.53. Tons concr., 950. Average silver oz., 460. Price silver, 59.32. Per cent. profit on prod., 61.38. Cost per oz.: min., $.1474; conc., .0388; deprec., .0616; mrkt., .0045; corp. exp., .0008; total, $.2531. Total after rents, $.2280.

Note.—The operations shown under 1909 are from May 31, 1909, to May 31, 1910, and those shown under 1910 are from June 1, 1910, to Dec. 31, 1910. At this point the fiscal year changed to correspond with the calendar years. The ore is sorted on the surface on bumping tables, and the undersize of 1½-in. screen is jigged. The fines are shipped to the smelters, and jig tails together with the discards from the sorting tables, are sent to the custom concentrator and classed as mill ore.

McKINLEY DARRAGH-SAVAGE MINES, LTD.

COBALT, ONTARIO, CANADA

Year Ended Dec. 31

U. S. Currency

	1912	1911
Production silver, ounces	2,704,868	2,569,654
Gross income	$1,719,702	$1,503,612
Total expenses	565,853	529,747
Profit	$1,153,849	973,864

	McKinley	Savage	McKinley	Savage
Tons ore and concentrates shipped	2,089.6	503.6	2,755.28	470.74
Average silver, ounces	912.9	1,246.4	741.7	1,297.1
Tons ore milled	51,897	17,888	46,497	13,917
Average silver, ounces	32.73	.....	39.68	.....
Extraction, per cent	86.93	.....	89.61	.....
Average tonnage per day	161.7	.....	145.9	44.89
Average price for silver, ounces	.....	61.66¢	54.16¢	54.16¢

COSTS PER TON MILLED

	McKinley mine		McKinley mine	
	Per ton, ore	Per oz., silver	Per ton, ore	Per oz., silver
Admin. taxes, etc	$0.735	$0.0185	$0.628	$0.0143
General charges	.275	.0069	.344	.0078
Mining — exploration	.435	.0110	.600	.0136
Mining — development	.868	.0219	.840	.0191
Mining — production	.956	.0240	.806	.0184
Handling mill dumps	.....	.....	.022	.0005
Milling	1.248	.0315	1.366	.0311
Bagging and loading concentrates	.168	.0043	.333	.0076
Sampling and assaying	.113	.0029	.124	.0028
Alteration to plant	.043	.0011	.134	.0030
Surface and road repairs	.005	.0001	.020	.0005
Camp and boarding house	.244	.0062	.204	.0046
Marketing product	1.968	.0497	2.283	.0519
Total	$7.058	$0.1781	$7.704	$0.1752
Savage mine costs	$7.483	$0.2118	$8.946	$0.2039

The McKinley ships comparatively little high-grade ore. It makes a practice of stoping good widths of mill ore and shipping the high-grade concentrates.

1913 Operations :—Prod. silver, oz., 2,214,036. Gross income, $1,192,265. Expenses, $420,778. Profit, $771,487. Tons ore and conc. shipped M'Kinley, 2,200. Tons milled, 48,761. Average silver, oz., 31.04. Ext., % 86.94. Price silver, 59.19¢. Cost per ton ore M'Kinley, $7.369; per oz., 21.8¢. Savage per ton, $4.989; per oz., 23.88¢.

NIPISSING MINING CO., LTD.

COBALT, CANADA

Year ended Dec. 31	1912	1911	1910	1909
Silver, ounces	4,688,261	5,197,042	5,548,651	4,727,231
Gross value	$2,896,990	$2,820,257	$2,984,084	$2,462,039
Total expenses	$815,279.95	$863,263	$1,096,150	$1,038,035
Profit	$2,081,710.15	$1,956,994	$1,887,934	$1,424,004
Tons, ore and concentrates shipped.	1850.9	2992.4	6717.2	6391.7
Average of silver	.....	885.4	835	724
High-grade mill:				
Tons treated	1752	922	.....	.....
Average ounces, silver	2212	2561	.....	.....
Extraction, per cent	99	99	.....	.....
***Treated by custom mill:**				
Tons ore treated	13,894	14,766	13,537	11,159
Average ounces, silver	13.3	22.3	29.6	27.9
Extraction, per cent	65.9	73.4	.....	.....
Profits on production, per cent.	71.86	74.3	72.62	68.53
Ave. price rec'd ounces, silver	61.457¢	53.58¢	53.44¢	51.54¢

Cost per ounce, silver				Per ton, ore	Per ounce, silver
Mine operation	.1208	$.0893	$.0887	$59.95	$.0811
Conc. and milling	.0365	.0215	.0083	5.54	.0075
Depreciation	.0112	.0074	.0058	7.79	.0105
Marketing	.0131	.0266	.0503	41.18	.0557
Corporation expense	.0030	.0038	.0036	1.95	.0026
	$.1846	$.1486	$.1567	$116.41	$.1574
Less income	.0107	.0091	.0095	6.30	.0085
	$.1739	$.1395	$.1472	$110.11	$.1489
Shafts and tunnels	.....	.....	.....	11.11	.0150
Total	.....	.....	.....	$121.22	$.1636

*In 1913 the low grade was treated in what is called the company's low grade mill at a cost of $4.132 per ton of ore.

The ore shipments are classified as follows:

		1910
High-grade ore	2,500 to 3,000 ounces silver per ton	73.6 per cent. of total value
Low-grade silicious ore	200 to 300 ounces silver per ton	15.6 per cent. of total value
Concentrates	400 to 1,000 ounces silver per ton	5.3 per cent. of total value
Nuggets	10,000 to 12,000 ounces silver per ton	5.5 per cent. of total value

See also Appendix, pages 374 and 400

TEMISKAMING MINING CO., LTD.

(See Appendix, page 395) COBALT, CANADA

TRETHEWEY SILVER COBALT MINE, LTD.

(See Appendix, page 395) COBALT, CANADA

WETTLAUFER LORRAIN SILVER MINES, LIMITED

SOUTH LORRAIN, ONTARIO, CANADA

U. S. Currency

Quarter ends	Sept. 30, 1912	Mar. 31, 1912
Prod.	$125,841.57	$153,516.14
Total costs	$ 48,444.65	$ 51,309.34
Profits	$ 77,396.92	$102,206.80

	Tons	Ag. ozs.	Tons	Ag. ozs.
First gr.	31.68	103,673	63.2	213,013
Second gr.	60.67	41,512	25.6	20,561
Concents	29.29	46,057	17.2	29,139
Bullion	.....	4,031	.....	1,970
Total	121.64	195,273	106.0	264,683

Ave. value per ton $1448.26 Ag. at 58¢ per oz.

Costs	Per oz.	Per ton ore	Per oz. Ag.
Development	3.534	$42.23	1.692
Stoping	3.677	68.35	2.737
Timbering	.823	16.54	.663
Hoisting	2.644	40.58	1.625
Tramming	.430	14.02	.562
Ore sorting and concentrating	3.082	48.87	1.957
Mine office; Gen. exp	.238	11.69	.468
Assur. and sur	.702	15.31	.613
Board H. exp	.108[1]	6.95	.278
Plant and eq	.326	59.42	2.380
Dumps A and B	.804	.....	.....
Gen. mine ex	.874	.....	.....
	17.026¢	$323.96	12.975¢
Smelting chgs	3.277	$70.47	2.823
Frt., insurance, etc	1.049	24.04	.964
Supt. and engineers' salaries	1.383	25.47	1.021
Taxes	.922	23.59	.944
Treas. salary and N. Y. off. exp	1.152	16.52	.662
Total	24.809¢	$484.05	19.389¢

[1] Profit.

The vein is similar to the Cobalt veins. It is a small streak of very high-grade silver ore. The depth dev. is about 300 ft. by shaft. The mill consists of sorting table, jigs and two concentrating tables. A Huntington mill will be added to crush the jig tails.

LABOUR COSTS IN COBALT AND PORCUPINE MINING CAMPS

Nine hours a day	Cobalt	Porcupine
Machine men	$3.25	$3.50
Helpers	2.75	3.00
Muckers and trammers	2.50	2 75
Cage-tenders	2.75	3.00
Timberman	3.25	3.50
Extra 25¢ for sinking in wet places.		
Board, per day	.60	.75
Millman, 12 hours average	3.50	3.75
Blacksmith	4.25	4.50
Hoisting engineer	3.50	3.75
Fireman and pipe-fitters	3.00	3.25

[1] Data by Mr. Samuel Cohen.

TILT COVE ESTABLISHMENT

TILT COVE, NEWFOUNDLAND

Operated by Cape Copper Co.

Year Ended Aug. 31

Money Sterling and U. S.

	1911		
Production	£30,940 14s. 8d.		
Costs	£19,928 10s. 4d.		
Operating balance	£11,012 4s. 4d.		
	East Mine	South Lode	West Mine Bluff
Long tons ore mined	16,094	10,728	2,255
Average copper content, per cent.	3.27	3.63	8.07
Working costs (long ton)	$2.42	$1.80	$6.22

Notes.—The mines are operated by "opencast" method. The ore is shipped. No further description is given of the ore-bodies or the methods practiced. It will be noticed that the financial data is expressed in pounds sterling and costs in dollars. They are so given in the report.

YUKON GOLD COMPANY

YUKON TERRITORY, CANADA

U. S. Currency

	1912	1911	1910	1909
Total production	$4,863,448	$3,106,127	$2,748,098	$1,474,599
Total expenses	2,142,029	.....	.....	.....
Profits	$2,721,419	.....	.....	.....
Dawson dredging operations:				
Cubic yards gravel	5,157,280	4,151,249	3,249,788	2,381,880
Gross value	$3,346,026	$2,671,845	$2,150,723	$1,363,722
Value per yard	64.88¢	64.35¢	66.18¢	57.24¢
Cost per yard	30.64¢	35.43¢	31.09¢	31.94¢
Profit per yard	34.24¢	28.92¢	35.09¢	25.30¢
Dawson hydraulicking:				
Cubic yards gravel	2,967,750	2,125,551	1,406,397	705,544
Gross value	$629,043	$434,282	$696,375	$385,877
Value per yard	21.19¢	20.43¢	49.51¢	54.41¢
Cost per yard	9.37¢	15.50¢	25.69¢	41.78¢
Profit per yard	11.82¢	4.93¢	23.82¢	12.63¢
Length of season, days	172...			
Iditarod dredging:				
Cubic yards gravel	172,233	.....	.....	.....
Gross value	$404,040	.....	.....	.....
Value per yard	2.34	.....	.....	.....
Cost per yard	.4591	.....	.....	.....
Profit per yard	$1.8809	.....	.....	.....

Cost per yard	Minimum	Maximum	Average
Labour	.015	.030	.023
Supplies	.006	.019	.013
Repairs	.002	.020	.004
Fuel	.001	.003	.001
Power	.006	.037	.024
Thawing	.000	.200	.150
Fixed charges	.050	.130	.090
	.080	.439	.305

1913 Operations:—Prod. $4,789,402. Expenses, $2,251,955. Profit, $2,537,447. Cubic yards gravel, 5,133,575. Value per yd.,65.13¢. Cost, 29.53¢. Profit, 35.60¢. Yds. gravel hydraulicking, 2,875,952. Value per yd. 8.9¢. Cost, 9.7¢. Loss on operations. Iditarod: Yds. dredged, 496,756; Value, $1.67; Cost, $.64; Profit, $1.02.

SUMMARY DREDGING OPERATIONS, 1913

Period	Oct., 1913	6 Months ended Oct. 31
Cost per yard:		
Direct cost:		
Fixed salaries	.0017	.0008
Labor	.0410	.0238
Fuel	.0043	.0009
Shop expense (repairs)	.0006	.0021
Material and supplies	.0043	.0174
Power	.0418	.0246
Total direct	.0937	.0696
Indirect cost:		
Preliminary	.0355	.0228
Taxes (representation)	.0008	.0005
Bullion charges	.0224	.0198
General charges	.0130	.0185
Depreciation	.0273	.0183
Insurance	.0020	.0012
Assay office	.0014	.0013
Stables	.0052	.0021
Main ditch	.....	.....
Company telephone lines	.0005	.0003
Transportation	.0009	.0001
Miscellaneous	.0050	.0051
Total indirect	.1140	.0900
Thawing	.0798	.1357
Total operating costs	.2875	.2953

See also Appendix, page 374

MEXICO

SONORA

CRESTON COLORADA COMPANY

SONORA, MEXICO

Year Ended Sept. 30

U. S. Currency

		1912[1]	1911	1910	1909
Production	.....	.....	$778,750	$695,886	$658,883
Production slimes	.....	.....	.....	255,954	381,671
Oper. exp. mine ore	.....	.....	662,629	510,105	581,806
Oper. prof. mine ore	.....	.....	116,121	185,781	77,026
Oper. prof. slimes	.....	.....	.....	70,064	170,421
Net profit	.....	.....	$107,257	$247,442	$241,547
Tonnage	130,664	199,700	186,700	107,500	96,100
Revenue per ton	$6.20[4]	.....	$4.05	$6.47	$6.85
Slimes	.....	.....	.....	$4.41	$6.22
Cost per ton:					
Mining	$ .90	$ .66	$1.23	$1.86	$2.64
Development[2]	.23	.09	.....	.....	.....
Milling	.58	.53	.53	.78	.90
Cyaniding	.94	.97	1.15	1.33	1.47
General expense	.12	.26	.29	.34	.42
Bullion	.22	.19	.23	.41	.47
Total	$3.13[3]	$2.70	$3.43	$4.74	$5.90
Total slimes	.....	.....	.....	3.20	3.44
Profit per ton	.....	.....	.62	1.72	.80
Profit slimes	.....	.....	.....	1.21	2.77
Extraction, per cent	.....	76	.....	79	80
Extraction slimes, per cent.	.....	.....	77	72	75

[1] Impossible to get figures for 1912 where omitted. [2] Years previous to 1912 development included in mining. [3] Incl. $0.14 concentrate exp. [4] Gross value.

See also Appendix, page 375

THE LUCKY TIGER-COMBINATION GOLD MINING CO.

THE TIGRE MINING CO., S. A.

YZABAL SONORA, MEXICO

See Appendix, page 395

1. Cananea 2. Santa Rosalia

5. Madera 6. Chihuahua

9. Guanajuato 10. E

3. Prietas 4. Nacozari

Parral 8. Santa Barbara

ro 11. Pachuca

LA DURA MILL & MINING CO.

La Dura, Sonora, Mexico

	1912	1911		August 1 to December 31, 1910	
Production		$197,478.51		$104,034.59	
Operating expense		153,150.62		62,705.23	
Operating profit		44,327.89		41,329.36	
Net profit		42,465.65		40,632.04	
1910 tonnage Prieta		552		647 Gloria	
1911 tonnage Prieta		2117		1234 Gloria	
	Prieta and Gloria	Prieta	Gloria	Prieta	Gloria
Revenue per ton hoisted		$93.92	$32.99	$94.94	60.39
Cost per ton:					
Mining	$12.61	13.55	16.52	12.04	2203
Development	8.91	15.85	10.89	6.85	1450
Shipping	9.14	6.73	2.40	6.77	4.38
Freight and treatment		10.76	5.34	7.63	7.16
General expense	3.20	7.26	4.27	6.55	8.11
Total expenses	$33.86	$54.15	$39.42	$39.84	$56.18
Profit		$39.77	$6.43 (loss)	$55.10	$4.21
Tonnage	6042				

Properties located at La Dura on the Yaqui River, Sonora, Mexico, on the Mexican Branch of the Southern Pacific. The Company operates two mines, *i.e.*, the Gloria and Prieta, owned and operated by Americans since 1888. The ore occurs in true fissure veins of a width of from 12 in. to several feet. The ore is quartz. Property is opened by shafts and drifts. In the Prieta Mine three ore-bodies are being worked. In the Gloria mine two main ore-bodies are developed. Some of the ore-bodies have been developed for 1800 ft. in length. The mine is 1040 ft. deep. The method of mining the ore-bodies is to strip the country rock from the vein on the foot-wall side, and the ore is then broken down. The method of reduction is concentration. Concentrates are smelted or cyanided. Ores were originally hand-sorted. This, however, has been done away with by the erection of a small concentrator. This plant handles 10 tons of ore in 10 hours, and is much cheaper than former method. The cost of hand-sorting was approximately $3 per ton of raw ore. With the small mill, according to the 1911 report, the management expected to treat the ore and make an 85 per cent. extraction of the silver at a cost not to exceed $1.25 per ton. At present mill is making an 11-ounce silver tailing, which is being stocked for re-treatment. (*U. S. Currency.*)

GREENE-CANANEA COPPER CO.

CANANEA, SONORA, MEXICO

Year ended Dec. 31	1912	1911	1910	1909
Lbs. copper (Greene Cons.)	40,996,018	37,101,119	36,921,309	.....
Lbs. copper (San Pedro)	7,191,829	7,796,347	8,758,836	.....
Total Greene-Cananea copper, pounds..	48,187,847	44,897,466	45,680,000	44,455,909
Ounces silver	1,457,308	1,295,297	1,184,980	930,710
Ounces gold	7,197	5,892	.....	.....
Combined income:				
Income, Greene Consolidated	$2,280,798	$1,026,951	.....	.....
Income, San Pedro	330,029	312,680	.....	.....
Total net income	$2,610,827	$1,339,631	.....	.....
Net income, Greene-Can.[1]	$2,580,749	$1,318,472	$681,653	$544,107[2]
Average price copper per pound	16.0194¢	12.886¢	.....	.....
Cost per pound:				
Cananea Consolidated	10.31¢	9.843¢	11.514¢	.....
San Pedro	11.53¢	8.907¢	[3]	.....
Average cost Greene-Cananea	10.868¢	9.67¢	11.334¢	12.03¢

[1] After construction and betterments. (*U.S. Currency*)

[2] Greene-Cananea.

[3] San Pedro cost 8.287¢. Cananea Dev. cost 12.519¢.

For details of Greene-Cananea's subsidiary companies' operations previous to 1911, see Green Consolidated and San Pedro Companies.

The production of the Greene Companies since 1906 has been as follows:

GREENE-CANANEA COPPER COMPANY[1]

Period	Lb. copper	Oz. silver	Cost per lb. copper[4]		Net earnings
			Greene-Cons.	Greene-Can.	
Aug. 1, 1906 to Nov. 4, 1907	58,180,856	766,422	.....	.....	1,870,247[2]
July 11, 1908 to Dec. 31, 1908	18,619,609	447,663	10.50¢	.....	214,140 de
Year ending Dec. 31, 1909	44,455,909	930,710	11.64¢	12.03¢	544,107[3] f.
Year ending Dec. 31, 1910	45,680,000	1,184,980	11.51¢	11.334¢	681,653
Year ending Dec. 31, 1911	44,897,466	1,295,297	9.84¢	9.67¢[3]	1,318,472
Year ending Dec. 31, 1912	48,157,847	1,457,307	10.31¢	10.868¢	2,580,749

[1] Figures shown take into account company holdings in Greene Consolidated Copper Co., San Pedro Copper Co., Cananea Central Copper Co. and Cananea Development Co.

[2] Including profit from 200,000 shares Cananea Central Copper stock.

[3] Earnings are for Greene Consolidated.

[4] Includes depreciation and construction.

For more recent operations see Appendix, page 400.

GREENE CONSOLIDATED COPPER COMPANY

CANANEA, MEXICO

Year ended Dec. 31	1912	1911	1910	1909
Total copper produced	48,187,847	44,897,466	45,680,145	44,547,689
Copper foreign ore	7,191,829	7,796,347	8,758,836	7,532,244
Copper domestic ore	40,996,018	37,101,119	36,921,309	37,015,445
Gross income, copper, gold, silver and miscellaneous revenues.	$7,929,468	$6,045,834	$5,592,050	$5,510,846
Total expenditures	5,496,022	4,738,702	4,407,301	4,408,287
Net earnings	$2,433,446	$1,307,131	$1,184,749	$1,102,559
Deprec. const. and improv.	152,647	280,179	684,097	558,452
Net profit	$2,280,799	$1,026,951	$ 500,652	$ 544,107
Direct charge prof. and loss	.....	.....	41,450	.....
			$ 459,202	
Price received for copper	16.0009¢	12.886¢	12.621¢	13.1102¢
Tonnage wet:				
Domestic mined	906,546	751,462	795,050	826,364
Domestic ore treated	895,406	741,872	792,313	835,929
Foreign ore treated	280,154[1]	195,091	221,005	225,607
Total ore treated	1,175,560	936,963	1,013,318	1,061,536
Ore milled:				
Domestic	547,025	415,199	509,228	602,366
Foreign	143,931	113,213	160,925	205,995
Total	690,956	528,412	670,153	808,361
Ratio conc. dom. ore milled	3.157 in 1	2.404 in 1	2.869 in 1	2.93 in 1
Ratio conc. for. ore milled	4.877 in 1	5.169 in 1	5.157 in 1	2.19 in 1
Recovery:				
Copper, domestic ore, per cent.	2.252	2.50	2.229	2.206
Silver, domestic ore, ounces	1.0696	1.0718	1.0317	.750
Gold, domestic ore, ounces	.005	.005	.005	.0046
Saving, per cent	73.79	77.69	75	.....
Cost per ton:				
Mining and development	.....	$1.86	$2.571	$2.071
Imp. and equip	.....	.....	.151	.095
Miscellaneous	.....	.592	.029	.055
Total mining	$2.93	$2.46	$2.75	$2.22
Milling, oper. and repairs	.722	.646	.693	.....
Improv. and betterments	.094 } .816	.076 } .722	.161 } .854	
Smelting	2.85[2]	2.57	2.69	3.09
Total mining and beneficiating per ton ref. prod. sold	$5.92	$5.257	$5.765	$5.459

GREENE CONSOLIDATED COPPER COMPANY.—*Continued*

	1912	1911	1910	1909
Cost per Pound:				
Gross f.o.b. Cananea	11.452¢	9.568¢	10.2091¢	10.174¢
Frt. to N. Y. tax ref. mkt. int.	1.498	1.343	1.7105	1.7353
Total	12.950	10.911	11.9196	11.9093
Credit precious metals	1.741	1.339	1.4072	1.0840
Credit miscl. revenue	.899	.484	.8485	.7969
Total cost fine copper	10.31¢	9.088¢	9.6639¢	10.0284¢
Depreciation	.....	(Const) .755	1.8501	1.6119
Cost inc. every expenditure	.....	9.843	11.514	11.6403
Yield per ton ore benef. lb	.....	50.01	46.58	44.12
Miscellaneous costs: Stoping	$1.391	$1.311	.....	.....
Development	.762	.557	.....	.....
Dead work and Surface expense	.744	.592	.....	.....
Total mining	$2.927	$2.46	.....	.....
Smelting per ton chg. in rev. incl. gen'l exp.	$1.667	$1.65	$1.90	$1.76
McDougall roasting	.....	.40	.....	.....
Development, feet	72.403	51,784	52,161	46,911
Cost per foot	.....	$8.00	.....	.....

[1] Includes 47,017 tons of Miami concentrates. [2] In the reduction cost of $2.85 there was included $.087 gen'l exp. and $.059 for hauling concentrates.

For more recent operations see Appendix, page 400.

The mines which are opened by shaft and tunnel are developed to comparatively shallow depths, an average being approximately 600 ft. The deepest shaft is the Capote being 1000 ft. The largest of the ore-bodies vary from several hundred feet in width to more than 1000 ft. in length. The ores are both concentrating and direct smelting, being composed chiefly of chalcocite, chalcopyrite and other sulphides.

The milling ores average between 2 and 2½ per cent. copper. The smelting ores average over 3 per cent. The ratio of concentration is approximately 3 tons into 1, with a saving around 76 per cent. All ores, concentrating and smelting, carry both gold and silver values. Method of mining, principally slicing and caving, a timber matte being employed. Reduction plants consist of a 3000-ton concentrator, smelter and converter plant. Smelter has both blast and oil-fired reverberatories. Waste gases from reverberatories utilized in generating steam. Mines and reduction plant operated by electric power generated from fuel. Water supply ample. Company pumps 9 miles. Narrow-gauge railway connects different mines with reduction plant, total length aggregates 20 miles. Company employs approximately 5000 men, principally Mexicans, with several hundred Americans.

MOCTEZUMA COPPER COMPANY

NACOZARI DE GARCIA, SONORA, MEXICO

Operating the Pilares Mine

U. S. Currency

	1912	1911	1910	1909
Moctezuma ores and conc., tons.	124,083	111,462	113,294	112,563
Gold, ounces	785	735	717	1,055
Silver, ounces	438,246	361,296	362,464	421,648
Pounds refined copper	31,739,748	25,511,582	22,681,472	24,814,747
Net earnings:	$2,735,060	$930,495	$480,690	$1,104,454
Deprec. plant and min. prop. not incl. in above.	$790,665	$1,206,182	$675,009	$363,009
Tons of ore mined	628,012	524,336	434,773	.....
Tons milled	596,600	517,352	447,555	510,094
Average copper contents %	3.494	3.1708	2.992	3.22
Tons concentrates produced	131,061	113,222	107,014	110,724
Assay value, per cent	13.373	11.932	10.56	11.80
Copper cont., tailings, per cent.	.59	.5579	.60	.584
Saving, mill, per cent	85.95	85.19	84.80	85.81
Tons ore milled per ton conc.	4.552	4.569	4.182	4.61
Tons milled per day, actual time	1692	1466	.....	1475
Yield in per cent. copper	.....	.....	2.5	2.56
Price copper	15.51	12.36	12.826	.....
Development, feet	16,206	13,668	21,596	19,555
Fresh water used per ton ore milled.	799 gal.	.....	.....	.....

The reports do not give costs. An estimate of costs is as follows: U. S. currency. Mining, $1.10; milling, $.50; transportation, $.05; freight concentrates to Douglas, $4.50 Mex. Cy.; smelting, $3.00 U. S. Cy. 95 per cent. of the copper paid for, 2¼¢ off the New York quotations.

Remarks.—The ore-bodies at the Pilares mine make in a more or less circular formation, the diameter of which is approximately 2000 ft. Formation is andesite breccia. Ore is principally chalcopyrite, with some bornite and pyrite. Property is developed by two shafts and the Porvenir tunnel. Shafts are 1000 ft. deep each. Tunnel enters 700 ft. below outcrop and 300 ft. above bottom of shaft. Method of mining, shrinkage stopes principally, a few cut and fill. Tunnel has electric haulage 1 mile long. From tunnel portal to mill is 6 miles, connection made by narrow-gauge railway owned by company. Concentrator is 1600 tons' capacity. Power plant at mill generates electricity from coal. The company owns narrow-gauge railway from Nacozari to Douglas across the U. S. border.

1913 Operations:—Lbs. copper, 36,598,132. Net earnings, $2,402,447. Depreciation, $400,037. Tons milled, 603,654, grade 3.557% copper. Saving, 85%. Tons conc., 135,057, grade 13.376%. Price copper, 15.37¢.

SAN PEDRO COPPER CO., S. A.

CANANEA, MEXICO

Year Ended Dec. 31

U. S. Currency

(Belongs to Greene-Cananea Group)

	1912	1911	1910	
			San Pedro	Cananea development
Copper sales	$1,159,664	$1,001,181	.....	.....
Gold and silver sales	353,657	317,142	.....	.....
Total income incl. miscl	1,514,585	1,319,723	$587,925	$759,616
Exp., incl., int	1,164,595	1,004,878	414,306	752,234
Balance copper inventory	19,961	2,164	.....	.....
Net income	$330,029	$312,681	$173,619	$7,382
Production:				
Fine copper, pounds	7,191,829	7,796,347	3,923,224	4,835,612
Silver, ounces	484,584	500,137	133,601	235,023
Gold, ounces	2,655	2,282	690	1,051
Tonnage:				
Wet tons ore mined	215,300	193,689	59,364	165,560
Wet tons ore treated	219,127	195,487	58,627	162,378
Dry tons treated	211,206	187,417		
Ratio of concentration	4.877 into 1	5.75 into 1	3.917 into 1	5.218 into 1
Recovery:				
Copper, per cent	1.703	2.08	3.346	1.489
Silver, ounces	2.29	2.67	2.279	1.447
Gold	.0126	.0122	.012	.006
Cost per ton:				
Mining per wet ton	$2.80	$1.945	$3.202	$1.746
Cost per pound, cents:				
Gross f.o.b. Cananea	14.740	10.871	8.678	13.978
Frt. exp., tax ref. mkt., etc	1.730	1.540	1.781	1.568
Total	16.470	12.411	10.459	15.556
Credit metals	4.9175	3.784	2.172	3.037
Less miscl	.0175	.280		
Total	11.535¢	8.907¢	8.287¢	12.519¢
Development, feet	12,998	11,466	5,347	3,198
Cost mining Cananea:				
Duluth per ton	$2.497	.....	.....	.....
Price rec'd for copper	.....	.....	12.618	12.618

Remarks.—Company operates Cananea-Duluth mine, a large body of disseminated ore. Mine opened to sixth level. The ores are concentrated.

COMPAGNIE DU BOLEO

SANTA ROSALIA, BAJA (LOWER), CALIFORNIA, MEXICO

Year Ended Dec. 31

Tons = 2240 lb.

Currency Francs, $ and £

	1912	1911	1910
Tons copper	12,650	12,360	13,000
Pounds copper	28,336,000	27,686,400	29,120,000
Profit after amortiz., francs	7,070,120	3,856,231[1]	.....
Profit after amortiz	$1,414,024	$771,246	.....
Tons ore mined	364,850	355,100	366,000
Tons treated	360,500	.....	.....
Average grade copper, per cent	3.51	.....	.....
Tons transported, railroad	652,312	605,661	.....
Copper on hand Dec. 31, francs	4,236,000	3,888,864	.....
Copper carried at per ton	£60	.....	.....

[1] After allowing Fr. 723,408 for expenses as result of cyclone in 1911.

Remarks.—The Boleo property is owned and controlled by French capital in which the Rothschilds are said to be heavily interested. Very little information is to be had on the Boleo mine. We give the above figures as throwing some light on the Company's operations. No costs are available. The approximate cost per pound can be computed by assuming the average selling price of metal for the year.

The mine is located on the east coast of Lower California, nearly opposite Guaymas. The property is reached by boat from that port. The company operates steamers between the mine and European ports. The ore occurs in beds of a conglomerate of sandstone and tuff. Three beds are worked. They average about 3 ft. in thickness and vary from 2 or 3 ft. up to a maximum of 10 ft. The ore consists of oxides—cuprite and melaconite, various carbonates including azurite and malachite, also chrysocalla and atacamite. In the lowest bed, sulphide ore occurs principally as chalcocite and covellite. The ore is sent direct to the smelter and treated in blast furnaces. The matte at last accounts was shipped to Europe, though Company was considering installing converters. The Boleo copper consequently does not appear in the North American production. Coal and coke are obtained from Europe. The mine and smelter has both steam and electric power. The country is dry and water scarce. Principally Mexican labour is employed, though Japanese and Chinese are used to some extent about the mines.

CHIHUAHUA

ALVARADO MINING & MILLING COMPANY

PARRAL, CHIHUAHUA, MEXICO

Weights Metric System — *Values U. S. Currency*

Production	July 1 to Dec. 31, 1911	Jan. 1 to June 30, 1911
Bullion, sales and miscellaneous earnings	$276,234	$140,771
Cost of operation	189,592	120,945
Profit	$86,642	$19,826
Tons treated (dry)	46,760	32,510
Value of ore	Not given	Not given
Costs (per ton):—Mining and tramming	$0.83	$0.707
Milling and marketing	3.22	3.01
	$4.05	$3.717

Remarks.—Operations at the Alvarado mine have been greatly handicapped owing to the Mexican revolution. It is stated that the above production has been obtained principally from development and exploratory work above the water level pending the installation of pumps in the mine. The property is opened by shaft and by inclined shaft to 927 ft. deep. The property is equipped with a 300-ton cyanide plant, which it is expected will develop a capacity of 450 tons per day. The new mill was placed in commission in 1911. Pumps are being installed in the mine at the sixth level. The property has electric power.

BATOPILAS MINING COMPANY

CHIHUAHUA, MEXICO

U. S. Currency

Year ending Dec. 31	1911	1910	1909	1908
Prod. ounces, silver	516,688.9	730,697.4	1,047,625	939,865
Tons ore treated	33,073.3	43,612.48	31,258	32,766
Ounces silver per ton:				
First class: Ave. of tot. ounces	15.6	.....	.....	695.0
Third class (mill ore)	.....	7.779	8.17	6.3
Mining, milling and smelting	$5.685	$8.75	$12.51	$9.69
Bullion, tax and expenses	1.925	.948	1.45	1.36
General expenses	1.615	1.702	2.80	2.24
	$9.225	$11.400	$16.76	$13.29
Bond acc't	.....	.613	.77	.38
		$12.013	$17.53	$13.67

Deficit of $106,257.98 for 1910.
Deficit of $17,409.17 for 1911.

See also Appendix, page 376

THE BUENA TIERRA MINING CO., LTD.

SANTA EULALIA, CHIHUAHUA, MEXICO

Year Ended Dec. 31

U. S. Currency

	1912
Sales of ore	£47,034
Total with int. and sundry recpts	48,004
Working expenses	23,585
Working profit	£24,419
Tons mined	31,781
Tons sorted as waste	1,038
Tons available for shipment	30,743
Tons shipped to smelter	30,085
Net smelter return	$256,014
Returns per ton	$8.51
Average silver content	8.65 oz.
Average lead content, per cent	15.1
On basis production 30,085 tons:	
Net ret. from smelter	$256,014
Total cost	120,467
Total profit	$135,547
Total cost per ton	$4.00
Total profit per ton	4.51
Cost per ton (30,073 tons):	
Mining	$1.33
Development	1.08
General expense	.54
Taxes	.11
Sorting and trans	.86[1]
Total cost	$3.92
Net smelter returns per ton	$8.66
Development, feet:	
Drifting	3,892
Raising	661
Sinking	252
Total	4,806

[1] Freight approximately 75¢, sorting 11¢.

In addition there was 2084 ft. of work done in the ore-bodies, partly in limestone and partly in ore, to facilitate the extraction of ore and hence chargeable to ore breaking.

Note.—Operation in 1912 was carried on under great difficulties. A strike of the miners was followed by the outbreak of the revolution in Northern Mexico. Railway communication was repeatedly interrupted and the smelter was able to run at only partial capacity and was at times closed down.

Remarks. Accessibility.—Situated about 15 miles east of Chihuahua and reached by the narrow gauge Mineral and Chihuahua Mining Cos.' railroads. Freight rate about 75 cents, U. S. Cy., from mines to Chih. Smelter.

Character of Ore.—Principally lead carbonate aver. 10 oz. Ag., 15 per cent. lead, also carbonate zinc ore, and say, 25 to 50 per cent. zinc, also low grade mixed sulphide.

Character of Ore-body.—Caves in limestone formation filled with lead carbonate ore, bodies of mixed sulphide, and carbonate zinc ore-bodies also found.

Width of caves vary from 10 to 200 feet, aver. about 30 ft., depth average 40 ft. but the Chorro ore-body has a depth of over 1000 ft.

Method of Mining.—The roof is first cleaned off and then the ore is mined in small benches, very little powder required and prac. no timber.

Method of Opening.—Raises put up to tap the caves at intervals of from 75 to 200 ft. Also opened up by following shrinkage on top of ore-body. The bodies found by prospecting mineral bearing fissures.

Depth of Mine.—Devel. ore-bodies most numerous at 450-ft. depth, but nearly all mines have ore-bodies down to depth 1300 ft. Buena Tierra shaft 1400.

Amount of Water Pumped.—Practically no water pumped in the camp.

Method of Ore Reduction.—Lead ore shipped to Chihuahua plant or El Paso plant of A. S. & R. Co., zinc to the U. S.

General Conditions.—Development costs are high due to difficulty of finding the ore-bodies, when once found generally extends a long distance along its major fissure or fracture. If a mine has sufficient number of ore-bodies to maintain a tonnage of 300 tons per day, conditions are admirable for low costs. No timber, no water to pump, and very little powder required, the ore being shoveled from the stopes to the mine chutes on contract. Ribs of lime occur in the ore-bodies making the percentage of waste lime rock in them 15 to 25 per cent.

Miners receive 2 pesos per day; machine men, 3 to 4.

DOLORES MINES COMPANY

MADERA, CHIHUAHUA, MEXICO

Year Ended Dec. 31

U. S. Currency

	1912[1]	1911	1910	1909
Production	.....	$1,041,145.99	$1,163,359.39	$1,160,531.67
Operating expense	.....	728,750.90	739,416.55	670,666.97
Operating profit	.....	312,395.09	423,942.84	489,864.70
General exp. including taxes, sal., comm., etc.	.....	21,704.94	17,587.88	27,157.65
Net profit	.....	$291,598.05	$406,354.06	$462,896.44
Tonnage	46,778	53,275	50,741	38,700
Extraction con., per cent.	25	.....	.....	.....
Extraction cyanidatn per cent.	62	.....	.....	.....
Total, per cent.	87	88	89	89
Cost per ton:				
Mining and developing	$ 3.72	$5.38	$6.35	$7.13
Development[2]	1.07	.....	.....	.....
Milling	2.40	2.38	2.25	2.68
Cyaniding	3.05	3.22	2.89	3.90
General expense	1.10	1.16	1.36	1.47
Bullion expense	.57	.90	1.06	1.51
Concentrates	.47	.63	.66	.95
Total per ton	$12.38	$13.67	$14.57	$17.64
Revenue per ton	.....	$19.54	$22.92	$30.02
Profit	.....	$ 5.87	$ 8.35	$13.38

[1] Impossible to get figures for 1912 where omitted.

[2] Years previous to 1912 development included in mining.

Properties located in State of Chihuahua, Mexico, 40 miles by trail from Madera, or 14 hours horseback. Madera is on Mexican & N. W. Ry., 200 miles from Chihuahua. Properties operated by tunnels, shafts and drifts. Depth of mine 600 ft. Ore-bodies vary from 4 to 15 ft. in width, average value being approximately $22 per ton U. S. Cy. The ore is hard quartz, containing 2 per cent. of sulphides. Method of mining, ore-filling. Method of reduction is cyanide treatment. Plant handles 5500 tons per month. Company employs 29 Americans and 449 Mexicans. Development work is being actively carried on, about 850 ft. per month being done.

EL RAYO MINES COMPANY

SANTA BARBARA DISTRICT, CHIHUAHUA, MEXICO

Year Ended Dec. 31

U. S. Currency

	1912[1]	1911	1910	1909
Production	.....	$760,457.77	$714,417.10	$507,455.21
Operating expense	.....	358,082.95	340,150.19	341,728.81
Operating profit	.....	$402,374.82	$374,266.91	$165,726.40
General expense	.....	9,631.26	18,293.48	28,637.71
Net profit	.....	$392,743.56	355,973.43	137,088.69
Tonnage	56,000	55,600	54,300	43,008
Average extraction:				
Concentrates, per cent	17	.....	.....	.....
Cyanidation, per cent	69	.....	.....	.....
Total, per cent	86	86¾	84	84
Rec. per ton	.....	$13.70	$13.20	$11.79
Cost per ton:				
Development	.86[2]	.....	.....	.....
Mining	$1.36	2.22	2.18	2.51
Milling	1.16	1.04	1.06	1.39
Cyaniding	1.36	1.42	1.28	1.68
General expense	.62	.70	.68	.88
Bullion expense	.70	.63	.65	.45
Concentrates	.43	.42	.37	.93
Total expense	$6.49	$6.43	$6.22	$7.94
Profit per ton	.....	$7.27	$6.98	$3.85

[1] Impossible to get figures for 1912 where omitted.

[2] Development included in mining for years previous to 1912.

Properties located in Santa Barbara Mining District, Chihuahua, Mexico. Eight miles by trail to Santa Barbara, or 14 miles by wagon road. Rock is rhyolite, traversed by several fissure veins. Widths vary from 2 to 20 ft., dip 50 deg. Ore occurs in large irregular lenses along vein. The ore is quartz, and near surface soft and highly oxidized; with depth, more or less compact, carrying some pyrites as high as 10 per cent., but averages approximately 5 per cent. The values are 85 per cent. gold and 15 per cent. silver. Average value of ore approximately $16.50 (U. S. Cy.).

Properties are opened by shafts, tunnels and drifts. Pettit tunnel cuts ore-bodies 1000 ft. below surface. The method of mining is overhead stoping and waste filling. Milling plant handles 5000 tons per month. Method of reduction. Ores crushed in cyanide solution, thence to Huntington Mills and classifiers. Coarser portion of pulp passed through Australian grinding pans. Pulp is now concentrated over Frue Vanners, thence to cyanide plant. Cone classifiers at cyanide plant separate sands and slimes. These are cyanided separately. Slimes after going to agitating tanks are sent to Butters' filter. The values are recovered by zinc dust precipitation. Development work is being carried on at the rate of 900 ft. per month.

RIO PLATA MINING CO.

CHIHUAHUA, MEXICO

U. S. Currency Used

Year Ended Nov. 30	1912	1911	1910	1909
Earnings	$178,628	.....	.....	.....
Expenses	96,575	.....	.....	.....
Profit	82,053	.....	.....	.....
Silver, ounces produced	291,963	846,698	834,862	422,137
Tons ore milled	6,175	8,775	13,952	14,545
Silver, ounces recovered per ton	47.16	36.0	46.84	61.21
Tons tails cyanided	.....	25,381	21,900	2,143[1]
Silver, ounces recovered	.....	34.3	28.3	37.3
Mill extraction, per cent	90	87.2	85.9	87.6
Costs per ton milled:				
Mining	$2.710	$2.24	$1.881	$1.89
Development	1.619	.....	.....	.....
Milling	.782	.46	.446	.....
Cyaniding	2.774	2.37	2.241	.....
Power	.697	.407	.409	3.27
General expenses	.652	.894	1.037	.....
Depreciation	.....	.847	.548	.....
Freight and forwarding	.631	.390	.682	1.37
Administration	2.040	.895	1.066	1.52
Mine total	$11.905	$8.530	$8.310	$8.05
N. Y. Administration	3.732	.818	.768	.65
Total	$15.637	$9.348	$9.078	$8.70

[1] The remaining 12,069 tons went to storage dam.

General Remarks.—The ores are a silver-bearing quartz. The veins vary from 4 ft. to 5 ft. in width. The ore crushed and concentrated. The tails are cyanided.

SAN TOY MINING CO.

CHIHUAHUA, MEXICO

Year Ended Dec. 31

U. S. Currency

	1912	1911	1910
Gr. val. prod	$314,884.22	$793,318.47	$529,470.48
Less smelting charges	34,479.37	48,282.48	96,766.36
Net. ret. fr. sales	$280,404.85	$745,035.99	$432,704.12
Miscl. income	21,112.77	24,489.07	4,858.50
Gross income	$301,517.62	769,525.06	437,562.62
Total expenses	195,060.09	273,031.69	279,996.06
Net earnings	$106,457.53	$496,493.37	$157,566.56
Tons ore mined	7,851	12,173	20,181
Tons ore shipped	7,324	12,173	20,181
Silver produced, ounces	485,712	1,433,071	879,492
Silver per ton, ore, ounces	66.3	117.7	43.6
Lead produced, pounds	260,989	1,275,778	1,584,528
Per cent. lead per ton ore	1.80	5.9	3.9
Gr. val. per ton	$42.99	$65.17	$26.23
Val. per ton fr. smltr	32.28	61.20	21.44
Net profit per ton	11.65	38.77	7.56
Costs per ton;			
Mining ore, handling and development	$15.595	$12.201	$8.247
Freight	1.368	2.100	2.154
Taxes	2.790	3.145	1.206
General expense	4.830	3.750	1.523
Depreciation	2.048	1.232	0.743
Total	$26.631	$22.428	$13.873
Average price received for silver, ounces	60.07¢	51.87¢	52.10¢
Average price received for lead, pounds	2.89¢	1.79¢	1.65¢

Notes.—The main ore-body is horizontal and occurs at a shallow depth. The ore is a silver-lead product which is shipped to the smelters for reduction.

The ore-body varies considerably in width and in mineral content. Ave. width 15 ft. The mine is operated through shafts, the greatest depth being 1657 ft. Little or no ore, however, is coming from below the first level. Prospecting has been carried on in a lower stratum of fossilized lime. Large open fissures have made the diamond drill work a difficult task. Electric power is generated by gas producer plant on the property.

STATE OF MEXICO

COMPANIA MINERA LAS DOS ESTRELLAS, S. A.

TLALPUJAHUA, NEAR EL ORO, MEXICO

MEXICAN CURRENCY MEXICAN WEIGHTS

RESUME OF ANNUAL REPORT FOR YEAR ENDING DEC. 31, 1912

Revenue:—Gross value of metals and ores sold	$11,421,995.70
Miscellaneous	72,129.38
	$11,494,125.08
Expenses:—Operating, including cost of selling shipping ore	4,732,203.44
Amortization	186,127.00
Paris and Mexico taxes, offices, etc	428,917.65
Miscellaneous	53,713.23
	$5,400,961.32
Net profit	$6,093,163.76

Produced during the year:—Milling ore.. 504,171 metric tons
Shipping ore..... 1,418 metric tons

Total..... 505,589 metric tons, from which were recovered

Gold, kilos	6,545.6
Silver, kilos	68,048.5
Gross value	$11,237,311.49

Average monthly production, 42,132 metric tons.

COSTS

Mining:—Development	1.21	
Ore breaking	2.71	
Tramming	.17	
Transportation, electric haulage	.05	
Maintenance	.63	
Ventilation	.04	
Surface expense	.19	
Sampling	.01	
General expense	.32	$5.33
Milling:—Crushing and conveying	.03	
Stamping	.41	
Tube milling	.36	
General expense	.03	$ .93
Cyaniding:—Labor and power	.77	
Na Cy, 0.44448 kilos	.36	
Lime, 13.56 kilos	.13	
Zinc, 0.4602 kilos	.18	1.57
Assaying:		.09
General expense		.54
Shipping and selling:—Freight and treatment	.37	
Taxes	.41	.78
Total costs		$9.24 per metric ton.

EL ORO MINING AND RAILWAY COMPANY, LTD.

STATE OF MEXICO, MEXICO

Year Ended June 30

U. S. Currency

	1912	1911	1910	1909
Gross value	$2,228,190.50	$2,389,349	$2,562,675	$2,442,374
Ore milled, tons	302,698	360,294	316,138	285,181
Average value per ton	$7.66	$7.63	$8.86	$9.55
Mill recovery, per cent.	85.14	87.00	91.41	89.65
Profit per ton	.....	$2.65	$2.93	$3.14
Costs per ton mined:				
Mining	$1.89	$1.55	$2.25	$2.50
Development	.83	.74	.94	.69
Milling	.18	.17	.28	.40
Cyaniding	.93	.91	.87	.90
Water supply	.01	.02	.01	.02
General expense	.22	.22	.25	.32
Taxes	.23	.29	.33	.32
Miscell. exp	.10	.08	.24	.27
Cost per ton treated	$3.79	.....	.....	.....
	$4.39	$3.98	$5.17	$5.42

Note.—The ore-bodies vary in width from 10 ft. to 60 ft. The values are mainly gold. Operated through shafts between 1500 ft. and 1600 ft. deep. The ore is stamped and then slimed in tube-mills. The product is then cyanided. Transportation facilities good. Average duty per stamp 8.88 tons per 24 hours.

The operating profit in 1912 was $759,356; and 1911, $955,509. In 1912, 84,459 tons of tailings were treated.

Operations, 1913 :—Gross, $2,188,723. Profit, $633,285. Tons milled, 253,434. Value, $7.21. Extraction, 88.39%. *Cost per ton mined:*—Min., $2.09. Dev., $1.42. Mill, $.18. Cyan., $.78. Total, $5.05. *Cost per ton milled:*—$3.59. Tons tailings treated, 180,274. Ore reserves, June 30, 1913:—448,053 tons, value, $9.90.

ESPERANZA MINING COMPANY

El Oro, Mexico

U. S. Currency

Year ended Dec. 31.	1912	1911	1910	1909
Gross value	$1,361,309	$1,675,611	$2,133,896	$2,094,446
Total expense	1,067,915	1,203,166	1,275,227	1,315,201
Working profit	$298,325[3]	$480,273	$858,669	$779,245
Net profit	.....	.....	.....	.....
Mine and mill:				
Tons treated wet	229,076[1]	272,235	229,878	212,470
Contents per ton (metric):				
Gold, grams	11.55	11.12	.....	.....
Silver, grams	70.48	76.76	.....	.....
Gross revenue per ton	$7.31	$6.17	$9.37	$10.44
Net profit per ton	1.30	1.76	3.74	3.71
Per cent. recovered:				
Gold (weight) per cent	79.72	88.12	.....	.....
Silver (weight) per cent	72.73	55.63	.....	.....
Total recovery (values) per cent.	78.64	83.00	84.04	86.17
Av. price recd., for metals:[2]				
Gold per kilo	$1,327.58	$1,333.33	.....	$1,332.57
Silver per kilo	42.16	34.37	.....	33.74
Cost per ton (milled wet):				
Mining	$2.26	$1.39	$2.05	$2.71
Development	1.08	.70	.96	.97
Milling	1.61	1.52	1.64	2.19
Shipping and selling	.23	.09	.16	.22
Genl. expense	.56	.46	.64[4]	.55[4]
Office expense	.03	.05	.....	.....
Maintenance	.26	.22	.90	.69
Total	$6.03	$4.43	$6.35	$7.33
Total	.....	.....	$5.66	$6.78
Development, feet	9,361	15,406	12,915	10,797

[1] Dry tons treated 210,726. [2] Mexican currency. [3] After miscl. profit. [4] Not included in figure given in annual report.

(Tons, 2000 lb. unless otherwise stated)

Résumé of Operations, 1908.—Gross production, $2,146,290; tons ore treated wet, 168,769; value ore milled, $14.75; average value per ton recovered, $12.72; extraction, 94.4 per cent.; profit per ton, $5.50; cost per ton, mining, $2.81; developing, 0.76; milling, $2.30; shipping and selling, $.54; general expenses, $.66; maintenance and reserve, $.84; total, $7.91.

Total Results of Mine to Dec. 31, 1912.—Dry metric tons, 1,856,434; gross yield, $63,984,698; Mexican currency; development, 129,043 ft.

Remarks.—Veins vary in width from 3 ft. and 5 ft. to over 50 ft. Mine operated by shafts. The mill treatment is concentration and cyaniding. Stamp mill has 120 stamps, 1250 lb. each, tube mill regrind and Pachuca cyanide tanks. Transportation facilities good.

THE MEXICO MINES OF EL ORO, LTD.

EL ORO, ESTADO DE MEXICO, MEXICO

Year Ended June 30

U. S. and English Currency

	1913	1911	1910
Bullion recovered	£340,864	£311,759	£284,036
Total recpt. with int. and sundry recpts.	346,790	314,107	294,364
Total expenses	145,213	130,022	139,373
Profit	£201,577	£184,085	£154,991
Mine:			
Ore prod. by stoping and dev., tons	158,630	131,820	138,266
Mill and cyaniding:			
Tons crushed	158,395	136,408	136,372
Assay value of ore, gold	$8.23	$8.93	$8.31
Assay value of ore, silver	$3.61	$3.68	$3.24
Extraction, theoretical, gold	91.85%	92.08%	91.55%
Extraction, theoretical, silver	79.50%	80.46%	80 20%
Extraction, theoretical, total	88.09%	88.69%	88.37%
Bullion realised, gold	$1,200,519	$1,128,256	$1,026,923
Bullion realised, silver	$469,021	$399,973	$365,413
Total bullion realised	$1,669,540	$1,528,229	$1,392,336
Percentages of values act. recovered:			
Gold	92.04%	92.65%	90.64%
Silver	82.02%	79.62%	82.78%
Total	88.99%	88.84%	88.43%
Costs per ton, U.S. Currency :			
Mining	$1.30	$1.35	$1.62
Development	.82	.87	1.02
Milling	.22	.23	.23
Cyaniding	.97	1.08	1.04
Water supply	.....	.02	.02
General	.35	.27	.25
Taxes	.46	.54	.50
Total cost	$4.12	$4.36	$4.68
Total cost with Miscl	4.12	$4.64	$4.75
Development, feet	8,140	12,137	9,558
Grade ore reserves:			
Gold value	$9.50	$9.50	$9.57
Silver, ounces	5.3	6.1	5.9
Mill ran per cent. of total time	97.32	97.73	97.8
Av. tons treated daily	433.9	373.7	
Stamp duty	11.15	9.56	9.55
Average received value per ton	$10.54	$11.20	10.21

The total working cost for the year 1909 was $5.67 and for 1908 was $6.33. During the latter part of 1910, the high-grade sulphide ore previously shipped to the smelter was cyanided separately, which increased greatly the profits from this ore. By giving it special treatment, average extractions of 97.49 per cent. of gold and 91.37 per cent. of silver were obtained or a total saving of 96.14 per cent. The high grade so treated was 607 tons, yielding bullion to the sum of $60,749, which amount is included in the production given under operations for 1910.

In 1912 total costs were $4.37: mining was $1.28; milling $.25; cyaniding, $1.08; genl. exp., $0.35; and taxes, $0.48.

Remarks. Accessibility.—El Oro Camp, State of Mexico, Mexico. El Oro Mng. & R. R. railroad connects with national lines of Mexico.

Character of Ore.—Siliceous quartz ore; principal metal content, gold with some silver. At depth and in some of the smaller veins a fine sulphide occurs in the quartz (mixed but principally iron).

Character of Ore-body.—Large fissure veins principally in shale, with 100 to 500 ft. of andesite capping covering both vein and shale.

Width.—Main San Rafael vein 40 to 200 ft. in width. West sulphide veins 3 to 30 ft. in width.

Method of Mining.—In big vein principally square setting and filling, some filling without square sets. Smaller veins filled and some held open with just stulls.

Method of Opening.—Opened by drifting on the vein, dist betw. levels 100 ft. Stoping started by square setting sill floor. In some places a 10-ft. pillar is left over the level and stoping carried up above that.

Depth of Mine.—1500 to 2000 ft.

Amount Water.—400 to 700 gal. per minute.

Method of Ore Reduction.—Some high-grade ore shipped direct to smelter but the bulk of ore is treated in the cyanide plant.

General Conditions.—This mine covers the north extension of the San Rafael and west veins of the Esperanza and El Oro mines. The Mexico mine holdings are small but the area has proved to be exceedingly productive, both the San Rafael and the smaller sulphide veins to the west.

Miners receive..... $1.25 to 2.50 (Mexican Currency) per day.
Peons receive..... $ .75 to 1.25 (Mexican Currency) per day.
Machine men receive..... $2.00 to 3.50 (Mexican Currency) per day.

DURANGO AND HIDALGO

Pachuca District

CANDELARIA LAND, MINING & POWER CO., LTD.

CANDELARIA, SAN DIMAS DISTRICT, DURANGO, MEXICO

Ten Months Ended June 30

U. S. Currency

	1912
Gross production	$217,128.36
Total expenses	$114,577.08
Net profit	$102,551.28
Tons ore milled	22,191
Assay value	$10.46
Value recovered	9.50
Value in tails	.96
Mill extraction, per cent	90.81
Costs per ton milled	
Mining and development	$2.2452
Milling	1.6666
Overhead charges	1.0723
S. F. office	.1791
Total	$5.1632
Development, feet	2,607
Cost per foot	$3.88

Notes.—The veins vary in width from 2 ft. to 3 ft. The values are mainly silver. The mine operates through tunnel or adit levels.

The mill has 18 stamps with average crushing capacity of 5.33 tons per 24 hours. The ore is re-ground in tube mills and cyanided in Pachuca agitation tanks.

The entire property including mill, power plant, etc., is undergoing extensive changes and improvements. It is stated that costs will be reduced and production increased next year.

COMPANIA DE MINAS LA BLANCA Y ANEXAS, S. A.

PACHUCA, HIDALGO, MEXICO

Metric Weights *Mexican Currency*

Year ended June 30	1913
Gross value of production	$3,659,084
Mining and milling costs	$2,190,198
General expenses, Mexico and Paris 118,729	2,308,927
Net operating profit	$1,350,157
Sale of 15,000 shares in Paris	450,000
Total cash received	$1,800,157
Distributed as follows:	
Dividends	$1,008,000
Reserve fund	168,489
Amortization of various accounts	623,668
	$1,800,157
Mine and mill:	
Dry tons milled	135,942
Average contents silver, grams	611
Average contents gold, grams	3.21
Price silver per kilo	$40.52
Silver values recovered	24.76
Gold values recovered	4.28
Total values recovered	$29.04
Per cent. recovery silver	92.18
Per cent. recovery gold	95.68
Total recovery, per cent	92.70
Stamp duty, tons	9.75
Costs per ton:	
Development	$2.215
Mining	7.822
Milling	.603
Concentration and cyaniding	2.855
General expense	.742
Shipping and selling	1.874
Total	$16.111

Remarks.—La Blanca is similar to Santa Gertrudis in practically every respect. Siliceous silver ore treated in a cyanide mill of 275 tons capacity. This plant is now being increased to 500 tons monthly.

THE SANTA GERTRUDIS COMPANY, LTD.

PACHUCA, HIDALGO, MEXICO

Year Ended June 30

Tons 2000 lb. *U. S. Currency*

	1913	1912
Production:		
Silver ounces	4,243,932	4,420,326
Gold ounces	21,807	26,006
Expenses and profits:		
Gross earnings	£631,718	£631,432
Operating expenses	370,859	355,934
Net earnings	£260,859	£275,498
Including miscellaneous revenue	£260,859	£276,648
Depreciation	25,374	24,227
Net profit	£235,485	£252,421
Tons treated and contents:		
Ore treated tons dry	263,554	269,839
Gross contents	$3,430,720	$3,484,551
Gross contents	£706,500	£714,047
Value per ton	$13.02	$12.90
Value per ton	£2 13s. 7d.	£2 12s. 11d.
Per cent. gold by value	14.1	15.2
Per cent. silver by value	85.9	84.8
Total gold, ounces	23,790	23,356
Total silver, ounces	4,763,152	4,718,019
Recoveries:		
Bullion per ton	£2 7s. 11d.	£2 6s. 10d.
Bullion per ton	$11.70	$11.42
Per cent. recovered values	89.41	88.43
Value bullion	$3,082,783	$3,081,393
Cost per ton:		
Mining and delivery to mill	$3.16	$3.55
Development	1.22[1]	1.08
Milling, shipping, selling, etc.	2.44	1.77
Total approx. cost incl. milling and all expenses	$6.82	$6.40
Profit per ton (approximate)	$4.88	$5.00
Average price silver per ounce, cents	.....	57.2
Development, feet	17,193	16,249

[1] Including outlay for new shaft.

Notes, Operations, 1912.—During the year the following results were obtained in Guadalupe and new mills:

	Guadalupe mill (tailings)	New mill
Dry tons, mills, and cyanided	44,590	225,249
Gross value per ton	$5.27	$14.43
Per cent. recovered	85.62	88.63
Value recovered per ton	$4.52	$12.79

Ore Reserves June 30, 1913:

(a) 778,000 tons of positive and partly developed ore that will yield a profit of	$3,740,000
(b) 269,000 tons of probable ore that will yield a profit of	1,040,000
	$4,780,000

Remarks.—The property is developed by three shafts and to a maximum depth of 2000 ft. During the year 1913 all contemplated construction work was finished and the mine is now fully equipped. During that period there was expended on construction $126,416. The San Francisco shaft was equipped with steel head frame electric hoist, etc., the main pump station was completed on 1800 level and new centrifugal pump station installed on the 2000 level. The mine is now equipped to produce 25,000 tons a month. The property has mill and cyanide plant. Company operates with electric power. No difficulty was experienced in 1912 from the revolution in Mexico. The general conditions pertaining to ore occurrence, etc., at Santa Gertrudis are the same as at the LaBlanca Mine (see data on that mine).

Costs, 1914: Mining and delivery, $2.53; development, $.55; milling, $1.21; shipping and selling, $.43; total $4.72. These figures include all costs in Mexico, plus depreciation. In the summer of 1914 the total cost was reduced to $4.04.

Guanajuato District

GUANAJUATO CONSOLIDATED MINING & MILLING CO.

GUANAJUATO, MEXICO

Year Ended Dec. 31,

U. S. Currency

	1912	1911	1910	1909
Total production	$510.469.31	$436,503	$599,895	$647,400[1]
Ton milled	76,645	51,949	91,671	86,580
Average value recovered, per ton	$6.67	$8.40	$6.544	$7.84
Mill recovery, per cent	96.81	96.39	96.12	95.31
Profit per ton	$.87	$1.319	$0.759	$1.044
Costs per ton:				
Mining, milling and cyaniding	$4.23	$4.579	$3.937	$4.276
Development	.65	1.198	.855	1.259
Construction	.04	.022	.0309	.....
Treatment of concentrates	.45	.619	.451	.507[2]
Taxes and bullion expenses	.23	.301	.296	.524
General expense	.20	.362	.216	.230
Total	$5.80	$7.081	$5.7859	$6.796

Since January 1, 1913, there has been a decided improvement in the earnings of this company. The profits per ton have averaged from $1.50 to $2 as compared with $.87 during 1912. This is the result of the advance in price of silver and in the grade of the ore going to the mill. The profits for April amounted to a little over $17,000 gold.

Résumé of Operation, 1908.—Total production, $586,101; tons milled, 87,548; value recovered, $7.525; extraction, 90.41 per cent.; profit, $1.193; mining, milling and cyaniding, $4.454; dev. and const., .688; treat. of conc., .495; taxes and bullion exp., .504; genl. exp., .191; total cost, $6.332.

[1] Includes $6763.30 shipping ore. Ratio silver to gold, 6 to 1.

[2] Includes treatment charges on shipping ore.

Remarks.—Mine opened by shaft to depth of about 1000 ft. Vein varies in width from 3 ft. to over 200 ft. in one stope. Values are mainly silver.

Mill has 80 stamps with tube mill regrind. The ore is stamped, concentrated, reground and then cyanided.

METRIC WEIGHTS (MEXICAN STANDARD)

1 metric ton = 2204 lb. avoir.
1 gramme = 15.432 grains = .0321 oz. Troy
1 kilogramme = 32.15 oz.
1 gramme gold = 64.3¢ U. S. Currency
1 meter = 39.37 in. = 3.28 ft.
A Mexican peso or silver dollar = $0.50 U. S. Currency

GUANAJUATO REDUCTION & MINES CO.

GUANAJUATO, MEXICO

Year Ended Dec. 31

U. S. Currency

	1912	1911
Gross metal production	$928,327.99	$857,460.06
Total gross revenue	961,107.25	918,975.00
Total expenses	935,236.32	897,569.68
Total profit	$25,870.93	$21,405.32
General average of ore milled { silver	200.7 grm.	.....
gold	2.26 grm.	.....
Metric tons milled, total	223,780	221,305
Mine ore sent to mill	95,465	76,912
Dump ore sent to mill	128,315	146,168
Average grade mine ore, approximately { silver	225.5 grm.	240.0 grm.
gold	2.70 grm.	2.1
Average grade dump ore { silver	182.8 grm.	190.4
gold	1.96 grm.	2.2
Mill recovery { silver, per cent	80.04	78.78
gold, per cent	88.09	88.27
Total recovery, per cent	82.26	81.7
Average daily tonnage	.....	606
Average stamp duty	.....	3.911
Average price of silver, ounces	60.82¢	53.3¢
Coats are *Mexican currency* and *metric tons.*		
Average milling costs	$.9807	$1.0160
Average cyaniding costs	$1.725	1.7815
Total treatment costs	$2.7057	$2.7975
Cost per ton Dump ore } layed at mill bins	$0.618	$0.528

This company is treating the stope fills and surface dumps of the bonanza ores from the Rayas and Mellado mines.

The main ore supply has been coming from the dumps while the old underground workings are being prepared for the drawing off of the old stope fills in the upper levels.

The company will unwater the lower levels and sink into virgin territory.

There have been very heavy development and installation expenses necessary during the past two years preparatory to getting the property into condition for a large tonnage.

The milling plant consists of 180 stamps, Wilfley and Johnson concentrating tables, tube-mills, cyanide-plant and Butters filter-presses.

GUERRERO AND JALISCO STATES

SURIANA MINING & SMELTING COMPANY

ACHOTLA, GUERRERO, MEXICO

Tons Metric	*U. S. Currency*
COSTS	
Mining	$2.44
Development	1.78
Smelting and refining	10.34
Total per ton	14.56
Production, metric tons per month	1056

Administration, construction and transportation charges are included in the above costs, which represent the total cost of all operations.

The Achotla Mine is located 50 miles down the Balsas River, from Balsas Station, the terminus of the railroad. Transportation is by boat from Balsas to Pezuapa and thence by mule 6½ miles to the mine. Elevation 2800 ft.; operating conditions difficult and freight charges very high. All bullion and matte produced must be freighted to the railroad on mules, a distance of 65 miles.

The stopes are small and irregular and have to be heavily timbered. The square-set method of timbering is used.

Wood is burned under the boilers. The power plant consists of a 50-h.p. engine, a Piquat Blower furnishing 750 cu ft. of air per minute at 15 oz. pressure, and a 10-h.p. direct current generator. The lead stack is 36×60 in. at the tuyeres and handles about 52 tons of charge per day, 61 per cent. of which is bedded ore, 10 per cent. iron flux, 3 per cent. litharge, 26 per cent. lime; percentage of coke varies from 10 to 16 per cent. and at times is partially replaced by charcoal. The ores smelted are oxidized lead ores, oxidized iron ores, silicious ore and sulphide ores. Low-grade lead bullion averaging about 20 kg. of silver and 300 gr. gold and a leady copper matte averaging 5 kg. of silver, 2 gr. of gold, 31 per cent. lead, 10 per cent. copper is produced. The bullion is refined in a cupelling furnace up to 600 fine.

Coke costs $25 per metric ton delivered at mine.

Timber cost, 50 cents U. S. Currency per ton of ore stoped.

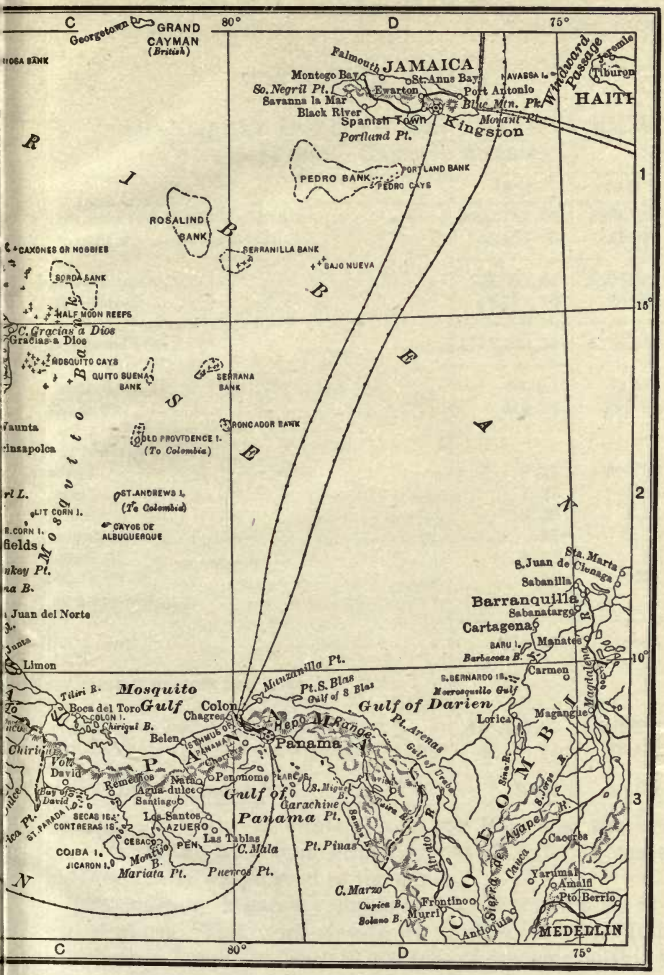
Data by W. B. DEVEREUX, JR.

AMPARO MINING CO.

ETZATLAN, JALISCO, MEXICO

See Appendix, page 396.

1. Oroya Leonesa 2. Lone S
4 Abangarez 5. R
7. Butter's Salvad



Siempre Viva 3. Montezuma
io Mine 6. Aguacate
Butter's Divisadero

CENTRAL AMERICA

U. S. CURRENCY — TON = 2000 LBS.

COSTA RICA

ABANGAREZ GOLD FIELDS OF COSTA RICA

COSTA RICA, CENTRAL AMERICA

	1912	1911	1910
Gross receipts sale of gold bullion	$606,782.22	$928,586	$805,233
Total expenses	735,465.66	721,996	532,683
Surplus earnings	128,683.44	$206,589	$272,046
Deduct interest	46,779.90	18,037	5,503
Net income or loss	$175,463.34	$188,552	$267,046
Tons treated	50,011	42,514	31,317
Average yield	$12.14	$21.84	$25.71
Cost per ton:			
Mining	9.11	$10.06	$8.17
Milling	1.07	1.61	.84
Cyaniding	2.28	2.38	1.94
Transportation	.57	2.38	5.05
General	1.13	.31	.59
Administration	.26	.24	.42
Bullion expense	.29	.....	.....
Total cost	$14.71	$16.98	$17.01
Direct charges to profit and loss:			
Depreciation on surface equipment	$76,897.03	$81,695	$84,241
Amortized charge representing 5 per cent. of gross output for year.	30,339.11	46,429	40,261
Underground development, feet	9,845	10,351	7,257

Remarks.—Property is located in Costa Rica near the coast, on the Pacific side up the Gulf from Punta Arenas 20 miles to nearest seaport, thence 20 miles by wagon road to the mine.

In 1909 company began a campaign of betterment work of increasing output of mines. This work was to be finished in 1913. It is expected plant will then handle at least 10,000 tons of ore per month. Company's new power plant went into commission in March, 1912. In mill new stamps have been added, and old stamps have been replaced with 1250-lb. stamps. At close of 1912 twenty heavy new stamps have been erected. Ores are stamped and cyanided. Ore ground fine in tube mills.

AGUACATE MINES

San Mateo, Costa Rica, Central America

Period May 15, 1911 to Aug. 1, 1912

Production:	
Bullion	37,034
Results of Amalgamation:	
Capacity mill stamps	10
Weight of stamps	1350 lb.
Tons milled	8,026
Assay value	$11.57
Per cent. recovered by amalgamation	40
Total value in tailings	56,651
Per cent., in tailings	60
Estimate results with cyanide plant cap. 2000 tons a month:	
Value ore per ton	$12.00[1]
Estimated recovery, per cent	85
Value recovery	10.20
Estimated costs	$ 5.32
Estimated profit per ton	$ 4.88
Estimated annual profit	$117,120

The following on operations for first six months of 1912 is published with permission of the Mining and Scientific Press:—

Cost of production:	
First 6 months, 1912, only amalgamation treating 966 tons per month using steam power.	
Mining	$ 1.62
Tramming	.52
Milling	1.24
Marketing bullion	.07
Gen'l. exp	.46
Administration	.47
	$ 4.38
Credit for land rental and store	.17
	$ 4.21[2]
Development	4,728 ft.
During this period the following tons were handled:	
Tons mined wet	6,713
Tons mined dry	5,863
Aveg. assay value	$12.15

[1] It is estimated that the grade of the ore can be maintained at $12 per ton, probably $15. Judging from the description given in the reports the veins, of which there are several, average from 2½ to 3 ft. in width. The mine is developed by seven levels. Development is by means of tunnels, the seventh level being the main haulage level. The mill is erected at the mouth of this tunnel. The cyanide plant of 200 tons daily capacity started February, 1914. [2] Of this $.35 was for wood used in steam plant. Company was arranging for electricity from Custom plant at cost of $33 a horse-power-year for 200 horse-power. In addition its own plant develops 75 horse-power.

MONTEZUMA MINES OF COSTA RICA

MONTEZUMA, COSTA RICA, CENTRAL AMERICA

Period 1910

Cost in U. S. Currency

	5 mo. July to Nov.	Nov.	Oct.	Sept.
Production	$58,217	$28,251	$9,623	$8,214
Est. profit	.....	18,430	1,822	966
Tons treated	7,610	3,251	1,215	1,208
Val. gold per ton	$8.86	$9.95	$8.76	$8.52
Total gold	67,567	32,347	10,643	10,292
Rec. per ton	$7.65	8.69	7.92	6.80
Cost per ton	4.69	3.23	6.42	6.00
Prof. per ton	$2.96	5.46	1.50	.80
Cost per ton:				
Ming. dev. proportion of general expense.	$2.34	1.38	Not available	
Milling with proportion general expense.	$2.35	1.85		
Total expense	$4.69	$3.25	$6.42	$6.00
Extraction, per cent	.....	87.2	.....	.....
Rec. and paid for by smelter:				
Gold, ounces[1]	3,259	.....	.....	.....
Silver, ounces	6,765	.....	.....	.....
Total, value	$69,632	.....	.....	.....

[1] Smelter returns show approximately 2 oz. silver recovered per ounce of gold. The above figures gave the tons treated and the estimated profits. It is seen that the actual recovery is considerably in excess of the estimated returns.

Dev. for the year 1910 was 1241 ft.

The ore reserves are estimated at $10.82 gold and $.60 silver values or a total of $11.42. The estimated recovered is placed at 90 per cent. = 10.28. Total costs are put at $3.50, leaving the profit per ton at $6.78.

Remarks.—Mill 40 stamps, tube-mill, regrind and cyanide. Operated by water power. Supply irregular. The vein filling is quartz accompanied by small amounts of chalcopyrite, galena, and sphalerite. For 300 ft. below surface ores are oxidized. Several parallel veins varying from 1 ft. to 20 ft. Where width does not exceed 5 ft. method of mining is over-hand stoping. Judging from the ore reserves given, the average width of the ore is between $2\frac{3}{4}$ and 3 ft. The mine is located 15 miles from Puntarenas, the principal seaport on the Pacific coast.

HONDURAS

NEW YORK AND HONDURAS ROSARIO MINING CO.

San Juancito, Honduras, C. A.

Year Ended Sept. 30

	1912	1911	1910
Gross income	$795,795	$1,023,952.59	884,513.28
Expenses	615,905	504,320.09	535,037.53
Profit	179,890	519,632.50	349,475.75
Production silver, ounces	1,387,077	1,395,136	1,289,173
Production gold, ounces	6,739	8,103	10,621
Total tons milled	39,258	35,813	36,634
Average value per ton	$24.23	$28.25	$26.65
Old mill:			
Tons milled	28,828	.....	.....
Average value	$27.88	.....	.....
Saving, per cent	84.75	84.93	87.73
New mill:			
Tons milled	10,429	.....	.....
Average value	$15.96	.....	.....
Saving, per cent	.90	.....	.....
Costs per ton milled:			
Mine	$7.592	$8.172	$7.680
Mill	3.460	3.664	3.640
Tramway	.500	.436	.600
Surface	2.392	2.548	2.100
Total	$13.944	$14.820	$14.120
Development, ft	10,282	13,353	12,918
Cost per foot	$6.97	$6.24	$6.24
No. stamps dropping	.....	47	.....
Duty per stamp	.....	2.08	.....

Remarks.—The mine is located in the rugged mountains of Honduras. All freight is carted by ox and mule teams 120 miles over rough roads. The veins carry small streaks of very rich silver ore. A stoping width is maintained which includes very low-grade material. The mill ore has from 20 to 25 per cent. waste in it. There are several veins developed by adit levels. The old mill is being supplanted by a new 20–1850 lb. stamp mill. The ores are amalgamated and cyanided. The new mill was started in July, 1912; when in good operating order will crush and treat about 200 tons per day at a cost not to exceed $3 per ton. The company expects to treat $15 ore at a profit.

NICARAGUA

LONE STAR MINING CO.

PIZ PIZ DISTRICT, NICARAGUA, CENTRAL AMERICA

Year Ended Feb. 28

	1910
Gold shipped	$92,240
Expenses	84,399
Profit	$7,841
Tons treated wet	32,398
Tons treated dry	28,251
Gold shipped per ton, dry	$3.26
Dry weight per cent. of wet	8.72
Cost per ton mined (dry):	
Mining	1.37
Milling	.406
Cyanide	.587
Electric plant	.0242
Improvements	.2275
Plantation	.0867
House	.0997
Export duty	.1805
	$2.9816
Cyanide plant, 5 mos. operations:	
Tons milled, gross	14,875
Gr. value per ton	$4.17
Recovery by amalgamation, per cent	52
Recovery by sands treated, per cent	21.8
Gross loss by sands discharged, per cent	3.9
Gross loss by slimes discharged, per cent	22.3

On the assumption that Slimes Plant would be in operation, it would give a recovery of 92.8 per cent. The actual mining of the ore costs very little, it being open cast. One man on a rope lowered into the glory hole can break loose a big tonnage. No timber is used in mines except in drifts. In the stopes "caving" and fill systems are employed, also, "under-hand." The vein in places varies up to 90 and 100 ft. wide.

Mill consists of 30 stamps, one battery of ten 750-lb. stamps, and two batteries each of ten 650-lb. stamps.

The figures given under "cost per ton" are the results for 12 months but included 1 month in which the cyanide plant did not run and 6 months' scarcity of labor. The greater part of the year only 20 stamps were running. Among the expenses is the cost of an aerial tramway. Mine has its own water power.

On a basis of 150 to 200 tons per day the costs are estimated as follows:

	From	To
Mining	$1.00	$1.35
Development	.50	.50
Outside tram	.10	.10
Power supply and maintenance	.10	.30
Mechanical dep't	.15	.15
Milling and crushing	.50	.60
Cyaniding	1.00	1.15
Engrg. sampling and assaying	.10	.10
Gen'l expense	.50	.60
	$3.95	$4.85
Unforeseen	.55	.15
	$4.50	$5.00

The $4.50 cost are for the easier ores and $5 for the more difficult ores.

The report covers two diffierent veins, the Highland Mary and the Lone Star vein. The value, width of ore and costs are estimated as follows:

Highland Mary	Val. per ton	Yield per ton	Expenses	Net prof.
Upper workings	$6.82	.....	$4.50	.....
Lower workings	10.00	.....	5.00	.....
Lone Star incl. Highland Mary	$10.27	$8.82	$4.87	$3.95
Extraction, per cent	85.87	.....	.....	.....

The ore-bodies as sampled in the Highland Mary vein average from 6 to 20 ft. in width, and in places vary to much wider widths. The Lone Star vein as sampled varies between 3½ and 10 width an average of probably 5.5 or 6 ft. (Data by Henry F. Lefevre.)

OROYA LEONESA

See Appendix, page 396

SIEMPRE VIVA MINE

NICARAGUA, CENTRAL AMERICA

	1908	1907	1906
Mint receipts	$106,290	$93,202	$98,824
Total income	113,000	98,647	101,534
Expenses	83,980	78,983	75,708
	$29,020	$19,664	$25,725
Tons treated	25,927	19,502	18,098
Assay value	$7.44	$9.02	$12.63
Yield per ton	4.11	4.83	5.46
Per cent. yield	55	53	43
Ounces bullion	8,429	6,699	7,231
Cost per ton:			
Mining	$0.61	.....	.....
Timbering	.225	.....	.....
Tramming	.434	.....	.....
Milling	.337	.....	.....
Cyaniding	.351	.....	.....
Washing creek	.020	.....	.....
Power plant	.170	.....	.....
Other general expenses	.306	.....	.....
Superintendence	.162	.....	.....
Mine development	.165	.....	.....
Maintenance plant	.236	.....	.....
Duty and charges on gold	.184	.....	.....
Survey and engineering	.030	.....	.....
	$3.23	$4.05	$4.30

The following data on milling is given for the month of July, 1908. Handled 2160 tons of ore assay value $8.05 per ton, $17,388.

	Per ton	
Saved in mill from plates	$3.06	$6,616.00
Saved in new extra plates	.31	684.00
Saved in sand plant by cyanide	.84	1,800.00
Lost in slimes to waste	3.84	8,288.00
		$17,388.00
Total recovery 52.3 per cent. of assay value	.....	$9,100.00
Loss 47.7 per cent.	.....	8,288.

Mill tailings contain 82 per cent. slime, 18 per cent. sand; average, $4.68.

During July treated 18 per cent. all sand over 80-mesh in cyanide plant and 7 per cent. fine slime (all possible).

See also Appendix, page 376

SALVADOR

BUTTERS DIVISADERO CO.

SALVADOR, CENTRAL AMERICA

	1911	1910
Production:		
Gold, ounces total	9,647.82	10,583.82
Silver, ounces total	645,061.38	650,080.68
Gross income	$551,463.77	$384,171.49
Expenses	427,740.88	326,713.32
Working profit	123,722.89	57,458.17
Tons ore mined	110,560	113,457
Tons ore milled	110,560	113,457
Aver. value per ton	$4.99	$5.87
Recovery, per cent	91.86	.....
Value recovered per ton	.....	.....
Cost per ton:		
Mining, Development	$1.92	$2.56
General	.26	.41
Milling	.58	.65
Cyaniding	1.11	1.17
Bullion exp., selling, comn., etc	.....	.....
Total cost	$3.87	$4.79

BUTTERS SALVADOR MINES

SALVADOR, CENTRAL AMERICA

	1911	1910
Production:		
Gold, ounces total, Silver, ounces total	33,690	32,745
Gross income	£146,254	£139,562
Expenses	£77,433	£76,927
Working profit	£68,821	£62,635
Tons ore mined	25,941	27,790
Tons ore treated	25,650	28,150
Aver. value per ton treated, ounces	1.31	1.163
Recovery, per cent. theoretical	95	95.35
Value recovered per ton	£5.59	£4.96
Cost per ton treated:—Mining, Development, Haulage, Milling, Cyaniding, Bullion exp., selling, comn., etc., Total cost including all office expenses–that is, head office, New York office, San Francisco office, and purchasing office–taxes, depreciation, etc., etc.	£3.02	£2.73

See also Appendix, page 376

SOUTH AMERICA


SOUTH AMERICA
Scale of Miles
0 100 200 400 600 800
Important towns are shown in heavy face type
70° Longitude West 60° from Greenwich 50°
CARIBBEAN SEA
CENTRAL AMERICA
MARTINIQUE (Fr.)
SANTA LUCIA (Br.)
BARBADOS (Br.)
ST. VINCENT (Br.)
GRENADA
TOBAGO (Br.)
TRINIDAD (Br.)
PORT OF SPAIN
Orinoco Delta
GEORGETOWN
PARAMARIBO
CAYENNE
C Orange
Mouths of the Amazon R.
Para or Tocantins R.
EQUATOR
VENEZUELA
CARACAS
COLOMBIA
BOGOTA
GUIANA
BRITISH
DUTCH
FRENCH
ECUADOR
QUITO
PERU
LIMA
BOLIVIA
SUCRE
BRAZIL
Amazon
Rio Negro
Madeira R.
Tapajos R.
Xingu R.
Araguaya
S. Francisco
Manaos
Santarem
Obidos
Para
Maranhao
Pernambuco
Bahia
Porto Alegre
Ouro Preto
Vitoria
La Paz
L. Titicaca
Potosi
Cuzco
Callao
Arequipa
Iquique
PACIFIC OCEAN
ATLANTIC OCEAN

1. Barima Mine 2. Pato Mine 3. Corocoro
4. Chile Copper Co. 5. Braden Copper Co. 6. Ouro Preto

BRAZIL

OURO PRETO GOLD MINES OF BRAZIL, LTD.

Year Ended June 30

	June 30, 1911, to Dec. 31, 1911	1910–1911	1909–1910
Gross production	£49,726 12s. 8d.	£100,787 6s. 3d.	£110,250 5s. 5d.
Total expenses	£44,650 10 1	£88,581 14 0	£94,435 7 10
Profit	£5,076 2 7	£12,205 12 3	£15,814 17 7
Tons ore milled	32,435	69,680	75,612
Average value per ton	7dwt. 16 gr.	7 dwt. 7 gr.	7 dwt. 9 gr.
Total extraction, per cent	92.3	92.15	91.87
Tails loss, grains	14.2	13.7	14.41
Concentrates in ore, per cent	7.54	6.61	6.36
Tons sands cyanided	23,929	50,380	53,570
Extraction from sands, per cent.	73.58	72.84	72.15
Tons slimes cyanided	4,890	11,767	13,070
Extraction from slimes, per cent.	84.85	84.1	80.18
Tons concentrates cyanided	2445.5	4607.8	4811.0
Extraction from concent	89.38	89.38	89.57
Costs per ton milled:	s. d.	s. d.	s. d.
Stoping and tramming	12 11	11 10	11 11
Development	2 6.5	2 1.25	1 10
Pumping	0 6	0 6.25	0 7.75
Hoisting	0 11.25	0 10.25	0 10.25
Water costs	0 5	0 3.75	0 5.5
Maintenance and repairs	0 8.75	0 7.5	0 7.75
Milling	3 10.25	3 8.5	3 5.25
Cyaniding concentrates	0 8.75	0 8.0	0 8
Cyaniding sands	0 6	0 5.75	0 5.5
Cyaniding slimes	0 4.75	0 5.25	0 4.75
Hospital	0 3.75	0 3.5	0 3
Duty on gold	1 0	1 0	0 11.75
Charges on gold	0 3.75	0 3.75	0 3.75
Miscellaneous expense	0 10	0 10	0 9.25
Administration	0 9.75	0 8.5	0 8.5
	£1 6 9.5	£1 4 8.25	£1 4 3.75

The mine is operated through shafts. Stoping is carried on to the 770-meter level. Width of vein varies from .9 to 2.6 meters.

The ore is stamped, amalgamated, concentrated and the tails and concentrates cyanided. About 1000 men are on the pay roll.

ST. JOHN DEL REY MINING CO.

See Appendix, page 396

BOLIVIA

CIA. COROCORO DE BOLIVIA

BOLIVIA, SOUTH AMERICA

U. S. Currency

Short ton of 2000 lb.

Period, year 1906, Average month's operations:

Production:	
Tons treated	2,608
Pounds copper recovered	199,190
Pounds copper recovered per ton	76.4
Cost per ton:	
Mine:	
Stoping and development	$1.43
Hoisting and tramming	.81
Timbering	.43
Mill:	
Labour	.60
Fuel	.80
Repairs and supplies	.41
Administration:	
Salaries, office exp., hospital and assaying	.72
Total	$5.20
Cost per pound:	
Recovered	6.8¢
Freight to market, Liverpool	1.4
Export duty	.4
Commission, insurance and interest	.6
Total cost	9.2¢

Power at Corocoro between 4 and 5¢ per horse-power-hour. Freight to Liverpool including lighterage, $9.70 U. S. currency, per English short ton.

Remarks. Principal Mines.—Cia. Corocoro de Bolivia (owned in Chile); Corocoro United Copper Mines, Ltd. (owned by London syndicate).

Location.—Province of Pacajes, Dpt. of La Paz, Bolivia, 60 miles southwest from La Paz and 180 miles inland from junction of Mauri and Deaguadera rivers.

Transportation.—Five miles by wagon road to Arica La Paz Ry., narrow-gauge.

Geology.—Upturned beds of clay and sandstone conglomerates running north-south. Barren and mineralized beds alternate. The mineralized beds vary in thickness from 1 ft. to 40 ft. Known length of beds, 75 miles. Total width of beds, 5000 ft. Native copper was precipitated from solutions by organic matter in beds after the beds had been upturned. Present dip of beds 90 deg. to 45 deg.

Mining is done through shafts. Deepest shaft 1500 ft. vertical. No timbering underground, although the main haulage levels are lined and roofed with dry-wall masonry. Stopes are carried up in 100 ft. lifts, masonry mill holes for the ore. Waste filling kept at convenient working distance from back.

Tonnage about 500 tons per day.

Annual production from 6,000,000 to 7,000,000 lb. of copper. Product is shipped in form of native copper "barilla," containing 65 to 90 per cent. copper. Market, England, France and Germany. A notable fact is that the copper "barilla" is purchased by European agents for the price of "Lake Copper" and no smelting charge is made. This, on account of the purity of the copper itself. The ore that is mined varies in richness from 2½ per cent. to 50 per cent., averaging 4 per cent. copper.

The Corocoro mines have been worked by white men since 1860. They have produced a total of 200,000,000 lb. of copper.

BRITISH GUIANA

BARIMA MINE[1]

BRITISH GUIANA, S. A.

Period, Aug. 1 to Dec. 31, 1911

Gross production	$20,946.26
Total expense	$19,418.18
Profit	$1,528.08
Profit per ton	$0.26
Tons crushed	5,757
Average value recovered	$3.63
Costs per ton:	
Mining	$1.214
Developing	1.084
Milling	.959
London expense	.115
	$3.372

Mill consists of 20 stamps.

[1] *E. and M. Journal*, Nov. 23, 1912.

CHILE

BRADEN COPPER COMPANY

RANCAGUA, CHILE, SOUTH AMERICA

U. S. Currency

Estimated production and costs on the basis of 3000 tons treated daily. The following factors are taken as a basis from which to figure:

Average assay copper	2.50%.
Mill extraction	75.00%.
Smelter	93.00%.
Yield copper per ton ore lbs.	34.885.
Average ratio of concentration	10.7 to 1.

	Per ton ore	Per lb. C.
Mining, Trans. to mill	$.550	1.577
Milling	.750	2.150
Smelt. at $6.25 per ton concentrates (10.7 into 1)	.584	1.675
Converting at $10.00 per ton blister	.174	.500
Freight at $19.06 per ton blister	.332	.953
Commission, etc. @ 14¢ copper	.048	.140
Total	$2.438	6.995¢

Costs include N. Y. expenses. Instead of putting an item General Expense, such expenditures are included under the several headings.

Remarks.—Mine and reduction plants have rail communication with sea-ports. Despite fact that property is located at high elevation, operating conditions favourable. Labour cheap.

The ore-bodies occur about crater of extinct volcano, the vent filled with tuff. Surrounding rock, andesite breccia and andesite, crater is about 1 mile in diameter. Ore-bodies vary from 80 to 300 ft. in width. Tunnels have completely encircled the crater. Topography very steep. Openings altogether by tunnels. Main No. 4 tunnel cuts ore-body nearly 2000 ft. below outcrop. 4000 ft. of "backs" possible by tunnel. Ore is disseminated chalcopyrite—probably primary also Bornite. Ore-bodies are mined by shrinkage stopes. 60 tons ore per man per day are obtained. Ore dropped by gravity to main haulage level.

Property equipped with 3000-ton concentrator. Management contemplates doubling capacity. Tests carried on with Minerals Separation Co.'s process indicate 75 per cent. extraction on ore 2.5 per cent. copper. Concentrator being equipped with this method. Property has smelter located at concentrator. Power-hydro-electric. Power plant is situated 40 km. from the concentrating plant. Blister copper shipped by boat to European ports.

CHILE COPPER CO.

CHUQUICAMATA MINE, CALAMA, CHILE, SOUTH AMERICA

U. S. Currency

The following estimates have been made by Pope Yeatman, Consulting Engineer.

Ore reserves Dec. 31, 1912	75,000,000 tons	
Average value copper	2.70 per cent.	
Life on 5000-ton plant	41.6 years	
	Tons per day	
Concentrator capacity	10,000	5,000
Tons treated per annum	3,600,000	1,800,000
Annual product. pounds copper	180,000,000	90,000,000
Profit 13¢ copper selling price 7 to 8¢ per lb.	$12,600,000	$6,300,000

COSTS

Based on an extraction of 90 per cent.

90 per cent. of 1.50 per cent. ore—90 per cent. of 30 lb. = 27.0 lb. metallic copper

90 per cent. of 2.75 per cent. ore—90 per cent. of 55 lb. = 49.5 lb. metallic copper

	1.50 % per ton ore	Ore per pound cu.	2.75 % per ton ore	Ore per pound cu.
Mining	$.400	1.481¢	.400	.808
Transportation—mine to mill	.100	.370	.100	.202
Crushing and delivering	.200	.741	.200	.404
Leaching	.170	.630	.200	.404
Add 10 per cent. to leaching for general superintendence, taxes, etc.	.017	.063	.020	.040
Electrolytic precipitation ($34.59 per ton of 2000 pounds).	.467	1.729	.856	1.729
Add 10 per cent. to electrolytic precipitation for general superintendence, taxes, etc.	.047	.173	.086	.173
Total operating cost	$1.401	5.187¢	1.862	3.760
Transportation to port (13½ shillings per metric ton at 24.3 = $2.974 per ton of 2000 lb.	.040	.149	.074	.149
Port charges (same as Braden is paying $1.19 per ton of 2000 lb. metallic copper).	.016	.059	.029	.059
Insurance on copper in transit (⅛ of 1 per cent. of value, at 16¢ copper = $2.00 per ton of 2000 lb. plus 10¢ weigher's fee in Europe = $2.10.	.028	.105	.052	.105
Freight to Hamburg (45 shillings per long ton, at 24.3 = $9.76 per ton of 2000 lb. metallic copper).	.132	.488	.242	.488
Selling commission (1 per cent. of sales, using 16¢ Cu).	.043	.160	.079	.160
	$1.660	6.148¢	2.338	4.741
Amortization at 10 per cent	.166	.614	.233	.474
Total cost	$1.826	6.762¢	2.571	5.215

Remarks.—Property situated on Antofagasta and Bolivia Ry., 150 miles northeast of Antofagasta, the shipping port. Copper will be shipped by boat to Europe. Labour conditions fair. Method of mining steam-shovelling. Deposit is over 6500 ft. long by several hundred feet wide. Number of holes drilled 38. Average thickness ore developed 404 ft., most of holes being stopped in ore. Three are over 1000 ft. and still in ore, giving indication of large increase in tonnage. An estimate of reserves April 5, 1913, places reserves at 95,657,000 tons averaging 2.41 per cent. The copper is in the form of Brochantite, a sub-sulphate of copper, and in the deepest workings in form of chalcocite, chalcopyrite and bornite. The rock is granodiorite.

The cost of treatment on 5000-ton concentrator is estimated at 5 to 6¢ per pound. There has been expended $2,000,000 and $8,000,000 additional necessary for completion present equipment. For 10,000-ton mill will require $5,000,000 to $6,000,000 additional. A 40,000-kw. power station will be erected at the coast at cost of $3,000,000 to $4,000,000.

Method of Treatment (E. A. Cappelen Smith, Met. Eng.).—The ore, crushed to pass ¼ to ½-in. mesh, will be leached in large open tanks with dilute sulphuric acid. The sulphuric acid solution will be electrolysed in the same manner as now in our electrolytic copper refineries, but with insoluble anodes, producing in this cathode copper, and regenerating the sulphuric acid. The loss in sulphuric acid in the operation is more than made up from the copper sulphate contained in the ore itself, so that after once starting the operation it should be self-sustaining so far as the acid is concerned. Our results show that we will recover, as electrolytic copper, 90 per cent. of the copper contained in the ore. (The above data and remarks as of April, 1913.)

Subsequent data as of September, 1914 :—The developed ore reserves as of September 1, 1914, amounted to 280,855,000 tons, averaging 2.13% copper. The development to date has shown a length of about 7,000 ft., an average width of over 800 ft. and a maximum width of 1,555 ft. Neither the full width nor the depth have yet been determined. Total holes drilled—57; average depth of ore over 500 ft.; 9 holes are over 1,100 ft. deep and still in ore, the lowest sections of these holes being in ore considerably above average grade. The cost of producing copper per pound is estimated at 6¢., delivered in Europe, based on 2.00% ore. The plant now being constructed is of 10,000 tons daily capacity, or 120,000,000 pounds of copper per annum. It is expected that operations will be started in the spring of 1915.

PERÚ

BACKUS AND JOHNSON CO.

See Appendix, page 397

CERRO DE PASCO MINING CO.

See Appendix, page 397

COLOMBIA

FRONTINO AND BOLIVIA GOLD MINING CO., LTD.

La Salada, Colombia, South America

(Reports are Semi-Annual)

	June 20, 1911, to Dec. 20, 1911	Dec. 20, 1910, to June 20, 1911
Production	£27,909 17s. 9d.	£35,049 11s. 10d.
Expenses	£32,428 12 5	£27,899 5 0
Profit or loss	£4,518 14 8	£ 7,150 6 10
Profit or loss per ton	5 3	12 5
Tons ore milled	17,147	11,555
Yield per ton	7.35 dwt.	13.6 dwt.
Revenue from mill per ton	£1 8s. 1d.	£2 12s. 4d.
Revenue from cyanide per ton	0 3 4	0 5 4
Miscellaneous revenue per ton	0 1 2	0 3 0
Total	£1 12 7	£3 0 8
Costs per ton milled:	s. d.	s. d.
Development	7 11	8 2
Mining	15 2	19 7
Surface tramming	1 1	0 11
Crushing	1 0	0 9
Milling	3 4	5 4
Cyaniding	1 2	1 10
Administration	0 10	.....
Charges on gold	1 2	2 5
Office expenses (mine)	1 2	1 8
General expenses	2 7	2 9
Tributors and London expense	2 5	4 10
	£1 17s. 10d.	£2 8s. 3d

Total development 885.2 meters.

The mine is evidently a small property in which the development has not been carried far enough ahead. At the present time the machinery and equipment are not adequate. Undoubtedly lower costs and better records will be made later on.

The tonnage is coming from several mines owned by this company. The reports do not mention how the mine is opened (shaft or adit), nor do they give any underground or mill data.

PATO PROPERTY

COLOMBIA, SOUTH AMERICA

(OrovilleDredging Co.)

U. S. Currency.

The following are the estimated costs and other data on the newly acquired Pato gold dredging property situated in Columbia, South America.

Acres	310
Proven yardage by prospecting	13,637,347
Yielding gross (deducting 25¢ for possible losses, etc.)	$3,202,986
Depth to bed-rock	27.27 ft.
Estimated operating cost per yard, approximately	6.0¢
Yards handled by dredge per month (9-ft. bucket dredge with steel hulls),	150,000 cu. yd.
Life in gravel	7½ yr.
Allowing 3.17 per cent. off gross yield for cost of marketing bullion, annual operating profit would be	$300,000

The following operating results obtained during the six months ended July 31, 1913.

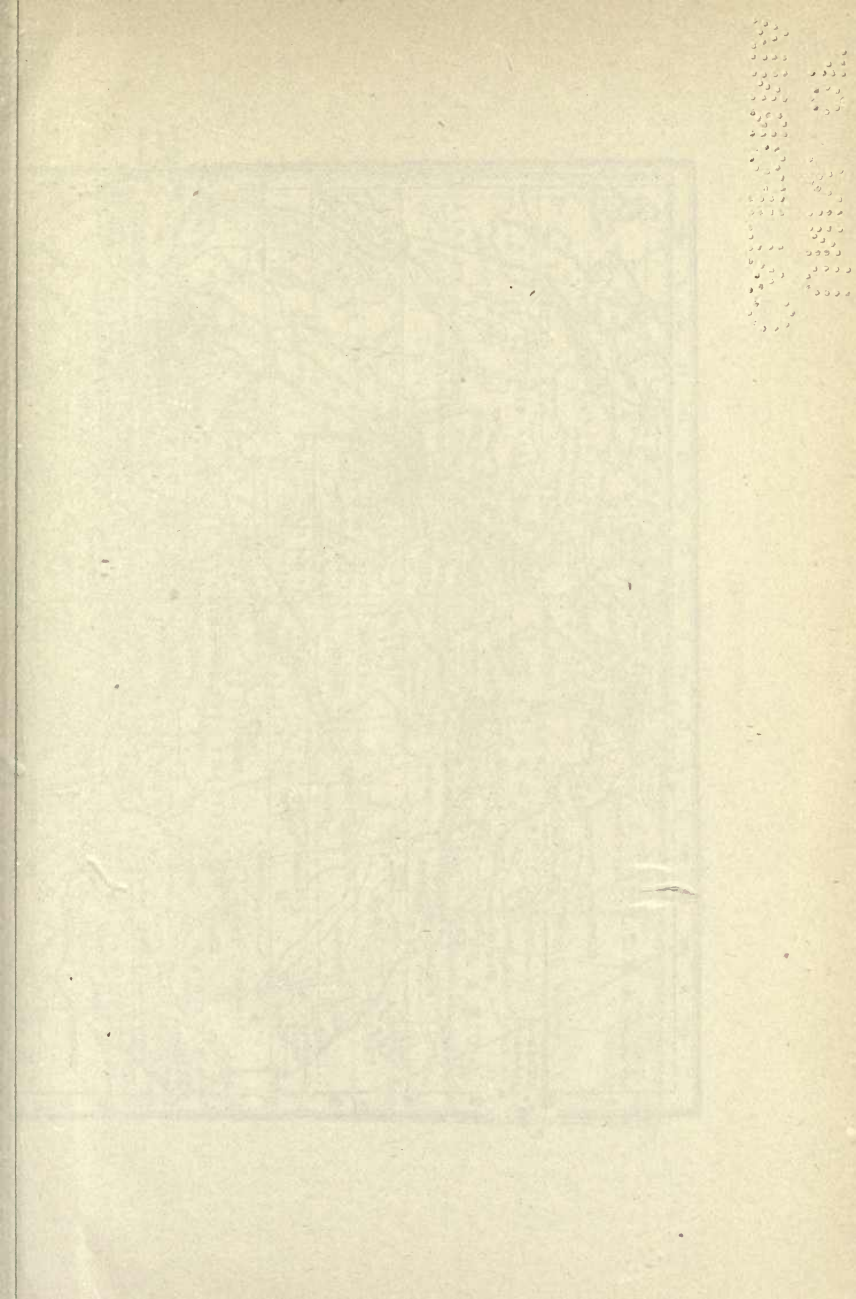
General:	
Cubic yards excavated	449,596
Average depth	24.4
Dredging time	2,740 hr. 20 min.
Average daily time	15 hr. 8 min.
Gross and Net Returns:	
Gross bullion returns	$66,513.32
Total expense	56,139.61
Net revenue	$10,373.71
Net after miscellaneous	10,469.47
Deduct repairs San Francisco, New York and London expenses	3,631.41
Net working profit	$6,838.06 [1]
Returns cost and net per yard:	
Returns, cents	14.79
Cost	12.49
Net revenue, cents	2.30

Cost per yard:	Cost cents	Per cent. of total
Labor and material	3.18	25.5
Clearing ground	1.64	13.1
Electric power	2.06	16.5
Repairs	1.78	14.3
Bullion expense	.38	3.0
General expense	3.45	27.6
Total expense, cents	12.49	

[1] After interest on bonds there was a net loss for the six months of $36,994.

See also Appendix, page 376

AFRICA




ATLANTIC
OCEAN
Bay of Biscay
C. Finisterre
Oporto
Lisbon
C. St. Vincent
Str. of Gibraltar
Tangier
AZORES (Port.)
MADEIRA (Port.)
CANARY IS. (Sp.)
Mogador
MOROCCO
Mekinez
FEZ
Madrid
SPAIN
Paris
FRANCE
Marseille
CORSICA
SARDINIA
GERMANY
AUSTRIA
Vienna
HUNGARY
Belgrade
SERVIA
ROUMANIA
BULGARIA
MONTENEGRO
Bukharest
Sofia
TURKEY
Constantinople
Black Sea
Caspian Sea
Aral Sea
Caucasus Mts.
Baku
Teheran
PERSIA
ASIA MINOR
Euphrates
Damascus
Babylon
Persian Gulf
Rome
Naples
Adriatic Sea
SICILY
MALTA
GREECE
Athens
CRETE
CYPRUS
MEDITERRANEAN SEA
ALGIERS
Oran
Bona
TUNIS
ALGERIA
Gardala
G. of Gabes
TRIPOLI
Benghazi
Derne
BARCA
Ghadames
FEZZAN
Murzuk
Alexandria
CAIRO
Suez
Suez Canal
EGYPT
Girgeh
Nile R.
RED SEA
ARABIA
Mecca
Libyan Desert
TROPIC OF CANCER
Tummo Mts.
TIBESTI
Tarso Mts.
Wady Halfa
Port Sudan
Suakin
NUBIA
Berber
Khartum
El Harib
Semmur
RIO DE ORO
Rio de Oro
C. Blanco
Wadan
Akabli
Ideles
Taudeni
SAHARA
Arawan
TAGANET
Timbuktu
L. Debo
Niger
Agades
BORKU
MILITARY TERRITORIES (French)
L. Tchad
Abeshr
WADAI
DARFUR
EGYPTIAN SUDAN
Dara
Fashoda
White Nile
Blue Nile
ERITREA
Massaua
ASMARA
Sennar
L. Tana
Str. of Bab el Mandeb
Aden
Gulf of Aden
SOKOTRA (Br.)
C. Guardafui
FRENCH SOMALI COAST
Berbera
BR. SOMALI COAST
ABYSSINIA
ADDIS ABEBA
Kaffa
Sobat R.
Queen Margherita L.
Bari
L. Stefanie
L. Rudolf
Lado
Obbia
ITALIAN SOMALILAND
ST. LOUIS
Senegal R.
C. Verde
SENEGAL
BATHURST
GAMBIA
Bafoulabé
PORT. GUINEA
Bamako
Sikaso
Sinder
BISSAO
FRENCH GUINEA
KONAKRY
SIERRA LEONE
FREETOWN
LIBERIA
MONROVIA
IVORY COAST
GOLD COAST
Abomey
DAHOMEY
TOGO LD.
SUDAN
NORTHERN NIGERIA
Yakoba
SOUTHERN NIGERIA
Asaba
Akassa
Lagos
LOME
AKKRA
PORTO NOVO
KAMERUN
Gundi
Ombanga
Wadda
Bangasso
Makua R.

1. Cape Copper Co. 2. Kimberley 3. Transvaal Mines

4. Rhodesia Mines

ENGLISH CURRENCY TONS = 2000 LBS.

ENGLISH WEIGHTS AND MONEY

Pound sterling = £ = $4.866 U. S. Currency
Shilling = s. = $0.243 U. S. Currency
Pence = d. = $0.02 U. S. Currency

TROY WEIGHTS

24 grains = 1 pennyweight (dwt.)
20 dwt. = 1 oz.
12 oz = 1 lb.
1 dwt. gold = $1.033 U. S. Currency. = 4.25 shillings, English Currency.
1 gr. gold = $0.043 U. S. Currency

Some of the descriptive data of the African mines are taken from "Mines of Africa", 1913, by R. R. Mabson.

CAPE COPPER COMPANY, LTD.

O'OKIEP, NAMAQUALAND, CAPE COLONY, SO. AFRICA

Year Ended April 30, 1911

Total revenue	£191,620	9s.	11d.
Total expenses	130,758	2	7
Profit	60,862	7	4

Tons ore smelted	O'okiep wks.	Cu	Nababeep wks.	Cu
O'okiep Mine	14,076.5	12%	2,978	12%
Nababeep South	10,246	5.51%	44,956	5.51%
Narrap Mine	2,493	4.34	3,288	4.34
Springbok Mine	510.5	10%	.....	.....
Koperberg Mine	655	6.24%	.....	.....
Nababeep North	.....	.....	4,804	6.07%
	27,981		56,026	
Total tons smelted	.....	84,007	.....	.....
Average copper content of matte	47.9%	.....	49.3%	.....

Total costs per ton smelted (calculated from report) £1 11s. 1.44d.

The mines are developed by adits and shafts. The ores are copper sulphides occurring as irregular masses in granite and gneiss.

The O'okiep smelter has six blast furnaces, burning coke.

The copper matte is shipped to the Company's Briton Ferry works in Wales, where it is re-smelted and refined. This plant does a general custom business also.

The estimated production in 1910 was about 15,000,000 lb.

The Company's reports are not complete as to production, costs and general data.

DE BEERS CONSOLIDATED MINES, LTD.

KIMBERLEY, SOUTH AFRICA

De Beers and Kimberley Mine
Wesselton or Premier Mine
Bultfontein Mine
Dutoitspan Mine

Year ended June 30	1912	1911
Income:—Diamond account and miscellaneous	£5,630,968	.....
Expenses	2,608,538	.....
Depreciation	678,051	.....
Working profit	£2,344,379	.....
Total loads hoisted	7,950,442	8,105,138
Loads blue ground washed	6,270,151	6,855,060
Loads of lump washed	284,888	119,762
Loads of tailings washed	1,440,914	2,359,021
Total quantity washed	7,995,953	9,219,192
Stock June 30:—Loads blue ground	10,035,190	8,416,372
Loads of lump	381,239	604,654
Total	10,416,429	9,021,026
Average yield (in hundredths of carat per load):		
From DeBeers and Kimberley	.31	.28
From Wesselton Mine	.29	.27
From Bultfontein Mine	.41	.38
From Dutoitspan Mine	.23	.21
Sales total carats	2,058,397	.....
Diamonds produced, carats	2,087,392	.....

DE BEERS AND KIMBERLEY MINES

	1912	1911
Loads blue ground hoisted	323,621	445,169
Loads blue ground washed	378,614	1,230,491
Cost hauling and washing per load	13/6.78	8/7.67
Carats of diamonds found	119,013	350,662
Selling value per carat	53/11.47	51/6.29
Value per load	16/8.716	14/5.12
De Beers floors:		
Cost of washing per load	4s. 8.7d.	1s. 6.4d.
Kimberley Mine:—Loads blue ground hoisted	295,015	.....
Cost of mining and depositing per load	11s. 4.969d.	7s. 0.51d.
Depth of main rock shaft	3,601 ft.	.....
Kimberley floors:—Loads blue ground hoisted	295,015	.....
Cost of washing per load	2s. 2.232d.	1s. 9.17d.
Cost of mining and washing per load	13s. 7.201d.	8s. 9.68d.
Loads tailings washed	740,176	.....
Yield, carats	73,467	.....

WESSELTON MINE

Loads blue ground hoisted	2,573,398	2,422,487
Loads blue ground washed	2,020,291	1,423,117
Cost, hauling and washing per load	4/7.576	4/9.09
Carats diamonds found	581,973	390,192
Selling value per carat	45/3.12	37/9.6
Value per load	13/1.504	10/2.47
Cost, mining and depositing per load	3s. 0.083d.	3s. 1.03d.
Depth No. 1 main rock shaft, ft	1,119	.....
Wesselton floors:		
Cost of washing per load	1s. 7.493d.	1s. 8.06d.

BULTFONTEIN MINE

Loads blue ground hoisted	2,334,720	2,457,412
Loads blue ground washed	2,025,450	1,866,212
Cost, hauling and washing per load	3/11.357	3/11.45
Carats diamonds found	834,760	700,398
Selling value per carat	40/8.242	35/0.52
Value per load	16/8.179	13/3.79
Depth No. 2 shaft, feet	1,084	.....
Bultfontein floors:		
Cost of washing per load	1s. 5.272d.	1s. 5.28d.
Cost of mining and washing	3s. 11.357d.	3s. 11.45d.

DUTOITSPAN MINE

Loads blue ground hoisted	2,718,703	2,780,070
Loads blue ground washed	1,845,796	2,335,240
Cost hauling and washing per load	3/10.665	4/7.09
Carats diamonds found	428,213	482,971
Selling value per carat	83/0.132[1]	73/6.5
Value per load	19/1.11	15/5.325
Cost of mining and depositing per load	2s. 4.037d.	2s. 4.02d.
Depth main shaft, feet	1,000	.....
Dutoitspan floors:		
Cost of washing per load	1s. 6.628d.	2s. 3.07d.
Cost mining and washing	3s. 10.665d.	4s. 7.09d.
Loads tailings washed	535,382	.....
Yield, carats	32,117	.....

[1] Based on blue and mixed crusher diamonds sold.

TAILINGS AND DEBRIS

No. loads tailings washed	1,440,914	2,359,021
No. carats diamonds found	123,431	256,631

See also Appendix, page 376.

RHODESIA

THE ELDORADO BLANKET GOLD MINING CO.

RHODESIA, SOUTH AFRICA

Year Ended Sept. 30, 1912

Production valued at	£222,917
Yield, ounces gold	52,563
Tons milled and cyanided	87,154
Cost per ton	£1 2s. 11d.
Estimated profit per ton	£1 8s. 3d.
Ore reserves, tons	123,000
Contents estimated	£390,502
Depth shaft (still sinking), feet	911
Development work, feet	2,877
Cost per foot	£4 8s. 5d.

THE FALCON MINES, LTD.

RHODESIA, SOUTH AFRICA

Year Ended Aug. 31. 1912

This property is now being developed. The main vertical shaft is down 165 ft. It is laid out to cut the reef at a point 1000 ft. below the outcrop on the incline. The incline shaft is now down to the sixth level. The pay-shoots which have been developed on four levels average from approximately 900 ft. in length on the third and fourth to 350 ft. on the sixth, with widths varying between 17 and 50 ft.; copper, from 2.45 to 3.22 per cent.; gold from 3.68 to 6.35 dwt. with sterling from 39 to 57s. These values are calculated on the basis of 10s. per unit for copper per short ton (equal to £56 per long ton).

Management has in process of construction 15,000-ton monthly reduction plant. This will include crushing and concentrating, sintering, blast furnace and converters. Lime and iron fluxes are within easy reach.

Ore reserves average 48s. 3d. per ton based on 10s. for copper and 4s. per dwt. of gold. Tons, 776,880.

Working costs including losses estimated at	34s.
Gross value	48s. 3d.
Net profit at £56 copper	14s. 3d.

Treatment will be expensive in gold and copper proposition of this character, but it presents no difficulties.

Development for year 5483 ft., costing £23,044.

THE GAIKA GOLD MINING CO., LTD.

RHODESIA, SOUTH AFRICA

Year Ended Aug. 31, 1912

Production, gold, ounces	14,609
Valued at	£61,996
Working costs	£43,589
Mine profit	£18,406
Grade ore reserves	15.5 dwt.
Depth shaft	Ninth level
Development, feet	5,369
Cost of development	£11,116

THE PLANET ARCTURUS GOLD MINES, LTD.

RHODESIA, SOUTH AFRICA

Year Ended Sept. 30

This property is in the development stage. Below we give a few notes on cost of development and grade of ore. The company operates the Slate, Arcturus and Planet Mines.

YEAR ENDED SEPTEMBER 30, 1911

	Depth shaft, ft.	Average value ore, dwt.	Contents gold, oz.	Value
Slate	645	17.0	66,704	£280,156
Planet	290	15.6	7,440	31,245
Arcturus	473	14.0	45,709	191,973

YEAR ENDED SEPTEMBER 30

	1912	1911
Slate:		
Total development	8,344	4,912
Cost per foot, 1912	£4 9 0	.....
Arcturus:		
Total development	5,919	3,169
Cost per foot, 1912	£4 15 8	.....
Planet:		
Total development	4,684	3,918
Cost per foot, 1912	£6 18 7	.....

Judging from data wherever given the vein widths are as follows: Slate, 5 to 6 ft.; Arcturus, 5 to 6 ft. and Planet, 27 in.

Reduction plant will not be built until negotiations for a railway are completed.

THE SHAMRA MINES, LIMITED

RHODESIA, SOUTH AFRICA

Year Ended Sept. 30, 1912

Total development includes 978 ft. main adit	26,165
Total development cost per foot	£2 17s. 1d.
Ore reserves, tons	2,203,912
Valued at	£2,323,513
Stoping since February, production tons	103,871
Estimated cost per ton	1s. 1¼d.
Development, total, feet	4,288
Cost	£3 14s. 6.78d.
Main adit cost per foot	£7 4 1.84

The property is now being equipped with a reduction plant.

THE SELUKWE COLUMBIA GOLD MINES, LTD.

RHODESIA, SOUTH AFRICA

Year Ended Sept. 30, 1912

Total recovery	£62,141
Costs (including development)	£56,676
Profit	£5,464
Tons treated mill	30,372
Recovery per ton	£2 0s. 9.6d.
Cost per ton	£1 17 2.4
Profit per ton	3s. 7.2d.
Main shaft sunk, feet	122
Cost of	£1,523
Development	4,012 ft.
Cost	$12,733
Ore reserves average grade	11.7 dwt.

Property developed to depth of 103 ft. Ore-bodies where mentioned in report spoken of as averaging 9.5 dwt. over 30 in. and 21½ dwt. over 24 in.

BUCKS REEF GOLD MINES, LTD.

SOUTHERN RHODESIA, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911	1910
Gold, ounces	5,699	.....	.....
Gross production	£23,766	£30,687	£61,038
Total expenses	23,329	26,090	27,923
Working profit	£437	£4,597	£33,115
Mill:			
Tons milled	9,726	9,933	8,026
No. stamps	5	5	5
Value rock, dwt	13.16	.....	.....
Yield, ounces	4,754	.....	.....
Yield per ton, dwt	9.78	12.6	31.27
Extraction, per cent	74.31	.....	.....
Cyanide:			
Yield oz. by cyanide	9.44	.....	.....
Yield dwt. per ton	2.9	2.23	5.14
Per cent. of extraction	14.74	.....	.....
Total extraction, per cent	89.05	91.85	94.97
Cost per ton (milled):	£ s. d.	£ s. d.	£ s. d.
Development	0 10 4	0 13 9	0 12 11
Mining	0 19 5	0 17 1	0 16 10
Milling	0 8 2	0 8 5	0 13 8
Cyaniding	0 3 10	0 4 2	0 6 4
Royalty	0 1 3	0 1 7	0 8 0
Mine charge	0 2 2	0 2 8	0 2 9
Gen'l charges	0 2 9	0 4 10	0 9 0
Total	2 7 11	2 12 6	3 9 6
Yield per ton	£2 8s. 10d.	£3 1s. 9d.	£7 12s. 1d.
Costs	2 7 11	2 12 6	3 9 6
Working profit	£0 0s. 11d.	£0 9s. 3d.	£4 2s. 7d.
Development, feet	1850	.....	.....

Remarks.—The reef stands at an angle of 80 deg. Stoping width 30 to 36 in. A shaft 500 ft. deep is sunk on the vein with seven levels driven. Mining costs high. Ore shoots short.

The mill is five-stamp, heavy pattern (2000-lb. stamps). Power developed by gas engines.

In December, 1912, all company operations stopped owing to an operating loss each month of the year.

TRANSVAAL

WITWATERSRAND GOLD MINES

Year Ended July 31

	1912	1911	1910
Revenue from gold	.....	£33,324,400	£30,516,700
Working expenditures	.....	£21,908,540	£19,300,600
Working profit	£12,200,000	£11,415,860	£11,216,110
Dividends declared	.....	£7,763,085	£8,876,086
Total output, ounces gold	8,431,379	7,567,412	.....
Tons milled	25,219,725	23,888,250	21,432,540
Costs:			
Total working per ton	18s. 5d.	18.33s.	18s.
Value gold recovered per ton	28s. 1d.	27.91s.	28.5s.
Net profit per ton	9s. 8d.	9.58s.	10.50s.
Dividends per ton	.....	6.50s.	8.25s.

1913 Operations:—Profit, £12,750,000. Ounces, 8,698,681. Tons, 26,333-530. Costs, 18s 1d. Value, gold, 27s. 9d. Profit, 9s. 8d.

TRANSVAAL GOLD MINING INDUSTRY

SOUTH AFRICA

Year Ended

Year Ended	July 31, 1912	July 31, 1911	Aug. 31, 1910
Production	8,857,398	7,919,179	7,361,372
Valued at	£37,623,834	£33,638,533	£31,269,120
Estimated profits	£12,523,000	£11,715,000	£11,610,053
Tons crushed including dry crushing and tons treated by direct cyaniding.	26,157,972	23,628,980	21,837,783

AVERAGE NUMBER ON TRANSVAAL GOLD MINES FOR THE MONTH OF JULY

	1912	1911
Stamps dropping	10,118	10,271
Tube mills running	270	231
Tons of ore crushed per stamp per day	8.058	7.668
Europeans employed	24,924	25,780
Natives employed	203,161	201,485

1913 Operations:—Production 9,114,219 ozs., valued at £38,714,742. Profit, £13,165,000. Tons crushed, 27,260,951.

1914 Operations:—Production 8,332,171 ozs., valued at £35,392,814. Profit, £12,100,000. Tons crushed, 25,767,998.

General Conditions existing on the Rand.—The efficiency of coloured labour on the Witwatersrand mines has been held to have been much improved as the result of the experiment with Chinese coolie labourers, who were, however, repatriated in the years 1908 and 1909. The higher standard of labour set by thoroughly efficient Chinese then replaced caused better results generally, through the example they set to the natives of South Africa by their intelligence and regular and continuous work.

The stable condition of mining on the Rand is due not only to its natural advantages and even average distribution of gold mines, but has also been brought about largely by the gradual and substantial reduction in working costs which has taken place in recent years, as illustrated for instance in the producing mines of the Gold Fields group, which in April, 1904, just before the introduction of Chinese, were the Simmer & Jack, Robinson Deep and Knights Deep Co's., having an average working cost during that month of 25s. 8.76d., the average working costs for the same Co's during the past year being 13s .81d. Mining costs on the Witwatersrand mines compare very favourably with the cheapest costs attained in any part of the world in respect of this particular class of mining, largely, of course, due to the availability of cheap coloured labor. Profitable operations are proceeding at much greater depth than usual elsewhere, and schemes for the carrying on of mining at 7,000 ft. or more are under consideration. It naturally commands capital and courage to sink deep shafts through broad areas of comparatively unproductive territory with only a possibility that at depth deposits of sufficient value and magnitude will be found to reward the enterprise and initiative of operators. Herein lies the whole difference between the mines of the Witwatersrand and mines in other parts of the world. On the Main Reef series there is the absolute assurance of encountering reef matter at a depth which can be estimated with a very fair degree of accuracy. Moreover, in fully nineteen cases out of twenty the ore has been found to be of profitable value. In other mining fields sinking deep shafts to intersect ore-bodies at considerable depth is, of course, a much more speculative operation.

MINES UNDER CENTRAL ADMINISTRATION
MESSRS. H. ECKSTEIN & CO.
JOHANNESBURG, TRANSVAAL

Bantjes Consolidated Mines, Limited; City Deep, Limited; City & Suburban Gold Mining & Estate Co., Limited; Crown Mines, Limited; Durban Roodepoort Deep, Limited; Ferreira Deep, Limited; Ferreira Gold Mining Company, Limited; Geldenhuis Deep, Limited; Modderfontein B. Gold Mines, Limited; New Heriot Gold Mining Company, Limited; New Modderfontein Gold Mining Company, Limited; Nourse Mines, Limited; Robinson Gold Mining Company, Limited; Rose Deep, Limited; Village Deep, Limited; Village Main Reef Gold Mining Company, Limited.

	1911	1910
Revenue from gold	£13,277,359	£11,665,733
Working expenditures	£7,937,453	£6,714,742
Working profit	£5,289,906	£4,950,991
Dividends declared	£4,047,123	£4,249,982
Total crushing capacity	8,500,000	8,500,000
Tons milled	8,057,414	7,201,371
Costs: Total working per ton	19.66s.	18.66s.
Valued gold recovered per ton	32.83s.	32.41s.
Net profit per ton	13.16s.	13.75s.
Dividends per ton	10.04s.	11.83s.

1913 Operations:—Revenue, £14,564,700. Tons, 8,706,508. Costs, 20.15s. Gold, 33.46s. Profit, 13.31s.

MINES UNDER CENTRAL MINING CONTROL, SOUTH AFRICA

Bantjes Consolidated Mines, Limited; City Deep, Limited; Crown Mines, Limited; Durban Roodepoort Deep, Limited; Ferreira Gold Mining Company, Limited; Geldenhuis Deep, Limited; Modderfontein B. Gold Mines, Limted; Robinson Gold Mining Company, Limited; Rose Deep, Limited; Village Deep, Limited; Village Main Reef Gold Mining Company, Limited

The above eleven mines in 1911 had ore reserves of 25,729,798 tons averaging 30.81 per ton. Taking the average rate of sorting for 1911, viz., 14.5 per cent., these reserves represented 21,998,977 milling tons of ore estimated to contain 35.34s. per ton.

The figures given for 1912 cover the entire group of fifteen mines. The reserves at the close of 1912 amounted to 35,802,255 averaging 30.8s. per ton. Taking the average rate of sorting for the year, viz., 14.08 per cent., these reserves represent 30,761,298 tons of a calculated gold contents of 35.2s.

Below we give the results of 1912 and 1911:

	1912 (15 mines)	1911 (11 mines)
Average yield	33.6s.	32.5s.
Average cost except tax	20.6s.	19.8s.
Average tax	1.3s.	1.3s.
Average profit	11.7s.	11.4s.

CONSOLIDATED GOLD FIELDS OF SOUTH AFRICA

SOUTH AFRICA

Year Ended July 31

Production	1912	1911	1910
Total gold output, ounces	946,520	936,780	911,419
Value, company's books	3,975,167	3,931,748	3,827,884
Value at £4.24773 per ounce	4,020,562	3,979,189	3,871,464
Mining profits[1]	1,304,143	1,388,696	1,427,957
Total profits including sundry revenue, accum. slimes, etc.	1,384,566	1,477,720	1,511,132
Tons crushed	3,616,143	3,269,160	3,252,375

[1] Excluding expenditures on machinery, renewals and replacements.

For the month of July	1912	1911
No. stamps dropping	1200	1160
No. tube mills	38	33
Tons crushed per stamp per day	9.083	8.842

1913 Operations:—Ounces 936,822. Profit, £1,170,019. Tons crushed, 3,978,882.

MEN EMPLOYED AND TONNAGE CRUSHED

Mine	1910–11	1911–12	1910–11	1911–12
Simmer and Jack	3,282	3,260	814,800	864,000
Robinson Deep	3,333	3,163	556,050	600,800
Knights Deep	3,106	2,981	695,670	727,700
Simmer East	2,235	1,942	364,870	379,700
Simmer Deep	3,116	3,109	505,833	569,750
Jupiter	2,320	2,016	281,376	422,050
Sub. Nigel	514	505	50,561	52,330
	17,906	16,876	3,269,160	3,616,330

That is to say, the tonnage crushed was increased by no less than 347,170 tons, despite the fact that there was an average decrease in the number of natives employed of 930. Below we give results per man:—

Tons crushed per month per surface boy at work on the usual operations.

Tons mined per month per underground boy on the usual operations, excluding development and shaft sinking.

Development footage per month per boy on development work.

July, 1911	July, 1912	Increase
80.89	90.56	11.95 per cent.
28.39	29.75	4.79 per cent.
9.73	10.34	6.27 per cent.

OPERATING RESULTS TRANSVAAL GOLD MINES, 1913–1914

Year ended Dec. 31, 1913 unless otherwise specified	Tons mined or milled	Per ton milled*		Total profit, £	Ore reserves, tons	Grade
		Yield per ton	Working cost			
		s. d.	s. d.			
Bantjes Consolidated....	300,440	25 11	22 8	48,387	871,900	25.6s.
Brakpan Mines.....	613,269	28 3	18 9	290,790	2,242,000	6.7 dwt.
Cinderella Consolidated..	97,440	26 8.175	27 5.086	L 3,617	613,000	6.35 dwt
City Deep.....	468,800	37 9	25 7	296,552	2,167,650	10.0 dwt.
City and Suburban.....	306,663	39.4s.	21.9	268,481	687,200	34.7s.
Consolidated Main Reef[7].	241,007	31 5.96	21 9.84	116,609	693,460	7.34 dwt.
Consolidated Langlaagte.	523,100	26 11	17 7	244,293	2,194,408	7.4 dwt.
Crown Mines.....	2,195,600	29 7	16 5	1,442,473	10,449,000	6.82 dwt.
DurbanRoodepoortDeep.	291,590	28 10	24 5	64,235	1,312,700	6.7 dwt.
East Rand Proprietary...	1,769,000	30 9	19 10	965,277	5,600,000	6.7 dwt.
Ferreira Deep[1].....	647,550	41 6	20 1	699,214	1,974,400	8.7 dwt.
Geldenhuis Deep.....	623,300	29 1	24 4	149,828	1,669,500	6.4 dwt.
Ginsberg Gold.....	176,182	27 7	19 8	69,854	312,540	6.0 dwt.
Jupiter Gold[8].....	.....	.....	.....	.....	.....	.....
Knight Central.....	278,010	22 7	20 3	32,231	539,100	6.0 dwt.
Knight's Deep[9].....	1,113,300	14 6.857	11 10.589	157,472	2,480,000	4.2 dwt.
Langlaagte Estate.....	620,622	21 9	17 1	144,883	1,512,359	.....
Main Reef West[7].....	212,972	28 5.58	23 1.75	56,641	526,440	5.7 dwt.
Modderfontein B.....	404,580	38 9	16 4	453,531	2,800,400	8.3 dwt.
New Heriot.....	133,128	34.7s	22.8s.	79,124	581,124	34.0s.
New Kleinfontein.....	540,300	27 6	18 11	231,524	1,345,216	7.53 dwt.
New Modderfontein[2]....	565,400	39 7	19 11	534,274	4,547,000	8.1 dwt.
New Rietfontein Estate..	185,830	21 5	19 11	14,225	51,737	7.55 dwt.
New Unified Main Reef..	147,390	25 4	17 8	56,863	387,500	5.9 dwt.
Nourse Mines[9].....	539,500	28 4	21 3	192,226	2,473,700	6.4 dwt.
New Primrose.....	295,800	27 10	13 7	210,028	401,045	6.2 dwt.
Randfontein Central.....	2,533,043	24 6	17 3	921,134	6,818,929	6.5 dwt.
Robinson Gold.....	668,900	35 9	14 1	724,792	538,500	44s. 1d.
Robinson Deep[9].....	580,370	27 8.491	16 6.616	331,175	1,527,000	5.9 dwt.
Rose Deep.....	768,070	26 3	16 7	369,664	3,828,400	5.8 dwt.
Simmer and Jack Proprietary[9].	769,600	20 8.917	12 4.335	322,678	2,320,000	5.4 dwt.
Simmer Deep[9].....	644,300	16 0.680	15 0.946	42,151	1,281,000	4.35 dwt.
Sub-Nigel[9].....	57,990	37 11.313	30 9.080	24,806	160,000	7.2 dwt.
Transvaal Gold Mining Estates.[5]						
Central Mine.....	139,976	58 1	22 0	253,745	389,233	14.4 dwt.
Elandsdrift Mine.....	8,053	93 0	28 7	25,930	38,270	16.0 dwt.
Vaalhoek Mine.....	17,860	32 0	19 7	11,093	54,651	11.4 dwt.
Van Ryn.....	456,190	27 11.538	15 11.956	272,919	2,064,529	6.5 dwt.
Van Ryn Deep.....	183,000	31 4	19 11	104,130	1,953,845	8.6 dwt.
Village Deep.....	535,300	29 10	20 7	247,109	2,662,600	6.6 dwt.
Village Main Reef.....	435,980	36.1s.	18.6s.	380,548	1,166,000	32s. 9d.
West Rand Consolidated.	321,050	28 5	22 9	91,218	1,364,956	6.16 dwt.
Witwatersrand Gold.....	448,680	25 7	14 8	245,652	1,225,688	6.4 dwt.
Witwaters and Deep.....	518,230	28 11	17 3	303,227	1,666,000	6.8 dwt.
Wolhuter[6].....	340,950	26 5	18 3	139,398	784,100	6.1 dwt.

L Loss. [1] Year ended Sept. 30, 1913. [2] Year ended June 30, 1913. [3] Year ended July 31, 1913. [4] Eleven months ended June 30, 1913. [5] Year ended Mar. 31, 1914. [6] Year ended Oct. 31, 1913. [7] Year ended June 30, 1914. [8] Year ended July 31, 1913. [9] Year ended July 31, 1914. * Yield.

TRANSVAAL GOLD MINING ESTATES, LIMITED

SOUTH AFRICA

Period Sept. 1, 1905, to March 31, 1912

Production, ounces, gold	752,985.953		
Total value	£3,163,180	16s.	5d.
Total expenditures	£2,053,909	2	7
Working profit	£1,109,271	13	10
General revenue	72,026	9	7
Net	£1,181,298	3	5
Tons treated, milled	1,273,487		
Yield per ton, milled	11.825 dwt.		
Cost per ton (milled)	£1	12s.	3.077d.
Average value per ton, ore	£2	9s.	8.129d.
Profit per ton ore		17s.	5.052d.

The properties consist of 32 farms mainly along the gold-bearing formation. The main mining operations have been conducted near Pilgrim Rest.

The crushing plant consists of a central battery of 60 stamps and three tube mills, while 10 stamps operate on the farm "Vaalhoek," and five heavy stamps at "Elandsdrift."

BANTJES CONSOLIDATED MINES, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911	1910
Gold, ounces	101,076	89,035	29,424
Gross revenue	£423,021	£372,956	£123,462
Expenses	345,275	319,020	110,932
Profit	£ 77,746	£ 53,936	£ 12,530
Ore rec'd from mine	327,710	278,540	104,148
Per cent. waste sorted out	12.6	16.5	16
Mill:			
Tons crushed	286,453	273,212	97,205
Stamp duty	11.0	14	11.4
No. stamps operating	80	60	60
No. tube-mills operating	3	3	2.1
Value ore treated	30s. 8d.	7.25 dwt.	7.2 dwt.
Yield, ounces	60,721	51,734	18,792
Yield per ton	17s. 9d.	3.79 dwt.	3.87 dwt.
Value pulp	12s. 11d.	3.46 dwt.	3.34 dwt.
Extraction, per cent	58	52.2	53.7
Cyanide:			
Tons treated	287,270	271,917	93,480
Assay value	12s. 11d.	3.57 dwt.	3.31 dwt.
Yield, ounces	40,355	37,301	10,632
Yield per ton	11s. 9d.	2.74 dwt.	2.27 dwt.
Actual extraction, per cent	91.4	76.9	68.6
Value residues	1s. 1d.	.350 dwt.	.347 dwt.
Total extraction, per cent	96.5	89.9	84.1
Cost per ton:	s. d.	s. d.	s. d.
Mining	13 0	12 0	18 1
Development redempt	4 6	4 8	4 2
Sorting and crushing	0 7	0 11	.....
Trans. to mill	0 1		
Amalgamation	0 5	1 0	.....
Stamp milling	0 11		
Tube milling	0 7	0 10	.....
Cyaniding	1 11	2 2	.....
General expense	2 1	1 9	0 7
Total	£1 4 1	£1 3 4	£1 2 10
Revenue per ton	£1 9 6	27 4	25 5
Cost per ton	1 4 1	23 4	22 10
Profit per ton	£0 5 5	4 0	2 7
Development, feet	16,339	14,410	26,028
Grade ore reserves	7 dwt. = 29s. 3d.	.....	.....

See also Appendix, page 377.

BRAKPAN MINES, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911
Gold, ounces	236,605	79,153
Gross revenue	£996,458	£332,237
Expenses	552,341	221,260
Working profit	£444,117	£110,977
Net profit	442,735	.....
Ore received from mine	738,108	249,041
Per cent. waste sorted out	15.242	14.57
Mill:		
Tons crushed	637,523	241,204
Stamp duty	13.74	12.02
No. stamps operating	135	100
No. tube mills operating	6.521	4.5
Value ore treated, dwt.	7.792	6.916
Yield, ounces	137,549	39,661
Yield per ton, dwt.	4.315	3.289
Value pulp	3.477	3.627
Extraction, per cent.	55.376	47.556
Cyanide:		
Tons treated	635,257	230,173
Assay value, dwt.	3.464	3.586
Yield, ounces	99,056	39,492
Yield per ton, dwt.	3.1186	3.431
Actual extraction, per cent.	90.03	95.678
Value residues, dwt.	.3645	.420
Total extraction, per cent.	95.263	94.896
Cost per ton miled:	s. d.	s. d.
Mining	11 1.703	10 11.019
Development redemption	1 6.000	1 6.000
Sorting and crushing	0 4.578	0 5.364
Stamp milling	0 10.357	1 0.637
Tube milling	0 8.480	0 7.685
Cyaniding	0 15.178	0 10.798
Recovery charge	0 4.656	0 7.740
General expense, mine	0 9.265	0 10.393
Head office	0 3.715	0 4.521
Total	17 3.932	18 4.157
Revenue per ton	31 3.123	£1 7 6.579
Cost per ton	17 3.932	0 18 4.157
Profit per ton	13 11.191	9 2.422
Development, feet	17,348	10,675
Grade ore reserves	6.74 dwt. 61 in.	6.73 dwt. 58 in.

See also Appendix, page 377

TRANSVAAL GOLD MINING ESTATES, LIMITED

CENTRAL MINE, LYDENBURG, SOUTH AFRICA

Year Ended March 31

Production	1912
Production mills ounces gold	40,351
Production cyanide plant ounces gold	36,239
Total ounces	76,580
Value of yield	£320,053 5s. 3d.
Rebates on freight	989 7 4
Total revenues	£321,042 12s. 7d.
Total expenses	142,773 1 9
Working profit	£178,269 10s. 10d.
Mills:	
Tons mined	121,458
Tons crushed	121,450
Value total recovery	£168,396 9s. 5d.
Value per ton milled	27s. 8.77d.
Average number stamps	60
Duty per stamp (tons)	6,039
Cyanide:	
Tons treated	118,950
Value total recovery	£151,185 4s. 5d.
Value per ton milled	24s. 10.75d.
Assay value, charges, dwt	6.994
Assay value, residues, dwt	.969
Actual extraction, per cent	87.10
Ounces gold recovered in accumulating slimes	113.6
Profit in accumulating slimes	£ 348 14s. 1d.
Costs per ton (milled):	
Mining	9s. 4.07d.
Development	4 7.17
Transportation	1 3.84
Prospecting	0 9.92
Milling	2 1.85
Cyaniding	3 4.29
General	1 11.00
Total	23s. 6.14d.
Net results per ton:	
Total revenues	52s. 10.42d.
Total cost	23 6.14
	29s. 4.28d.
Grade ore reserves, dwt	14.22

CINDERELLA CONSOLIDATED GOLD MINES, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911
Production:		
Gold, ounces	69,514	.....
Total revenue	£294,313	£264,606
Working expenses	261,338	229,672
Working profit	£32,875	£34,934
Profit after sundry income	£47,932	£49,731
Mine:		
Tons mined	.....	.....
Per cent. waste sorted out	13	13¼
Mill:		
Tons crushed	211,518	192,341
Grade ore treated, dwt	7.086	6.933
No. stamps working	75	70
Stamp duty	8.663	.....
Total ounces gold	40,248	.....
Yield per ton, dwt	3.806	.....
Extraction, per cent	57.9	.....
Cyanide:		
Tons sand treated	138,118	126,253
Total yield gold, ounces	.....	.....
Tons slime treated	73,722	65,768
Total yield gold, ounces	29,266	.....
Yield, dwt	2.767	.....
Yield per ton milled	27s. 9.83d.	27s. 6d.
Cost per ton:		
Mining	15s. 1.652d.	13s. 10.4d.
Development redeemed	2 0.000	2 .1
Sorting, crushing and transportation	0 4.903	0 6
Milling	1 10.825	1 11.6
Cyaniding sands and slimes	1 10.311	1 11.6
General expenses, head office	0 9.108	1 5.28
	24s. 8.528d.	23s. 9.58d.
Revenue per ton	27 9.83	27 6
Cost per ton	24 8.528	23 9.58
Working profit pert on	3s. 1.302d.	3s. 8.24d.
Development, feet	15,509	.....
Average grade ore reserves	6.70 dwt.	.....

See also Appendix, page 377

CITY DEEP, LIMITED

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911
Production ounces, gold	203,019	128,113
Total revenue	£852,039	£537,548
Total working costs	569,621	406,634
Total working profit	£282,418	£130,914
Net profit	£289,543	£90,936
Mills:		
Tons mined	487,565	285,960
Ore from surface	81,228	
Sorted as waste	88,863	45,763
Per cent. sorted out	15.6	11.6
Tons crushed	479,630	349,713
Value ore before crushing	35s. 9d.	7.63 dwt.
Yield fine ounces	132,763	90,820
Yield per ton	£1 3s. 3d.	5.19 dwt.
Assay value pulp	12s. 6d.	2.44
Theoretical extraction, per cent	65.1	68
Actual extraction, per cent	65.1	68
Cyanide:		
Tons treated	477,160	334,228
Assay value	12s. 4d.	2.45 dwt.
Total yield, ounces	70,256	37,293
Yield per ton	£0 12s. 3d.	2.23 dwt.
Assay value residue	1s. 2d.	.347 dwt.
Actual extraction, per cent	99.5	91.1
Total extraction, per cent	.....	96.0
Cost per ton (milled):		
Mining	£0 14s. 6d.	£0 14s. 1d.
Development	0 3 2	0 1 11
Reduction expenses, milling and cyanide	0 4 3	0 4 11
General expense	0 1 10	0 2 4
Total working cost	£1 3 9	£1 3 3
Profit from accumulations	£10,235	£3,972
Net results per ton:		
Total revenue	35s. 6.3d.	£1 10 9
Total working cost	23 9.0	1 3 3
Working profit	£0 11s. 9d.	£0 7s. 6d.
No. of stamps operating	120	90
No. of tube mills operating (running time)	7.5	5.6
Development	16,602	9,947

See also Appendix, page 378

THE CITY AND SUBURBAN GOLD MINING AND ESTATE CO., LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911
Gold, ounces	142,273	113,306
Gross revenue	£622,847	474,299
Expense	350,512	311,776
Profit	£272,335	£162,523
Total profit	£278,418	£174,004
Ore received from mine, tons	367,368	372,763
Per cent. waste sorted out	11.90	15
Mill:		
Tons crushed	323,934	317,579
Stamp duty, tons, 24 hr	6.585	6.009
No. stamps operating	143	160
No. tube mills operating	2.097	.123
Value ore treated	38s. 3d.	7.886 dwt.
Yield, ounces	99,010	72,707
Yield per ton	25s. 8d.	4.579 dwt.
Value, pulp	12s. 7d.	3.307 dwt.
Extraction, per cent	67.084	58.065
Cyanide:		
Tons treated	324,762	316,264
Assay value	12s. 8d.	3.284
Yield, ounces	43,263	40,599
Yield per ton	11s. 3d.	2.567
Actual extraction, per cent	88.596	78.12
Value residues	1s. 8d.	.724
Total extraction, per cent	96.397	90.487
Cost per ton (milled):		
Mining	13s. 11.808d.	12s. 8.065d.
Development	1 2.646	1 5.43
Sorting and crushing	0 6.931	0 7.485
Transportation to mill	0 2.036	0 1.910
Stamp milling	1 4.526	1 5.464
Tube milling	0 7.302	0 .506
Cyaniding	2 2.987	1 9.792
General expense	1 5.455	1 4.963
Total	£1 1 7.691	19 7.62
Revenue per ton	£1 18 5.462	29 10.44
Cost per ton	1 1 7.691	19 7.62
Profit per ton	16s. 9.771d.	10s. 2.82d.
Development, ft.	8,301	10,442
Grade ore reserves	8.4 dwt.	.....

See also Appendix, page 378

CONSOLIDATED LANGLAAGTE MINES, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912
Production:	
Gold, ounces	89,610
Total revenue	£380,693
Working expenses	281,247
Working profit	£99,446
Profit after accl. slimes and miscellaneous	£123,939
Mine:	
Tons mined	290,036
Mill:	
Tons crushed	295,072
Grade ore treated, dwt	6.561
Number stamps working	230
Stamp duty	5.25 and 16.89[1]
Total ounces gold	56,632
Yield per ton, dwt	3.839
Cyanide:	
Tons sand treated	175,127
Total yield gold, ounces	24,587
Yield per ton treated, dwt	2.808
Yield per ton milled, dwt	1.666
Average value charge, dwt	3.546
Tons slime treated	113,570
Total yield gold, ounces	8,391
Yield per ton treated, dwt	1.478
Yield per ton milled, dwt	.569
Average value charge	1.801
Final extraction per ton milled, per cent	92.577[2]
Cost per ton:	Shillings
Mining	8.394
Development	2.115
Hoisting	1.467
Pumping	.382
Transportation of ore	.397
Ore sorting and crushing	.224
Milling Tube milling	1.729
Cyaniding sands and slimes	1.830
General expense, mine	.969
General expense, head office	1.516
Total cost	19.063

Summary per ton:	
Revenue	25,803s.
Cost	19.063
Working profit	6.740s.
Total extraction, dwt	6.074
Ounces gold from accumulated slimes not incl. in above	7,483
Grade ore reserves, dwt	6.4
Development, feet	28,575

[1] 5.25 in old mill of 140 stamps and 16.89 in new mill of 90 stamps.
[2] Excluding gold recovered from accumulated silme.

Remarks.—The east shaft had attained a depth of 2,702 ft. having been sunk 755 ft. on the incline during the year. The cost of shaft sinking including stations, ore bins and equipment in East and West Shafts was £49,195. The West Shaft was sunk 420 ft. on the incline to a depth of 2599 ft.

The average stoping width in the mines was 47.54 in. There were engaged in hand stoping during the year 889 boys.

72.50 per cent. of tonnage mined was hand stoping.
10.79 per cent. of tonnage mined was machine stoping.
7.99 per cent. of tonnage mined was ore reclamation.
8.72 per cent. of tonnage mined was development.

The average width stopes in hand labour stopes was 46.94 in. and 52.04 in. in the machine stopes.

CONSOLIDATED MAIN REEF MINES AND ESTATE, LTD.

SOUTH AFRICA

Year Ended June 30

	1912	1911	1910
Gold, ounces	83,722	.....	.....
Gross production	£350,423	£360,211	£297,185
Total expenses	256,289	272,237	206,714
Working profit	£94,134	£87,974	£90,471
Tons mined	272,897	.....	.....
Per cent. sorted out	11.36	.....	.....
Mill:			
Tons milled	242,416	252,485	197,083
No. stamps	100	120	103
Stamp duty, tons 24 hours	7.703	6.992	5.723
Value rock, dwt	7.207	.....	.....
Yield, ounces	63,733	.....	.....
Yield per ton, dwt	5.258	4.928	4.059
Extraction, per cent	72.96	.....	.....
Cyanide:			
Sands treated, tons	121,271	.....	.....
Slime treated, tons	121,145	.....	.....
Yield, ounces by cyanide	19,989	.....	.....
Yield, ounces per ton, dwt	1.649	1.891	3.115
Per cent. of extraction	22.88	.....	.....
Total extraction, per cent	95.84	93.3	90.11
Cost per ton (milled):			
Mining	9s. 8.290d.	9s. 8.107d.	8s. 10.647d.
Development	4 5.043	4 10.937	5 10.049
Pumping	0 7.480	0 7.333	0 8.392
Tramming, sorting and crushing	0 11.370	0 11.695	1 1.091
Milling	1 10.748	2 1.612	1 7.442
Cyanide	1 8.662	1 8.927	1 9.562
Mine charge	0 8.692	0 5.068	0 1.691
General charges	1 1.450	1 1.097	0 10.854
Total	21s. 1.735d.	21s. 6.776d.	20s. 11.728d.
Yield per ton	28s. 10.931d.	28s. 6.40d.	30s. 1.901d.
Costs	21 1.735	21 6.776	20 11.728
Working profit	7s. 9.196d.	6s. 11.624d.	9s. 2.173d.
Development, feet	18,946	.....	.....
Grade ore reserves	7.26 dwt. 48 in.	.....	.....

See also Appendix, page 378

CROWN MINES, LIMITED

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911
Production ounces, gold	731,749	674,828
Total revenue	£3,071,216	£2,831,625
Total working costs	1,756,969	1,560,519
Working profit	£1,314,247	£1,271,106
Total working profit	1,315,818	1,280,757
Net profit	£1,270,142	£1,261,345
Mills:		
Tons mined	2,183,305	1,831,182
Tons crushed	1,920,700	1,618,500
Value of ore before crushing	33s. 6d.	8.68 dwt.
Yield, fine ounces	513,231	481,612
Yield per ton	22s. 5d.	5.95 dwt.
Assay value pulp	11s. 1d.	2.73 dwt.
Extraction, per cent	67	68.5
Cyanide:		
Tons treated	1,915,716	1,616,941
Assay value	11s. 1d.	2.73 fine dwt.
Total yield	218,518	193,216 oz.
Yield per ton	9s. 7d.	2.39 dwt.
Assay value residue	1s. 7d.	.403 dwt.
Actual extraction, per cent	86.5	87.5
Costs per ton (milled):		
Mining	£0 12s. 1d.	£0 12s. 4d.
Development and redemption	0 1 2	0 1 2
Reduction expenses, milling and cyanide	0 3 9	0 4 2
Genl. expense	0 1 4	0 1 8
Total working cost	£0 18 4	£0 19 4
Net results per ton:		
Total revenue	£1 12 0	£1 15 0
Total working cost	£0 18 4	19 4
Working profit	£0 13 8	£0 15 8
Accumulations, profit	£1,571	£9,650
No. of stamps operating	660	620
No. of tube mills operating	22	16.9
Duty per stamp (tons)	10.3	8.8
Per cent. waste sorted in mining	11.9	11.7
Development work, feet	46,804	71,023
Grade of ore reserves	7.1 dwt.	7.25 dwt.
Total mill recovery, per cent	95.5	96

See also Appendix, page 379

DURBAN ROODEPOORT DEEP, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911	1910
Gold ounces	104,986	.....	.....
Total revenue	£439,699	£381,558	£357,128
Total expenses	357,614	319,808	295,407
Working profit	£82,085	£61,750	£61,721
Net profit after miscellaneous	77,798	58,859	61,029
Mine:			
Tons mined	357,270	327,171	309,067
Per cent. waste sorted	17.7	.....	.....
Mill:			
Tons crushed	293,995	262,540	240,530
Value ore	31s. 6d.	.....	.....
No. stamps operating	100	.....	.....
Stamp duty per 24 hr	8.6	.....	.....
Yield total gold, ounces	74,042	.....	.....
Yield per ton	21s. 1d.	.....	.....
Extraction, per cent	67	.....	.....
Cyanide:			
Tons treated	293,508	.....	.....
Assay value, originals	10s. 5d.	.....	.....
Yield, total, ounces	30,944	.....	.....
Yield per ton	8s. 10d.	.....	.....
Assay residues	1s. 7d.	.....	.....
Extraction, per cent	84.8	.....	.....
Cost per ton:	£ s. d.		
Mining	0 15 7	.....	.....
Development	0 2 6	.....	.....
Sorting and crushing	0 0 9	.....	.....
Transportation to mill	0 0 1	.....	.....
Milling	0 1 11	.....	.....
Cyaniding	0 1 6	.....	.....
General expense	0 2 0	.....	.....
Total cost	1 4 4	£1 4.36s.	£1 4.56s.
Total revenue per ton	1 9 11	1 9.07	1 9.70
Total cost per ton	1 4 4	1 4.36	1 4.56
Working profit per ton	0 5 7	0 4.71s.	0 5.14s.
Development feet	15,555	.....	.....
Average value ore reserves, dwt	6.9	6.8	.....
Average value ore reserves	29s.	28.05s.	.....

The development work for 1912 disclosed the following which were used in calculations for ore reserves.

	Distance, ft., exposed	Width, inches	Assay value
Main Reef	4415	28	45s. 4d.
South Reef	5840	10	132 9

The ore reserves show the following on the Main and South Reefs.

	Value			Stoping width, inches
	dwt.	s.	d.	
Main Reef	6.2	26	0	56
South Reef	7.3	30	8	42
Average	6.9	29	0	

Remarks.—The area contains the reef for about 1¼ miles along the strike. Dip of reef about 42 deg.

The mill has 100 stamps and three tube mills with an annual capacity of about 285,000 tons. About 20 per cent. of the rock mined is sorted out and rejected.

RÉSUMÉ OF OPERATIONS FROM FIRST YEAR (6 MO.) ENDING DEC. 31, 1898 TO DEC. 31, 1912, INCL.

Tons milled			1,923,124
Revenue per ton milled	£1	12s.	8.8d.
Cost per ton milled	1	5.	10.4.
Profit per ton	0	6.	10.4.
Working profit			£660,169
Net profit			£593,480

DURBAN-ROODEPOORT GOLD MINING CO., LTD.

ROODEPOORT, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911
Gold, ounces	42,770	48,023
Gross revenue	£180,361	£203,472
Expenses	£132,931	135,250
Working profit	£47,430	£68,222
Profit after miscellaneous	£45,015	.....
Net after depreciation, London office, etc	£34,957	.....
Ore received from mine	195,157	.....
Per cent. waste sorted out	14.46	13
Mill:		
Tons crushed	166,915	165,665
Stamp duty per day, tons	5.25	.....
Number stamps operating	90	90
Yield ounces	31,554	.....
Yield per ton	3.781 dwt.	17s. 4.8d.
Extraction	66.59	.....
Cyanide:		
Tons treated	164,147	.....
Yield ounces	11,026	.....
Yield per ton	1.321 dwt.	7s. 1.9d.
Actual extraction, per cent	23.73	.....
Total extraction, per cent	90.74	.....
Cost per ton:		
Mining	9s. 0.5d.	9s. 6.4d.
Development	1 3.9	1 7.9
Milling	1 9.4	1 7.4
Sorting	0 7.1	0 6.9
General charges	1 7.6	1 9.3
Tailing and slime treating	1 6.5	1 6.6
Profit tax	0 5.2	0 8.1
Depreciation and London office	1 6.7	1 6.1
Total	17s 10.9d	18s 10.7d.
Revenue per ton	£1 1 8.9	£1 4 7.8
Cost per ton	0 17 10.9	0 18 10.7
Profit per ton	£0 3s. 10.0d.	£0 5s. 9.1d.
Development, feet	5,082	.....
Grade ore reserves	20s. to 22s.	.....

Remarks.—Company operates on the Main and South Reefs. The average stoping width for 1912 was 44 in. Property is equipped with a 90-stamp mill and cyanide plant.

EAST RAND PROPRIETARY MINES, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911	1910
Gold, ounces	705,325	664,304	691,860
Gross revenue	£2,967,443	£2,784,882	£2,900,883
Expenses	1,928,350	1,828,261	1,651,527
Working profit	£1,039,093	£956,621	£1,249,356
Total profit after accul	£1,076,746	£974,516	.....
Ore received from mine	2,054,507	2,354,336	2,334,907
Per cent. waste sorted out	10	7	8.7
Mill:			
Tons crushed	1,848,050	2,194,552	2,126,334
Stamp duty, tons 24 hr	7.39	8.23	6.78
No. stamps operating	820	820	820
No. tube mills operating	25	25	.....
Value ore treated, dwt	7.991	6.579	7.008
Yield, ounces	424,945	366,787	373,407
Yield per ton, dwt	4.599	3.343	3.512
Extraction, per cent	57.5	.....	50.11
Cyanide:			
Tons treated	1,846,275	.....	[1]
Assay value, dwt	3.392	3.232	[1]
Yield, ounces	280,380	297,517	318,452
Yield per ton, dwt	3.034	2.711	[1]
Actual extraction, per cent	89.53	83.9	[1]
Value residues, dwt	.385	.432	[1]
Total extraction, per cent	95.5	.....	92.85
Cost per ton:	s. d.	s. d.	s. d.
Mining	11 9.4	8 3.7	7 6.6
Development	3 0.0	3 1.5	2 6.0
Reduction expense	4 5.5	4 8.8	4 11.6
General expense	1 7.5	0 5.9	0 6.2
Total	£1 0 10.4	16 7.9	15 6.4
Revenue per ton	£1 12 1.4	25 4.5	27 3.424
Cost per ton	1 0 10.4	16 7.9	15 6.4
Profit per ton	0 11 3.0	8 8.6	11 9.0
Development, ft	57,440	69,714	110,084
Grade ore reserves, dwt	6.8	6.9	.....

[1] Sands treated, 1,278,414 tons; assay value, 3.985 dwt.; obtained 3.379 dwt. per ton treated; per ton milled, 2.032; per cent. extraction, 84.78.

Slime treated, 847,920 tons; assay value, 2.519 dwt.; obtained 2.205 dwt. per ton treated; per ton milled, .879 dwt.; per cent. extraction, 87.53.

See also Appendix, page 379

TRANSVAAL G. M. EST., LTD.

ELANDSDRIFT MINE, LYDENBURG, SOUTH AFRICA

Year Ended March 31, 1912

Production	1912
Mills ounce gold yield	8,235.734
Valued at	£34,430 5s. 9d.
Cyanide plant yield, ounces gold	1,185.009
Valued at	£4,935 13s. 3d.
Total recovery	£39,365 19s. 0d.
Underestimated	38 1 8
Net total recovery	39,404 0 8
Total costs	9,919 6 0
Profit for year	£39,484 14s. 8d.
Tons mined	8,025
Overburden stripped, cu. yd	16,104
Mills:	
Tons crushed	7,930
Yield ounces gold	8,235.734
Recovery per ton ore, dwt	20.77
Recovery per ton milled	86s. 10.02d.
Cyanide:	
Tons treated	8,404
Yield ounces gold	1,185.009
Recovery per ton in dwt	2.988
Recovery per ton milled	12s. 5.38d.
Tonnage includes slime stored of 474 tons.	
Cost per ton (milled):	
Mining	6s. 4.33d.
Development	4 5.92
Transportation	1 4.22
Milling	5 1.97
Cyanide	3 8.54
General expenses	3 11.22
Total	25s. 0.20d.
Total recovery	99s. 4.55d.
Total costs	25s. 0.20d.
Profit per ton	74s. 4.35d.
No. stamps	5
Duty per stamp	4.696
Grade ore reserves approximately, dwt	10

FERREIRA DEEP, LIMITED

SOUTH AFRICA

Year Ended Sept. 30

	1912	1911	1910
Revenue from gold	£1,116,979	£811,723	£873,337
Working expenditures	595,418	391,784	344,400
Working profit	£521,561	£419,939	£528,937
Add revenue from slimes	£12,922	.....	.....
Tons mined	.....	466,213	454,571
Tons milled	559,800	373,196	364,147
Waste sorted out, per cent	15.7	19.5	20
Costs:	s. d.	s.	s.
Total working per ton	21 3	21.00	18.91
Value gold recovered per ton	39 11	43.50	47.96
Profit per ton	18 8	22.50	29.05
Profit per ton ded. current expense	.....	21.8	.....
Tax per ton	.....	2.1	.....
Net profit	19 0	19.8	.....
Average grade ore reserves	.....	41.22.	.....

See also Appendix, page 380.

FERREIRA GOLD MINING COMPANY, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1911	1910
Revenue from gold	£460,298	£581,150
Working expenditures	264,250	278,398
Working profit	£196,048	£302,752
Tons mined	340,433	390,526
Tons milled	310,300	346,150
Costs:	s.	s.
Total working per ton	17.03	16.09
Value gold recovered per ton	29.67	33.58
Profit per ton	12.64	17.49
Profit per ton after current expenses	11.75	.....
Tax per ton	.95	.....
Net profit	10.80	.....
Average grade ore reserves per ton	34.55s.	.....

See also Appendix, page 380

GELDENHUIS DEEP, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911	1910
Gold, ounces	225,517	265,083	276,002
Total revenue	£946,154	£1,111,423	£1,156,543
Total expenses	811,301	883,846	905,238
Working profit	£134,853	£227,577	£251,305
Net profit after accum	£141,987	£236,125	£260,524
Credit balance	£137,259	£232,611	268,118
Mine:			
Tons mined	776,511	1,013,323	1,058,175
Per cent. waste sorted	19.1	21	21.8
Mill:			
Tons crushed	627,960	801,860	826,610
Value ore	31s. 4d.	6.89 dwt.	7.01
No. stamps operating	300	420	420
Stamp duty tons per 24 hours	7.1	6.7	6.4
Yield total gold, ounces	153,730	175,318	185,020
Yield per ton	20s. 7d.	4.37 dwt.	4.48 dwt.
Extraction, per cent	65.6	63.4	63.9
Cyanide:			
Tons treated	633,162	803,625	824,629
Assay value, originals	10s. 9d.	2.52 dwt.	2.53 dwt.
Yield total, ounces	71,787	89,765	90,982
Yield per ton	9s. 6d.	2.23 dwt.	2.21 dwt.
Assay residues	1s. 4d.	0.403 dwt.	0.45 dwt.
Extraction, per cent	88.6	88.6	82.3
Cost per ton:	£ s. d.	£ s. d.	£ s. d.
Mining	0 15 10	0 13 7	0 13 4
Development	0 3 1	0 1 10	0 1 10
Sorting and crushing	0 0 8	0 0 8	0 0 9
Transportation to mill	0 0 2	0 0 2	0 0 2
Milling	0 2 0	0 1 8	0 1 7
Cyaniding and tube milling	0 1 11	0 2 6	0 2 8
General expense	0 2 0	0 1 8	0 1 7
Renewals and replacements	0 0. 2	.....	.....
Total cost	£1 5 10	£1 2 1	£1 1 11
Total revenue per ton	£1 10 2	1 7 9	£1 8 0
Total cost per ton	1 5 10	1 2 1	1 1 11
Working profit per ton	£0 4 4	£0 5 8	0 6 1
Development, feet	29,459	30,273	25,829
Aver. value ore reserves	6.3 dwt.	6.2 dwt.	6.1
Stoping width, inches	40 to 52	37 to 51	37 to 52
Yield per ton milled	30s. 2d.	27s. 9d.	28s.

See also Appendix, page 380

GINSBERG GOLD MINING CO.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912.
Production:	
Gold, ounces	59,411
Total revenue	£252,534
Working expenses	171,877
Working profit	80,657
Mine: Tons mined	248,849
Of which "fines" sent to mill were	82,828
Mill: Tons crushed	167,922
Grade ore treated	7.582
No. stamps working	80
Total ounces, gold	38,394
Yield per ton, dwt.	4.573
Extraction, per cent	60.31
Cyanide: Tons sand treated	102,492
Total yield, gold, ounces	15,089
Yield per ton treated, dwt.	2.944
Yield per ton milled, dwt.	1.797
Average value charge, dwt.	3.573
Tons slime treated	65,413
Total yield gold, ounces	5,928
Yield per ton treated, dwt.	1.813
Yield per ton milled, dwt.	.706
Average value charge	2.064
Final extraction, per cent	93.32
Cost per ton: Mining	9.332s.
Development	.629
Hoisting	1.608
Pumping	.871
Transport. of ore	.358
Ore sorting and crushing	.529
Milling	1.884
Tube milling	.507
Cyaniding sands and slimes	2.244
General exp., mine	1.065
General exp., head office	1.444
Total cost	20.471s.
Revenue per ton, dwt.	7.076
Revenue per ton	30.077s.
Working cost per ton	20.471
Working profit per ton	9.606s.
Development, feet	1,361
Grade ore reserves, dwt.	6.9

GLENCAIRN MAIN REEF G. M. CO., LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912
Production: Gold, ounces	42,935
Total revenue	£182,506
Working expenses	159,152
Working profit	£23,354
Profit after accl. slime and miscellaneous	£35,202
Mine: Tons mined and from dumps	274,375
Per cent. waste sorted out	13.77
Mill: Tons crushed	236,685
Number stamps working	160
Stamp duty	4.5
Total ounces gold	25,568
Yield per ton, dwt	2.161
Cyanide: Tons sand treated	151,706
Total yield gold, ounces	12,629
Yield per ton treated, dwt	1.665
Yield per ton milled, dwt	1.067
Value, before treatment dwt	2.238
Extraction, per cent	74.26
Tons slime treated	82,822
Total yield gold, ounces	4,738
Yield per ton treated, dwt	1,130
Yield per ton milled, dwt	.400
Value before treatment, dwt	1.314
Extraction, per cent	85.73
Cost per ton:	Shillings
Mining	5.882
Development	.397
Hoisting	.914
Pumping	.462
Transportation of ore	.330
Ore sorting and crushing	.432
Milling	1.772
Cyaniding sands and slimes	1.842
General expense, mine	.624
General expense, head office	.793
Total cost	13.448
Summary of results per ton: Mill recovery, dwt.	2.161
Cyanide sand and slime	1.467
Total	3.628
Value mill recovery	9.189s.
Value cyanide recovery	6.233
Total yield	15.422s.
Total cost	13.448
Working profit	1.974s.
Recovery of ore reserves (estimated, dwt.)	3.6
Development, feet	2,162

JUPITER GOLD MINING CO., LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911	1910
Gold yield, oz.	116,241	85,682.327	74,285.23
Gold revenue	£488,122	£359,171	£311,656
Working expense	£430,974	£332,232	£270,992
Working profit	£57,148	£26,938	£40,664
Total profit	£63,632	£31,951	£46,879
Tons mined, dumps	492,789	347,071	311,638
Waste sorted, per cent	7.24	9.48	14.08
Tons milled	476,450	314,650	267,398
Tons sands treated	217,437	147,399	145,498
Tons slimes treated	259,013	167,251	121,900
Value rec. battery and tubes per ton.	s. d. 11 6.652	s. d. 12 8.106	s. d. 13 10.014
Value rec. sands per ton	5 3.417	6 4.112	6 6.787
Value rec. slimes per ton	3 7.586	3 9.405	2 10.572
	£1 0 5.655	£1 2 9.623	£1 3s. 3.373d.
Working profit per ton	£0 2 4.562	£0 2 0.371	£0 3 0.147
Costs per ton (milled):	s. d.	s. d.	s. d.
Mining	11 0.179	11 11.204	10 11.519
Sorting, crushing and transporting.	0 4.619	0 6.204	0 7.410
Milling	0 10.281	1 0.414	1 5.210
Tube mill	1 0.733	1 0.132	0 9.715
Cyanide sands	0 8.769	0 11.956	1 0.723
Cyanide slimes	0 6.777	0 6.259	0 6.871
Development	1 10.788	3 0.959	2 10.703
General charges	1 4.773	1 7.751	1 11.075
	£0 17s. 10.919d.	£1 0s. 8.879d.	£1 0s. 3.226d
Renewals, etc.	£0 0 2.174	4.532	.....
Total	£0 18 1.093	£1 1 1.411	£1 0 3.226

	1912	1911	1910
Ave. no. stamps	100	73	88
Days running time	342.5	339	322
Duty per stamp	13.908	12.68	9.408
Tube mills	6½	4	7
Development, feet	10,618	11,349	7,702
Value of reserves	6.0	5.7 dwt.	5.8 dwt.

Note.—Tube mills run jointly with Simmer and Jack.
Milling plant has 100 heavy stamps with tubes.

KNIGHT CENTRAL, LTD.

SOUTH AFRICA

Year Ended Dec. 31

	1912	1911	1910
Gold, ounces	79,730	87,591	.....
Gross production	£333,877	£366,406	£344,325
Total expenses	279,450	295,589	265,314
Total profit	£54,427	£70,817	£79,011
Mine:			
Tons hoisted	310,420	350,353	.....
Tons mined and from dump	313,227	344,800	.....
Per cent. sorted out	8.18	8.60	.....
Mill:			
Tons milled	286,600	315,171	302,228
Average value ore, dwt.	5.76	.....	.....
No. stamps running	107.1	110	110
Duty per stamp	8.65	9.14	9.22
Gold, oz. recovered	58,735	62,466	.....
Per ton recovered, dwt.	4.1	3.96	3.88
Per cent. extraction	71.16	.....	.....
Cyanide:			
Sand, tons	166,104	192,440	.....
Slimes, tons	120,572	124,048	.....
Tailing assay, dwt.	1.76	1.84	.....
Residue assay, dwt.	.26	.28	.....
Total oz. recovered	20,995	25,125	.....
Recovery per ton, dwt.	1.46	1.59	1.57
Per cent. extraction	82.97	86.52	.....
Total extraction	96.6	95.60	95.14
Costs per ton milled:	s. d.	s. d.	s. d.
Mining	11 8.19	11 5.83	9 11.0
Development	2 7.56	2 2.31	1 10.95
Crushing and sorting	0 6.93	0 6.20	0 6.43
Milling	1 10.01	1 11.60	2 5.02
Cyaniding	1 5.40	1 4.44	1 5.47
Gen'l mine charges	0 6.75	0 6.23	0 6.98
Gen'l charges	0 9.17	0 8.48	0 8.84
Total	19s. 6.01d.	18s. 9.09d	17s. 6.69d
Total recovery, dwt.	5.56	.....	.....
Total revenue	23s. 3.59d	£1 3s. 3.02d.	.....
Profit per ton	3 9.58	4 5.93	.....
Grade ore reserves	6.1 dwt.	6.04 dwt.	.....
Width ore reserves, in	62.5	60.56	.....
Development, feet	10,776	10,837	.....

Remarks.—The mine is operated through two shafts connected underground. The Main, Middle and North reefs were cut at the following depths: 2056 ft., 2072 ft. and 2116 ft. The Eastern shaft has been carried to a depth of 4495 ft.

The stoping width is about 60 in. of 6 dwt. rock, exclusive of stripping. This has averaged to date about 9 in. over the total area mined. The mill has 120 heavy duty stamps, and 33 tube mills.

KNIGHTS DEEP, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended July 31

	1912	1911
Yield, gold, oz	151,114.973	162,369.702
Value	£634,984	£681,725
Working costs	418,519	407,989
Working profit	216,464	273,735
Sundry revenue	8,365	12,993
Total profit	£224,830 6s. 10d.	286,729 6s. 11d.
Less tax, int., etc	22,999 9 0	32,325 16s. 11d.
	£201,830 17s. 10d.	254,403 10s. 0d.
Tons mined	751,058	737,957
Waste sorted, per cent	3.11	5.69
Tons milled	727,700	695,670
Tons sands treated	413,850	429,450
Tons slimes treated	313,850	266,220
Value rec. in battery	8s. 5.123d.	8s. 10.704d.
Value rec. in sands	3 10.626	4 9.459
Value rec. in slimes	1 6.186	1 5.538
Value rec. in tube mills	3s. 7.205d.	4 5.193
Total	17s. 5.140	19s. 6.894
Add rebate on frt	0 0.282	0.295
Total	17 5.422	19 7.189
Working profit	5 11.392	7 10.436
Ave. No. stamps dropping	270	270
Running time, days	342	328
Tube mill running	6	6
Running time, days	345	339
Development	1454	3527
Gal. water hoisted	44,553,260	131,562,533
Ave. grade of reserves	4.7 dwt.	5.2 dwt.

	1912		1911	
Ave. value ore milled	4.39 dwt. = 18/5		5.05 dwt. = 21/0.75	
Ave. value residue	0.27 dwt. = 1/1.58		0.329 dwt. = 1/4.55	
Costs per ton:				
	s.	d.	s.	d.
Development			0	3.225
Mining	6	4.367	6	6.113
Pumping	0	2.136		
Transporting, sorting and crushing	0	8.108	0	8.097
Milling	1	1.280	1	1.690
Tube milling	0	6.266	0	7.101
Sand expenses	0	9.381	0	10.240
Slime expenses	0	5.110	0	4.587
Hire of plant	0	1.385		1.415
General charges	0	11.355		11.123
	11	1.388	11	5.590
Renewals, etc		4.642		3.162
Total	11	6.030	11	8.753

Notes.—The mine is operated through two shafts 2100 ft. apart. The main reef was intersected at a depth of 1200 ft. The dip of reef varies from 18 deg. to 27 deg.

There are four reefs in the mine but the main producers have been the main reef leader and South Reef. Reserves are based upon a stoping width of 70 in. of approx. 5.2 dwt. per ton.

The combined mills contain 280 stamps and six tube mills.

MAIN REEF WEST, LTD.

SOUTH AFRICA

Year Ended June 30

	1912	1911	1910
Gold, ounces	73,471	.....	.....
Gross production	£307,709	£338,797	£307,787
Total expenses	203,469	198,924	169,838
Working profit	£104,240	£139,873	£137,949
Tons mined	212,788	.....	.....
Per cent. sorted out	13.81	.....	.....
Mill:			
Tons milled	185,781	196,391	189,649
No. stamps	81.62	120	103
Stamp duty per 24 hours	7.369	6.342	5.41
Value rock, dwt.	8.259	34s. 6.028d.	32s. 5.503d.
Yield dwt. per ton	5.951	5.774	4.892
Total yield, ounces	55,284	.....	.....
Extraction, per cent	72.06	.....	.....
Cyanide:			
Sands treated, tons	101,198	.....	.....
Slimes treated, tons	84,583	.....	.....
Yield ounces by cyanide	18,187	.....	.....
Yield dwt. per ton	1.958	2.475	2.858
Per cent. of extraction	23.70	.....	.....
Total extraction, per cent	95.76	93.95	91.86
Cost per ton (milled):			
Mining	11s. 10.810d.	10s. 7.964d.	9s. 2.828d.
Development	3 9.819	3 6.212	3 3.591
Pumping	.....	.....	.....
Tramming, sorting and crushing	0 7.290	0 8.550	0 7.584
Milling	2 3.732	2 1.532	1 9.395
Cyanide	1 9.440	1 9.921	1 9.107
Mine charge	0 4.349	0 4.557	0 2.345
General charges	1 1.419	1 0.359	1 0.079
Total	21s. 10.850d.	20s. 3.095d.	17s. 10.929d.
Yield per ton	33s. 1.512d.	.....	.....
Costs	21 10.850	.....	.....
Working profit	11s. 2.662d.	14s. 2.933d.	14s. 6.574d.
Development, feet	12,842	.....	.....
Grade ore reserves, dwt.	6.36	.....	.....

See also Appendix, page 381

MODDERFONTEIN B. GOLD MINES, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911
Gold, ounces	172,838	30,918
Total revenue	£725,219	£145,363
Total expenses	343,066	81,000
Working profit	£382,153	£64,363
Mine:		
Tons mined	437,306	86,568
Per cent. waste sorted	11.1	9.5
Mill:		
Tons crushed	388,570	77,960
Value ore	39s. 2d.	9.00 dwt.
Number stamps operating	80	80
Stamp duty per 24 hrs	14	13.7
Yield total gold, ounces	99,374	15,178
Yield per ton	21s. 6d.	3.89 dwt.
Extraction, per cent	54.9	43.3
Cyanide:		
Tons treated	387,487	70,132
Assay value, originals	17s. 8d.	5.28 dwt.
Yield total, ounces	73,464	15,740
Yield per ton	15s. 11d.	4.49 dwt.
Extraction, per cent	90.2	84.9
Cost per ton:		
Mining	£0 9s. 3d.	£0 11s. 2d.
Development, redemption	0 1 10	0 1 5
Sorting and crushing	0 0 4	0 0 7
Transportation to mill	0 0 1	0 0 1
Stamp milling	0 0 10	0 1 0
Tube milling	0 0 9	0 1 4
Amalgamation	0 0 2	.....
Cyaniding	0 2 1	0 2 7
General expense	0 1 10	0 2 2
Renewals	0 0 6	0 0 5
Total cost	0 17 8	1 0 9
Total revenue per ton	1 17 4	1 13 3
Total cost per ton	0 17 8	1 0 9
Working profit per ton	£0 19s. 8d.	£0 12s. 6d.
Development, feet	8,606	13,346
Average value ore reserves	7.2 dwt.	7.5 dwt.
Stoping width, inches for year	55	50
Stoping width ore reserves	.....	51

See also Appendix, page 381

THE NEW HERIOT GOLD MINING CO., LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911	1910
Gold, ounces	60,833	.....	.....
Total revenue	£255,509	£268,243	£258,516
Total expenses	151,222	150,715	152,141
Working profit	£104,287	£117,528	£106,375
Net profit after miscl.	111,415	.....	.....
Mines: Tons mined	162,131	179,618	185,484
Per cent. waste sorted	15.08	19.5	19.25
Mill: Tons crushed	137,630	144,643	149,990
Value ore	38s. 1d.	.....	.....
No. stamps operating	70	.....	.....
Stamp duty per 24 hr.	6.61	.....	.....
Yield total gold, ounces	43,345	.....	.....
Yield per ton	26s. 6d.	.....	.....
Extraction, per cent.	69.52	.....	.....
Cyanide: Tons treated	138,665	.....	.....
Assay value, originals	12s. 2d.	.....	.....
Yield total ounces	17,487	.....	.....
Yield per ton	10s. 7d.	.....	.....
Assay residues	1s. 6d.	.....	.....
Extraction, per cent.	87.33	.....	.....
Cost per ton milled: Mining	12s. 6.9d.	.....	.....
Development	1 6.5	.....	.....
Sorting and crushing	0 8.4	.....	.....
Transportation to mill	0 3.3	.....	.....
Stamp milling	1 7.7	.....	.....
Tube milling	0 6.0	.....	.....
Cyaniding	2 5.0	.....	.....
General expense	1 11.4	.....	.....
Renewals and replacements	0 4.6	.....	.....
Total cost	21s. 11.7d.	.....	.....
Total revenue per ton	37 1.6	.....	.....
Total cost per ton	21 11.7	.....	.....
Working profit per ton	15s. 1.9d.	.....	.....
Development, feet	3,898	.....	.....
Average value ore reserves	8.1 dwt.	.....	.....
Gold ounces not included in above / Accumulated slimes	2,425	.....	.....
Total ounces gold	63,258	.....	.....
Total revenue per ton included	£1 18s. 7.3d.	.....	.....
Total with sundry revenue	1 18 8.4	37.09s.	34.47s.
Total working cost	1 2 6.2	20.84s.	20.29s.
Profit	16s. 2.2d.	16.25s.	14.18s.

See also Appendix, page 381

NEW MODDERFONTEIN GOLD MINING CO., LTD.

SOUTH AFRICA

Year Ended June 30

	1912		
Gold, ounces			
Total revenue	£1,011,020		
Total expenses	346,961		
Working profit	£ 464,059		
Net profit after miscl	£ 478,862		
Mine:			
Tons mined	657,806		
Per cent. waste sorted	11		
Mill:			
Tons crushed	585,900		
Value ore	35s. 5d.		
No. stamps operating	180		
Stamp duty	9.7		
Yield total gold, ounces	184,081		
Yield per ton	26s. 4d.		
Extraction	74.6		
Cyanide:			
Tons treated	586,615		
Assay value, originals	8s. 11d.		
Yield, total oz	56,901		
Yield per ton	8s. 2d.		
Assay residues	0s. 9d.		
Extraction	91.0		
Total extraction	97.7		
Cost per ton milled:	£	s.	d.
Mining	0	11	5
Development	0	1	7
Sorting and crushing	0	0	4
Transportation to mill	0	0	1
Milling	0	1	10
Cyaniding	0	1	10
General expense	0	1	7
Total cost	0	18	8
Total revenue per ton	1	14	6
Total cost per ton	0	18	8
Working profit per ton	0	15	10
General:			
Development, feet	21,865		
Average value ore reserves	8 dwt.		
Average stoping width of ore reserves, Main Reef	59 in.		
Average stoping width reserves, South Reef	58 in.		
Stoping width for year	57 in.		

See also Appendix, page 382

NEW PRIMROSE GOLD MINING CO., LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912
Production: Gold, ounces	99,471
Revenue from gold	£404,086
Total cost	201,658
Working profit	£202,428
Mine: Tons mined	309,608
Per cent. fines	39.44
Delivered to sorting plant	187,485
Per cent. waste sorted out	9.234
Additional waste left in stopes	21,000
Milling: Ore crushed, tons	289,000
Value, dwt	7.134
Yield, ounces	61,747
Yield per ton, dwt	4.273
Per cent. extraction	59.89
Cyanide: Sand, tons	185,850
Value, dwt	3.521
Yield gold, ounces	25,843
Extraction, dwt	2.78
Extraction per ton milled, dwt	1.788
Per cent. total contents	25.06
Slime treated, tons	97,926
Value, dwt	1.777
Yield gold, ounces	7,430
Extraction per ton	1.517
Extraction per ton milled, dwt	.514
Per cent. of gold contents	7.205
Accumulation slimes, yield ounces	4,451
Value per ton, dwt	2.341
Cost per ton: Mining	Shillings 5.849
Development	.902
Hoisting	1.146
Pumping	.337
Transportation of ore	.156
Crushing and sorting	.297
Milling	1.576
Tube milling	.029
Cyaniding sand and slime	1.837
General expense, mine	.686
General expense, head office	1.141
Total working cost	13.956
Revenue per ton	27.964
Costs	13.956
Profit per ton	14.008

NEW RIETFONTEIN ESTATE GOLD MINES, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended, Dec. 31

	1912
Gold, ounces	57,156
Value product	£243,032
Working cost	204,248
Working profit	£38,784
Mine: Ore stoped, tons	219,863
Ore from development	15,879
Total sent to crusher	235,742
Per cent. sorted out	19.66
Mill: Tons crushed	189,287
Value per ton, dwt.	6.655
Number stamps	120
Stamp duty, tons	4.79
Ounces recovered	39,695
Yield per ton, dwt.	4.194
Per cent. extraction	63.02
Cyanide: Sand treated, tons	127,270
Value, dwt.	2.698
Extraction, dwt.	2.077
Yield, ounces	13,222
Yield per ton milled, dwt	1.397
Slimes treated, tons	61,556
Value, dwt.	1.617
Extraction	1.38
Yield, ounces	4,238
Yield per ton milled, dwt.	0.448
	Shillings
Cost per ton: Mining	9.797
Development	1.902
Hoisting	1.961
Pumping	.622
Transportation of ore	.493
Crushing and sorting	.460
Milling	1.831
Cyaniding	1.914
General expense, mine	.962
General expense, head office	1.639
Total working cost	21.581
Recovery per ton	6.039 dwt. =25.679s.
Cost	21.581
Profit	4.098s.

NEW UNIFIED MAIN REEF GOLD MINING CO., LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912
Ounces gold produced	46,439
Revenue from gold	£197,215
Working costs	140,725
Working profit	£56,490
Total profit	£60,634
Mine:	
Tons mined	161,735
Waste sorted, per cent	18.32
Ore sent to mill, tons	132,100
Ore crushed, tons	132,325
Mill:	
Stamps running	60
Stamp duty	6.297
Gold recovered, ounces	32,299
Yield per ton, dwt.	4,882
Value of ore milled, dwt.	7.316
Cyanide:	
Sands treated	78,856
Yield, ounces	9,946
Yield per ton, dwt.	2.523
Assay of charge, dwt.	3.002
Slime treated, tons	52,538
Yield, ounces	4,193
Recovery per ton, dwt.	1.596
Assay value charge, dwt.	1.927
Cost per ton (milled):	Shillings
Mining	9.658
Development	2.324
Hoisting	.968
Pumping	.780
Transportation of ore	.124
Crushing and sorting	.717
Milling	1.753
Tube milling	.515
Cyaniding sand and slime	1.679
General expense, mine	1.068
General expense, head office	1.683
Total working cost	21.269
Revenue from gold	29.807
Working cost	21.269
Working profit	8.538
Yield per ton milled, dwt.	7.019
Width stoped, inches	56.07

NOURSE MINES LIMITED

TRANSVAAL, SOUTH AFRICA

Year Ended July 31

	1912	1911
Production ounces, gold	221,369	223,571
Total revenue	£928,921	£936,597
Total working costs	684,278	£695,573
Working profit	£244,643	£241,024
Total working profit	£253,233	£252,159
Mills:		
Tons mined	718,621	732,117
Tons crushed	609,250	643,675
Value of ore before crushing	31s. 10d.	7.3dwt.
Yield fine ounces	165,814	163,527
Yield per ton	30s. 6d.	5.08dwt.
Assay value pulp	9s. 0d.	2.22dwt.
Actual extraction, per cent	71.8	69.6
Cyanide:		
Tons treated	610,196	645,440
Assay value	9s. 0d.	2.24dwt.
Total yield, ounces	55,555	60,044
Yield per ton	7s. 8d.	1.86dwt.
Assay value residue	1s. 4d.	.375dwt.
Actual extraction, per cent	95.8	83.2
Total extraction, per cent	.....	95.1
Costs per ton (milled):		
Mining	£0 14s. 6d.	£0 13s. 5d.
Development and redemption	0 2 3	0 2 2
Reduction expenses, milling and cyanide	0 4 0	0 4 5
General expense	0 1 9	0 1 7
Total working cost	£1 2 6	£1 1 7
Profit from accumulations	£8,590	£11,134 14s. 2d.
Net results per ton:		
Total revenue	£1 10 10	£1 9 1
Total working cost	1 2 6	1 1 7
Working profit	£0 8 4	£0 7 6
No. of stamps operating	260	260
No. of tube mills operating running time	7	6.3
Duty per stamp (tons) 24 hours	7.6	7.6
Per cent. waste sorted in mining	15.1	12.8
Development work, feet	26,368	28,549
Grade of ore reserves	6.6 dwt.	6.6 dwt.

See also Appendix, page 382

QUEST GOLD MINING & DEVELOPMENT CO., LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Oct. 31

	1912
Production: Ounces, gold	7,184
Income	£30,445
Working cost	26,943
Working profit	£3,502
Profit after miscellaneous	£4,117
Mine:	
Tons received from mine	30,304
Mill:	
Ore crushed, tons	30,595
Number stamps running	30
Stamp duty	3.85
Yield, ounces	3,408
Yield per ton, dwt.	2.228
Assay value ore milled, dwt.	5.508
Cyanide:	
Sands treated, tons	24,893
Yield, ounces	3,022
Yield per ton, dwt.	2.43
Assay value of charge, dwt.	3.26
Slimes treated, tons	5,702
Yield, ounces	733
Yield per ton, dwt.	2.64
Assay value charge, dwt.	2.99
Total extraction per ton milled, dwt.	4.696
Cost per ton (milled):	Shillings
Mining	5.066
Development	.024
Hoisting	.790
Pumping	1.403
Transportation of ore	.491
Crushing	.528
Milling	3.122
Cyaniding sand	2.700
Cyaniding slime	.489
General expense, mine	1.645
General expense, head office	1.355
Total working cost	17.613
Revenue per ton	19.902
Cost per ton	17.613
Profit per ton	2.289
Total depth mine, feet	574
Reef average width, in.	48
Reef average value, dwt.	6.2

PREMIER (TRANSVAAL) DIAMOND MINING CO., LTD.

See Appendix, page 396

RANDFONTEIN CENTRAL GOLD MINING CO., LTD.

TRANSVAAL, S. A.

Year Ended Dec. 31

Production and profit	1912	1911
Production gold, ounces	733,780	632,621
Value of production	.....	£2,647,048 12s.
Total revenue	£3,085,711	£2,661,280 18
Total expenses	2,199,312	1,807,039 2
Profit	£886,399	£854,241 15s.
Mine and mill:		
Ore mined, tons	2,823,916	2,287,393
Waste sorted out, per cent	8.85	5.61
Ore milled, tons	2,573,908	2,159,033
Ore cyanided, tons	2,638,112	.....
Revenue per ton milled	23s. 11.74d.	24s. 7.83d.
Expenditure	17s. 1.09d.	16s. 8.87d.
Profit per ton	6s. 10.65d.	7s. 10.96d.
Costs per ton (milled):		
Development	1s. 1.45d.	1s. 2.05d.
Mining	9 10.05	9 .64
Hauling and pumping	1 9.62	1 8.18
Sorting, crushing, transportation	0 7.76	0 9.59
Milling	1 7.06	1 8.86
Cyaniding	1 6.13	1 8.88
General mining expense	0 4.62	0 4.87
General office expense	0 1.38	0 1.80
Total	17 .07	16 8.87
Accumulated slimes	0 1.02	0 .00
Grand total	17s. 1.09d.	16s. 8.87d.
Development	88,445 ft.	87,541 ft.
Yield per ton milled	5.702 dwt.	5.860 dwt.
No. stamps operating	752	745
Extraction, amalgamation, per cent	51.32	51.8
Per cent. total gold recovered by cyanide	48.68	48.2
Grade ore reserves	6.2 dwt.	6.633

See also Appendix, page 383

RANDFONTEIN SOUTH GOLD MINING CO., LTD.

RANDFONTEIN, TRANSVAAL, S. A.

Year Ended Dec. 31

Company taken over in 1910, no later data available.

	1910
Revenue:	
Milling	£840,741 2s. 6d.
Cyaniding	759,672 9 11
Sundry revenue	1,864 12 6
Total revenue	1,602,278 4 11
Expenditures	1,063,694 0 6
Working profit	538,584 4 5
Mine and mill:	
Tons mined	1,265,470
Per cent. discarded as waste	7.65
Tons crushed	1,168,641
Gold recovered from batteries, ounces	200,841
Gold recovered from cyanide	181,511
Total gold recovered	382,352
Cost per ton (milled):	
Development	1s. 8.17d.
Mining	9 8.99
Hauling and pumping	1 11.73
Sorting	0 1.96
Crushing	0 2.40
Transportation	0 2.13
Milling	1 11.44
Water service	0 .65
Cyaniding	1 7.41
General mine	0 5.02
General head office	0 2.54
Total cost	18s. 2.44d.
Total revenue per ton	27 5.05
Working profit per ton	9s. 2.61d.
Miscellaneous data:	
Development	40,219 ft.
Grade ore reserves	7.8 dwt.
No. stamps operating	400
No. tube mills	10
Per cent. gold won in milling	52.53
Per cent. total gold won in cyaniding	47.47
Stamp duty	8.671
Amt. of water pumped, gallons	507,806,776
Depth of main shaft	2,272 ft.

See also Appendix' page 383

ROBINSON DEEP GOLD MINING CO., LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended March 31

	1912	1911
Yield gold, ounces	226,183	200,178
Value	£948,778	£839,609
Working costs	523,380	505,229
Working profit	425,397	334,379
Sundry revenue	6,686	7,437
Total profit	£432,084	£341,816
Tons mined	698,521	629,792
Waste sorted, per cent	14.85	15.23
Tons milled	594,800	533,850
Tons sands treated	342,260	333,490
Tons slimes treated	252,540	200,360
Val. rec. in battery	15s. 0.186d.	16s. 3.304d.
Val. rec. in tubes	7 5.480	5 8.728
Val. rec. in sands	6 8.526	7 2.208
Val. rec. in slimes	2 8.283	2 2.751
Val. rec. in rebate	0 0.354	.....
Total	31 10.829	31 4.991
Working profit per ton	14 3.647	12 6.325
Ave. No. stamps dropping	210	218
Running time, days	342	326
Stamp duty, tons	8.26	7.50
Tubes running	5	5
Running time, days	342	294
Development, feet	15,555	22,018
Ave. grade ore reserves	7.0 dwt.	7.2 dwt.
Costs per ton (milled):	s. d.	s. d.
Mining	10 0.537	10 4.026
Development	1 10.263	2 6.587
Ore sorting and crushing	.. 3.479	.. 3.960
Transport. of ore	.. 1.574	.. 2.124
Milling exp	1 4.840	1 7.746
Tube milling	.. 7.280	.. 7.017
Cyaniding sands	1 0.028	1 0.694
Cyaniding slimes	.. 6.491	.. 6.188
Gen. charges	1 3.394	1 4.451
	17 1.886	18 6.793
Renewals, etc	.. 5.296	.. 4.340
Total	..17 7.182	18 11.133

See also Appendix, page 383

ROBINSON GOLD MINING COMPANY, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911
Production oz., gold	300,365	320,591
Total revenue	£1,260,529	£1,344,819
Total working costs	451,769	433,511
Total working profit	£808,760	£911,308
Mills:		
Tons mined	673,058	710,000
Tons crushed	577,300	592,700
Value of ore before crushing	44s. 11d.	11.19 dwt.
Yield, fine ounces	216,064	226,736
Yield per ton	31s. 5d.	7.65 dwt.
Assay value pulp	13s. 6d.	3.54 dwt.
Theoretical extraction, per cent	69.9	68.4
Actual extraction, per cent	69.9	68.4
Cyanide:		
Tons treated	578,485	590,110
Assay value	13s. 8d.	3.53 dwt.
Total yield, ounces	84,301	93,856
Yield per ton	12s. 3d.	3.18 dwt.
Theoretical extraction, per cent	96.8	84.9
Actual extraction, per cent	97.2	90.2
Costs per ton, milled:		
Mining	£0 9s. 5d.	£0 8s. 3d.
Development	0 0 6	0 0 8
Reduction expenses, milling and cyanide	0 4 2	0 4 4
General expenses	0 1 7	0 1 5
Total working cost	£0 15 8	£0 14 8
Net results per ton:		
Total revenue	£2 3s. 8d.	£2 5s. 5d
Total working cost	0 15 8	0 14
Working profit	£1 8s. 0d.	£1 10s. 9d.
No. of stamps operating	250	250
No. of tube mills operating (running time)	6	6.1
Duty per stamp (tons)	7.1	7.5
Per cent., waste sorted in mining	13.8	16.6
Development work, feet.	5,823	9,770
Grade of ore reserves	11 dwt.	11.4 dwt.

See also Appendix, page 383

ROSE DEEP, LIMITED

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911
Production, oz. gold	268,610	231,839
Total revenue	£1,128,127	£972,440
Total working costs	681,304	623,410
Working profit	£446,823	£349,030
Net profit	£443,135	£342,832
Tons mined	922,844	821,555
Tons crushed	782,200	695,100
Value ore before crushing	29s. 9d.	6.95 dwt.
Yield fine ounces	178,509	154,433
Yield per ton	19s. 2d.	4.44 dwt.
Assay value pulp	10s. 7d.	2.51 dwt.
Actual extraction, per cent	64.4	63.9
Cyanide:		
Tons treated	781,735	693,869
Assay value	10s. 7d.	2.50 dwt.
Total yield, ounces	90,101	77,407
Yield per ton	9s. 8d.	2.23 dwt.
Actual extraction, per cent	91.2	89.2
Costs per ton (milled):		
Mining	£0 10s. 8d.	£0 10s. 10d.
Development	0 1 0	0 0 11
Reduction expenses, milling and cyanide	0 4 3	0 4 7
General expenses	0 1 6	0 1 7
Total working cost	£0 17 5	£0 17 11
Net results per ton:		
Total revenue	£1 8 10d.	£1 7s. 11d.
Total working cost	0 17 5	0 17 11
Working profit	£0 11 5	£0 10 0
No. of stamps operating	300	300
No. of tube mills operating (running time)	7	6.8
Duty per stamp (tons)	7.6	7.3
Per cent. waste sorted in mining	15.1	15.6
Development work	14,499	14,324 ft.
Grade of ore reserves	.....	6.0 dwt.
Total recovery, theoretical, per cent	94	93.9
Total recovery, actual, per cent	96.9	95.9

See also Appendix, page 384

SIMMER DEEP, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911	1910
Gold production, ounces	124,289	121,117	109,671
Value	£521,957	£507,654	£460,057
Working costs	486,411	£450,870	399,344
Working profit	£35,546	£56,784	£60,713
Sundry revenue	16,548	12,701	15,743
Total profit	£52,094	£69,485	£76,456
Tons mined	625,033	585,503	530,325
Waste sorted out, per cent	4.7	7.77	9.178
Tons milled	594,650	541,700	480,803
Tons sands treated	271,609	253,790	261,673
Tons slimes treated	323,041	287,910	219,130
	s. d.	s. d.	s. d.
Val. recovered in battery	10 9.618	11 2.978	11 8.710
Val. rec. in sands	4 0.048	4 8.444	5 1.684
Val. rec. in slimes	2 8.801	2 9.212	2 2.962
Val. in frt. rebate	0 0.194	0 0.282	0 0.289
Total value per ton	17 6.661	18 8.916	19 1.645
Working pro. per ton	1 2.346	2 1.159	2 6.306
Costs per ton (milled):	s. d.	s. d.	s. d.
Mining	9 11.071	9 6.769	8 1.733
Pumping	0 2.242	0 2.128	0 2.306
Sorting, crushing and transportation	0 4.272	0 3.804	0 5.184
Milling	0 9.909	0 11.549	1 5.653
Tube mill	1 0.206	0 11.335	0 9.876
Cyaniding sands	0 8.503	0 10.949	1 1.152
Cyaniding slimes	0 6.637	0 5.742	0 6.802
General charges	1 1.481	1 2.200	1 4.633
Development	1 7.138	2 1.104	2 6.000
Renewals on plant	.. 0.856	0 0.177	.....
Total	16 4.315	16 7.757	16 7.339
Ave. No. stamps dropping	126	125.5	165
Days running	344.1	342.8	320.6
Tons per stamp	13.725	12.587	9.088
Tube mills ran, days	328.5	336.7	328.0
Development, feet	13,994	16,219	22,078
Gals. water hoisted	49,775,400	42,285,000	46,930,332
No. tube mills running	8.3	7	7
Ave. grade of reserves	4.2 dwt.	4.9 dwt.	5.0 dwt.

Remarks.—The property is a consolidation of the South Geldenhuis Deep, South Rose Deep, Rand Victoria and Rand Victoria East.

The reefs are worked through three shafts which encountered the reef at vertical depths of 2150 ft. and 3036 ft.

The mill has 300 1750-lb. stamps and tube mills. The plant is used jointly with the Jupiter, ⅝ Jupiter and ⅝ Simmer Deep.

SIMMER AND JACK PROPRIETARY MINES, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended June 30

	1912	1911
Yield gold, oz.	246,771.0	249,239.7
Total gold revenue	£1,041,465	£1,051,601
Working expense	511,521	501,414
Working profit	529,944	550,187
Sundry revenue	33,247	31, 600
	563,191	581,787
Less tax and amts. written off	51,836	54,921
Profits	£511,355	£526,866
Tons mined	922,624	890,200
Waste sorted	7.15%	9.32%
Tons crushed and treated	863,500	803,400
Tons battery	863,500	803,400
Tube mills	863,500	529,937
Sands	474,613	484,403
Slimes	388,887	318,997
Val. rec. battery	.....	3s. 11.240
Val. rec. tube mills	12s. 2.626d.	11 0.766
Val. rec. sands	7 9.646	7 10.972
Val. rec. slimes	3 11.835	3 1.565
	£1 4 0.107	£1 6 0.543
Accumulated slimes	0.817	1.195
Rebate of frt. on gold	0.540	0.407
	£1 4 1.464	£1 6 2.145
Ave. No. stamps	320	300 320
Running time, days	356	200 145
Duty per stamp, tons	7.45	7.53
Tube mills	7	6
Running time, days	350	349

COSTS PER TON

	1912		1911	
	s.	d.	s.	d.
Mining	7	0.794	6	9.631
Pumping	.....	.....	0	2.135
Transport, crushing and sorting	.....	4.852	0	5.320
Milling	.....	11.414	1	0.645
Tube milling	.....	7.442	0	7.223
Cyaniding sands	.....	11.712	0	1.859
Cyaniding slimes	.....	5.796	0	4.709
General charges	1	0.156	1	1.565
Development	.....	3.428	0	7.424
	11	9.596	12	2.511
Renewals	.....	0.576	0	3.277
Total	11s.	10.172d.	12	5.788
Ave. profit per ton	12	3.292	13	8.357
Development	.....	4566′	.....	8417′
Ave. grade of reserves	.....	6.2 dwt.	.....	6.4 dwt.

Notes.—The thicknesses of the reefs vary greatly in this mine. They are given as 24, 36, 57, 84 and 121 in.

The mill has 320 stamps and six tubes.

SUB NIGEL, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended June 30

	1912	1911
Gold yield, ounces	22,638.963	18,466.22
Value gold revenue	£94,790	£77,297
Working costs	90,961	76,200
Working profit	£3,828	£1,096
Tons mined	80,671	75,847
Waste sorted, per cent	30.35	18.31
Tons milled	52,328	49,710
Sands treated	33,418	30,693
Slimes treated	18,910	19,017
Value recovered in battery	15s. 9.669d.	13s. 2.734d.
Value recovered in tubes	4 6.460	3 9.934
Value recovered in sands	12 1.776	10 11.378
Value recovered in slimes	3 8.596	3 0.713
	36s. 2.501d.	31s. 0.759d.
Rebate freight	.250	.431
Total	36s. 2.751d.	31s. 1.190d.
Profit per ton	1s. 5.560d.	0s. 5.294d.
Costs per ton:		
Mining	15s. 11.458d.	12s. 8.829d.
Ore sorting, crushing and transportation	8.512	10.298
Stamp milling	2 9.953	3 0.141
Tube milling	5.350	4.900
Cyaniding sands	1 11.085	2 0.538
Cyaniding slimes	10.998	10.428
General charges	6 4.867	6 8.621
Development	5 5.036	3 0.753
Transfer level	1.932	5.853
Renewals, etc	.....	4.814
Dewatering d. shaft	.....	0.721
Total	£1 14s. 9.191	£1 10s. 7.896d.

For the quarter ending Sept. 30, 1913, the following figures show a material decrease in operating expenses.

Tons milled	Revenue per ton	Expenses per ton	Profit per ton
14,036	37 0	29 7	7 5

See also Appendix, page 385

TRANSVAAL GOLD MIN. EST. LTD.

VAALHOEK MINE, LYDENBURG, SOUTH AFRICA

Year Ended March 31

Production	1912	
Fine gold recovered milling, ounces		2,453.7
Fine gold recovered cyanide, ounces		2,889.6
Total gold recovered		5,347.1
Total revenue	£22,400	19s. 1d.
Expenditures	17,052	0 4
Profit	£5,348	18s. 9d.
Tons mined		15,016
Mill:		
Tons crushed		15,093
Yield per ton, dwt.		3.251
Value per ton	13s.	7.06d.
Per cent. total recovery		45.9
Cyanide:		
Tons treated		14,996
Yield per ton, dwt.		3.854
Value per ton milled	16s.	1.06d.
Per cent. of total recovery		54.1
Costs per ton (milled):		
Mining	8s.	4.27d.
Developing	1	9.62
Transportation		4.47
Milling	2	6.91
Cyaniding	8	4.99[1]
General expenses	1	0.89
Total	22s.	7.15d.
Profit per ton	7s.	1.05d.
Number of stamps		10
Duty per stamp per day, tons		4.65
Grade ore reserves, dwt.		10.07
Development, ft.		1,818

[1] Report states high cost due to refractory nature ore and large cyanide consumption, it being 5.78 lb. at cost of 5s. 0.691d.

VAN RYN GOLD MINES ESTATE, LTD.

TRANSVAAL

Year Ended June 30

	1912	1911	1910
Gross revenue	£639,396	£566,766	£560,772
Expenses	363,161	304,425	288,829
Profit	£276,235	£262,341	£271,943
Tons ore milled	460,740	396,440	392,911
Average value recovered per ton	27s. 9d.	25s. 7d.	28s. 6d
Average profit per ton	12s. 0d.	12s. 3d.	13s. 10d.
Waste sorted out, per cent	7.5	12	10.2
Costs per ton	15s. 9d.	15s. 4d.	14s. 8d.
Average No. stamps operating	128	128	145

Remarks.—The mine operates on the Main Reef and several small leaders, stoping all together to a width of 8 to 10 ft.

There are 160 stamps equally divided in two mills. There are six tube mills and cyanide plant.

WEST RAND CONSOLIDATED, LTD.

TRANSVAAL, SO. AFRICA

Quarter Ended Sept. 30

	1912	1911
Revenue	£117,287	£366,401 18s. 5d.
Expenses	94,187	317,496 19
Profit	23,100	48,904 19 5
Tons ore milled	80,250	319,640
Average value per ton recovered	29s. 2.768d.	22s. 11.11d.
Average expenses per ton	23 5.683	19 10.4
Profit per ton	5 9.085	3 0.71
Stamp duty tons per 24 hours	11.201	10.584

The mill operated 302 days with stamp duty of 10.584 tons per 24 hours. The mill has 100 stamps and four tubes.

The company operates through a number of outcrop and deep shafts, the greatest depth being 1850 ft.

The stoping width is 49 in., average grade 5.25 dwt. In all probability the crushing capacity will be greatly increased before long.

VILLAGE DEEP, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911	1910
Production, gold, oz	212,109	180,284	148,060
Value of yield	£889,246	£755,785	£620,547
Working costs	594,436	530,005	466,480
Working profit	£294,810	£225,780	£154,067
Mine:			
Tons mined	698,124	670,521	595,942
Tons sorted out	103,625	101,721	88,575
Per cent. sorted out	14.8	15.2	14.8
Mill:			
Tons milled	596,900	569,500	507,800
Value of ore	30s. 8d.	6.61 dwt.	6.17 dwt.
Yield, ounces	149,336	119,817	99,461
Yield per ton	21s. 0d.	4.21 dwt.	3.92 dwt.
Value of pulp	9s. 8d.	2.40 dwt.	2.25 dwt.
No. stamps operating	180	180	180
Tube mills	6	5.9	5.7
Stamp duty per 24 hours	9.5	9.3	8.7
Cyanide:			
Tons treated	596,860	567,300	507,083
Assay value	9s. 8d.	2.39 dwt.	2.25 dwt.
Yield, ounces	62,773	60,467	48,599
Yield per ton	8s. 10d.	2.13 dwt.	1.92 dwt.
Assay value residues	1s. 2d.	0.309 dwt.	.345 dwt.
Actual extraction, per cent	91.3	87.1	85
Total extraction, per cent	97.3	95.9	94.5
Cost per ton (milled):	£ s. d.	£ s. d.	£ s. d.
Mining	0 11 6	0 11 1	0 10 10
Development	0 3 3	0 2 6	0 2 6
Reduction expenses	0 3 8	0 3 7	0 3 8
General expenses	0 1 6	0 1 5	0 1 4
	£0 19 11	£0 18 7	£0 18 4
Revenue and costs per ton:			
Total revenue	£1 9 10	£1 6 7	£1 4 5
Total costs	0 19 11	0 18 7	0 18 4
Working profit	£0 9 11	£0 8 0	£0 6 1
Development	18,693	29,132	23,968
Grade ore reserves, dwt	6.9	6.1	6.1
Value ore reserves, dwt	29s. 0d.	25s. 7d.	25s. 7d.

See also Appendix, page 385

VILLAGE MAIN REEF GOLD MINING CO., LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911	1910
Gold, ounces	221,785	211,962	205,093
Gross revenue	£929,727	£889,043	860,840
Expenses	437,512	429,586	410,433
Working profit	£492,215	£459,457	450,406
Total profit	£501,126	£404,196	374,014
Ore received from mine	563,511	468,238	588,552
Per cent. waste sorted out	16.42	16.56	16.3
Mill: Tons crushed	470,056	476,250	493,300
Stamp duty, tons, 24 hr.	7.189	6.954	6.896
No. stamps operating	220	220	220
No. tube mills operating	6	5	5
Value ore treated	40s. 10d.	9.276 dwt.	8.84 dwt.
Yield, ounces	149,762	143,250	133,846
Yield per ton	26s. 9d.	6.016	5.427
Value pulp	14s. 1d.	3.260	3.413
Extraction, per cent	65.487	64.858	61.388
Cyanide: Tons treated	470,535	476,462	491,937
Assay value	14s. 1d.	3.261 dwt.	3.409 dwt.
Yield, ounces	72,023	68,712	71,247
Yield per ton	12s. 10d.	2.884 dwt.	2.897
Actual extraction, per cent	91.377	88.456	84.957
Value residues	2s. 0d.	.489 dwt.	.518
Total extraction, per cent	99.98	95.968	94.065
Cost per ton (milled): Mining	12s. 2.470d.	11s. 2.158d.	10s. .042d.
Development	0 2.539	0 5.491	0 7.112
Sorting and crushing	0 6.397	0 6.485	0 6.579
Transportation to mill	0 2.268	0 2.956	0 2.111
Amalgamation	0 3.623	.....	.....
Stamp milling	1 3.128	1 5.991	1 5.807
Tube milling	0 7.167	0 8.061	0 8.773
Cyaniding	1 9.930	1 11.280	1 10.136
General expense	1 5.862	1 6.062	1 3.123
Total	18 7.384	18 .484	16 7.683
Revenue per ton	£1 19s. 6.698d	£1 17s. 4.022d	£1 14s. 10.815d
Cost per ton	0 18 7.384	0 18 .484	0 16 7.683
Profit per ton	£1 0s. 11.314d.	£0 19s. 3.538d.	£0 18s. 3.132d
Development, feet	1934	5233	7735
Grade ore reserves	33s. 7d. = 8 dwt.	37s. 2d. = 885 dwt.	38s. 8fl. = 9.2 dwt.

See also Appendix, page 386

WITWATERSRAND DEEP, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912	1911	1910
Gold, ounces	150,606	175,259	.....
Gross production	£631,231	£732,843	£707,492
Total expenses	426,224	431,301	384,079
Working profit	£205,007	£301,542	£323,413
Tons mined	498,021	564,188	.....
Per cent. sorted out	9.375	11.49	.....
Mill:			
Tons milled	451,000	500,330	474,660
No. stamps	245	239	245
Stamp duty per 24 hours	5.846	6.359	5.92
Value ore, dwt	6.94	.....	.....
Yield, ounces	112,014	124,446	.....
Yield per ton, dwt	4.967	4.97	5.13
Extraction, per cent	71.61	.....	.....
Cyanide:			
Sands treated, tons	274,186	313,775	.....
Slimes treated, tons	176,833	186,332	.....
Yield, oz. by cyanide	38,591	50,813	.....
Yield, dwt. per ton	1.71	2.03	1.99
Per cent. of extraction	24.67	27.72	.....
Extraction, per cent	86.85	86.43	.....
Total extraction, per cent	96.28	95.615	95.56

Cost per ton milled:	s.	d.	s.	d.	s.	d.
Mining	11	6.41	11	.39	10	2.33
Development	2	1.29	1	4.26	0	11.82
Tramming, crushing and sorting	0	6.73	0	6.98	0	7.01
Milling	2	4.55	2	.44	2	1.53
Cyaniding sands	1	.18	1	.34	1	.84
Cyaniding slimes	0	4.70	0	4.30	0	5.15
Gen. mine charges	0	4.48	0	4.31	0	3.26
Gen. charges	0	6.48	0	5.87	0	6.26
Total	18	10.82	17	2.89	16	2.20
Yield per ton	27	11.91	29	3.53	29	9.73
Costs	18	10.82	17	2.89	16	2.20
Working profit	9	1.09	12	.64	13	7.53
Development, feet		12,052		7,245		.....
Grade ore reserves	6.83 dwt.	50.1 in.	6.79 dwt.	54.5 in.	7.16 dwt.	48.8 in.

See also Appendix, page 386

WITWATERSRAND GOLD MINING CO., LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Dec. 31

	1912
Production: Gold, ounces	128,555
Total revenue	£564,826
Working expenses	£336,076
Working profit	£210,750
Total profit after sundry revenue	£231,394
Mine: Tons mined	566,827
Per cent. waste sorted out	20.55
Mill: Tons crushed	457,850
No. stamps working	220
Stamp duty	6.11
Total ounces gold	80,322
Yield per ton, dwt.	3.509
Cyanide: Tons sand treated	319,570
Total yield gold, oz.	40,885
Yield per ton treated, dwt.	2.559
Yield per ton milled, dwt.	1.786
Value, dwt., before treatment	3.254
Extraction, per cent	78.64
Tons slime treated	138,040
Total yield gold, oz.	7,347
Yield per ton treated, dwt.	1.065
Yield per ton milled, dwt.	.321
Value before treatment	1.301
Extraction, per cent	81.86
Total extraction, sand and slime, per cent	79.10
Cost per ton:	Shillings
Mining	7.102
Development	1.203
Hoisting	1.113
Pumping	.373
Transport. of ore	.156
Ore sorting and crushing	.508
Milling	1.363
Cyaniding sands and slimes	1.319
General exp., mine	.591
General exp., head office	.952
Total cost	14.680
Summary of results per ton: Total recovery, dwt.	5.616
Value recovery mill	14.927s.
Value recovery cyanide sand	7.596
Value recovery cyanide slime	1.363
Total recovery	23.886
Costs	14.680
Working profit	9.206

THE WOLHUTER GOLD MINES, LTD.

TRANSVAAL, SOUTH AFRICA

Year Ended Oct. 31

	1912	1911	1910
Gold, ounces	114,937	109,235	.....
Gross production	£480,993	£456,966	£388,085
Total expenses	301,503	284,802	265,530
Working profit	£179,490	£172,164	£122,554
Tons mined	396,895	436,049	.....
Per cent. sorted out	12.496	21.09	.....
Mill:			
Tons milled	347,050	344,015	304,360
No stamps	120	120	120
Stamp duty tons, 24 hours	8.645	8.467	7.622
Value rock, dwt	7.002	6.71	6.56
Yield, ounces	78,065	73,618	
Yield per ton, dwt	4.499	4.28	3.905
Extraction, per cent	64.253	63.757	.....
Cyanides:			
Sands treated, tons	206,100	226,265	.....
Slimes treated, tons	140,550	117,750	.....
Yield, oz. by cyanide	36,871	35,617	.....
Yield, dwt. per ton	2.125	2.071	2.187
Total extraction, per cent	94.6	94.607	92.866
Costs per ton (milled):	s. d.	s. d.	s. d.
Mining	8 6.684	7 7.999	8 1.581
Pumping and haul	1 .985	0 9.601	0 10.098
Tram. sort. and crush	0 10.385	0 11.372	0 11.899
Milling	2 5.460	2 2.706	2 6.466
Development	2 1.511	2 6.493	2 4.748
Cyaniding sand	1 1.172	1 1.036	1 2.914
Cyaniding slimes	0 3.804	0 4.157	0 4.640
Mine charge	0 3.620	0 4.505	0 3.815
Gen'l charges	0 6.882	0 6.821	0 7.220
Total	17 4.503	16 6.690	17 5.381
Yield per ton	£1 7 8.628	£1 6 6.799d.	£1 5s. 6.02d.
Costs	17 4.503	16 6.690	17 5.381
Working profit	10s. 4.125	10s. .109d.	8s. .639d.
Development, feet	10,539	12,888	
Grade ore reserves	6.48 dwt. 50.7 in	6.45 dwt. 51.6 in	

See also Appendix, page 386

ASIA, AUSTRALIA AND NEW ZEALAND

1. Mysore District (Kolar)
2.
4. Spassky
5. Kosaka

ul District 3. Kyshtim

6. Ashio 7. Besshi

ASIA

INDIA

CHAMPION REEF GOLD MINING CO. OF INDIA, LTD.

MYSORE STATE, SO. INDIA

Year Ended Dec. 31

	1911	1910[1]
Prod. gold, ounces	121,112.5	113,540.6
Val. gold	£468,290 16s.	£441,255 11s.
Tot. rev. less roy	£448,416 10s.	£423,884 10s.
Total expense	£280,236 8s.	£293,844 4s.
Total profit	£168,180	£130,040 6s.
Tons ore mined	253,668	228,174
Tons waste sorted	48,499	41,494
Tons milled	205,169	186,680
Yield per ton, milled	8 dwt. .10 gr.	8 dwt. .15 gr.
Tons tails, cyanided	195,118	171,870
Yield per ton	1 dwt. 18 gr.	2 dwt. .0 gr.
Assay of tails	0 dwt. .22 gr.	0 dwt. .21 gr.
Tons old tails, cyanided	92,849	80,910
Yield per ton	1 dwt. 13 gr.	1 dwt. 12 gr.
Assay of tails	1 dwt. 10 gr.	1 dwt. 18 gr.
Total ext. tons milled	10 dwt. 19 gr.	11 dwt. 4 gr.
Costs per ton milled:	s. d.	s. d.
Mining	18 3.72	21 1.56
Milling	2 5.88	2 9.48
Cyaniding tailings	1 8.76	2 10.20
General mine expense	3 3.60	3 3.72
General expense	0 9.00	0 10.20
Total	26 6.96	30 11.16
Development, feet	17986	19265
Number stamps operating	142	154

[1] All tonnages in 1910 based on long ton of 2240 lb. Other year based on 2000-lb. ton

The vein is irregular in width, varying from 1 ft. to 10 ft. The ore is gold-bearing quartz with comparatively high and regular value. The mine is operated by incline shafts to a depth of about 3765 ft. Dip of vein 70 deg. The milling plant contains 160 stamps. The ore is crushed to 40 mesh, amalgamated, sized and the sands and slimes cyanided. An old tailings dump is being worked in a separate cyanide plant. Electric power is used. Coolie labour predominates. A total of 6819 men were on the pay roll during Sept., 1911.

See Appendix, page 395

MYSORE GOLD MINING CO., LTD.

MARIKUPPAM, MYSORE STATE, INDIA

Year Ended Dec. 31

	1912	1911
Gross production	£852,802	£896,651 13s.
Total costs	347,033	355,341 5
Profits	513,845	494,794 19
Tons ore milled	299,660	291,477
Assay value	15 dwt. 8 gr.	15 dwt. 17 gr.
Mill recovery	12 10	12 19
Tons tails cyanided	247,340	233,214
Cyanide recovery	2 dwt. 1 gr.	2 dwt. 3 gr.
Total recovery	14 4	14 22
Contents of tails from cyanide	0 21	0 19
Costs per ton milled:		
Mining	15s. 9.57d.	16s. 8.16d.
Milling	2 2.76	2 3.24
Cyaniding	1 2.16	1 372
General mine expenses	3 4.80	3 516
General expenses	0 6.48	0 1140
	22s. 5.77d.	24s. 7.68d.

See also Appendix, pages 387 and 395

OOREGUM GOLD MINING CO. OF INDIA, LTD.

PROVINCE OF MYSORE, INDIA

Year Ended Dec. 31

	1912	1911
Gross production	£327,702 19s.	£341,683 7s.
Total expenses	£177,963 16	£187,281 5
Profits	£154,534 18	£154,402 2
Tons ore milled	145,558	152,545
Mill recovery	9 dwt. 12 gr.	9 dwt. 9.57 gr.
Tons tails cyanided	139,476	138,998
Cyanide recovery	2 dwt. 1 gr.	1 dwt. 20.33 gr.
Total recovery		11 dwt. 5.9 gr.
Costs per ton milled:	s. d.	s. d.
Mining	16 6.12	16 6.48
Milling	2 1.80	2 1.56
Cyaniding	1 9.24	1 6.00
Gen. mine expense	2 2.16	1 7.32
Mine administration	1 1.23	1 0.60
Gen. expense	0 8.64	0 8.64
	£1 3 5.19	£1 4 6.60

See also Appendix, pages 387 and 395

NUNDYDROOG COMPANY, LTD.

OORGAUM, SOUTH INDIA

Year ended Dec. 31	1912	1911	1910
Production:			
Gold, ounces	85,096	87,260	86,110
Value realised	£330,937 14s. 7d.	£339,243 4s. 8d.	£334,748 11s. 3d.
Value realised, after allowing for royalties, rents, int. and disc.	313,128 17 1	320,788 12 2	319,410 1 0
Expenditures	140,159 18 4	140,002 15 10	153,813 17 5
Profit	£172,968 18s. 9d.	£180,785 16s. 4d.	£165,596 3s. 7d.
Mill:			
Ore recd. from mine, tons	108,656	115,962	.....
Waste sorted, tons	8,104	13,090	101,920
Tons ore milled	100,552	102,872	.....
Fine gold obtained	71,653	72,856	72,755
Fine silver obtained	7,964	8,299	.....
Fine gold yield per ton	14 dwt. 6 gr.	14 dwt. 4 gr.	14 dwt. 6 gr.
Assay trailing	2 dwt. 20 gr.	2 dwt. 23 gr.	2 dwt. 20 gr.
Extraction, per cent	83	83	.....
Cyanide works:			
Sand slimes and residue treat., tons.	95,662	101,936	87,805
Average charge assay	2 dwt. 14 gr.	2 dwt. 16 gr.	2 dwt. 19 gr.
Extraction	1 dwt. 9 gr.	1 dwt. 10 gr.	1 dwt. 10 gr.
Extraction, per cent	50.32	53.12	50.7
Recovery fine gold, oz	6,443	7,262.87	6,322
Recovery fine silver, oz	929.87	1,145.08	801.98
Cyanide consumption, lb.	.561	.561	.588
Total extraction bar gold.	17 dwt. 13 gr.	17 dwt. 13 gr.	19 dwt. 15 gr.
Total extraction fine gold ore milled.	15 dwt. 15 gr	15 dwt. 14 gr.	15 dwt. 16 gr.
Total production bar gold, oz.	87,719	90,174	88,729
Cost per ton (milled):			
Mining (approx.)	19.2s.	18.5s.	21.05s.
Milling (approx.)	1.87	2.06	2.30
Cyanide (approx.)	1.30	1.35	1.65
Total min.,mill. and general costs.	£1 6s. 9d.	£1 5s. 10d.	£1 9s. 0d.
No. stamps operating	78.25	82	80
Duty of stamps (short tons).	3.51	3.59	3.58
Development, feet	12,943	12,096	11,740
Water pumped, gallons	135,408,000	129,748,000	170,433,000

See also Appendix, pages 387 and 395

JAPAN

THE FUJITA COMPANY

OSAKA, JAPAN

Operating: Kosaka Copper Mine, Zuiho Gold Mine, Omori Copper Mine.

These mines produce the following percentages of Japan's total output: Silver 30.66 per cent., copper 18.91 and gold 12.76.

Kosaka Copper Mine	1910	1909	1908
Gold, ounces	13,180	11,109	10,900
Silver, ounces	1,282,290	1,048,632	1,127,000
Copper, tons	6,797	6,851	7,572
Lead, tons	714	512	378

The ores occur in three classes with the following compositions:

	Complex sulphides	Pyrite ore	Silicious ore
Gold	.00013	.00002	.00001
Silver	.0141	.0041	.0027
Copper	2.43	2.34	1.97
Lead	2.28	.47	.26
Iron	15.64	26.83	19.44
Zinc	9.80	3.15	1.48
SiO_2	8.11	13.72	41.47
Al_2O_3	6.96	7.58	6.80
$BaSO_4$	30.35	12.13	5.37
S	22.71	31.93	21.81

This mine was worked originally as a silver mine, the oxidized surface ores being treated. The ore-deposit is composed of pyrite, zinc blende, chalcopyrite, galena and barite. The area of deposit opened to date is 2000 ft. long, 800 ft. wide by 500 ft. deep. The ores are mixed so as to become self-fluxing. Mining is now carried on by surface quarry system similar to that used at Mt. Lyell in Tasmania, and Rio Tinto, Spain. Ore is worked in terraces. Over-burden to be removed equals 4,000,000 cu. yd. The pit is 2200 ft. by 1000 ft. The slopes of the sides average 45 deg. Ore is broken down by blasting and trammed by electricity to the smelter. The underground tunnels of the former method of working are used in transporting the ore. The average tonnage mined daily is 1000 tons, and from 1000 to 1800 cu. yd. of over-burden.

The smelter consists of seven blast furnaces of 1000 tons each capacity. A self-fluxing charge is obtained by mixing the three ores. Not more than 3 per cent. (of the charge) fuel is used. The first matte of 30 per cent. is resmelted to a 50 per cent. matte, then it is converted by English reverberatory furnaces into blister copper. A Bessemer plant is now being

erected. The copper is then refined at the property. Some lead is also obtained and treated by the Parks' process.

Electricity is the sole motive power used. It is generated from four hydro-electric stations, 3800 h.p. being generated.

Omori Mine, Province of Iwami, Japan

The Omori Mine is situated in a mountainous region in the province of Iwami in the northwest of Hondo, near the coast of the Japan Sea, and is said to have been discovered some 600 years ago. In 1884 the Fujita Co. came into control and the property was equipped with a modern installment. The district is composed of tuffs and sandstones interspersed with andesite containing ore. The ore-deposit consists of fissure veins running parallel to one another. Dip 70 deg. to 80 deg. Some of the veins are 2000 ft. in length. Five veins are worked.

The ores are principally chalcopyrite, galena and zinc blende, containing gold and silver. An analysis of the ore is as follows:

Gold	.0014 per cent.
Silver	.056 per cent.
Copper	7.75 per cent.
Lead	.80 per cent.

The method of mining is stoping, ore removed by adits and shafts and hoisting done by a skip driven by a water wheel. The water, which accumulates to the extent of 35 cu. ft. a minute, is drained off by electric pump from the depth of 500 ft.

The ore after being cobbed and picked is mechanically dressed by breakers, rolls, trommels, giggers, etc. The ore with requisite amount limestone and coke is smelted in an ordinary jacketed circular furnace, and the matte formed from this partial pyritic smelting, after calcination in stalls, is once more smelted, forming blister copper containing gold, silver and lead. This last operation is carried out according to the Japanese Mabuki process. The company has made the following production for 1908, 1909 and 1910:

	1910	1909	1908
Ore mined, tons	28,613	26,516	22,500
Production:			
Gold, ounces	2,251	2,155	1,694
Silver, ounces	98,684	82,857	96,764
Copper, tons	367	350	315
Lead, tons	2	3	4

The blister copper is shipped to the Kosaka where it is refined electrically. There are three different kinds of motive power, viz.,

Steam.....823 h.p. Electricity.....255 h.p. Water.....188 h.p.

Altogether 682 miners are employed, 291 working below and 391 above the surface.

ZUIHO GOLD MINE

ISLAND OF FORMOSA, JAPAN

The company has made the following production for the years given below.

	1910	1909	1908
Ore mined, tons	23,541	23,143	28,411
Production:			
Gold, ounces	11,216	8,920	9,047
Silver, ounces	4,704	3,742	4,177

The Zuiho Gold Mine is situated at the northern end of the Island of Formosa near the coast, about 8 miles east of Keelung, from which port provisions and other necessaries can be easily obtained. It is in the vicinity of the Kinkaseki and the Botanko mines. As soon as Formosa came into possession of Japan, the Fujita Co. opened up a gold mine in Zuiho in 1895, and by adopting the most improved foreign system of mining and metallurgy, proved that mining in the new territory was a lucrative business, and that the country was rich in untouched mineral wealth.

The geological formation in the vicinity of the Zuiho Mine is of Tertiary formation, andesite alternating with a bed of sedimentary rocks. The gold veins occur on the contact between these rocks. Six workable veins have been discovered varying from 2 to 3 ft. thick, about 300 ft. in length. The ore is silicious, containing a small percentage of pyrite and sulphides. Some of the ore is clayey and difficult to classify. The analysis is as follows: Gold .0016 per cent., silver .001 per cent., SiO_2 66.59 per cent.

The method of mining is over-hand stoping. Property is operated by shafts and winzes. Ore is transported to mill on aerial tramway. Ore is crushed, re-ground in Huntington Mill and amalgamated at the same time. Sand and slimes are separated by classifiers or tables. The sand is treated in leaching vats by Butters-and-Mein distributors and slimes are treated by decantation process, agitation being effected either by Stirrer or centrifugal pump. Cyanide solution is treated in zinc boxes with zinc shavings. The entire property is equipped with steam and water power and electricity for lighting purposes. 331 men are employed, 176 underground and 155 on the surface.

MITSU BISHI CO.

TOKYO, JAPAN

This company is one of the largest in the empire. It carries on an extensive banking, mining, ship-building, engineering and general business. Its mines are varied in character, including gold, silver, lead, copper and coal. The company's report gives only general information and no operating costs. It is likely the following data on the several metal mines will be of interest.

Osaruzawa Mine.—This property, one of the principal copper mines of Japan, is located near Hanawa, Kazuno District, Akita Prefecture.

The ores are chalcopyrite, chalcocite, bornite and native copper occurring in numerous fissure veins in a Tertiary formation consisting of shale and tuff intruded with quartz-trachyte and andesite. The veins vary from 1 ft. to 10 ft. in width and from 3 to 4 per cent. copper content. Over-hand stoping is carried on. The mine is opened by adit levels, there being about 110,000 ft. of development. The mine produces about 8000 tons of ore per month, employing 1780 hands at the property. The mine has its "dressing plant" and smelter. All machinery is electrically driven.

Following is annual production for 3 years.

	Gold, ounces	Silver, ounces	Copper, tons
1908	541.3	19,505.0	1,284.269
1909	308.6	31,298.9	1,574.645
1910	417.9	38,345.9	2,295.607

Arakawa Mine.—Located in Sempoku District, Akita Prefecture. The ores occur in lodes numbering 10 in all. The grade of ore seldom runs above 2 per cent. copper. The mine is operated through adit levels and shafts to a depth of 800 ft. to 1000 ft. The workable length of the lodes is from 1000 ft. to 4000 ft.

The mine produces about 5500 tons of ore per month turning out 90 tons of copper slabs assaying 99 per cent. The mine and plants employ 1900 hands.

ANNUAL OUTPUT (INCLUDING THE HISAICHI BRANCH MINE)

	Silver, ounces	Copper, tons
1908	20,792.0	1,392.66
1909	43,126.0	1,858.10
1910	48,890.5	2,082.79

Hisaichi Mine.—Located in Nakagawa Village about 5 miles southeast of Arakawa mine.

The same geological and general conditions are found here as at the Arakawa mine. Seven cupriferous lodes exist of which the two largest are operated by shaft 500 ft. deep. The ore is argentiferous chalcopyrite, the copper content being about 3 per cent. Men employed, 680.

The output of ore is 4500 tons per month. The smeltery treats 1200 tons from which 84 tons of copper slabs assaying 98 per cent. are won.

Takara Mine.—Located in Minami Tsuru District, Yamanashi Prefecture.

The formation is slate and quartzite intruded by diorite. The ore-deposit occurs in the former, taking a massive structure. The ore is pyrite carrying copper. The upper levels show 5 to 6 per cent. copper, but the ore becomes poor with depth. As a pyrite producer the mine has value.

The output is 12,000 tons per year which is marketed for sulphuric-acid manufacture.

Sado Mine.—Located near the town of Aikawa on an island province in Japan Sea, some 32 miles off the coast of Echigo.

There are three main parallel lodes. The principal one has a length of 8000 ft. and a width of 10 ft. to 120 ft.; the second, a length of 6300 ft. and width of 5 ft. to 50 ft.; the third, a length of 1900 ft. and width 5 ft. to 30 ft. The ores comprise native gold, argentite and chalcopyrite in company with galena and blende. An assay shows the average of the ores to be, gold .276 oz. and 5.29 oz. silver = $8.70 approximately.

There are three shafts which develop the mine to a depth of 1000 ft., with a total of underground workings of about 100,000 ft. The milling plant consists of up-to-date devices including stamps, cyanide plant and electrical power equipment.

The discovery of the mine dates back 350 years. It was known as the "Gold Mine of Sado" and was a household word.

ANNUAL OUTPUT

	Gold, ounces	Silver, ounces	Copper, tons
1908	14,033.0	97,789.9	4.088
1909	16,252.7	145,329.9	1.251
1910	15,411.4	140,982.2	.....

Omodani Mine.—Located in Kami-Anama Village, Ono District, Fukui Prefecture.

"The geological formation of the mine consists of sandstone and quartz-porphyry, the latter of which impregnates the ore-deposit, occurring in the structure of true veins. The deposit parted by the Omodani River running through the concession forms two main divisions, but one of them is considered unpromising; the operations are chiefly confined to the other." There are numberless ore stringers averaging 1 ft. in width; they are unreliable in development so that great difficulty is experienced. Some of the veins are high-grade, while others are low-grade. Both types are being operated. The ores are argentiferous chalcopyrite, bornite, tetrahedrite and native copper. Assays go 10.6 per cent. copper and .045 per cent. silver on an average. A monthly average of 1154 tons of ore with 23 tons of 97.5 per cent. copper slabs are turned out. 400 men are employed. Annual production is as follows:

	Silver, ounces	Copper, tons
1908	30,478.2	203.1
1909	30,799.7	196.2
1910	40,489.7	253.2

The irregularity of production is due to nature of veins.

Ikuno Mine.—Located close to the town of Ikuno, Hyogo Prefecture. The property has an enormous acreage made of eight lots of concessions. It is one of the ancient mines of Japan. The geological formation is andesite-propylite, tuff and quartz-trachyte. There are a number of rich gold and silver bearing lodes varying in length from 600 ft. to 4000 ft., and in width from a few inches to 40 ft. There is also a rich copper lode with a length of over 10,000 ft. and width from 8 to 10 ft.

The veins of the several lots are worked independently. The mines are equipped with mills, smelter and hydro-electric power plant.

Kanayama Mine.—This mine is dependent upon Ikuno. It is located on the island of Shikoku across the Inland Sea in the Kita District.

The ore-deposit is a bed of cupriferous pyrite in Archean chlorite schist. Workable length 3000 ft. with an erratic width of a few inches to 10 ft. A monthly output of 950 tons assaying 3.3 per cent. copper and 40 per cent. sulphur is maintained and sent to Ikuno for treatment.

Yoshioka Mine.—The mine is located around Fukiya-machi, Kawakami District, Okayama Prefecture.

The formation is slate, sandstone and phyllite, with intrusions of porphyrite and quartz-porphyry. The ore-deposit is divided into two—one occurring in the sedimentary strata, growing richer with depth, and the other impregnated in the metamorphic slate in the contact zone of the Palæozoic rocks and porphyrite. The former takes the form of true fissure veins of varying strikes, dips and widths, the last being from a thin seam to 12 ft. The latter deposit is irregular and massive.

The ore is chiefly chalcopyrite associated with galena and blende. Copper content, 3 to 8 per cent. There are eight levels and cross-cuts with a total of 135,000 ft. The main gallery is 39,193 ft. long.

The monthly production of ore averages 7000 tons. The slabs from the refinery assay 98.802 per cent. copper, .0003 per cent. gold and .266 per cent. silver.

The annual production is as follows:

	Gold, ounces	Silver, ounces	Copper, tons
1908	168.82	54,886.5	822.714
1909	122.43	72,443.6	852.601
1910	128.37	67,598.6	778.794

Makimine Mine.—Located in Kitakata, Higash-Usuki District, Miyazak Prefecture.

The formation consists of slate interstratified with sandstone and capped with lava. The veins, of which there are nine main ones, occur in the strata and are lenticular in form, attaining a width from 10 to 20 ft. and 30 ft. to 150 ft. in length. The ore is cupriferous pyrite averaging 4 per cent. copper. Adit levels aggregate 20,306 ft. and two stopes measure 1000 ft. and 310 ft. The mine and plants are supplied with electricity from a hydro-electric plant.

The monthly production is 2570 tons, which produce 44,600 kg. of slabs assaying 98.7 per cent. copper, .02 per cent. gold and .27 per cent. silver. 630 employees.

ANNUAL PRODUCTION

	Gold, kilograms	Silver, kilograms	Copper, tons
1908	10.4	138.86	545.59
1909	10.47	158.23	516.50
1910	9.11	113.04	486.01

Togi Mine.—Located at Togi, Hakui District, Ishikawa Prefecture. The formation is andesite in which a group of veins occur. They are irregular in dip and strike and vary in width from .5 ft. to 6 ft. The ore bears native gold and silver sulphide assaying .012 per cent. gold and .04 per cent. silver. The property is new and under course of development. The past 6 months (1910), the output totalled 3000 tons from which were obtained 38.166 kg. gold and 78.782 kg. silver.

Osaka Metallurgical Works.—The works are located at Shin, Kawasaki, Kita-kuosaka. This plant refines the slab copper from the company's numerous mines. The feature of the plant is its thoroughly modern electro-refinery.

An assay of the ingots by the Bank of England is as follows:

Lead	.014
Arsenic	.01
Oxygen	.05
Copper	99.89
Loss	.36
Sulphur	Tr.
Silver	1 oz. per ton of 2240 lb.

The plant is equipped with modern steam and electric power appliances, has 15 furnaces of various descriptions, and is capable of turning out 1000 tons of electrolytic copper per month.

ANNUAL OUTPUT

1908.....	825.9	17,105.6	4,905,136.4	.....	976,291.5
1909.....	1944.9	18,955.8	6,467,307.6	.....	980,880.0
1910.....	1692.9	20,377.9	7,264,029.1	97,438.7	1,289,392.5

SUMITOMO BESSHI COPPER MINE

BESSHI, IYO, JAPAN

Year Ended Dec. 31

	1911	1910
Gross proceeds	$1,938,154.78	$1,857,324.00
Pounds, copper proceeds	15,925,080	14,725,568
Tons ore treated	208,508	203,145
Average copper content	4 per cent.	4 per cent.
Average recovery	80 per cent.	85 per cent.

Cost per ton estimated $7 to $8.

KOREA

KAPSAN MINING CONCESSIONS

SEOUL, KOREA

Report of Sept. 24, 1912

The mine has developed 140,000 tons of ore, averaging 10.5 per cent. copper. The company contemplated building a smelter of 100 tons' daily capacity. The following figures of costs and profits are based upon this tonnage.

Annual production	3780 tons cu.
Value at present quotation	£263,250
Working cost	£99,000
Net value	£164,250
Less 10 per cent. smelting loss	£137,925

When copper is £69 12s. 10d. per ton.

Ore value per ton	£7 6s. 3d.
Estimated costs	£2 15s. 0d.
Net value	£4 11s. 3d.

SUMMARY OF TOTAL

Probable ore reserve, tons	140,000
Average grade, copper	10.5 per cent.
Gross value	£1,023,752
Net value	£536,377
Estimated cost of smelter	£60,000

The deposit is a replacement of lime with a varied width averaging between 25 ft. and 30 ft. The dip of the body is 30 deg. The ore is a massive pyrrhotite containing chalcopyrite and arsenical pyrites.

Following is a typical analysis of the ore.

	Per cent.
Moisture	.30
Silica	.60
Sulphur	41.78
Iron	39.10
Copper	11.80
Aluminum oxide	1.80
Arsenic	2.75
Lime	.50
Magnesia	.37
Undetermined	1.00
	100.00

See also Appendix, page 387

ORIENTAL CONSOLIDATED MIN. CO.

UNSAU DISTRICT, KOREA, ASIA

Year Ended June 30

Values in U. S. Currency

	1912	1911	1910
Total receipts	$1,562,109.77	1,541,346	$1,434,494
Total operating costs	864,490.98	839,858	780,258
Total operating and profit	$697,618.79	701,488	654,236
Construction and development	45,092.00	28,768	30,559
Net receipts	$652,526.79	672,720	623,677
Total value ore	$1,898,518.62	1,787,628	1,749,468
Tonnage mined	323,703	344,097	320,707
Value per ton	$5.86	$5.19	$5.45
Bullion secured	$939,389.96	921,731	885,675
Bullion secured, per ton	$2.90	$2.68	$2.76
Gross value concentrates	$767,020.52	695,880	646,742
Net value concentrates	$600,817.18	581,997	526,957
Yield concentrates per ton	$1.86	$1.69	$1.64
Total yield, ton	$4.76	4.37	4.40
Per cent. free-milling	49.5	51.6	50.6
Per cent. gross saving	89.9	90.5	87.6
Per cent. net saving	81.1	84.1	80.7
Value mill tails	$.59	.49	.68
Cost per ton: Mining	$1.62	1.41	1.415
Milling	.50	.56	.54
Concentrate expenses	.20	.15	.13
Transportation	.01	.01	.015
General expenses	.36	.32	.335
Total operating and general	$2.69	2.45	2.435
Development outside mines	.05	.02	.055
Construction expense	.09	.06	.04
Total expense	$2.83	2.53	2.53
Profit per ton	$2.03	$1.96	$1.95
Receipts per ton: Bullion from mills	$2.91	2.67	2.75
Concentrates	1.86	1.69	1.635
Store profit	.06	.07	.07
Interest and other receipts	.02	.05	.015
Profit on tribute	.01	.....	.....
Ore	.....	.01	.01
Total	$4.86	4.49	4.48
Number of stamps 5 mills	240	240	240
Duty per stamp 24 hours	4.5	4.2	4.3

SEOUL MINING COMPANY

HWANG HAI PROVINCE, KOREA

Year Ended Dec. 31

U. S. Currency

	1911	1910
Gross production	$550,272	$369,404
Total expense	211,268	153,253
Total profit	339,004	215,151
Mine and mill:		
Tons ore milled	70,229	32,793
Average value recovered	$7.83	$9.865
Average profit per ton	$4.82	$5.515
First class ore shipped, tons	.....	707
Average value per ton	.....	$63.48
Total costs per ton	.....	14.91
Profit per ton	.....	48.57
Mill extraction, gold, per cent	79.1	78.03
Mill extraction, copper, per cent	18.4	18.32
Costs per ton ore milled:		
Mining	$1.25	$1.76
Milling	.62	1.035
Transportation to mill	.05	.05
Concentrate expense	.24	.20
General expense	.85	1.305
Total	$3.01	$4.350

See also Appendix page 387

SIBERIA

THE SPASSKY COPPER MINE, LTD.

SPASSKY ZAVOD, SIBERIA, RUSSIA

Year Ended Sept. 30

	1911
Gross production	£219,787 2s. 1d.
Siberian expenses	120,785 5 4
Siberian profit	99,001 16 9
Tons copper produced	2,858
Tons ore smelted	20,258
Tons ore mined	31,302
Average value ore smelted	14.7 per cent.
Mining costs per long ton	£0 12s.
Total costs per long ton	1 9 2.4

See also Appendix, pages 388 and 395

AUSTRALIA

NEW SOUTH WALES

BRITISH BROKEN HILL PROPRIETARY CO., LTD.

NEW SOUTH WALES, AUSTRALIA

Half Year Ended

	Dec. 31, 1912	June 30, 1911	Dec. 31, 1911
Total production	£190,561 12s.	£98,065 12s. 11d.	£170,087 9s. 5d.
Total expenses	130,864 8	74,591 18 8	97,739 4 10
Gross profit		23,473 14 3	72,348 4 7
Net profit	59,697 4	15,142 5 8	61,910 2 1
Lead concentration plant:			
Tons ore milled	103,680	63,370	81,001
Ave. assay val. Ag oz	7.3	7.6	7.8
Ave. assay val. Pb per cent..	13.2	13.6 mill 52.1%	14.4 mill 52.1%
Recovery Ag. Pb. Zn		rec. 71%	rec. 70.5%
Ave. assay val. Zn per cent..	11.7	12.8	12.7
Produced Ag, oz	363,043	252,701	332,779
Produced Pb, tons	9,423	6,130	8,274
Produced Zn, tons	993	684	943
Zinc concentration plant:			
Tons tails from lead plant	49,238	34,845	41,740
Ave. assay val. Ag, oz	3.8	3.9	3.7
Ave. assay val. Pb per cent..	3.9	3.9 mill 72.7%	3.7 mill 79.5%
Recovery Ag. Pb. Zn		rec. 71.3%	rec. 75%
		77.2%	78.6%
Ave assay val. Zn per cent..	14.0	15.3	15.0
Produced Ag, oz	153,053	98,774	125,118
Produced Pb, tons	1,566	971	1,170
Produced Zn, tons	5,386	4,138	4,939
Total Ag, oz	516,096	351,475	457,897
Total Pb, tons	10,989	7,101	9,444
Total Zn, tons	6,379	4,822	5,882
Costs per ton treated:			
Mining	£0 13s. 11.0d.	£0 12s. 4.49d.	£0 12s. 4.57d.
Milling	8 6.72	8 10.23	8 4.47
Forwarding expenses	0 1.10		
General expenses	2 6.48		
Total expenses	£1 4s. 3.30d.		

See also Appendix, pages 388 and 393

AUSTRALIA

1. Mount Morgan
2. Cobar (Mount Boppy)
3. Broken Hill
4. Kalgoorlie
5. Coolgardie
6. Murchison Gold Field

NEW

7. Consolida
   New Z
   Blackwat
   Progress
8. Waihi
   Talisman

ZALAND

Goldfields of

nd.

TASMANIA

9. Mount Lyell

10. Tasmania Gold Mines

nsolidated

BROKEN HILL SOUTH SILVER MINING COMPANY

BROKEN HILL, NEW SOUTH WALES, AUSTRALIA

	6 mos. ended Dec. 31, 1912	6 mos. ended Dec. 31, 1911
Mine production	£319,535 6s.	£264,650 12s. 4d.
Tailings	76,501 2	59,035 2 6
Total	£396,036 8s.	£323,685 14s. 10d.
Expenditures	174,013 19	165,262 5 8
Working profit	222,022 9s.	£158,423 9s. 2d.
Tons treated	180,080	181,790
Per cent. lead	13.7	14.4
Lead contents (tons)	24,676	26,015
Silver per ton, ounces	6.4	6.9
Total silver, ounces	1,147,569	1,249,657
Per cent. zinc	13.8	14.1
Total zinc (tons)	24,780	25,491
Concentrates, tons	27,238	27,339
Lead contents, tons	18,755	19,659
Silver contents, ounces	617,679	668,968
Zinc contents, tons	1,695	1,376
Tailings (zinc), tons	128,446	123,969
Lead contents, tons	3,865	4,190
Silver contents, ounces	400,581	452,141
Zinc contents, tons	20,357	20,765
Tailings quartz, tons	6,735	10,571
Lead contents, tons	160	212
Silver contents, ounces	14,545	20,375
Zinc contents, tons	12	980
Slimes, tons	17,661	19,941
Lead contents, tons	1,896	1,954
Silver contents, ounces	114,760	108,173
Zinc contents, tons	2,214	2,370
Costs: Mining	12s. 0.6d.	10s. 6.0d.
Mining filling depleted stopes	1 3.5	1 3.8
Total	13 4.1	11 9.8
Developmental	2 4.8	1 2.9
	15 8.9	13 0.7
Concentrating	3 6.3	3 5.3
	19 3.3	16 6.0
Cost per ton conc	£6 7s. 5d.	£5 9s. 8.3d.
Price received for lead, ton	19 6 3	14 17 0
Price received for silver	2 $7\frac{1}{8}$	2 $2\frac{11}{16}$
Price received for zinc	26 8 7	£26 11 6

See also Appendix, pages 388 and 393

GREAT COBAR, LTD.

NEW SOUTH WALES, AUSTRALIA

Year Ended June 30

	1912	6 months ending June 30, 1911	1910
Total production	£815,952 15s.	£817,434 8s.	
Total costs	647,335 12	715,080 5	
Total profits	168,617 3	102,354 3	
Metals produced:			
Copper, tons	6,736.5	3,347.9	6,304.3
Gold, ounces	37,696	14,318	22,330
Silver, ounces	178,938	62,250	110,406
Tons ore smelted:			
Cobar Mine	271,828	143,596	241,764
Chesney Mine	21,733	11,907	33,391
Peak Mine	155	30	310
Cobar Gold Mine	45,778	23,593	24,221
Ore purchased	7,030	46,302	81,677
Total	346,524	225,428	381,363
Value per ton smelted		26s. 11.16d.	
Costs per ton	27s. 3.2d.	23 6.72	
Profit per ton		3 4.44	

GRADE OF ORE RESERVES IN 1912

	Copper per cent.	Gold, oz.	Silver, oz.
Chesney Mine	2.6	.035	.35
Cobar Mine	2.6	.05	.40
Cobar Gold	1.7	.40	.35

General Notes.—The mine is 430 miles from Sidney on the Western Branch Railway. The ore-bodies occur as lenticular masses in slate. The widths varying from 10 ft. to 100 ft. In the Cobar mine the ore is pyrite, chalcopyrite, pyrrhotite and magnetite, massive, basic and disseminated in slate gangue. Chesney mine the same. Cobar gold mine it is the same but more quartz. Widths of ore-bodies in the Chesney and Cobar gold are 20 ft. to 30 ft. and 30 ft. to 40 ft. respectively.

The ore is broken by over-hand stoping and stopes filled by surface passes. Levels are about 130 ft. apart.

The ore is drawn from the mines in the proper proportions for best smelting mixture. The ores are bedded at the smelter.

A 700 ton concentrator has been erected to treat Chesney ores and Cobar Mine siliceous ores. In addition the Minerals Separation process has been installed and the plant is treating the tailings successfully, making a 19 per cent. concentrate and an 85 to 90 per cent. extraction.

The smelting plant consists of four 56 in. × 240 in. blast furnaces treating green ore and Chesney concentrate. The matte is converted and the blister copper shipped to New York refineries. The mines have reached the following depths:

Cobar	1520 ft.
Chesney	925 ft.
Cobar Gold	540 ft.

For later operations see Appendix, page 393

THE MOUNT BOPPY GOLD MINING CO., LTD.

CAUBELLICO, NEW SOUTH WALES

Year Ended Dec. 31

	1912	1911
Production		
Gold ounces	17,117	26,405
Value realised	£72,597 14s. 8d.	£111,223 19s. 11d.
Total income	72,597 14 8	111,583 4 2
Total expenditures	73,610 8 9	80,917 7 4
Profit	£1,012 14 1	£30,665 16 10
Ore milled, tons treated	53,990	74,132
Fine gold recovered, oz. (amalgamation)	6,895.7	8,565.5
Tailings treated, tons sand	28,520	48,132
Fine gold recovered oz	4,643.6	8,594
Slimes treated, tons	25,464	26,845
Fine gold recovered	5,218.1	5,979.7
Retreatment sand, tons roasting	5,811	13,388
Yield, oz		1,841
	Tons cwt. qr. lb.	Tons cwt. qr. lb.
Concentrates sold	55 9 0 18	269 15 0 19
Assay value, oz	359.7	1,424
Grand total realised	£72,485 6s. 11d.	£111,223 19s. 11d.
Aver. yield per ton milled	6 dwt. 8 gr.	7 dwt. 2.97 gr.
Aver. yield per ton bullion	9 dwt. 11.30 gr.	10 dwt. 12.99 gr.
Value realised per ton	£1 6s. 10.3d	£1 10s. ¼d.
Workings costs per ton	26s. 1d.	20s. 3.05d.
Average extraction, per cent	72.1	
Average residue	2.45 dwt.	
Development, feet	1,404	1,061
Stamp duty per ton (2240 lb.)		
Oxide ore	4.77	5.19
Sulphide ore	3.45	3.63
No. men employed	276	371

See also Appendix, pages 388 and 393

SOUTH AUSTRALIA

WALLAROO AND MOONTA MINING AND SMELTING CO., LTD.

See Appendix, page 397

QUEENSLAND

MOUNT MORGAN GOLD MINING CO., LTD.

QUEENSLAND, AUSTRALIA

	6 mos. ending Nov. 30, 1912	Year ending May 31, 1912	Year ending May 31, 1911
Total revenue	£637,607	£989,713	£953,292
Total expenses	387,585	731,715	759,316
Operating profit	250,022	257,998	193,976
Metal production:			
Copper, tons	5,004.45	7,440	6,973
Gold, ounces	62,553.17	134,575	142,449
Tons ore treated	172,423	351,858	334,869
Yield per ton, Cu	2.90%	2.11%	2.05%
Yield per ton, Au	7.25 dwt.	7.65 dwt.	8.50 dwt.
Tons mined:			
Open cut	.....	255,149	233,366
Underground	.....	235,977	276,316
Tons waste discarded	.....	231,198	211,396
Operating costs per ton treated:	£2 4s. 11.48d.	£2 1s. 7.08d.	£2 5s. 4.20d.
Average price received for Cu per ton.	£80 3s. 11d.	£63 13s. 2d.	£58 4s. 7d.

General Notes.—The ore has a gold-copper value. Above the 750 ft. level the values are mainly gold and the ore is mined with steam shovels in open pits. This is the gossan capping to what is probably a large copper sulphide deposit. From the 750 ft. level down the ore is a gold-bearing copper sulphide and is mined through shafts to a depth of 1200 ft.

The reduction plants include mills for the gold ores and a smelting plant with a daily capacity of about 1000 tons. The blast furnaces are 48×190 in.

One reverberatory furnace treats flue dust. The converter product assays about 98.6 per cent. copper and 15 oz. gold. It is shipped to refineries.

Considerable sums of money are being spent upon improvements and enlargements of the plant and reduction works. When completed they will be modern in every respect. The management expects an increased metallurgical saving and a decided decrease in operating costs.

For later operations see Appendix, page 393

WESTERN AUSTRALIA

ASSOCIATED GOLD MINES OF WESTERN AUSTRALIA, LTD.

HANNAN, KALGOORLIE DISTRICT, WESTERN AUSTRALIA

Mines: Australia North, Australia East, Australia and Adelaide

Production	1912	1911
Gold, ounces	38,477	.....
Silver, ounces	1,107	.....
Value gold and silver	£163,538 8s. 8d.	.....
Net profit for year	33,062 16 6	.....
Written off for shaft sinking, development and depreciation.	32,573 14	.....
Net carried forward	£862 18 7	.....
Treatment:		
Tons ore treated	118,735	105,238
Value of heads assay	28.995s.	.....
Contents of heads assay	6.821 dwt.	.....
Value of yield	27.54s.	27.86
Theoretical extraction, per cent	94.29	92.57
Costs per ton:	s.	s.
Mine working account	21.54	22.68
Construction	.88	5.00
Mine development	4.41	5.88
Total mining	26.83	33.56
Gross surplus	.71	Deficit 5.70
Workings costs:	£ s. d.	£ s. d.
Ore milling	0 11 2.7	0 12 2.0
Ore extraction	0 9 .4	0 9 2.1
General and administrative	0 0 10.4	0 0 10.1
Insurance	0 0 2.9	0 0 3.6
Disposal of bullion	0 0 1.9	0 0 2.1
	1 1 6.3	1 2 7.9
Development	7,092 ft.	6,220
Cost per foot	72s. 3.5d.	79s. 6.9d.
Diamond drilling	.....	6,027 ft.
Cost per foot	.....	13s. .2d.

Value ore reserves between 21s. and 29s.

Developed to 2244-ft. level; width lode not given.

The total working costs only for August, 1912, were 18s. 11d. This is exclusive of development and capital expenses.

For later operations see Appendix, page 394

ASSOCIATED NORTHERN BLOCKS (W. A.), LTD.

IRON DUKE LEASE AND VICTORIOUS LEASE, KALGOORLIE, West AUSTRALIA

Year Ended Sept. 30

	1912	1911	1910
Sales bullion mine	£15,733 8s. 3d.	£38,025 5s. 4d.	£50,841 7s. 1d.
Sales bullion ore purchased	33,043 1 0	46,836 7 1	27,507 1 8
Tributors	49,901 2 6	11,519 2 1	2,838 4 3
Total with int., etc	104,006 6 10	96,416 8 9	87,785 6 5
Total exp. and ore pur	87,105 19 6	80,091 0 6	70,285 2 6
Profit	£16,900 7 4	£16,325 8 3	£17,500 3 11
Total gold ounces	23,484	22,672	19,101
Total silver ounces	1,295	861	543
Total value	£99,882 4 10	£96,380 14 6	£81,186 13 0
Ore mined underground, tons	6,253	17,602	32,120
Ore from surface	.....	556	.....
Tons treated, company account	.....	18,158	32,120
Tons treated for tributors	14,223	4,450	904
Total from mine	20,476	22,608	33,024
For public	7,292	10,428	5,665
Total	27,768	33,036	38,689
Milled oxide ore, tons	8,296	7,831	2,480
Milled sulphide ore, tons	19,472	25,080	36,209
Total	27,768	32,911	38,689
Average	17s. 7.157d.	14s. 8.045d.	12s. 10d.
Tons roasted	19,472	25,080	.....
Extraction for year mill, per cent.	.....	92.9	94.55
Value per ton extracted company ore.	.....	41s. 9d.	.....
Cost per ton:	£ s. d.	£ s. d.	£ s. d.
Ore extraction	0 11 10.851	0 8 2.70	0 7 0.81
Ore milling	0 17 7.157	0 14 8.04	0 12 0.10
General expenses	0 2 5.236	0 2 0.79	0 1 9.26
In addition there was expended on dev., diam. drilling, plant and machinery	£1 12 3.596[1] £816 8 9	£1 4 11.53 £37,870 4 5	£0 20 10.17 £1,877 3 10
Extraneous—options	.....	£ 8,918 12 8	£1,945 14 7
Development	.....	589 ft.	694 ft.
Cost per foot	.....	35s. 5.8d.	£2 14s. 4.62d.
Diamond drilling	.....	2,789 ..	.....

[1] Including cost of 4.352d. per ton for supervision of tributors.

See also Appendix, pages 388 and 394

BURBANKS MAIN LODE (1904), LTD.

COOLGARDIE, WESTERN AUSTRALIA

Year Ended June 30

Tons = 2000 lb. *Pounds Sterling Currency*

	1912	1911
Proceeds gold won	£45,354 8s. 6d.	£47,449 9s. 7d.
Less gold tailings purchased	.....	1,069 11 11
Total	45,354 8s. 6d.	46,379 17 8
Total with slimes and recpts	45,779 12 0	£47,236 18 7
Expenditures	25,978 11 11	24,665 19 8
Operating profit	£19,801 0 1	£22,580 18s. 7d.
Net profit	£8,144 3 2	£11,425 17 4
Ore extracted, tons	20,336	19,413
Mill battery / Ore treated	20,336	19,413
Yield ounces gold	11,201	10,870
Yield per ton	11 dwt. .3 gr.	11 dwt. 4.7 gr.
Total value bullion	£39,115 13s. 1d.	£38,430 2s. 5d
Cyanide:		
Tons treated	13,483	12,596
Yield ounces	2,763	3,356
Av. yield	4 dwt. 2.3 gr.	5 dwt. 7.8 gr.
Value	6,238 15s. 5d.	£7,949 15s. 8d.
Custom ore treated	.....	2,592
Slimes accuml. ton	6,795 avg. 1 dwt. 6.2 gr.	6,515 avg. 1 dwt. 18 gr.
Total bullion rec. oz	13,964	14,226
Cost per ton:	s. d.	s. d.
Mining	15 7.504	15 11.685
Treatment	7 4.633	6 11.583
Baling and pumping	2 6.456	2 5.549
Total working cost	25 6.592	25 4.817
Yield per ton	44 7.26	47 9.387
Profit per ton	19 0.668	22 4.569
Value ore reserves	10.5 dwt.	10.5 dwt.
Dev. feet	2,643	2,313
Stamp duty tons heavy mill	4.03	4.11
Stamp duty tons light mill	2.66	2.39

For later operations see Appendix, page 394

Remarks.—Property is developed to the eighth level 914 ft. deep. The reef averages around 1½ to 2 ft. wide. Mine pumps 100,000 gal. daily.

CENTRAL AND WEST BOULDER GOLD MINES, LTD.

KALGOORLIE, WESTERN AUSTRALIA

Worked with the Oroya Links, Ltd.

Year Ended Dec. 31

	1910		
Income, gold	£20,183	8	1d.
Expenditures	16,656	7	0
Working profit	3,527	1	1
Development, construction and equipment	600	5	11
Profit	£2,926	15s.	2d.
Production:			
Gold, ounces			4,757.32
Yield per ton milled		23s.	1.82d
Tons extracted			17,466
Tons milled			17,466
Tons agitating and filter-pressing			16,258
Yield per ton milled		8s.	6.46d.
Concentrates—roasting, agitating and filter pressing, tons			1,208
Yield per ton milled		14s.	7.36d.
Total yield		23s.	1.82d.
Cost per ton:			
Breaking, filling stopes, trucking and raising		6s.	7.37d.
Crushing, milling, concentrating, roasting, cyaniding, filter-pressing, etc.		11	10.61
General expenses			10.42
Bullion realisation			1.10
Grand total		19	5.50
Deduction rebate on stores		0	4.63
Net working cost		19	0.87
Development, feet		282	
Cost of development per foot:			
Driving		48s.	9.10d.
Rising		47	6.31
Diamond drilling		13	5.54
Cost per ton of ore treated			8.25d.

Remarks.—See Oroya Links, Limited.

GOLDEN HORSE-SHOE ESTATES CO., LTD.

KALGOORLIE, WEST AUSTRALIA

Year Ended Dec. 31

	1911
Metal production	£403,429
Miscell. revenue	743
Total revenue	404,172
Total expenses	373,714
Net profit	30,458
All tons given are 2240 lb.:	
Tons ore milled	269,667
Ave. grade ore (gold)	7.98 dwt.
Mill extraction, per cent	85.53
Costs per ton milled:	
Mining	10.89s.
Develop	3.70
Ore reduction	10.39
Maintenance	.166
Gen. expense	.907
Plant and machinery	.063
London expenses	.37
Miscell. capital exp	1.21
Total	£1 7s 8.35d
Ore reserves average	8.801 dwt.
Development, feet	9,130
Shafts, feet	460.5
Diamond drilling, feet	507

The veins vary from 4 ft. to 15 ft. in width. The mine is opened by shaft to a depth of about 2650 ft.

The ores are stamped, sized, concentrated, reground and cyanided.

The different plants handled and produced the following:

	Tons	Oz. bullion	Oz. fine gold
Milling plant	269,667	27,111.8	24,518.48
Sands plant	88,536	8,230.8	5,701.82
Slimes plant	159,951	50,966.5	35,280.08
Concentrates	21,180	37,306.8	25,471.48
Retreatment of tails	20,717	4,266.4	2,908.99
Cyanide	.....	.....	1,102.19
Total	.....	.....	94,983.04

For August, 1912, the total working costs were 20s. 2d. which is exclusive of development and capital expenses.

GREAT BOULDER PERSEVERANCE GOLD MINING CO., LTD.

KALGOORLIE, WESTERN AUSTRALIA

Year Ended Dec. 31. Aug. 1–Dec. 31, 1910

	1912	1911	1910
Production:			
Gold ounces	62,932	72,415	27,013
Silver ounces	7,839	9,716	3,408
Val. realised	£270,434 19s. 2d.	£30,725 8s. 4d.	£113,962 14s. 3.
Total with msc	272,290 8 7	£310,534 6 3	£115,961 19 6
Exp. total	246,609 4 10	262,075 11 5	136,875 3 8
Profit	£25,681 3s. 9d.	£48,458 14s. 10d.	£20,913 4s. 2d
Ore production and treatment:			
Tons treated	234,636	243,109	91,852
Val. per ton			7.383 dwt.
Val. of pro	£270,760 0s. 10d.	£308,570 12s.	£115,083 8 9
Rec. of gold, per cent	89.76	90.15	79.13
Monthly cap. plant	19,553	20,259	20,000
Tons broken in stopes:			
Tons	240,912	266,247	133,288
Av. val	25s. 7d.	30s. 5d.	29s. 5d
Av. width, feet	12.86	12.94	10
Av. cost	4s. 4.9d.	7s. .06d.	6s. 6.36d
Tons broken in develop	14,700	13,211	8,646
Value per ton	20s. 8d.	16s. 3d.	24s. 4d
Working cost per ton:	s. d.	s. d.	s. d.
Ore breaking	7 2.47	7 0.25	7 1.628
Treatment	9 9.38	9 9.58	10 4.502
Gen. exp	0 8.72	0 8.44	0 10.088
Stope filling	0 0.41	0 .09	0 1.358
Dis. of residues	0 6.39	0 6.79	0 7.981
Total cost per ton	18 3.39	18 1.15	19 1.557
Total working cost	£214,491 14 0	£219,960 19 4	£107,632 13 2
Treatment cost as follows:			
Crushing	0 5.575	0 5.837	0 5.591
Milling	2 2.848	2 4.411	2 3.676
Roastings	2 9.641	2 10.409	3 1.319
Amal. and agitation	2 2.23	1 11.854	2 3.589
Filter and pressing	1 8.877	1 9.282	1 10.086
Precp. and Smelting	0 4.214	0 3.783	0 4241
Total	9 9.385	9 9.576	10 4.502

See also Appendix, pages 389 and 394

THE GREAT BOULDER PROPRIETARY GOLD MINES, LTD.

KALGOORLIE DISTRICT, WEST AUSTRALIA

Year Ended Dec. 31

Money, £, s. d. Tons, 2240 lbs.

Production	1912	1911						
Gold production, ounces	158,737	158,351						
Valued at	£573,245	£567,640						
Less minting and sundry receipts	575,964	569,495						
Total expenses	263,756	256,738						
Operating profit	£312,208	£312,757						
Mined and treated (tons)	193,451	187,510						
Treated at sulphide mill	193,451	187,510						
Grade ore treated	13.95 dwt.	.....						
Yield, ounces, by amalgamation	59,284	53,899						
Value	£213,924	£193,471						
Yield by cyanidation, ounces	98,249	104,451						
Value	£354,850	£375,785						
Total value	£573,159	569,256						
Aver. val. of residues (tons 2240)	1.6 dwt.	1.7 dwt.						
Loss in mercury, sulphide mill per ton.	.178 oz.	.079 oz.						
Loss in cyanide, cyanide mill per ton	.90 lb.	.973 lb.						
Costs per ton:	Per ton		Per ton		1910		1909	
	s.	d.	s.	d.	s.	d.	s.	d.
Mine expenses (opening up)	3	2	5	1	3	11	3	8
Mine expenses (stoping)	11	3	10	1	8	9	8	9
Sulphide mill exp	8	0	8	2	8	9	8	11
Cyanide mill exp	3	5	3	10	3	7	3	6
General charges	0	11	0	11	0	10	0	10
Sundries	0	4	0	4	0	4	0	4
Total	27	1	28	5	26	2	26	0
Value ore reserves	14.5973 dwt.		14.5625 dwt.		.....			
Development work, feet	2,419		2,580		.....			
Diamond drilling, feet	1,252		4,609		.....			
Depth, feet	2,800		2,800		.....			

For later operations see Appendix, page 394

Remarks.—Workings very extensive. Property developed to 2800-ft. level. Mine opened by several shafts. Ore-bodies vary from 4 to 15 ft. in width. The ores are sulpho-tellurides. The method of treatment is amalgamation and cyanidation.

THE GREAT FINGALL CONSOLIDATED, LIMITED

DAY-DAWN, WEST AUSTRALIA

Year Ended Dec. 31

	1912			1911		
	Oz.	Dwt.	Gr.	Oz.	Dwt.	Gr.
Production	31,013.157	.....	.....	36,795	19	8
Valued at	£116,212	4s.	2d.	£157,093	8s.	1d.
Profit custom ore	2,630	4	7	4,923	3	4
Miscl. income	3,973	0	8	4,033	13	5
Total income	£122,815	9s.	5d.	£166,050	4s.	10d.
Total expenditures	106,385[1]	9	6	146,934[2]	4	0
Total profits	£16,429	19s.	11d.	£19,116	0s.	10d.
Mill tons treated	67,177	Per ton	milled	101,949	Per ton	milled
Yield, ounce	11,604	14s.	8.63d.	17,540	14s.	7.4d.
Concentrates, tons	1,023	.....	.....	1,881		
Yield, ounce	1,804	2s.	3.64d.	2,871	2s.	4.72d
Cyanide sands, tons	48,559	.....	.....	71,663		
Yield, ounce	2,670	3	4.83d	5,482	4	6.83
Current slimes, tons	17,595	.....	.....	28,435		
Yield, ounce	3,252	4	1.7	2,227	1	10.28
Total retreatment, ounce	7,852	.....	.....	8,664		
Total custom, ounce	3,827	.....	.....	6,030		
Total ounce, gold	31,013	.....	.....	42,817		
Costs (per ton milled):		s.	d.		s.	d.
Mining	.....	10	7.9	.....	10	11.78
Development	.....	3	2.04	.....	3	3.01
Milling and cyaniding	.....	8	1.73	.....	7	8.44
Credit customs ore	.....	.....	10.86	.....	.....	10.12
Net milling and cyaniding	.....	7	2.87	.....	6	10.32
General expense	.....	2	5.65	.....	1	9.98
Bullion realised	.....	.....	3.73	.....	.....	3.23
Grand total	.....	23	10.28	.....	23	2.32
Rebate stores	.....	.....	Nil	.....	.....	2.61
Net working expenditure	.....	23	10.28	.....	22	11.71
No. stamps	40	.....	.....	.....	40	.....
Duty, tons	7.71	.....	.....	.....	8.68	.....
Grade reserves above fourteenth level.	26s. 5d.	Tons 52,926	.....	.....	28s. 8d.	.....
Grade reserves below fourteenth level.	40s. 0d.	Tons 31,812	.....	.....	42s. 10d.	.....

[1] Includes £33,087 .10 .10 Accumulated slimes, rents, charges on gold, etc., not including shaft sinking.

[2] Includes £36,785 5 6. Accumulated slimes, rents, charges on gold, shaft sinking, etc.

See also Appendix, pages 389 and 394

HAINAULT GOLD MINE, LTD.

WESTERN AUSTRALIA

Hannan's East Coolgardie Gold Fields

Period Year Ended May 31

	1912	1911	1910
Income from bullion	£78,825	£84,237	£93,639
After realization trans. and int.	78,358 8s. 0d.	83,763 17s. 11d.	.....
Total expenditures	81,259 17 10	79,156 10 10	.....
Profit	£2,901 9s. 10d.	£ 4,607 7s. 1	.....
Tons mined	63,542	66,147	.....
Tons mullock sorted	.....	3,815	.....
Mullock assay	.....	.94 dwt.	.....
Mullock, per cent. of total tonnage	.....	5.75	.....
Mill treated tons ore	63,542	62,332	69,068
Mill treated tons accl. slimes	4,335	10,811	.....
Mill treated tons conc. (accl.)	.....	74	.....
Val. bullion yield per ton	.....	1 7 .34	1 7s. 1.38
Av. monthly tonnage crushed	5,295	5,194	.....
Val. residue	1.84 dwt.	1.54 dwt.	.....
Cost per ton:	s. d.	s. d.	
Mining	9 2.11	8 8.08	.....
Rough crushing and sorting	3.13	0 6.14	.....
Sep. and settl., cyan. and treat. of	9 4.09	8 4.34	.....
conc. precip., smelt., clean up, repairs, renewals, ore treat., power battery, etc.	6.66	0 6.83	.....
Administration and genl.			
Total cost	19 3.99	18 1.39	17 5.18
Value of ore reserves	28	28	28
Tonnage of ore reserves	100,000	100,000	.....
Development, feet	3,382	3,626	.....

Remarks.—Mine is developed to 950 level. Ore-bodies often occur up to 30 and 50 ft. wide. In speaking of development sampling widths are given as 5 and 6 ft. Formerly ore was amenable to treatment by ordinary wet milling and concentrating methods. The ore now being treated does not give such satisfactory results which has necessitated alterations and additions to the plant. This is being done in the direction of increasing the roasting department. The treatment is as follows: Amalgamation, concentration, and cyanidation.

IVANHOE GOLD CORPORATION, LIMITED

KALGOORLIE, WEST AUSTRALIA

Year Ended Dec. 31

	1912	1911
Production, gold, ounces	110,438	113,691
Production, silver, ounces	23,263	22,442
Valued at	£471,483 7s. 11d.	£484,869 8s. 6d.
Total working cost	262,763 13 1	252,414 16 1
Profit for year after all expenses	£196,167 10 11	£220,971 0 0
Tons treated	237,266	238,965
Tailings, sand	105,892	108,662
Slimes	108,285	106,863
Concentrates	23,089	23,440
Gold recovered:		
Battery amal., ounces	27,608	33,022
Sands, ounces	15,690	16,176
Slimes, ounces	42,550	38,973
Concentrates, ounces	24,590	25,518
Silver recovered:		
Battery, ounces	2,236	2,348
Sands, ounces	4,291	3,919
Slimes, ounces	10,297	9,772
Concentrates, ounces	6,438	6,402
Extraction battery, per cent	22.3	25.75
sands, per cent	12.68	12.60
slimes, per cent	34.38	30.37
concentrates, per cent	19.87	19.89
Loss in residues, per cent	10.77	11.39
Original value of ore	44s. 3.82d.	45s. 7.18d.
Total recovery	39s. 6.52d.	40s. 4.87d.
Loss	4s. 9.3d.	5s. 2.31d.
Percentage extraction, sands	68.78	66.49
Percentage extraction, slimes	89.73	88.37
Total extraction, per cent	89.23	88.61
Costs per ton:	s. d.	s. d.
Mining	9 3.52	8 3.57
Breaking for mill	4.53	3.93
Transportation	1.75	1.72
Milling	1 9.40	1 7.80
Concentrating	6.29	7.27
Roasting	7.07	6.14
Fine-grinding concentrates	1.87	1.66
Cyaniding concentrates	5.30	5.40
Cyaniding	3 9.24	4 1.83
Total ore treatment	8 7.45	8 3.32

Year ended Dec 31	1912	1911
General expense	1 5.96	1 4.70
Charges on bullion	4.49	4.52
Total working cost	19 9.42	18 4.11
Mine development	2 2.90	2 5.22
Buildings, plant and equipment	1.47	4.18
Total cost	22 1.79	21 1.51
Grade ore in reserve	40s. 7d.	43s. 7d.
Mine development	3602 ft.	4464 ft.
Stamp duty tons, 24 hours	6.88	6.92

For later operations see Appendix, page 394

Remarks.—Accessibility.—Railway sidings on the property.

Character of ore.—Silicious sulphide. Ore containing more silica than majority of Kalgoorlie mines.

Width of ore-body.—Varies from 4 ft. to 25 ft., possibly averages 12 ft. or 14 ft.

Method of opening.—Vertical shafts, cross-cuts and levels.

Method of mining.—Rill stopes.

Depth of mine.—Main shaft 2785 ft., bottom level 2720 ft.

Amount water pumped.—Small.

Method of ore reduction.—Ore is concentrated, reground and cyanided, cyanidation of concentrates.

THE KALGURLI GOLD MINES, LTD.

WESTERN AUSTRALIA

Year Ended Jly 31

Currency Pounds Sterling

Weight 2000 lb. 1 ton

	1912	1911	1910
Production gold sales	£249,602 13 9	£296,872 15 9	.....
Value yield gold with interest, etc.	£251,575 18 0	£298,929 17 3	.....
Profit after all expenses, depreciation, prospecting, construction, traveling, administration, taxes, etc.	£95,768 9 5	£116,326 0 9	.....
Tons treated	123,800	127,010	127,600
Yield gold value	£251,630	£299,619	£332,522
Yield per ton	£2 0s. 7.81d.	£2 7s. 2.16d.	£2 12s. 1.43d.
Extraction, per cent	93.67	94.75	94.32
Aver. value residue	2s. 8.87d.	2s. 7.34d.	3s. 1.71d.
Aver. val. heads before treatment	£2 3s. 4.68d.	£2 9s. 9.5d.	£2 15s. 3.14d.
Cost per ton 2000 lb.:			
Mining:	£ s. d.	£ s. d.	
Labor	0 5 10.06	0 5 5.86	.....
Stores	0 1 3.43	0 1 2.19	.....
Haulage and drills	0 1 0.83	0 0 8.79	.....
Total at pit mouth	0 8 2.32	0 7 4.84	.....
Prop. of admin. and genl. exp. in West Australia.	7.72	0 0 7.05	.....
Total mining	0 8 10.04	0 7 11.89	8s. 4.05d.
Ore treatment	0 10 9.90	0 11 0.43	.....
Prop. adm. and genl. exp.	0 0 10.11	0 0 10.34	.....
Total ore treatment	0 11 8.01	0 11 10.77	11s. 9.67d.
Total mining and treatment	0 20 6.05	0 19 10.66d.	20s. 1.72d.
Aver. tons treated per month	10,316	10,584	.....
Development	4,083	5,664 ft.	.....
Diamond drilling	2,108	1,649	.....
Ore reserves tons	250,000	Not given.	400,000
Grade reserves	Not given.	Not given.	Not given,

See also Appendix, pages 389 and 394

LAKE VIEW AND STAR LIMITED

KALGOORLIE, AUSTRALIA

Year Ended Feb. 29

Production	1912	1911
Gold, ounces recovered	51,700.676	
Value realized	£220,063 9s. 4d.	
Working expenditure	184,007 12 0	
Written off plant and machinery	9,196 4s. 8d.	
Net profit after administration and all charges	£23,584 8s. 4d.	
Tons milled	132,226	
Tons concentrates	16,662	
Yield concentrates, oz. gold	30,467	
Yield concentrates, oz. silver	1,310	
Value combined contents gold and silver	£129,532 9s. 9d.	
Value per ton milled	14s. 2.6d.	
Slimes cyanided, tons	165,564	
Yield gold, oz	21,070	
Yield silver, oz	3,822	
Total value	£89,834 10s. 7d.	
Total value per ton milled	9s. 10.32d	
Tons slag	21.97	
Gold obtained, ounces	229	
Total value realized	£220,063 9s. 4d.	
Costs per ton;	s. d.	s. d.
Ore extraction		
Breaking ore	4 5.93	
Filling stopes	0 2.78	
Hoisting and tramming	2 3.02	
Total mining	6 11.73	7 4.04
Treatment:		
Crushing, transportation, milling, concentration, roasting, cyaniding concentrates, cyaniding sands	9 11.36	9 11.94
General expense	0 10.56	1 1.66
Realization of bullion	0 1.97	0 2.05
Total excluding dev	17 11.62	18 7.69
Development	2 2.73	3 8.50
Total working cost	20 2.35	22 4.19
Development	3828 feet	
Diamond drilling	2265 feet	
Grade ore reserves	28.419s.	

See also Appendix pages 390 and 394

THE LANCEFIELD GOLD MINING COMPANY, LIMITED

BERIA, WEST AUSTRALIA

Period Year Ended Dec. 31

	1911	
Production, ounces	36,110	
Total incl. slag sales	36,430	
Realised at	£155,073	
Total expenses	163,332	
Total loss	£8,259	
Ore extracted, tons	103,545	
Ore reduction:		
Slimes, tons	103,545	
Total yield, gold, ounces	36,106	
Per ton milled	29s.	8.29d.
Slags, tons	21.75	
Yield, gold, ounces	322.26	
Per ton milled	0s.	3.14d.
Total tons	103,545	
Total yield	36,428.6	
Per ton milled	29s.	11.43d.
Costs per ton (milled):	s.	d.
Development	2	11.7
Ore extraction	9	4.83
Treatment including breaking, drying, milling, roasting, grinding, agitating, pressing, precipitation, smelting, etc.	16	10.35
Retreatment slag	0	0.32
Genl. expense, including salaries, wages, supplies,	1	7.10
Realisation of bullion		3.40
Grand total	31	1.70
Less rebate on stores, etc		4.38
Net working expenditures	30	9.32

Remarks.—**Accessibility.**—500 miles from Perth.

Character of ore.—Quartz containing arsenical pyrites.

Character of ore body.—Fissure vein.

Width of ore body.—Upward of 20 ft.

Method of opening.—Shaft and levels.

Method of mining.—Back stoping.

Depth of mine.—500 ft.

General Conditions.—Those of a "back-blocks" mine in Western Australia Water scarce, timber also.

OROYA-LINKS, LTD.

KALGOORLIE, WESTERN AUSTRALIA

Period Year Ended Dec. 31

Production	1912	1911	1910
Ounces, gold	36,358	27,836	32,703
Values of gold	£154,398 19s. 4d.	£118,457 8s.	£138,891 1s. 4d.
Royalty, etc	8,009 17s. 4d.	8,021 13 5d.	12,155 5 4
Total	£162,408 16 8	£126,479 1 5	£141,046 6 8
Expenditures	109,703 12 10	99,414 19 9	117,457 3 6
Profit	£52,705 3s. 10d.	£27,064 1s. 8d.	£23,589 3 2
Profit after mine dev., equip., const., and also expenses West Australia.	£36,265 3 8	9,777 9 6	21,614 11 2
Tons treated	131,880	100,016	103,705
Recovery per ton	23s. 4.71d.	23/9.12	26/9
Tributers account tons ore crushed.	5,802	18,185	
Yield	6,237 oz.	£39,062 12s.	
Royalty collected	£5,934 12s. 5d.	£8,479 14s. 9d.	
Recovery, per cent	92.6		
Cost per ton:	£ s. d.	£ s. d.	£ s. d.
Ore extraction	0 6 7.66	0 7 11.37	0 6 11.13
Ore treatment	0 8 11.98	0 10 11.78	0 12 .31
General expenses	0 0 9.09	0 1 .76	0 0 11.97
Realization on bullion	0 0 1.59	0 0 1.47	0 0 1.49
Total cost	0 16 6.32	1 0 1.38	0 20 1.1
Deduct. reb. on stores	0 0 0.77	0 0 3.58	0 0 4.85
Net total working cost	0 16 5.55	0 19 9.80	0 19 8.25
Including dep., dev., and shaft sinking.			23 5.50
Agitat. and filter-press tons			96,050
Recovery per ton milled			9s. 1.34d.
Conc. roast., agit., and filter press tons.			7,655
Recovery per ton milled			17s. 2.96d.
Slag recovery			5.20
Total recovery			26s. 9.50d.
Stamp duty tons, 24 hours	7.52	5.79	
Development, feet	5,799	3,464	3,097
Value ore reserves per ton	25.37s.	26.4	28.47s.
Tonnage ore reserves	126,473	99,770	82,509
Additional ore not developed.	60,000		

See also Appendix, pages 390 and 394

THE SONS OF GWALIA, LIMITED

LEONORA, WEST AUSTRALIA

Year Ended Dec. 31

	1912			1911		
Production, gold:						
Total gold	61,678 oz.	5 dwt.	2 gr.	70,636 oz.	16 dwt.	0 gr
Valued at	£262,094	1	0	£300,157	8 s.	6 d.
Income incl. sundry rcpts.	£266,774	11	1	£302,876	9	9
Expenses	£191,521	4	6	179,536	16	9
Profit	£75,253	6	7	£123,339	13	0
Depreciation	10,580	7	9	11,978	10	3
Taxes	5,179	4	1	8,986	15	5
Net profit	£59,493	14 s.	9 d.	£102,374	7	4
		Yield per ton milled			Yield per ton milled	
Mill by amal. tons	155,603	..	.....	165,664	..	.....
Total yield oz. gold	24,867	13 s.	6.98 d.	45,143	23 s.	1.99 d.
Concentrates, tons	1,626	..	.....	2,217	..	.....
Yield	4,862	2	7.87	6,931	3	6.66
Cyanide sands, tons	39,991	..	.....	77,580	..	.....
Yield	6,041	3	3.59	10,805	5	6.50
Slimes, filter, ac'm. slimes, filter and slugs, tons.	121,973	..	.....	83,798	..	.....
Yield, ounces	22,605	12	4.20	7,762	3	11.79
Total, ounces	58,376	31 s.	10.64 d.	70,642	36	2.94
Costs per ton milled:						
Mining	.....	9 s.	6.53 d.	.....	8 s.	10.83 d.
Development	.....	4	5.02	.....	4	2.02
Transportation	.....	0	2.14	.....	..	1.47
Rock breaking	.....	0	4.48	.....	..	4.61
Milling	.....	1	4.73	.....	1	1.93
Concentrating	.....	0	3.00	.....	..	2.81
Cyaniding, etc	.....	5	10.71	.....	..	4.698
General expenses	.....	1	8.43	.....	1	5.73
Bullion realized	.....	..	3.06	.....	..	4.12
Grand total	.....	24	0.11	.....	21	4.50
Less rebates	.....	..	....	.....	..	3.17
Net working expenditure	.....	24	0.11	.....	21 s.	1.33 d.
Development in 1911	7755 ft.			7802 ft.		
Diamond drilling	3593 ft.			1054 ft.		
Plat cutting and shaft bins	4000 cu. ft.			9400 cu. ft.		

See also Appendix, pages 391 and 394

SOUTH KALGURLI GOLD MINES, LTD.

KALGOORLIE, WEST AUSTRALIA

Period Year Ended Sept. 30

	1911	1910
Revenue gold and silver	£143,946	£145,040
Total revenue	146,493	147,368
Expenditures	126,886	127,302
Operating profit	£19,607	£20,066
Production:		
Gold, ounces	33,954	34,034
Silver, ounces	2,584	2,448
Yield per ton	6.05dwt.	6.18dwt.
Tons treated	112,170	110,199
Return per ton	25s. 8d.	26s. 4d.
Cost per ton:	s. d.	s. d.
Mine development	3 2.25	3 4.83
Ore extraction	6 11.49	6 6.17
Ore treatment	10 2.81	10 8.07
Genl. expenses	0 8.21	0 9.95
Realization of bullion	0 1.37	0 1.31
Deduct. rebates on stores	.....	0 1.07
Total working exp	21 2.13	21 5.26
Value of ore in Reserve slightly over 6 dwt.	s. d.	£ s. d.
Cost per foot shaft sinking.	254 3.73	13 8 5.86
Cost per ft. driving	66 3.99	3 7 3.87
Cost per ft. cross cutting	75 3.75	3 6 5.99
Cost per ft. rising	86 7.50	4 19 3.97
Cost per ft. winzing	81 0.12	4 10 2.45
Development, feet	4708	 4778

Property adjoins Great Boulder Perseverance. Perseverance lode dev. to 1200 level.

Nos. 1 and 2 east lode and middle lodes, dev. to 1500 level. Lake View lode dev. to 1500 level. Ave. width lode 65 to 72 in.

The working costs for the month of August, 1912, were as follows, exclusive of development and capital costs.

Tons ore milled	9,604
Total working costs	17s. 9d.

For later operations see Appendix, page 394

YUANMI GOLD MINES, LTD.

SANDSTONE, WESTERN AUSTRALIA

Oroya Black Range Property

Period Oct. 1, 1911 to June 30, 1912

	£	s.	d.
Income:			
Gold won	79,489	3	3
Sundry revenue	8	0	3
Total	79,497	3	6
Expenditures:			
Total	47,880	12	4
Balance over working expenditures	31,616	11	2
Capital account:			
Development less sales of plant	6,878	13	11
Profit—excess of all expenditures in western Australia	24,737	17	3
Tons treated	41,890		
Total yield fine gold, ounces	18,710	..	.....
Average per ton milled	.....	37	11.45
Of the above there was milled by amalgamation	11,631	..	.....
Average per ton milled	.....	23	7.18
Cost per ton (per ton milled):			
Ore extraction:			
Breaking ore (inc. ore from dev.)	....	8	8.70
Filling stopes		0	3.43
Trucking and rising		5	4.31
Total		14	4.44
Ore treatment:			
Rock breaking		0	5.34
Milling		2	0.35
Treatment by vacuum filter		2	0.74
Fine grinding sand		0	7.24
Cyanide by percolation		1	4.48
Precipitating and smelting		0	4.86
Disposal of residues		0	9.36
Total		7	8.37
Realisation on bullion		0	5.51
Grand total not allowing retreatment		22	6.32
Sulphide ore in reserve		41	5
Oxidized ore in reserve		44	5
Development		2,315 ft.	

The 20-stamp mill ran 5704 hours during the 9 months—86.74 of the total hours.

Stamp duty per 24 hours (2000 lb. ton), 8.81 tons.

	£	s.	d.
Chamber cutting	2	19	0.09
Cross-cutting	1	4	6.87
Rising	1	17	2.31
Winzing	7	16	0.20

Judging from development work, assays and widths given in the report, the vein averages from 2 ft. to 4 ft. in width.

Property is developed by inclined shafts, to fifth level. This is 373 ft. vertically and 716 ft. on the incline.

Remarks.—**Accessibility.**—On the railway about 250 miles from coast.

Character of ore.—Free milling quartz.

Character of ore-body.—Quartz and schist.

Width of ore-body.—Average say 4 ft. 6 in.

Method of mining.—Rill stoping.

Method of opening.—Incline shaft and ordinary methods.

Depth of mine.—467 ft.

Amount of water pumped.—

Method of ore reduction.—Amalgamation cyanidation sands and slimes, treated in vac. filter.

General Conditions.—Reef in parts is very flat.

YUANMI GOLD MINES, LTD.

YUANMI MINE, YOUANME, WESTERN AUSTRALIA

Period Apr. 27, 1911, to June 30, 1912

Gold won	£36,949	7s.	10d.
Sundry revenue	4	15	0
Total income	£36,954	2s.	10d.
Expenditures,[1] total	15,653	15s.	8d.
Balance over working expenditure	£21,300	7s.	2d.
Mine development	2,908	16s.	7d.
Construction and equipment	1,873	4s.	11d.
Excess of income in Western Australia	£16,518	5s.	8d.

Tons treated			18,332
Total yield pure gold, ounces			8,703
Average per ton milled and treated		40s.	4.3d.
Stamp duty per 24 hours, tons			9.42

Cost per ton (per ton milled):		
Ore extraction:		
Breaking ore including ore from dev	4s.	5.43d.
Filling stopes	0	3.72
Trucking and rising	3	9.58
Total	8s.	6.73d.
Treatment:		
Rock breaking	0s.	5.25d.
Ore transport	0	3.46
Milling	3	0.16
Treatment by vacuum filter	3	0.61
Fine grinding sands	0	4.64
Precipitation and smelting	0	6.79
Disposal of residues	0	2.64
Total	7s.	11.55d
Realisation of bullion		6.64
Grand total	17s.	0.93d.
Oxidised ore in reserves averages, per ton	44.4s.	
Sulphide ore in reserves averages, per ton	41.4s.	

[1] Subsequent to starting treatment plant. Equipment includes 20 stamp mill.

DEVELOPMENT COST PER FOOT

April 1, 1911, to Feb. 29, 1912

Shaft sinking	£37	2s.	7.87d.
Plat cutting			
Driving	7	4	3.73
Cross-cutting	4	13	0.56
Rising	5	17	10.73
Winzing	5	1	5.73
Costeaning	0	14	9.25
Total depth shaft, feet			451
Development during period, feet			1002

Judging from the ore opened in development, the vein averages from 4 to 5 ft. in width.

See also Appendix, pages 391 and 394

NEW ZEALAND

THE BLACKWATER MINES, LIMITED

REEFTON, NEW ZEALAND

Year Ended Dec. 31

Production	1911		
Value gold recovered omitting value concentrates	£93,059		
Working expenditure	48,315		
Profit over working expend	£44,744		
Concentrates (estimated as if treated)	4,924		
Profit over working expend	£49,668		
Tons treated mills	44,038		
Contents gold, ounces	20,274.6		
Cyanided tons	25,761		
Contents, ounces	3,292.2		
Tons concentrates	362.5		
Value contents	£4,923		
Grand total value	£97,026		
Costs:	s.	d.	
Ore extraction	13	2.52	
Ore treatment	5	1.12	
Genl. expenditures	3	1.82	
Bullion charges	0	5.85	
Total	21	11.31	
Values, costs and profit per ton:	£	s.	d.
Yield (omitting value concen.)	2	2	3.16
Working expenditure	1	1	11.31
Profit over working expend	1	0	3.85
Concentrates (estimated)		2	2.83
Profit over working expenditure	1	2	6.68
Value ore in reserve	10.16 dwt.		
Development work, feet	1,384		

For later operations see Appendix, page 394

THE CONSOLIDATED GOLD FIELDS OF NEW ZEALAND, LTD.

Wealth of Nations Mine, Reefton, New Zealand

Year Ended Dec. 31

	1911	1910
Gold, ounces	13,050	
Value gold own mine	£50,896	
Value gold with Golden Fleece ore	53,054	
Working expen	23,022	
Prof. over working expend	27,352	
Treatment:		
Tons milled	24,968	
Ounces of gold	9,626.5	
Value of yield	£39,560	
Tons cyanided	15,353	
Ounces gold	3,424	
Valued at	11,336	
Total value gold	£50,896	
Tons concentrates	64.5	
Valued at	£807	
Grand total value	£51,703	
Value bullion yield from tons milled	50,374 16s. 2d.	
Costs per ton:	s. d.	s. d.
Ore extraction and transport	13 3.79	12 0.48
Ore treatment	3 7.22	3 6.02
Genl. expenses	1 0.40	1 5.89
Bullion charges	0 5.88	0 1.29
Assay office	.....	0 2.58
Total expenses (working)	18s. 5.29d.	17s. 4.26d.
Costs (Sept. to Dec. 31, 1911)	15 3.06	
Bullion yield per ton	40 4.21	
Expenses (working)	18 5.29	
Working profit	21s. 10.92d.	
Development, feet	3,732	
Ore reserves	11.152dwt.	

For later operations see Appendix, page 394

THE PROGRESS MINES OF NEW ZEALAND, LTD.

Year Ended Dec. 31

	1911		1910	
Value realised	£48,014			
Total inc. dividends, rents, etc	61,218			
Total expenses	62,957			
Loss	£1,739			
Gold recovery:				
Tons treated	41,596			
Gold contents	7,827.8			
Valued at	£31,655			
Tons cyanided	26,780			
Contents, ounces	2,689			
Valued at	£8,718			
Tons concentrates	438			
Valued at	£5,533			
Grand total value	45,906			
Smelter ounces	607.95			
Valued at	£2,459			
Tailings cyanided	24,140			
Valued at	2.88dwt.			
Residue	.83dwt.			
Accumulated sands treated	2,640			
Costs per ton:	s.	d.	s.	d.
Ore extraction	20	1.59	19	2.90
Transportation	0	6.48	0	10.16
Oré treatment	3	1.85	3	11.65
Genl. expense	1	5.60	1	1.71
Bullion charges	0	3.35	0	1.31
Assay office:	26	4.87	25	5.57
Total smelting	2	5.66		
Total	28	10.53		
Loss over working expenditure	0	2.18		
Total loss	4	6.08		

For later operations see Appendix, page 394

THE TALISMAN CONSOLIDATED, LIMITED

NEW ZEALAND

Year Ended Feb. 29

Production	1912
Bullion, ounces	271,648 18 dwt.
Values realized	£233,297 14s. 11d.
Total expenditure at mine (ex. const.)	90,298 17 6
	£142,998 17 5
Tons crushed	47,920
Yield per ton	£4 17s. 4.4d.
Contents bullion and concentrates, gold	53,936 oz. 9 dwt. 14 dwt.
Contents bullion and concentrates, silver	207,612 oz. 2 dwt. 22 dwt.
Recovery gold, per cent	93.6
Recovery silver, per cent	80.6
Recovery by value, per cent	92.1
Costs per ton:	s. d.
Mine development	9 8.8
Mining	12 9
Milling	13 .9
Karangulake office	2 1.3
Construction and equipment	5 8.3
Total working expenditure	£1 17s. 8.2d.
Development	3,219 ft.
Stamp duty per day	3.94 tons
Grade ore reserves	£6 0 0

Remarks.—**Accessibility.**—Short distance from Auckland and connected by rail.

Character of ore.—Free milling.

Character of ore-body.—Lenticular.

Width of ore-body.—5 to 6 ft.

Method of opening.—Adits above No. 8 level and internal shaft below.

Method of mining.—Flat back and rills.

Depth of mine.—Bottom level (No. 14) is 450 ft. below river level.

Amount water pumped.—No record in London.

Method of ore reduction.—Forty-stamp mill, fine grinding (tube mill) amalgamation, concentration, cyanidation.

General Conditions.—Grade of ore developed being maintained at about £6 per ton. Labour conditions improved since settlement of Waihi strike.

For later operations see Appendix, page 394

WAIHI GOLD MINING CO. LTD.

NEW ZEALAND

Year Ended Dec. 31

	1912	1911	1910
Total metal production	£278,438 19s.	£679,116 11s. 3d.	£926,861 9s. 9d.
Total gross production	293,790 16	692,833 17 9	.....
Total expenses	174,078 0	321,293 19 6	.....
Total profit	119,712 16	371,539 18 3	.....
Tons ore milled	147,828	350,699	442,020
Average value	£2 2s. 9.5 d.	£2 2s. 10.3 d.	£2 1s. 10.04d.
Average value of tails	4 4.65	0 4 7.85	.....
Mill extraction, per cent	89.7	89.2	.....
Costs per ton:			
Mining	8s. 1.08d.	6s. 8.76d.	6s. 5.64d.
Development	1 6.60	1 8.04	0 11.05
Transportation	4.56	0 3.72	0 3.05
Milling	2 4.08	2 3.0	2 6.0
Cyaniding	3 9.00	3 6.36	3 6.0
Repairs	.....	0 6.96	0 5.75
General mine expenses	4 6.96	2 3.0	2 1.68
London	0 10.08	0 3.6	.....
Miscellaneous	1 11.7	0 0.24	0 10.25
Total	23s. 6.06d.	17s. 7.68d.	£0 17s. 1.82d.

Note.—During 1912 the mines were closed from May 13 to Oct. 2 owing to a labour strike. Costs and production not normal.

The veins are fissures with quartz filling varying in width up to 50 ft.

The mine is operated through shafts to a depth of about 1200 ft. In 1911 the mine pumps handled 729,355,799 gal. of water.

The milling plants consist of three mills with the following equipment:

	Stamps	Tube mills	Time	Tonnage
Waihi Mill	90	5	297 days	111,133
Victoria Mill	200	11	297 days	238,093
Union Mill	40	1	26 days	1,473

Approximate duty per stamp, 5 tons crushed to 10-mesh.

	1912	1911
Average number stamps operating	170	236.8
Average number tube mills operating	8.98	13.7
Running time, days	172	.....

The ores are stamped, concentrated, reground and the entire products cyanided. Total yield of mine to 1913, £10,118,217.

For later operations see Appendix, page 394

TASMANIA

MOUNT LYELL MINING & RAILWAY CO., LTD.

MOUNT LYELL, TASMANIA, AUSTRALIA

Semi-annual Reports Ended

	Sept. 30, 1912	Mar. 31, 1912	Sept. 30, 1911	March 31, 1911
Total income	£326,112	£163,694	£306,311	£326,058
Expenses	219,940	143,171	237,278	240,283
Profit	106,172	20,523	69,033	85,775
Production:				
Refined copper, tons	3,124	1,482	3,797	4,063
Silver, ounces	213,284	102,454	246,099	298,458
Gold, ounces	4,316	1,858	5,018	5,357
Tons ore smelted	157,167	63,651	160,695	183,094
Average metal content:				
Copper, per cent	2.45	2.73	2.70	2.63
Silver, ounces	1.58	1.69	1.56	1.75
Gold, ounces	0.026	0.027	0.027	0.029
Costs per ton smelted (calculated from balance sheet):				
Mining and development	10s. 0.19d.	12s. 9d.	9s. 2.88d.	7s. 10.56d.
Smelting	8 9.43	12 8.28	9 6.36	8 7.56
Converting	1 1.35	2 0.72	1 4.32	1 2.04
Railway	1 8.89	3 6.12	1 8.76	1 7.56
Frt. on Cu. and charges	2 5.73	3 10.56	3 2.04	2 10.68
Prospecting	0 9.02	1 2.88	1 3.48	1 6.72
Div. and income tax	0 9.08	0 2.88	0 7.56	0 5.64
Depreciation	1 2.67	3 5.76	1 2.28	1 1.08
Strike expense	. ....	2 3.60	. ....	. ....
General office expense	1 1.47	2 9.6	1 4.68	1 0.24
Total expense	27s. 11.78	40s. 11.4	29s. 6.36	26s. 4.08
Cost per ton ore to produce blister Cu. as given in reports.	20s. 0.51	27s. 5.41	20s. 0.49	17s. 8.04
Tons Cu. sold, old stock	1,172	1,265	1,196	787
Price received per ton	£78 0s. 5d.	£65 6s.	£57 16s. 10d.	£58 10s. 6d.
Tons Cu. sold, new stock	2,128	310	2,532	2,867
Price received per ton	£81 2s. 11d.	£73 1s. 1d.	£57 2s. 3d.	£57 3s. 3d.

See also Appendix, pages 391 and 394

THE TASMANIA GOLD MINE, LTD.

Year Ended Sept. 30.

	1911
Production gold, ounces	23,141
Value gold produced	£97,820
Total income incl. miscel	97,893
Total expenditures	101,913
Loss	£4,020
Output from mine, tons	53,968
Quartz treated:	
Tons treated	53,564
Fine gold extracted, ounces	14,741
Yield per ton	5 dwt. 12 gr.
Grinding plant:	
Treated tons	11,683
Of which from furnaces	8,801 tons
From roasted conc. heaps	1,643
From chlorination tail. heaps	1,239
Gold extracted	7,055
Yield per ton	12 dwt. 2 gr.
Cyanide plant:	
Treated tons	23,200
Gold extracted	738
Yield per ton	0 dwt. 15 gr.
Slags shipped, ounces	222
193 tons concrete flooring containing oz. gold	385
Total ounces gold	23,141
Total standard ounces	25,236
Product through roasting furnaces:	
From concentrates heaps, tons	4,341
From accumulated sand heaps	4,460
	8,801
Cost per ton (calculated):	
Mining, tramming, pumping and crushing	23.50s.
Milling	3.42s.
Concentrating	1.48
Roasting	1.08
Grinding, filtering and cyaniding	3.50
Repairs and general expenses, Tasmania	2.00
Administration at mine	1.15
English office expense	.76
Total expense	36.89s.

See also Appendix, pages 392 and 394

EUROPE

EUROPE

RUSSIA

THE KYSHTIM CORPORATION, LTD.

KYSHTIM, RUSSIA

Tons = Long Tons, 2240 lb.

Year Ended Dec. 31

Currency £ and Rubles

Production	1912		1911	
Electrolytic copper, tons	7,547		5,140	
Gross receipts	£1,221,379		.....	
Total expenses	752,978		.....	
Profit	£468,401		£172,394	
Mine:				
Ore mined, tons	347,850		247,102	
Grade copper, per cent	3		3.19	
Grade gold, ounces	.10		.....	
Grade silver, ounces	1.1		.....	
Total shipments, tons	338,379		233,052	
Smelter:				
Ore charged to blast furnaces, tons	300,100		218,310	
Net blister copper produced, tons	7,030		3,804[1]	
Recovery metal, blasts furnace:				
Copper, per cent	75.2		.....	
Gold, per cent	81.0		.....	
Silver, per cent	69.8		.....	
Refinery:				
Kathodes produced, tons	7,547		4,033	
Slimes produced, pounds	47,647		18,402	
Slimes realised	£129,020		£55,321	
Slimes realised per ton kath	£17.2		£13 14s.	
Costs (rubles):	Per ton ore	Per ton blister	Per ton ore	Per ton blister
Mining	R2.92	R129.51	R2.78	R126.98
Smelting	3.81	168.78	3.48	159.09
Transport	0.23	10.02	.28	12.77
Overhead expenses	0.36	15.91	.58	25.70
Total	R7.32	R324.22	R7.12	R325.5
Refinery cost per ton blister	....	38.55	.....	
Transport to refinery	.....	2.42	.....	
Total cost	....	R365.19	.....	
In terms copper del. to RR	....	R369.63	.....	

THE KYSHTIM CORPORATION, LTD.—*Continued*

Production	1912		1911	
Costs (s. and £):	Per ton ore	Per ton blister	Per ton ore	Per ton blister
Mining	6.1s.	£13.64	5.9s.	£13.43
Smelting	8.0	17.77	7.4	16.83
Transport	.5	1.05	.6	1.34
Overhead expenses	.8	1.68	1.2	2.72
Total	15.4s.	£34.14	15.1s.	£34.32
Refinery cost per ton blister	....	4.06	.....	.....
Transport to refinery	....	0.25	.....	.....
Total cost	....	£38.45	.....	.....
Net cost after credit of gold and silver in refinery slimes (approximate).	....	£22.	....	£20.3.
Cost per pound, cents		4.8		4.4
Development, feet		9,351		7,303
Grades ore reserves (per long ton):				
Copper, per cent		3.0		.....
Gold, ounces		.1		.....
Silver, ounces		1.0		.....

[1] Shipped.

Remarks.—The Kyshtim Corporation is the English Company. The Kyshtim Mining Works Co. is the Russian Company. The shares of the latter are held by the Kyshtim Corporation. The works are located at Kyshtim, Russia. **Accessibility.**—Kyshtim is on Siberian Railway, mines and smelter 30 miles away, connected by Co. Ry. 36-in. gauge.

Character of ore-body.—Lenticular, replacements in belt of schist, in the main narrowing to the north and widening into impregnated zone to the south. **Character of ore:** Massive pyrite, with some schistose.

Width.—Varies, largest 35 ft. maximum and following above rule. One of the principal ore-bodies has the following dimensions: Aggregate length, 2950 ft.; Average width, 13.3 ft.; average grade, 3.18 per cent. copper.

Method of opening.—Two inclined shafts in footwall, one incline (old) in ore, three main vertical. **Method of mining.**—Square-sets.

Depth of mine.—Deepest 750 ft. Ore proven by bore-holes to 900 ft.

Amount water pumped.—Small, not over 75 gallons a minute at any one mine. **Method of ore reduction.**—Pyritic smelting for coarse (+ ½ in.); fines and flue-dust in gas-fired reverberatories (regenerative).

General Conditions.—Labour cheap and mediumly efficient. Mechanical work as good as anywhere. Masonry poor. Furnace work good. Supervision excellent. Fuel is wood and coal, coal high in ash. Copper is refined electrolytically at the Lower Kyshtim Works.

In addition to the copper mines and smelters, the Kyshtim Co. operates iron works, gold and silver alluvial deposits, sulphur pyrites mines, etc.

See also Appendix, pages 392 and 395

GERMANY

MANSFIELD COPPERSCHIST MINING CO.

GERMANY

Tons metric, currency marks	1912	1911
Electrolytic copper, tons	20,503	20,850
Silver, kg	112,651	113,272
Total income, marks	43,864,102	35,735,098
Net income	15,017,390	.....
Net profit after bond int. dep., etc	3,077,879	.....
Mine:		
Ore production, tons	879,695	795,206
Cost per ton, marks	25.70	23.95
	Copper kg. silver	Copper kg. silver
Contents ore shipped to smelter	25.70 0.0155	29.31 0.020
Smelter:		
Matte produced, tons	53,888	52,847
Copper recovered	24.57	26.15
Black copper produced, tons	28,248	28,863

SPAIN

RIO TINTO COMPANY, LTD.

SPAIN

The annual reports contain very few data of interest and no operating costs. The following figures on production may be of interest:

	1912	1911
Tons mined for shipment without treatment	698,399	649,215
Tons mined for local treatment	1,708,570	1,536,390
	2,406,969	2,185,605
Tons copper sold	39,925	33,385
Price received	£73 1s. 0d.	£56 1s. 9d.

THARSIS SULPHUR AND COPPER CO., LTD.

ALOSUO, HUELVA, SPAIN

Year ending Dec. 31,	1912	1911	1910
Net profit	£253,066	£188,140	£161,211
Production tons refined copper	3,377	3,393	3,494
Tons ore extracted Tharsis Mine	33,480	50,741	52,031
Tons ore and sterile extracted Calanas	331,322	282,027	321,266
Total ore raised excluding sterile	352,281	327,348	362,750
Total tons shipped	555,616	481,700	468,622
Cost data not available. —			

APPENDIX

ALASKA TREDWELL GOLD MINING CO.

TOTALS FROM 1885 TO 1911		WAGE SCALE	
Tons milled	$12,089,540	Machine drillers	$3.50 day
Tons yield	29,400,313.10	Machine helpers	3.25 day
Yield per ton	2.43	Mine laborers	3.00 day
Concentrate per ton	1.34	Amalgamators	120 per mo.
Dividend	12,135,000	Feeders	100 per mo.
		Vannermen	95 to 130 mo.
		Machinists and helpers	3 to 7 day
		Blacksmiths	5 to 6 day
		Tool sharpeners	4.50 day
		Blacksmiths' helpers	3.00 day

Remarks.—The mine is located on Douglas Island at tide water. The ore-bodies are large zones of altered albite diorite reaching a width of over 400 ft. The present depth by shaft is 2000 ft. The ore is gold bearing with the values nearly evenly distributed in free gold and in the iron pyrites. The mine was first operated by open-pit method but for several years it has been operated entirely through shafts. The workings are supported by pillars of ore. A heavy construction expense occurred in 1912. New shaft, hoist, concrete ore bins and cyanide plant for concentrates have been installed.

The milling method is as follows: The ore is crushed in large gyratory crushers, stamped, amalgamated, concentrated on vanners and the concentrates from the three mines cyanided in one plant. The Treadwell, Mexican and United are under one control and management.

THE BISBEE CAMP

Located a few miles north of the Mexican line. Though situated far south the elevation is sufficiently high to give excellent climatic conditions. The principal mines of the camp are Copper Queen, Calumet & Arizona, Superior & Pittsburg (now merged with Calumet and Arizona) and the Shattuck-Arizona. The ore-bodies occur in carboniferous limestone, near granite porphyry. Limestone dips 30 deg. and has a thickness of 50 to 100 ft. normal. On the Copper Queen property the ore comes to the surface. It occurs at greater depth on the Calumet and Arizona property and still greater on the Superior and Pittsburg property. The ores consist of rich oxides of copper, black and red, malachite and azurite, pyrite, chalcopyrite and copper glance. Oxide ores are sometimes found at great depth, while sulphides have been found near the surface. The ore shipped averages 6 to 7 per cent. copper with gold and silver values. The proportion of sulphide ore to oxide is increasing and roughly 2 tons of former are being developed to one of latter. Owing to the occurrence of the ore-bodies, which are in big masses scattered through the ledge matter, the amount of

development which has to be carried on is very great. This is but one of the items which is responsible for the high costs in this district. The ore-bodies occur in soft ground and have to be timbered as soon as opened. The pressure is very great, breaking the largest timbers. The timber charge per ton of ore is heavy. Timber costs $28 per M. In the Calumet and Arizona and Superior and Pittsburg mines the water is an expensive item (See Superior & Pittsburg.).

CALUMET AND ARIZONA MINING CO.

Note.—The costs per ton worked out from the annual reports do not check with the cost per pound given in the reports. This is due to certain ores from the Courtland camp not being included. The figures shown on cost per ton are derived after certain estimates are made on these ores. In several cases the management has given tonnage figures not given in the reports.

Remarks.—Property is developed by two working shafts, the Irish Mag and the Oliver. Maximum depth 1600 ft. Ore-bodies occur in limestone near porphyry contact. They are irregular in form and often very large. Ore consists of carbonates and oxides of copper, malachite, azurite, black and red oxides and native copper. The sulphide ore-bodies consist of chalcopyrite and chalcocite. The method of mining is square setting. Owing to the very heavy character of the ground little ore is opened ahead of the stopes. Ground requires heavy timbering. Timber is very high. All ore is smelted direct, and is sorted to smelting grade. Although some water is encountered it is not excessive. The smelter is located at Douglas, 25 miles from the mine, to which it is connected by rail. This plant treats the Superior & Pittsburg and Shattuck-Arizona ores. In 1913 the company placed in commission its new $2,000,000 smelter. The company is said to have low freight rate between these points. Blister copper is shipped to Atlantic seaboard for refining. Electric power is used at both mine and smelter.

SHATTUCK ARIZONA COPPER CO.

Remarks.—The Shattuck-Arizona mine is developed to a depth of 900 ft. Property is opened by one shaft. Connection is made, however, with the Calumet & Arizona, Copper Queen and Wolverine workings, which gives good air. Total development aggregates 8 miles. The ore-bodies are irregular in shape in the limestone, varying from a few feet to 100 ft. in width. One of these bodies is 1200 ft. in length.

The method of mining is by square-set or stulls. Timber is expensive, costing from $20 to $22 per thousand, Oregon pine being used. The water is not excessive as at some of the Bisbee mines, and amounts to from 40 to 50 gal. a minute. Pumps not operated continuously. Power is generated

from oil pumped up to the mine from the railroad. Ore is transported to railroad by 3500-ft. aerial tramway.

The ore consists of chalcocite, carbonates of copper, native copper in bunches, also cuprite. A rough analysis of the ore is as follows:

Iron	20–25 per cent.
Lime	1.9 per cent.
SiO_2	16 per cent.
Al_2O_3	10 per cent.

The ores are shipped by rail to the Calumet & Arizona smelter at Douglass, 25 miles distant,where they are smelted

DETROIT COPPER MINING OF ARIZONA

Note.—Costs per ton are not available.

By the introduction of new systems of mining, the tons mined per man in 1909 was 2.566 against 1.81 tons in 1908. During the year the following tonnage was mined: 55,900 square-setting, 75,077 caving, 217,160 slicing.

During 1911 the relative costs were as follows:

	Slicing	Block caving	Square set and fill	Under-hand, sq.-set and back-filling	Gopher and fill
Cost sq. setting as basis	81.6	54.8	100	127	51
Timber used per ton, ft. B.M	9.03	1.85	10.19	14.99	1.8

Average timber used, 8.985.

Remarks.—Location Morenci, Ariz. Has rail connection with S. P. R. R. Operates several large mines. Method of opening adits and shafts. Deepest workings not over 500 ft. Ores are chalcocite and chalcopyrite, both as disseminations and network of interlacing veins in monzonite porphyry. Method of mining principally top slicing, but some ore is mined by square-setting and block caving. Equipment includes concentrator and smelter with converters both situated at the mines. Water for concentration is pumped 6 miles against 600 ft. head. It is re-used. Blister copper is refined at Atlantic seaboard.

RAY CONSOLIDATED COPPER CO.

Remarks.—Property located at Ray, Arizona. Mine and mill situated on railroad. Company owns R. R. from mine to Ray Junction, 7 miles. Haul is thence by So. Pac. R. R., 14 miles to concentrator.

Formation is Pinal schist, called porphyry. Ores are disseminated, consisting of secondary chalcocite. Aver. thickness overburden 252 ft. Aver. thickness ore 101 ft. Churn-drilling covered area 183 acres. Ore-body 7000 ft. in length by max. of 2000 ft. wide. Ore reserves Dec. 31,

1913, 78,380,966 tons assaying 2.20 per cent. copper. Property opened by 3 main shafts. Development aggregates 55 miles.

Method of mining "shrinkage stopes." Stopes 15 ft., pillars 10 ft.; pillars are drawn with the broken ore. Main drifts are driven at right angles to stopes. Method known as "Cates method." This system is giving very good results. Mine has electric haulage throughout, in fact, entire plant operated by electricity. Power is generated at concentrator from coal and transmitted to mine. Ore hoisted in 12-ton skips. Ore crushed to 1 in. size at mine. Concentrator 8000 tons daily normal capacity. Will probably handle 10,000 tons. Concentrates are smelted at A. S. & R. Smelter which is situated at the mill. Company has very low smelting rate. Blister copper is shipped east for refining.

YUBA CONSOLIDATED GOLDFIELDS

Remarks.—Company operates 13 dredges. In 1912, eleven were operated continuously and part of the year 13. The new No. 13 dredge is said to be the largest in the world. It handles nearly 8300 yd. a day at an average cost of 3.11¢ per yard. This is stated to be the highest efficiency in dredge construction. The operating conditions are very favorable at the Yuba Consolidated property. Electric power is cheap. Climatic conditions good, winters mild and many other conditions which make for low costs.

PENN MINING CO.

Remarks.—Accessibility.—Sou. Pac. R. R., 5 miles.

Occurrence of Ore.—Lenses.

Character of Ore-bodies and Width.—65 deg. dip, irregular widths.

Character of Ore and Analysis.—Sulphides, 30 per cent. S, 20 per cent. Fe.

Method of Development of Mine.—Shafts 75 deg. and 1450 ft.

Method of Mining.—Butte stull system, back filling.

Capacity of Smelter.—Two hundred tons.

Remarks Pertaining to Operating Conditions.—Reverberatory oil-fired furnaces. Local labor.

Note.—It has been impossible to obtain costs at this property. The above data on production, grade ore, etc., may be of value in giving information on the copper deposits in this section of California.

FIRST NATIONAL COPPER CO.

Remarks.—The Balaklala mine is located 3 miles from Coram, a station on the main line of the Southern Pacific, where the smelter is situated. The ore-bodies occur in a rhyolite formation, the ore being in large masses as replacement of country rock. The ore-bodies dip at a slight angle. They average in the neighbourhood of 40 ft. thick, and are of considerable extent,

the largest body being roughly 800 to 1000 ft. long by 300 ft. wide and 40 ft. thick. Development is carried on entirely by tunnel.

The ore is a heavy homogeneous iron pyrite carrying from 2½ per cent. to 3 per cent. copper, with about $1 gold and silver values. The method of mining is caving, very little timber being used. The ore is dropped by gravity and hauled by electric locomotives to the ore-bins, thence by aerial tramway to the reduction works. The ores are smelted direct. The smelter is of 1250 tons capacity, consisting of three blast furnaces and one reverberatory. The average analysis of the Balaklala ore is as follows: Gold, .025 oz.; silver, .944 oz.; copper, 2.627 per cent.; iron, 29.4 per cent.; silica, 23.88 per cent.; alumina, 4.85 per cent.; sulphur, 35.35 per cent.; zinc, 2.6 per cent. The ore is smelted to a 25 per cent. matte.

The First National Copper Co. has experienced great difficulty with the farmers owing to sulphur fumes given off in smelting and operations were discontinued in 1911. The property was still shut down at the close of 1913. At that time, however, there was installed the Hall Desulphurizing Process. This method was tried out in 1914.

CAMP BIRD LTD.

Remarks.—The ore-bodies occur in a fissure vein in andesite. The stoping width is from 5 ft. to 8 ft. The ore is hard, white to blue quartz carrying gold in the native state and in iron pyrites.

The vein is back-stoped. The workings are tunnels and underground shafts. The ore is stamped, amalgamated, concentrated and the tails cyanided. The costs of this property are comparatively high owing to its being about 8 miles from the railroad which necessitates hauling concentrates and supplies over a hard mountain road which in winter is at times impassable owing to heavy snow. The mine is located at an altitude of about 11,000 ft. and connected with the mill by an aerial tramway. Frequent snowslides are a source of expense and interruption.

Mill has 40 stamps	Tons	Gross value	Net value	Gross ave. value per ton
Production since 1903.....	702,209	$20,084,450	$12,951,193	$28.50

LIBERTY BELL GOLD MINING CO.

Remarks.—The vein is a fissure varying in width from 3 ft. to 4 ft. The ore is gold- and silver-bearing quartz containing iron pyrites. The mine is operated through tunnel levels. The ore is sent to the mill over an aerial tram. The milling method is crushing by stamps, amalgamation, concentration, regrinding and cyaniding. The railroad and smelting facilities are good. Winters are very severe which at times interfere with operations.

The company has discontinued publishing its cost, consequently the year 1912 as shown here is incomplete.

IRON SILVER MINING CO.

Remarks.—The company operates the Moyer and Tucson mines. Development is entirely by shafts to a depth of about 800 ft. In addition to the development work now being carried on at these two mines work is being done on the Blind Tom and South Moyer. According to the 1913 report the ore shoot in the Moyer mine which was discovered late in 1911 and which has been the only important source of production since that time has proved to be one of the largest ore-bodies ever developed in the Iron-Silver property. It has been opened to date for a continuous length of 400 ft., averages 70 ft. in width and 25 ft. in thickness. The limitations of the ore-body to the southward have not yet been determined.

The method of mining employed at the Moyer mine is the square-set system of timbering, re-inforced by waste filling. The ground is very heavy and many sets cannot be left open at one time without danger of caving. As the ore is taken out the sets are filled in behind the working faces. This filling is obtained from exploratory drifts and workings in the surrounding porphyry. All the ore is shipped as broken. Under the conditions which exist the mining method is the most satisfactory and cheapest for this ore-body—it avoids the use of any considerable quantity of timber. The ore-shoot is entirely enclosed in white porphyry. Those previously worked were located along the porphyry blue lime contact.

At the Tuscon mine the ores are much more widely scattered than at the Moyer and a large amount of development work has to be carried on.

The character of the ore may be had from the above production data. The ores are shipped to the Leadville smelters, to Florence and Canyon City plants and some to the Western Chemical Co.

No cost data are available.

YAK MINING, MILLING & TUNNEL CO.

Remarks.—Property is developed by the Yak Tunnel, located 700 ft. below the surface and also by other workings to a depth of 1300 ft. The ore is trammed through tunnel and dumped into railroad cars and transported to the smelters. Much of the Yak iron ore has the following composition: Iron, 40 per cent.; silica, 5 per cent.; upward 40 per cent. sulphur; 5 to 12 oz. silver; 0.05 oz. gold; trace lead and trace copper. The ore occurs in stringers, blanket veins and shoots, the last named varying up to 150 ft. $\times$ 150 ft. $\times$ 150 ft. These bodies are worked by square-setting, the stopes after the ore is removed are filled with waste. The method of treatment is direct-smelting, and the ore is not subjected to any preliminary water concentration.

It will be seen that in 1910, when the average value ore shipped was less than $4 and the cost of mining and tramming was less than $2.50, that even on this extremely low-grade ore, allowing for credits, there was a small profit. These low-grade ores are extensive. This property produces the various oxide and sulphide ores of lead, zinc and iron customary to that district, although some of them at times in small quantities. The principal ore mined, however, is an iron sulphide, which occurs in large bodies, but the market for which is limited by the smaller output of siliceous ores with which the sulphide is combined in smelting. The ores are sent to the Colorado plants, to Kansas and Oklahoma zinc smelters, Iola, Kansas and Argentine, Kansas, and other points, for making sulphuric acid. The data in this report, based upon operations of the year 1910, and prior to that time, have not varied greatly since said date and up to Oct., 1913.

STEWART MINING CO.

Remarks.—Accessibility.—Connected by gravity-tramway with Wallace branch of the O. Ry. & Nav. Co. Adjoins Bunker Hill & Sullivan mines at Kellogg, Idaho. **Character of ore.**—Galena carrying silver, values being approximately for lead 57 per cent. of total value and for silver 43 per cent. of total value. **Character of ore-body.**—It lies in the Burke quartzite and occurs as a replacement of same along a regular fissure cutting the bedding planes of enclosing strata. **Width of ore-body.**—3 ft. to 56 ft., average width about 10 ft. **Method of mining.**—Over-head stoping using stull timbering and where necessary square-sets. **Method of opening.**—Tunnels, three in number, connected by inside shafts or raises. **Depth of mine.**—About 600 ft. **Amount of water pumped.**—Drainage is through tunnels, no pumping except in sinking winzes. **Method of ore reduction.**—Wet concentration of second class, first class smelted at A. S. & R. Co. works, Helena, Mont. **General conditions.**—Mining and milling about 450 tons daily from which 15 tons of first class is sorted. Grade of concentrating ore 9½ per cent. Pb. and 10 oz. Ag. Grade of first class ore 46 per cent. Pb. and 48 oz. Ag. Average net profits per month since Jan. 1, 1913, have been $39,895. **Mill and smelter, where located.**—Milling done in Mammoth Mill at Wallace, leased from Federal Mng. & Smelting Co.

AHMEEK MINING CO.

Mine.—The mine is developed by four shafts. Two of these shafts are inclines sunk at about 40 deg. The other two shafts at the Ahmeek, which are sunk in the hanging wall, are at an angle of 80 deg. On striking the lode these shafts are curved until the direction of the vein is attained. The Ahmeek property is developed to a depth of more than 2700 ft. The Kearsarge lode averages 12 to 14 ft. in width. The method of mining em-

ployed is back stoping. The dip of the lode is slightly over 40 deg. The equipment at the mine is very complete.

Mill.—The Ahmeek mill is equipped with four stamps. It is the intention of the management to install two more. Steam power is employed.

Ahmeek is one of the lowest-cost producers of any of the Lake mines.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

ALLOUEZ MINING CO.

Remarks.—This property adjoins the Ahmeek. Operations were originally carried on on the Allouez conglomerate. Development was then conducted on the Osceola lode, but this was later abandoned. Present work is confined to the Kearsarge amygdaloid. Copper occurs in native state disseminated through the amygdaloid. This lode averages approximately 12 ft. in width. The mine is developed by two main shafts. These shafts started at very steep angles until near the lode, when they curved to conform to dip of the vein. The vein averages from 38 deg. to 39 deg. The Allouez company owns a half interest in the Lake Milling, Smelting & Refining Co. and its ore is treated at this plant, together with that of the Centennial mine. The plant is equipped with six stamps. Two of these have been employed on Allouez rock. During year 1912 the one-man drill was installed and by the middle of 1913 these were used throughout the mine. Shortage of trammers has tended to keep down production.

In 1913 production was seriously curtailed owing to labor strike.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

BALTIC MINING CO.

Remarks.—The Baltic is the most northerly of the Copper Range properties, the Baltic, Trimountain and Champion. The company's mining operations are confined to the Baltic Amygdaloid lode, which lode is continuous through and worked in all three properties. The Baltic property is developed by four inclined shafts extending over a distance of approximately 3000 ft. The maximum depth attained Jan. 1, 1913, was 2526 ft. The dip of the Baltic lode is much steeper than the lodes at the other copper properties in the Lake District, being about 70 deg. The dip of the lode at the Baltic mine is the steepest of any of the Copper Range properties, and averages about 73 deg. The Baltic lode averages around 30 ft. in width with a maximum width of 60 to 75 ft.

The method of mining in the Copper Range properties differs from that of the other Michigan mines and is known as the Baltic system. The Baltic lode is a wide strong bed, well-mineralized but well adapted to sorting.

In addition to this condition, bodies of copper rock are found in the walls. The method originally employed was one of broken ore in the stopes, but it was found that the method was not well adapted to the conditions. The Baltic System which was devised consists in mining on a filling of waste with dry walls built up along the drifts, thereby effecting a considerable saving in timbering; also, in the case of mill-holes where dry walls are used in place of cribbed chutes. The rock is sorted underground, the waste being rejected. The level pillars are mined by caving.

The Baltic mill, composed of two compound stamps and four simple stamps, is located on Lake Superior. The mill is equipped with an elaborate water system including a very heavy concrete and steel dam across the mouth of the Salmon River. The system permits of a gravity flow, no pumping being necessary. The construction of a plant for the regrinding of tailings was installed during the year. This is composed of 45 Hardinge mills at the three stamp mills. Plant is operated by electricity generated from low-pressure steam turbine at Baltic mill.

Steam power is employed at both the Baltic mine and mill, coal being used for fuel. Electric power is generated. The Copper Range Railroad connects the mine and mill also with Houghton, Mich., and the through trunk lines.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

CENTENNIAL COPPER MINING CO.

Remarks.—This mine is situated at Calumet, Mich. The property contains the Calumet conglomerate, Osceola amygdaloid and the Kearsarge amygdaloid. Copper occurs in native state disseminated throughout the beds. Both the Calumet and the Osceola lodes were operated unsuccessfully. Development is now confined to the Kearsarge amygdaloid. This lode averages around 12 ft. in width, is developed by two shafts, Nos. 1 and 2. The No. 1 shaft has attained a depth of 3821 ft. and the No. 2 shaft 4158 ft. The lodes at the Centennial property have a dip of from 38 deg. to 40 deg. The method of mining is by back stoping. The property is equipped with steel shaft house, rock house, compressor plant, boiler plant, etc. Steam power is used. Rock from the Centennial mine is treated at the Lake Milling, Smelting & Refining Company's plant. This mill consists of six heads, two of which are assigned to the Centennial rock. During year 1912 the Leyner-Ingersoll one-man drill was adopted. The mine and mill have railway connections, being situated on the Copper Range and Mineral Range Railroads.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

CHAMPION COPPER-CO.

Remarks.—Champion is one of the Copper Range properties. It is located southwest of the Trimountain mine. The principal developments are on the Baltic lode, which traverses all the Copper Range territory. The bed in Champion ground averages about 25 ft. in width, but in places swells to 50 ft. The dip is about 70 deg. The mine is developed by four large inclined shafts. The maximum depth attained is 2514 ft. The method of mining employed is similar to that of the Baltic, namely, mining on a filling of waste. Electric power is employed at the mine, being generated from steam. Mine has electric haulage. Improved drilling machines were installed in 1912.

The mill is located at Freda on Lake Superior. It contains four compound stamps and two simple stamps. The total capacity of the plant is about 4,000 tons. The mill is operated by steam power. The water used is pumped from the lake. The mine and mill are connected by the Copper Range R. R.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

ISLE ROYAL COPPER CO. OF N. J.

Remarks.—The Isle Royale property is situated southeast of town of Houghton, Mich. Company's operations are confined to the Isle Royale and Portage amygdaloid beds. Copper occurs in native state disseminated through the formation. The mine is developed by four important shafts. A new No. 7 shaft is now being sunk. The property is opened by incline shafts to a depth of over 3000 ft. Three other shafts vary from 1200 to 2000 ft. The Isle Royale lode averages about 12 ft. in width; 45 per cent. of the lode is actually stoped and 15 per cent. of the stoped rock discarded. Method of mining employed is back stoping.

The Isle Royale mill is located about a mile from the mine on Portage Lake. Mine and mill are connected by company railroad and both with through trunk-lines. During 1912 the one-man drill was installed and by July, 1913, it is stated that two-thirds of the drills in use were of this type. During 1912 the company suffered from shortage of labor. This has been one of the causes which contributed to higher costs.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

LAKE COPPER CO.

Remarks.—The Lake Mine is situated about 30 miles west of Houghton, Michigan. The property is located on a continuation of the copper belt on which the large producers are situated. The formation in general is the same as the other properties at "the Lake." Development work has been

carried on in an amygdaloidal bed averaging 50 to 100 ft. in width. The mineralized portion of the lode is very irregular. At times rich rock is encountered with much mass copper. The dip of the lode at the surface is about 37° but flattens out as depth is attained. Mine is down to eleventh level.

The conditions at Lake are similar to those at the Baltic and the filling system of that property is used in mining. System is satisfactory but picking and filling is expensive. In places, owing to scarcity of suitable rocks, timber has been employed for the rock walls and has been found cheaper. Lake ships its rock to both the Trimountain and Baltic Mills.

Lake is one of the newer Michigan copper properties. For several years it has been in development and equipment stage. Production was begun during 1912.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

MASS CONSOLIDATED MINING CO.

Cost per Pound.—The following results were obtained in the first and last five months of the year 1912.

	First five months, cost per pound refined copper	Last five months, cost per pound refined copper
Total tons stamped	40,443	80,234
Average tons stamped per day	311.1	622.0
Pounds refined copper produced	660,341	1,189,232
Mining and development expense	.10202	.07619
Surface expense	.01892	.01712
Office and general expense	.00241	.00131
Taxes and insurance	.00733	.00407
Freight on rock and mineral	.01078	.01187
Stamp mill expense	.02489	.02051
Smelting, freight and eastern expense	.01673	.01355
Total mining cost	$ .18308	$ .14462

Remarks.—General conditions are more or less the same as at the other Michigan copper mines. See "Brief Description of Lake Superior Copper District."

QUINCY MINING CO.

The Quincy reports have never contained a great deal of information on tonnage mined, sorted, stamped, etc. The above figures on the cost per ton are calculated from what little data are given ont his subject. It will be noted that different tonnages are given in the various reports.

Remarks.—Quincy is one of the oldest of the Michigan Copper mines. The Pewabic Lode which is worked at Quincy has been developed for

over 1¾ miles in length. The deepest shaft is approx. 6000 ft. The dip of the lode in the lower workings is 37 deg. Property is opened by five shafts. The copper occurs in the native form. The vein system is composed of several branches. The small widths of these make for high cost of mining. Character of deposits necessitates heavy development. Owing to flat dip of lode rock has to be helped down the stope. Company has experienced some bad air-blasts doing considerable damage.

The rock is treated at the Quincy mills, Torch Lake 6 miles from mine. One mill has five heads the other mill three heads. Steam stamps are used. Mine and mill connected by company R. R. The Quincy smelter is situated at Hancock near the mine. Miners' wages average $70 to $72 per month. Trammers' wages average $65 per month.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

SUPERIOR COPPER CO.

Remarks.—Property is located south of Houghton between Isle Royale and Baltic mines. Operations are confined principally to the Baltic amygdaloid. Property is developed by two incline shafts, the depths of which are given in the data above. In addition to the Baltic lode, the company has encountered and developed the West Lode. The lode at the Superior mine is very wide, running up to 130 ft. and averaging from 30 to 40 ft. The total extent on the lodes possibly amounts to 6500 ft. Development has been carried on to a length of over 2500 ft. The lodes dip to angle of about 50 deg. The copper occurs in the native state disseminated through the amygdaloid. The Superior rock is treated at the Alloucz Centennial mill owned by the Lake Milling, Smelting & Refining Co. The mine is equipped with steam power. Both mine and mill have rail connection.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

TAMARACK MINING CO. OF MICHIGAN

Remarks.—The Tamarack property is situated adjoining the Calumet & Hecla. At this mine the under-lay of the Calumet Conglomerate and Osceola Amygdaloid beds have been opened by vertical shafts rather than by the usual inclined shafts found in the Lake District. The property is developed by five shafts. Tamarack holds the distinction of having the deepest shaft in the world. The No. 3 and No. 5 are both over a mile in depth. The deepest was 5308 ft. in 1913. Mining has been carried on extensively on both Calumet Conglomerate and on the Osceola Amygdaloid. In 1912, however, operations on the latter were discontinued owing to the poor grade of rock encountered. The average width of the lode is from 12 ft. to 15 ft. Mining costs are high. The conglomerate hanging-wall is weak,

requiring much timber. The pressure in the deep levels of the mine is very great and heavy timber pillars are used to keep the workings open. The conglomerate beds are more expensive to work than the amygdaloid beds. The rock is harder to drill and break and more difficult to handle. In the deep levels at the Tamarack the heat is excessive which also contributes to the high operating costs. A large amount of water is encountered. This was formerly 29,000,000 gal. a month. In 1912 it averaged 23,600,000 gal., but was recently reduced to 13,000,000 gal.

The Tamarack mill has five stamps. Mill is located on Torch Lake. Mineral is smelted at the Lake Superior Smelting Co. The maximum production at Tamarack took place in 1897, when slightly over 20,000,000 lb. of copper were turned out.

In 1913 operations were greatly interfered with owing to a severe labor strike.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

TRIMOUNTAIN MINING CO.

Remarks.—The Trimountain is one of the Copper Range properties. The mine is located between the Baltic and the Champion. Property is operated through three large shafts. These shafts are inclined and follow the dip of the vein which is about 68 deg. to 70 deg. The maximum depth attained on the dip is 2810 ft. The principal workings are confined to the Baltic lode. The average width of the lode is approximately 20 ft. with a maximum width of about 50 ft. Considerable mass copper is encountered in the lode, the pieces occasionally reaching considerable size. The method of mining is the Baltic system. This consists of mining on a filling of waste rock. Dry walling is used on the levels and for chutes. In this property areas of barren ground of considerable extent are encountered in the underground workings, these often extending for several hundred feet. It is not uncommon to find good copper rock occurring in depth below a low-grade section followed again by low-grade rock, this alternation seeming to occur both longitudinally and vertically. Steam power is employed at mine for hoisting, compressing, etc. The mine has electric pumps. Improved drilling machines were installed in 1912.

The Trimountain mill is located on Lake Superior. The plant contains four steam stamps with the usual equipment of jigs and tables. Fine grinding machinery was installed in 1912 for treating tailings. The mill is operated by steam power generated from coal. Electric power is used for regrinding. The mine and mill are connected by the Copper Range R. R.

The Trimountain property has never been such a profitable mine as either the Baltic or Champion. In the past few years, however, the property has

improved greatly while some of the other Copper Range properties have not been maintaining their former records.

For further particulars on general operating conditions, see "Brief Description of Lake Superior Copper District."

WOLVERINE MINING CO.

Remarks.—Main development is on the Kearsarge Lode. Three working shafts have been sunk. The vein dips approx. 41 deg. The deepest shafts are 3600 ft. to 3800 ft. and are inclined from the surface, being in the lode for entire distance. The method of mining is overhead stoping. Very little timber is used underground. The vein averages about 16 ft. in width. The copper occurs in the native state scattered throughout the amygdaloid. The rock is treated at the Wolverine Mill at Gay, Michigan, 13 miles from the mine. The plant is composed of two heads—800 tons. The mineral is smelted at the Michigan Smelting Company, 25 miles from the mill. Mines, mill and smelter are connected by rail.

For further particulars on general operating conditions see "Brief Description of Lake Superior Copper District."

EAST BUTTE COPPER CO.

The following results were obtained for the year ending June 1.

	1913	1912	1911
Gross yield	$2,148,796	$1,560,660	$1,376,253
Net earnings	$517,393	$250,187	$118,986
Tons treated	110,968	94,532	89,888
Value per ton	$19.36	$16.51	$15.31
Cost per ton:			
Mining	$4.84	$4.31	$3.79
Treatment	4.91	4.91	5.33
Smelter deductions	2.54	2.14	2.05
Freight, selling and refining	2.33	2.38	2.52
Total	$14.62	$13.74	$13.69
Additions to equipment	.14	.12	.30

Remarks.—Property situated at Butte just east of the town. In 1909 East Butte took over the Pittsburgh and Montana Copper Co. Company owns several mines. Development work extensive. Mines opened to 1500 ft. in depth. Several veins contribute to production. One vein traceable for 2000 ft. underground. Ore-bodies and ore characteristic same as Butte. Widths vary from few feet up to wide bodies. Method of mining square-setting. The ores are chalcocite, enargite and other copper ores carrying good gold and silver values. First-class ore is about 73 per cent. of total tonnage and second class 27 per cent. Company does a custom smelting business. Property has concentrator and smelter located at

the mine. This is the only custom smelter at Butte outside of the Anaconda plants. Among the custom shippers is the Keating Mine at Radersburg, Mont. This ore is high in iron and of value in fluxing the Butte ores. Company has very efficient management.

For operating conditions at Butte see "Brief Description Butte Camp."

NORTH BUTTE MINING CO.

Remarks.—The North Butte mine is the most important Butte property outside of the Anaconda Group. Depth of working 2800 level. Property has 10 workable veins running nearly parellel. Mine is opened by two shafts. Veins are cut on various levels by cross-cuts from main Spectular shaft. The veins vary in width from a few feet up to 25 and 30 ft. and probably average 8 to 10 ft. The method of mining is by square-setting, two products being made first class or direct-smelting ore averaging 6 to 7 per cent., and second class or concentrating ore averaging 3 per cent., a rough sorting being made in the stopes. In 1912 the Company was forced to increase wages owing to the high price which prevailed for copper. Numerous efficiencies have been brought about in the past few years at North Butte, such as improved ventilation in the deep workings, electric haulage, etc., etc., which have made for lower costs. The ore on coming from the mine is loaded into railway cars and transported to Anaconda where it is treated at the Washoe Reduction Works. The low-grade ore is concentrated and concentrates smelted. The high-grade ore is smelted direct. The copper produced is refined on the Atlantic seaboard.

For further information on general conditions see "Brief Description of Butte Camp."

FLORENCE GOLDFIELD MINING CO.

Cost per foot development, $7.57 in 1910.

Remarks.—Mill was not operating regularly until Feb., 1909. Consists of 40 stamps and three tube mills. Treatment is amalgamation, concentration and cyaniding. Mill destroyed by fire Dec., 1911.

Vein is a fissure in andesite. The stoping width averages about 12 ft. Mine entered by shaft.

Operations were practically suspended during 1912 and as a result no data is available for that year. Some development work was carried on, however, during the shut down.

ROUND MOUNTAIN MINING CO.

Remarks.—Several veins of varying widths from 6 ft. to 20 ft. Mine operated by shaft to depth of 700 ft. Total depth 1000 ft. Mill has 10 stamps and 1 Huntington mill for regrind. All conditions are favourable for cheap operations.

GOLDFIELD CONSOLIDATED MINING CO.

The output is from several mines now consolidated into one company. The veins are fissures in andesite. The stoping width varies from few feet to 20 ft. or 30 ft. Underground water flow not heavy. Depth of mines about 1200 ft. in deepest workings. Entered by shafts.

The mill consists of 100 stamps. The ore is amalgamated and concentrated. The concentrates are being shipped to smelter but later will be treated at mine, thus making a material saving as shown in report of 1912.

Goldfield is located on the railroad. Electric power furnished by custom companies at fair rates is available. The section is arid, consequently no trouble is experienced with underground water. Timber and supplies are comparatively high.

NEVADA HILLS MINING CO.

The mine is developed by shaft. Depth about 650 ft. There are three veins of varying widths. The Eagle vein is 18 ft. wide. The narrow veins are mined by back-stoping and stulled; the wider vein is timbered with square-sets and filled.

The ore is a silver-gold-bearing quartz. The silver is contained in sulphide form and in the native state. The gold is secondary in importance.

The mill has a capacity of 140 tons per day. The ore is stamped, concentrated and cyanided.

The mine is practically in its infancy. It is 45 miles from a railroad, consequently, costs are high. The water for milling is pumped from the mine. Electric power has been transmitted to the property.

TONOPAH BELMONT DEVELOPMENT CO.

Remarks.—The mine is located near Tonopah which is on a branch railroad of the Southern Pacific R. R. The country is arid, consequently water for operations is an expensive item. All timber and supplies are brought in from the nearby states. The veins of the district are fissures occurring in andesite and standing at a high angle. The widths vary from 5 ft. to 45 ft. The mine is operated by shaft to a depth of about 1300 ft. The mining method is the back-stoping system. In the wide places a modified method of the square-set system is used.

The ore is gold- and silver-bearing quartz. The values are mainly silver occurring in a ratio of about 3 to 1.

A new 60-stamp mill was recently completed and is very satisfactory. The flow sheet is as follows: Coarse crushing plant to 60–1250 lb. stamps, to eight duplex Dorr classifiers, the fine product to 16 Wilfley tables, the coarse to eight 5×18 tube mills and thence to Wilfleys. The Wilfley concentrates are dried and shipped to smelter. The tails to four Dorr thickeners and

thence to tall agitation cyanide tanks. There are 2 batteries of tanks, the first serie's overflow is again thickened and charged to the second series. The discharge is put through Butters filter presses and zinc dust is used for precipitation of the gold.

WEST END CONSOLIDATED MINING CO.

Remarks.—Property located in west end of Tonopah Camp, adjoining that of the Tonopah Mining Co. Mine developed to 800 ft. Vein on that level said to be 18 to 20 ft. wide, pay-ore 4 to 5 ft. Ore improves in grade at junction of faults. In addition to the high-grade ore-bodies, there is a large amount of low-grade ore, and management has been increasing the mill capacity to handle this material. The mill operated by the Nevada Milling Co. is located ½ mile from the mine. Capacity 150 tons daily. The high-grade ore is shipped to the smelter. In the month of March the actual cost of milling was $2.758. This cost is said to compare favourable with any mill of equal tonnage in the district. The mill is composed of stamps, tube-mills, a concentrating plant containing 12 Deisters and a Wilfley slimer, and usual cyanide equipment. The extraction obtained is stated to be about the average of the camp. Mining and milling costs also compare favourably with any in the district. Plants are operated by electric power furnished at a cost of 1½¢ per kilowatt-hour.

TONOPAH MINING CO.

Résumé of Operations 1909.—Gross production amounted to $3,731,607 158,052 tons were treated averaging $23.61. Extraction 90.3 per cent; cost per ton $13.40; profit per ton $10.21; net earnings $1,295,553.

Notes:—The mine is operated through shaft. The vein is a fissure varying in width from 7 ft. as minimum . The silver and gold values are in a ratia of 2.5 to 1.

The ore is stamped, concentated, the tails reground in Chilian Mills and then cyanided.

Water is scarce and supplies comparatively high.

PITTSBURGH SILVER PEAK MINING CO.

Remarks: Mine.—Property is situated in southwest Nevada at an elevation of about 2000 ft. above the sea. The ore-bodies are lenticular in shape and occur in schists and dip at a slight angle. The ore-bodies formerly were worked extensively by the glory-hole and open-cut method of mining, by which means from 35 per cent. to 40 per cent. of the total tonnage was extracted. The main work at the present time is underground. In the underground method of mining, pillars are used instead of timbers, or the filling method is employed. The underground mining method was changed in 1910, and this has resulted in a considerable reduction in costs. The property is developed principally by tunnel.

Mill.—The mill is located at Blair, Nevada, 17 miles distant from the mine. Property has rail connection with trunk line. The mill consists of 120 stamps. Weight of stamps 1050 pounds. Stamps are followed by amalgamation and cyanidation.

General Conditions.—It is stated that 8.6 tons of product per man per shift for eight hours has been attained. Labourers work eight hours. Machinemen, timbermen, shovel-helpers, etc., receive $4.50. Muckers, trammers, etc., $4. Wages since cut and costs went up. The mine is situated in a desert country and the costs attained under these conditions are looked upon as very satisfactory.

NEVADA CONSOLIDATED COPPER CO.

The company owns the Nevada Northern Ry., from Ely to Cobre, Nevada, on main line 160 miles in length, and derives benefit of these profits. The property is one of the lowest cost copper producers in the world.

Analysis of the ore is as follows:

Cu	1.7 per cent.
SiO_2	72 per cent.
Fe	3.5 per cent.
CaO	.5 per cent.
Al_2O_2	11 per cent.
S	3.5 per cent.

Analysis of concentrates:

Fe	25 per cent.
SiO_2	31 per cent.
S	25 per cent.
Al_2O_2	5 per cent.

CHURN DRILL COSTS, ELY, NEVADA

For itemized expenses see: Holes 11, 13 and 15.

Note.—The above holes were drilled through monzonite-porphyry and altered limestone, both rocks being quite uniform in texture and fairly soft. A No. 5 Keystone drill was used.

All operating costs are included, also such items as sampling, surveying, and 10 per cent. of the cost of casing used. No account is made of depreciation or general expense.

Note.—The heavy costs under casing and equipment are due to loss of tools and strings of casing being ruined by breaking loose.

The amount of hole drilled per shift varies greatly. With good conditions and no accidents a 7½-in. hole can be sunk from 50 ft. to 60 ft. per shift. A fair average is 30 ft. The highest day's run in the above work was 75 ft.

NEVADA-DOUGLAS COPPER CO.

Remarks.—The Nevada-Douglas property is located in the Yerington District of Western Nevada. The ores occur in limestone between porphyry and granite. They are largely replacement deposits. Fissure veins and contact deposits are also present. The principal ores are chalcopyrite,

pyrite, malachite, azurite and silicates. Garnet is often present. The mines are developed by tunnels and shafts. The principal shaft is an incline sunk to a depth of 800 ft.

The ore-bodies vary from a few feet up to 40 and 50 ft. in width. The bodies are working by overhand stoping though some square setting is used. In some places at the surface the ore is worked, by the quarrying and glory-hole system. In the report for the year ended Mar. 31, 1912, the cost of mining at the Douglas Hill property was $1.85 and at the Ludwig $1.69. In that report the total tons shipped from Dec., 1911, to Apr. 15, 1912, is placed at 28,312. The following averages in per cent. copper are given for the three mines: Ludwig, 5.62 per cent.; Douglas Hill, 5.24 per cent. Copper Basin, 5.06 per cent.

The ores are shipped to the Mason Valley Smelter at Wabuska for treatment—18 or 20 miles distant from the mines. Ores are transported over the Nevada Copper Belt railroad owned by Company. At Wabuska the line connects with the main north and south branch of the Southern Pacific. The elevation of the mine is moderate, the climate good and conditions favourable.

YELLOW PINE MINING CO.

Remarks.—Property is situated in the Good Springs Mining District. Mine is at Yellow Pine. Company owns and operates railroad to Jean, a distance of 12 miles. The mine is developed by incline shaft to 600 ft. The ore-bodies average 40 ft. in width. The ore is zinc and lead carbonate with galena. The mill is situated at Yellow Pine. Power is obtained from oil-fired boilers. The lead concentrate is sold, to American Smelting & Refining Co. at Murray, Utah. The zinc concentrate is sent to Bartlesville, Oklahoma.

CHINO COPPER CO.

Remarks.—Property is situated at Santa Rita, N. M., 49 miles northwest of Silver City. Elev. 6000 ft. Climatic conditions ideal. The mine is one of the porphyry coppers. Formation quartz-diorite-porphyry. Ore-bodies occur in a more or less horse-shoe or circular shape. The centre of the horse-shoe, which is barren, is from 2000 ft. to ½ mile or more across. The ore reserves at the close of 1912 amounted to 94,000,000 tons of 1.8 per cent. copper ore. At least two-thirds of this tonnage will be mined by steam shovel. Two large steam-shovel pits are being opened. These will have the following dimensions, 4500 ft. by 600 ft. and 2500 ft. by 750 to 1000 ft. Seven steam shovels are employed, two on ore and five on over-burden. Railroad tracks extend in the pits and shovels dump ore directly into standard gauge cars, which are hauled to the concentrator.

The Chino ore consists principally of chalcocite, with some pyrite, disseminated through the porphyry. Considerable cuprite and native copper are found. In certain of the ore-bodies, the ore comes to the surface. The average over-burden is not great.

The company's concentrator is situated 10 miles from the mine down-grade haul. Mine and mill connected by A. T. & S. F. R. R. Service good. Concentrator is 5000 tons rated daily capacity. Actual capacity approx. 6000 tons. Mill is operated by electric power. Power generated from coal. Power plant consists of three 1250-k.w. generators. Power transmitted to mine for operating machine shops, etc. The water employed in concentration is settled and re-used. Concentrates are shipped to A. S. & R. smelter at El Paso, Texas, 140 miles distant, where they are smelted to matte and converted, and blister copper sent to Atlantic seaboard for refining.

At the mine and mill there are employed 1500 men, principally Mexican labor. Mexicans receive $2 per day.

HOMESTAKE MINING CO.

Remarks.—Period of June 1, 1911, to Jan. 1, 1912, not shown here, during which time 888,507 tons were milled, average value of $4.1205. The company changed the fiscal year from June 1 to Jan. 1 in 1911. The company's report does not give costs per ton, nor are its expenditures arranged so that one can state accurately to what account different items should go. The above figures, however, are a very close approximation. The total is certainly very nearly accurate.

The mine is one of the greatest in the world. The ore-bodies are large masses of quartz and silicified schist through which the gold values are evenly disseminated. The ore-bodies vary in thickness from 200 ft. to 500 ft. and over; a maximum depth of 1850 ft. has been reached. The mine is operated through several shafts. Formerly the method of mining employed was square-setting. This has since been abandoned and the following system is now employed. A main drift is carried on the center of the ore-body, and main haulage drifts run in the foot and hanging wall. The vein is laid off into stopes and pillars. The stopes average 60 ft. wide by 250 ft. long by 150 ft. high. The pillars are 40 ft. wide by 250 ft. long. The overhand method of stoping is employed. Approximately 2,000,000 tons of broken ore are in the stopes.

The mills have a total of 1020 stamps. The ore is amalgamated, concentrated, reground in tube mills and cyanided. About 72 per cent. of the gold is won by amalgamation and the remaining 22 per cent. by cyanidation, a total recovery of 94 per cent.

The company has just completed a large hydro-electric plant at Spearfish which furnishes power to the mine. This, it is stated, gives a material

saving over steam power previously used. The town of Lead is located on the railroad, consequently transportation facilities are excellent.

The company has expended large sums of money to furnish comfortable accommodations for its employees. There is a company hospital, library and club for the men.

WASP NO. 2 MINING CO.

Remarks.—The property is located about 2½ miles from Lead on the B. & O. Railroad. It is situated on a high table mountain which is capped with flat lying sedimentaries. The ore body is a stratum of quartzite about 20 ft. thick. It is capped by decomposed slates, mud and soil for a depth of from 8 to 12 ft. The floor to the quartzite is slate.

The mineral content is gold bearing pyrite which has been partly oxidized. Mineralization probably due to porphyry intrusions.

The ore is stripped by steam shovel but mined and loaded into cars by hand. The ore is dry crushed to ¼ mesh as follows. Gyratory crusher to rolls to cyanide vats. The first solution is 5# cyanide and second 2# cyanide then clean water wash. When everything is running smoothly the mill handles 520 tons per day.

During 1913 the property operated only 8 months and 20 days owing to unfavorable weather and water shortage. During the first 2 months of 1914 the total costs are said to have been about $1.20.

The present management hopes to cut the costs to $1.00 per ton. This is quite possible by using steam shovels to mine the ore, as well as strip the overburden and by making one or two minor economic changes.

TENNESSEE COPPER CO.

Remarks.—The company operates 3 mines, *i.e.*, Burra Burra, London and Polk County. Burra Burra principal producer. Rocks consist of gneiss and schists. Ore-bodies occur in large lenses dipping at 75 deg. to 80 degs. Ore-bodies vary up to 175 ft. in width and average 50 ft. The ore consists of pyrrhotite with chalcopyrite and iron pyrite. Some galena and zinc blende are present. Properties opened by inclined shaft 75 deg. sunk in foot-wall rock. Pillars are left. Method of mining has been changed from under-hand stoping to back-stoping. The mines are comparatively dry.

Company's railroad, total length 7½ miles, transports ore to smelter. Plant composed of 7 blast furnaces, and has converter department. Pyritic smelting is employed. Company does custom smelting business.

Property is equipped with sulphuric acid plant. The fumes from the furnaces, carrying SO_2, are taken to the Glover towers. Gases pass to the lead chambers where they encounter live steam. The sulphuric acid precipitates to the bottom of the chambers, gases passing to the Gay-Lussac

towers where nitrous oxides are recovered. During the year 1912 the company produced 192,000 tons of sulphuric acid.

BINGHAM MINES CO.

Notes.—The mines furnish two classes of ore, one a silver-lead product and the other a copper-iron ore of low values. Both ores occur as fissure and replacement deposits of varying dimensions in lime and quartzite formation. Some of the ore-bodies in this section are very large, needing square-sets for timbering. The ore in both cases is a direct smelting product. Transportation and smelting facilities are good.

CHIEF CONSOLIDATED MINING CO.

Remarks.—The property is located on the Denver & Rio Grande and San Pedro, Los Angles & Salt Lake Railroads. The ores contain silver, gold and lead, and the ore-bodies which are in the form of lenses, pockets and pipes are from 6 in. to 150 ft. in width. Method of opening; drifts, crosscuts and raises. Method of mining, square-set timbering. Depth of mine 1800 ft. Ore reduction is accomplished by direct smelting, shipments being made to Salt Lake smelters.

General Conditions.—The mine has been opened in a very satisfactory manner, at the present time there being a very much larger amount of ore showing than at any previous time. The tonnage of ore for 1913 amounted to 51,173 tons. Value; ore, $16.29; Net, $7.37; Costs, $5.17; Net profit, $112,587. (Data by Cecil Fitch).

DALY-JUDGE MINING CO.

	1911	1912
Ratio of conc. crude ore . .	4.2 into 1,	6.03 into 1.
Ratio of conc. all products	3.2 into 1,	3.45 into 1.

Mine developed to 2300-ft. level. The ores, which are principally lead-silver-zinc, are shipped crude and also concentrated—a lead concentrate zinc middlings and iron middling made. Where a 30 per cent. Zn product was formerly produced a 40 per cent. to 45 per cent. product is now made.

The main drain tunnel, which is equivalent to the 2500 level, drains the mine and will effect a considerable saving. Transportation and smelting facilities are good.

IRON BLOSSOM CONSOLIDATED MINING CO.

Remarks.—Property is situated on railroad. Mine is developed by shaft and tunnel. Electric hoisting employed. Ore-bodies occur as large irregular masses in limestone. Ore is smelted direct being sent to the Salt Lake smelters. Shipments of low-grade ore have been curtailed as management plans erecting mill for treatment at the property. Ore is principally lead-silver. Some copper occurs in the No. 1 ore-body. The deepest shipping

ore discovered is on the 700-ft. level. The method of mining is by square-set and often ground is very heavy requiring much cribbing. The large amount of timber used is an important item in the mining cost.

BOSTON CONSOLIDATED COPPER & GOLD MINING CO.

Remarks.—Property developed by tunnels. Ore occurs in limestone in large masses, in the form of beds dipping at flat angles. The ore-bodies occasionally are very large, often several hundred feet in length by from 150 to 200 ft. in width. The ore is composed of chalcopyrite and pyrite and in certain localities chalcocite. Ores carry around 2.5 per cent. copper, $2 in gold and 2 oz. in silver per ton. The method of mining is square-setting. The ore is direct smelting. It contains an iron excess. Ores are shipped to A. S. & R. smelters near Salt Lake City, Utah.

OHIO COPPER CO.

Remarks.—The Ohio property is admirably situated for economic operations. Its ore-bodies, which dip at an angle of about 60 deg., are intersected at a depth of 1400 ft. below the outcrop by the Mascotte tunnel, 14,000 ft. in length, which extends to Lark where the company's concentrator is located.

The Ohio ore-body is a quartzite and monzonite deposit. The ores are chalcocite, with some chalcopyrite and pyrite finely disseminated throughout the mass. The width of the ore-body is approximately 400 ft. Based on last estimate, ore reserves averaged 1.1 per cent. copper. The ore-bodies are mined by caving method known as the McDonald. This system consists of radiating raises from a central or master raise which carries the ore to the Mascotte tunnel ore-bins. There are three of these main raises. The overburden is caved from the surface. No timber is used in the stopes only in the raises. The least angle at which the raises are driven is 40 deg. and the ore is found to run at this slope.

The property is equipped with 2000-ton concentrator, which is being enlarged to 3000 tons. No steam power is used. Electric power is obtained from one of the custom hydro-electric plants at very low cost, ¾¢ per kilowatt hour. Method of treatment is concentration and smelting of concentrates. Concentrates are shipped to Garfield smelter at Salt Lake City, 15 miles distant, where they are smelted. Elevation of mine not excessive, climate good.

The Mascotte tunnel is equipped with electric haulage, the ore from the bottom of the main shaft being transported in this manner, and dumped directly into the mill bins at the concentrator. The company is charged 15¢ per ton for haulage through the tunnel.

Costs are very low. Ohio is probably one of the lowest of the low-grade disseminated copper deposits being worked underground at a profit.

SOUTH UTAH MINES AND SMELTERS

Remarks.—The property is developed to a depth of 900 ft. Opened by tunnel to 600 level. Formation is quartzite. The ore-bodies are large, often as much as 150 ft. square. The ores are disseminated, the minerals being pyrite and chalcopyrite. The method of mining is caving, pillars being left. The method of treatment is water concentration. Concentrator is located 4 miles from mine. Concentrates are shipped to the International smelter at Tooele, Utah, 250 miles from the property. The mine and mill are operated by electric power purchased from the Beaver River Power Co.

UNITED STATES SMELT., REF., & MIN. CO.

Remarks.—The United States Smelt., Ref. & Min. Co. is a very important producer of silver, lead, copper and gold.

The Mammoth Mine at Kenneth, Calif., is one of the large copper mines of the United States. Its ores consist of a dense homogeneous pyrite carrying from 3 to 4 per cent. copper. The ores are smelted direct at the company's smelter. 278,088 tons of ore treated 1912.

The Centennial Eureka is a producer of copper, gold and silver. Mine is developed to depth of 2000 ft. Ore-bodies occur in limestone. Ores are oxides, carbonates and sulphides high in silver. Ores are smelted. Method of mining square-setting. During 1912, 117,957 tons were extracted.

The Real del Monte mine, Pachuca, Mexico, is a very heavy silver producer. Tonnage of ore treated during year amounted to 418,476 tons. Ore is milled. (For costs in this section see Santa Gertrudis.)

The Gold Roads property was acquired by the U. S. S. R. & M. Co. in 1911. Mine is an important producer of gold. Ores occur in large vein formation said to average $8 to $10 per ton. Property is equipped with 350-ton mill and cyanide plant. Ore extracted 1912, 109,070 tons. Mine is developed to depth of 900 ft. (For costs gold property operating in this section see Tom Reed mine.)

UTAH CONSOLIDATED MINING CO.

Remarks.—The Utah Consolidated Company operates the Highland Boy mine, located at Bingham, Utah, on a branch of the D & R. G. Western Ry.

The ore-body occurs in large masses in the limestone adjacent to intrusives. The bodies which are replacement deposits are often several hundred feet in width and length. The ore occurs principally as chalcopyrite and pyrite, although some chalcocite, bornite and tetrahedrite are found. The ore is direct-smelting.

The mine is developed both by shafts and tunnels, by tunnels to the seventh level, below this the main shaft has been sunk to the twelfth and bottom level. The ore-bodies are worked by top caving and square-setting.

In 1909 the company erected an aerial tramway 21,140 ft. in length, having a capacity of 100 tons per hour, connecting the mines with the International Smelting & Refining Co.'s plant at Tooele, Utah. The ore is smelted at this plant.

The Highland Boy was originally a gold mine, but as greater depth was obtained the copper ores were encountered. The copper contents of the ores have declined rapidly in recent years. In 1905 and 1906 the recovery in copper per ton was 60 lb., and at that time the cost of producing copper per pound was very low—said to have been from 4 to 5 cents per pound. This was due largely, however, to the high gold and silver values being credited to the cost of production. The annual production of copper during these years ran up to 18,500,000 lb. It has only been within the past two or three years that the Company has been producing lead.

HEDLEY GOLD MINING CO.

Remarks.—Company operates Nickel Plate and Sunny Side Mines located in Osoyoos District, British Columbia. Elevation, 1700 ft. at mill, 5800 ft. at mine. Ore occurs in Nickel Plate formation. The base of this is the Sunny Side limestone. Andesite intruded through lime. Ore-bodies occur in close proximity to andesite sheets, and usually on upper side. Property opened by adit tunnels or inclined shafts on intrusive sheets. The ore is composed of epidote, garnet and calcite, associated with arseno-pyrite, and carries about $12 gold per ton. Values do not decrease with depth.

Ore-bodies dip 23 deg. Thickness from 10 ft. to 80 ft. Method of mining is pillar and chamber system, and no timber is used. Rock is very hard, but mining reasonably cheap. Electric haulage employed underground, 2-ton cars, 12 to train. At surface 7000 ft. electric trolley transports ore to aerial tramway, terminal 9500 ft. down mountain side. Loads haul empties back. Property contains 40-stamp mill. Stamps weigh 1050 lb. each. Up to 1910 ore was amalgamated; present method, concentration and cyaniding. Concentrates are shipped to Tacoma smelter. These are very rich, averaging often $200 per ton. Approximately 300 tons of concentrates are produced per month from the treatment of roughly 6000 tons per month. Electric power is generated from coal, and this is used throughout mines and mill. The property has rail transportation.

BRITISH COLUMBIA COPPER CO.

Résumé of 1908 Operations.—Production, 5,767,355 pounds; income, $1,086,635; exp., $889,475; prof, after misc., $200,483; total ore treated, 321,427 tons; yield, 17.8 pounds; yield gold and silver, $.985; pr. rec'd copper, 13.504; cost per ton, $2.632; cost per pound, 9.99¢.

Remarks.—Company operates several mines of which the Mother Lode is the principal. This property is situated 3½ miles from the smelter at

Greenwood. Mine is opened by tunnel and shaft—latter four-compartment, 575 ft. deep. Hoisting is by air generated by electricity. The ore-body is 130 ft. wide and is opened for 1500 ft. in length. The ore which is smelted direct is mostly chalcopyrite in lime gangue. Mines are equipped with elect. haulage. Ore is handled automatically at mine and smelter, many new labor-saving devices having been installed. The ore-bodies are worked by the caving method, pillars being left. At the time of writing the pillars were being worked. The management states that as much as 250,000 tons of ore have been broken down with one blast. The ores are practically self-fluxing. In one month's run when 60,000 tons were smelted 3800 tons of flux were used. The smelter is of 2500 tons' capacity composed of three blast furnaces and three converter stands. Electric power is used throughout. It is obtained from the West Kooteney Power & Light Co. at a cost of approximately $50 per horse-power per year. Both mines and reduction plant have rail connection with transcontinental lines.

CONSOLIDATED MINING & SMELTING OF CANADA

Quotations For Metals, 15 Months	1913	1912	1911
Lead, London, per ton	£18–19–7	£15.593	£12.953
Silver, New York, per ounce	60.993¢	56.355¢	53.696¢
Copper, electrolytic, per pound	16.113¢	13.942¢	12.337¢

Costs and other data on the Center Star, Sullivan, and Snowshoe, are given in this book under their respective titles.

Remarks.—This company does a large silver-lead smelting business and has a lead refinery, using the Betts Electrolytic Process, capacity about 75 to 100 tons per day. This is the only lead refinery in Canada and produces practically all of the lead used in that country. In addition to supplying these wants, the company had in the past exported large quantities to China and Japan.

Smelter consists of five copper blast furnaces and three lead stacks. The company owns and leases a large number of mines in that section. In addition to treating their own ore, it also does a custom business.

The value of production is greater than any other plant in the Northwest. The values in precious metals contribute largely to this total amount.

COPPER MOUNTAIN

Remarks.—Location.—Property is situated about 15 miles south of Princeton, B. C., which is on the Great Northern Railway, the nearest railroad point.

Accessibility.—Accessibility to base of supplies at present poor, but on completion of Great Northern and C. P. R. lines to coast, property will have direct outlet.

Character of Ore and Geology.—Ore occurs as disseminated chalcopyrite and bornite in lenticular bodies of varying size in dioritic rocks.

Mining.—Combined glory hole and underground methods will probably be used.

Milling.—Due to heavy character of gangue, ordinary milling methods cannot be used. It is said that the metallics can be recovered by oil flotation methods. Concentrates will be shipped to Grand Forks or Greenwood, B. C.

General Conditions.—Aside from present inaccessibility of property, general mining conditions are favorable for cheap work. Property has been prospected for over a year but definite equipment of same has not been started.

NEW DOMINION COPPER CO., LTD.

Remarks.—Company operates the Rawhide, Athelstan, Brooklyn, and Idaho, Sunset and other mines. Rawhide property is principal producer. This mine adjoins the Granby Consolidated. The Athelstan lies adjacent to the British Colombia. Ore-bodies are massive and are generally found in greenstone or altered limestone. The ores are chalcopyrite and pyrite, often pyrrhotite or magnetite. Calcite, garnet and epidote are common. An average analysis of the ore would be 38–40 per cent. silica, 16 to 20 per cent. lime and 15–16 per cent. ferrous oxide. The veins at the Rawhide have flat dip from 30° to 40° and vary from a few feet up to 45 ft. in width. The method of mining is caving, pillars being left and robbing the pillars. Very little timber is used. Rawhide property is developed by tunnel. The various mines are connected with smelter at Greenwood by rail—the distance varying from a few miles up to 25 miles. The ore is smelted at the British Columbia smelter. The controlling interest in the New Dominion Copper Co. is held by the British Columbia Copper Co.

DOME MINES, LTD.

W. W. MEIN, Consulting Engineer says:—"A fall in costs should be effected incident upon (1) the cessation of extraordinary expenditures associated with the early operations of a new mine and mill, (2) the increasing efficiency of methods and supervision in relation to local problems, (3) a probable improvement in the standard of labor efficiency through the establishment of more attractive and stable conditions in the camp and (4) an uninterrupted supply of hydro-electric power, the benefit of which installation was not gained during the past year."

Remarks.—The ore outcrops in the form of an immense dome rising above the surrounding country. Its dimensions are roughly 800 ft. in length by 200 in width by 25 ft. in height. The mine is developed to shallow depths underground. Mining is carried on both at the surface and underground. The ore occurs as quartz carrying free gold. Pyrite is also present with which gold is associated.

Treatment Operations.—The design and erection of the reduction works were carried out by the Merrill Metallurgical Company of San Francisco, and comprise forty 1250 lb. stamps, four duplex Dorr classifiers, four 5×22-ft. tube mills, four Pachuca tanks 8×40 ft., three 90×4-in. frames Merrill slime filter presses, two 52-in. Merrill zinc dust precipitation presses.

NIPISSING MINING CO., LTD.

In the future everything will be reduced to bullion at the mine, making a material saving over shipping to the smelters.

On Feb. 1, 1911, a mill for the treatment of high-grade ore was completed. The process is unique, it being worked out by Chas. Butters to suit this particular case. It consists of amalgamation in cyanide solution in a tube mill where more than 97 per cent. of the silver is recovered by amalgamation. The residue or tails are then treated by the regular cyanide method.

A low-grade mill capacity of 200 tons per day was constructed in 1912. It consists of forty 1500-lb. stamps and four 6×20 ft. tube mills. The ore is crushed in cyanide solution to 200-mesh, agitated and passed through Butters filters, precipitated by Al. dust through a Merrill filter.

YUKON GOLD CO.

DREDGE OPERATIONS, 6 MONTHS TO OCT. 31, 1913

Dredge number	1	2	3	4	5	6	7	8	9
Cost per yard:									
Direct cost:									
Fixed salaries, cents	.0009	.0009	.0010	.0007	.0007	.0008	.....	.0008	.0006
Labor	.0315	.0333	.0234	.0201	.0221	.0202	.....	.0201	.0236
Fuel	.0008	.0017	.0007	.0001	.0008	.0005	.....	.0013	.0010
Shop expense (repairs)	.0015	.0023	.0011	.0037	.0017	.0027	.....	.0021	.0018
Material and supplies	.0169	.0211	.0200	.0150	.0151	.0241	.....	.0147	.0142
Power	.0313	.0318	.0266	.0222	.0213	.0216	.....	.0222	.0236
Total	.0829	.0911	.0728	.0618	.0617	.0699	.....	.0612	.0648
Indirect cost:									
Preliminary	.0422	.0302	.0188	.0168	.0206	.0234	.....	.0209	.0152
Taxes (representation)	.0006	.0006	.0006	.0005	.0005	.0005	.....	.0005	.0004
Bullion charges	.0170	.0259	.0131	.0121	.0209	.0261	.....	.0247	.0164
General charges	.0201	.0200	.0209	.0205	.0169	.0215	.....	.0175	.0131
Depreciation	.0224	.0238	.0187	.0206	.0154	.0181	.....	.0151	.0164
Insurance	.0012	.0013	.0010	.0017	.0011	.0012	.....	.0010	.0011
Assay office	.0011	.0018	.0009	.0008	.0014	.0017	.....	.0016	.0012
Stables	.0009	.0026	.0021	.0013	.0027	.0021	.....	.0017	.0027
Main ditch	.....	.....	.....	.....	.0003	.....	.....	.....	.....
Company telephone lines	.0003	.0003	.0003	.0002	.0002	.0003	.....	.0002	.0002
Transportation	.0001	.0001	.0001	.....	.....	.....	.....	.0001	.0001
Miscellaneous	.0050	.0050	.0050	.0053	.0050	.0050	.....	.0050	.0051
Total	.1109	.1116	.0815	.0798	.0850	.0999	.....	0883	.0719
Thawing	.1255	.1228	.1836	.1795	.1234	.1638	.....	.1279	.0749
Total operating costs, cents	.3193	.3255	.3379	.3211	.2701	.3336		.2792	.2116

Remarks.—In 1912 the operations at Pacific, Atlin and lease contributed $484,337 at a cost of $204,672, yielding a profit of $279,665. These figures we included in the grand total under 1912 operations.

The company now has gravel mines in several districts. The season for operations is during the summer months, lasting from May to October inclusive. There are nine dredges and a hydraulicking outfit in operation. The magnitude of operations depends upon length of season and water supply for hydraulicking.

The formation consists of tightly compacted gravel lying on a fractured schist bedrock. The gravel is covered by an over-burden of muck varying from 2 to 20 ft. in depth, except in the stream beds where the over-burden has been removed leaving the gravel exposed. The total depth of the deposits range from 20 to 35 ft.

The gold values occur in the gravel directly above bedrock and in the crevices of the bedrock itself extending into it for a depth of from 2 to 12 ft. The average depth of bedrock excavated in dredging is 5 ft. Approximately 75 per cent. of the gravels is frozen and must be thawed before it can be dredged. To accomplish the thawing steam is distributed from generating plants through insulated pipes, which feed a battery of approximately 180 steam points to each. The points are driven to bedrock, allowed to steam for 24 to 48 hours, and withdrawn when the thawing is completed. Each thawing plant has a boiler capacity of approximately 300 h.p. Five of the dredges are equipped with 7½-cu. ft. buckets and three with 5-cu. ft. buckets.

CRESTON COLORADA CO.

Properties located at Minas Prietas, Sonora, Mexico, on the Union Mexicano Ry. Connects property with main line at Torres. Company operates two mines, Creston and Colorada. Property is developed by shafts, drifts and glory-hole. At one mine ore-bodies are mined underground, while at other properties glory-hole system is employed. Properties are developed to 1000 ft. in depth. The ore-bodies occur in parallel veins, connected by stringers and fissures. The east end contains fractured quartz sulphides on lower levels, with harder quartz in west end. The widths of the veins vary from 10 to 30 ft.; average value of the reserves 1911 estimated at $4.87 per ton.

The method of reduction is cyanide treatment. The Grand Central mines, mill, and cyanide plant have been purchased. The company's own mill and cyanide plant treats approximately 12,000 tons per month, and the Grand Central about 8000 tons per month. Aerial tramway transports ore between mine and plants. Company employs 46 Americans and 336 Mexicans.

BATOPILAS MINING CO.

The mines of this company have been operating for a great many years. Some of the veins have contained bonanza silver ore. There is little of this left as far as the present development has shown. The future of the mine depends upon new development. Mines operate through tunnels and shafts. The ores are concentrated and the tails re-ground and cyanided.
General conditions are favourable for operations.

SIEMPRE VIVA MINE

Sand and slimes are separated by classifiers or tables. The sand is treated in leaching vats by Butters-and-Mein distributors, and slimes are treated by decantation process, agitation being effected either by stirrer or centrifugal pump. Cyanide solution is treated in zinc boxes, with zinc shavings. and entire property is equipped with steam and water power and electricity for lighting purposes. 331 men are employed, 176 underground and 155 on the surface. (Data by Henry F. Lefevre.)

BUTTERS SALVADOR MINES

Remarks.—The Butters Salvador Mines are located 25 miles from La Union, Salvador. Seaport La Union. The property contains a series of veins 5 to 12 ft. wide paralleling each other along a distance of 3000 ft. and along two main fracture zones. Property is opened by tunnels and shaft. The ore-body is a replacement in rhyolite. The ore is gold with a quartz gangue. The method of mining is stoping in steps of 6 ft. and filling from the surface. No timber is used. The mines are developed to 800 ft. in depth. Drainage is by tunnel. The method of treatment is milling—all sliming in cyanide solution.

PATO PROPERTY

Remarks.—Operations began Feb. 1, 1913. Numerous delays and difficulties were experienced in the early operations. It is worthy of mention in connection with the working profit of $10,373 shown, that for two months losses were made, also that the cost per yard of 33.12¢ for the first month had been reduced at the end of six months to 5.35 cents. The acreage exhausted equalled 11.42 yielding $5,824 per acre at a cost of $4,916 per acre.

From Aug. 1 to Oct. 1 based on cable advices 89 days the dredge recovered $156,820 from 266,270 yds. washed, an average of 59 cents per cubic yard. The daily yardage was 3000, an increase of 550 cu. yd. over the prior six months period. The average value recovered was nearly four times as great.

DE BEERS CONSOLIDATED MINES, LTD.

Remarks.—Properties are located near Kimberley, 647 miles northeasterly from Cape Town in Cape Colony. The principal mines are the De Beers,

Kimberley, Wesselton, Bultfontein, Dutoitspan and many other holdings. The large mines are all near together and are situated in an area not over five miles square. The diamonds occur as separate crystals in pipes of blue ground of serpentinized olivine or kimberlite. A maximum depth of 3600 ft. has been attained in development. At some of the properties the surface ores are worked by open-cut. The load mentioned in the above data is equal to 16 cu. ft. or 1.4 short tons. The diamonds are extracted by washing. There are millions of tons of old tailings at the various properties, the result of former washing. These are now being retreated at a profit. In addition to its mining operations, the company has extensive manufacturing, agricultural, and other interests in that section.

The tonnage handled at these mines is probably one of the greatest in the world.

BANTJES CONSOLIDATED MINES, LTD.

Remarks.—Property began producing Aug. 9, 1910. The average stoping width of the four reefs—namely, the Main Reef, Main Reef Leader, Leader and South Reef, is 41 in. The principal producer is the South Reef. The Reefs are narrow. In 1911 the development done on the South Reef disclosed an average width of 12 in. assaying 19.8 dwt. and on the Leader 24 in. assaying 10.1 dwt. Mine is developed by inclined shafts. Maximum depth around 3000 ft.

A mill of 100 stamps has been built. In 1912 an average of 80 were operating. Tube mills and cyanide treatment complete the equipment.

BRAKPAN MINES, LTD.

Remarks.—Company began operating at end of May, 1911. In 1912, 12,619 ft. of development done on the reef averaged 9.36 dwt. over a width of 37.67 in. In this year the average stoping width of ore mined was 66.50 in. and the calculated milling width 56.39 in. In 1911, 9701 ft. of development was done in the reef with an average of 10.07 dwt. over a width of reef of 32.89 in. For stope widths used on basis ore reserves calculations see tabulated data given. The system of waste packing which has been adopted has proven well suited to the flat dip of the reef and the great depth at which mining operations are carried on. The property is equipped with pumps of 1,250,000 gal. per 24 hours capacity. There is pumped daily approximately 600,000 gal.

CINDERELLA CONSOLIDATED GOLD MINES, LTD.

Remarks.—Mill has 80 stamps and 3 tube mills; wt. of stamps 1650 lb. The plants are operated by electric power. The Central Shaft was sunk 793 ft. in 1912 to 2375 ft. This shaft makes considerable water. In October 1912 the flow was 200,000 gal. per day. This shaft will cut the

Reef at a depth of 3000 ft. The Cinderella shaft intersected the reef at 4000 ft. The lowest level in the mine in 1912 was 4443 ft. The company owns about 3 miles on the strike of the reef.

The increase in working cost in 1912 is mainly due to additional expenditures of sand filling, closer timbering, packing, ventilation and contribution to Miners Phthisis Insurance Fund. In 1911 stoping width was 58 in. In 1912 it was 46 in. The latter is due to figures being taken out on a hand stoping basis insted of machine. In the sand filling method the sand is sent down dry.

CITY DEEP, LTD.

Duty per stamp (tons)	13.2
Waste sorted in mining, 15 per cent	11.6
Development work	9947 ft.

The Main Reef Leader has a stoping width of from 17 in. to 24 in. assaying from 16 to 33 dwt. per ton. At present this is the main source of ore supply. This reef is exposed for a distance of over 2500 ft. Dip of reef about 38 deg.

The mill has 200 stamps and nine tube mills and will treat 65,000 ton per month when in full operation. Electric power is used.

CITY AND SUBURBAN GOLD MINING AND ESTATE CO., LTD.

Results of Operations from 1901 to 1912 Incl.—Ore milled, 3,013,013; yield per ton, 7.456 dwt.; cost per ton, 19s. 1.057d.; revenue per ton, 31s 6.07d.; profit per ton, 11s. 7.50d.; working profit, £1,752,372; total profit, 1,825,610.

Remarks.—The principal reefs worked are the Main Reef Leader and South with widths and assay values in 1911 as follows:

Main Reef	31.2 in.; 9.4 dwt.
Leader	19.4 in.; 24.7 dwt.
South	16.6 in.; 19.4 dwt.

These two reefs have in the past been stoped together to a width of 8 ft. or 9 ft., with a sorting out of probably 3 ft. of waste rock. Dip of reef, 30 deg.

The mill has 160 stamps in operation.

Résumé Operations, 1910.—Gold, ounces, 106,049; working profit, £86,252; tons crushed, 308,366; value ore, 6.880 dwt.; cost per ton, 19s. 8.37d.; revenue per ton, 25s. 3.52d.; profit, 5s. 7.15d.

CONSOLIDATED MAIN REEF MINES AND ESTATE, LTD.

Remarks.—This property operates on the Main Reef Leader and South Reef. The work is done through three large shafts. No. 3 was commenced in 1910 and will cut the Main Leader Reef at about 2500 ft. depth.

The west shaft is down over 3500 ft. Plant has 120 stamps, three tube mills, which will probably be enlarged.

CROWN MINES, LTD.

Remarks.—This company is a consolidation of several properties that are being worked together. The underground workings are being connected on large haulage levels and the ore hoisted through several working shafts. On the surface the several mills are connected with the shafts by electric trams.

The widths and gold content of the three reefs are as follows:

Main Reef	38 in.	12s.	9d.	1911
Main Reef, Leader,	24 in.	73s.	2d.	
South Reef	24 in.	57s.	8d.	

A stoping width of from 58 in. to 65 in. is maintained which brings the value of mill ore to about 8 dwt. = 33s. 4d. The combined stamps of the five mills amount to 835. These have a capacity of about 210,000 tons per month or about 2,500,000 tons per annum. Electric power is used. The contemplated improvements for centralizing the work are very extensive. The full effects of this work are not as yet felt.

RECORD OF OPERATIONS FROM 1907 TO DEC. 31, 1912

Total tons milled	8,742,615
Cost per ton	£0 18 9.76
Working revenue	1 14 6.12
Profit per ton	15 8.357
Working profit	£6,861,388
Net profit	6,859,199

EAST RAND PROPRIETARY MINES, LTD.

Remarks.—This company is a consolidation of a number of outcrop and deep level mines extending some 6 miles along the strike of the reef.

The reefs have been faulted and the croppings appear twice upon the surface. The Main Reef Leader is the main reliance of the mine. It is from 20 to 28 in. wide and is stoped to a width of 48 in. The Main Reef is 48 in. to 50 in. wide, but low grade. The South Reef is pyritic and non-payable. The winding is done in two stages to a total inclined depth of 6000 ft., each stage being 3000 ft. The milling is done in four plants. Two plants, with a total of 440 stamps, are driven by electricity and the other two plants with 380 stamps by steam. It is said that by increasing the tube mills to 44 in the former two mills, the tonnage can be maintained at a saving in operating costs. This change is contemplated.

The recovery of the East Rand Proprietary Mines Co. was as follows for 1908 and 1909.

1908	31s. 6d. per ton.
1909	29s. 2d. per ton.

Yield from all Sources to December 31, 1910.—Tons milled, 10,054,414; Silver, oz., 455,694; per ton milled, dwt. 0.906; total ounces gold, 4,064,321; per ton milled, dwt., 8.085; total value realized, £17,199,696 7s. 1d., per ton milled, 34s. 2.559d.

FERREIRA DEEP, LTD.

Stoping widths, widths of veins and values for 1912 were as follows:

Main Reef Leader	72 in.	34 in.	67s.	2d.
South Reef Leader	60 in.	23 in.	96s.	7d.

Dip of reefs 27 deg. The main reef is wide but very low grade. The mill has 280 stamps and seven tube mills. Capacity of mill 750,000 to 800,000 tons per annum.

FERREIRA GOLD MINING CO., LTD.

Notes.—The company is mining the three reefs. An average stoping width of 77 in. is maintained with an average assay value of 8.10 dwt. per ton. Dip of reefs about 40 deg. The mill has 120 stamps and three tube mills.

The capital of the company is £95,000. From 1891 to 1899 (the Boer War) £1,268,500 was distributed in dividends, while since the conclusion of the war, and up till June, 1911, a further £2,556,250 was distributed. The mine is now practically worked out.

GELDENHUIS DEEP, LTD.

Remarks.—The property mines on the three reefs. The widths, assay value and stoping widths are as follows:

	Width	Value	Stoping width
Main reef	26 in.	6.0 dwt.	54 in.
Main reef leader	9 in.	21.0 dwt.	41 in.
South reef	16 in.	14.6 dwt.	45 in.

The combined mills have a total of 420 stamps, with a maximum crushing capacity, with the aid of tube mills, of 948,000 tons per annum. Electric power is used.

The payable ore reserves Dec. 31, 1912, showed the following widths and values:

	Value			Stoping width
	dwt.	s.	d.	
Main reef	5.8	24	4	57 in.
Main reef leader	6.7	28	2	40 in.
South reef	6.4	26	11	49 in.
Total	6.3	26	6	.....

Résumé of Operations from First Year (three months) Ending Dec. 31, 1895, to Dec. 31, 1912, inclusive.—Ore milled tons, 5,660,782; cost per ton milled, £1 1 10.265; rev. per ton milled, £1 11 9.468; profit per ton milled, 9 11.203; total working profit, £2,811,591; net profit, £2,769,738.

MAIN REEF WEST, LTD.

Remarks.—The mine is operating through several shafts. The reefs were encountered in the different shafts from 1250 ft. to 2500 ft. deep.

In 1912 the stoping widths and gold contents were as follows:

Main Reef Leader	56 in.	6.35 dwt.
South Reef	36 in.	7 dwt.

Mills operate 80 stamps at present, but have total 120, and 3 tubes.

MODDERFONTEIN B GOLD MINES, LTD.

Remarks.—Crushing at the mine began in October, 1911. The nature of the reef formation is a rich ore-body about 12″ thick, with frequent bulgings; stoped to a width of 48 inches. Dip of the reef about 14 deg. Two large shafts are operated. The mill has eighty 1650-lb. stamps and five tubes with the latest cyanide appliances. A maximum of 30,000 tons per month can be treated. The reef varies from 7 in. to 14 in. and assays 33 dwt. per ton. In 1912 the development on the reef disclosed a total of 3489 ft. averaging 15 in. and assaying 99s. 7d. per ton. Owing to flat dip and weak nature of strata the hanging wall is heavy. Systematic packing is resorted to. About 17 per cent. of area exhausted is filled with waste rock.

In 1912 in mining an average of 1.7 tons was broken per shift by each native employed on hammer work at a cost of 3s. 6½d. per ton and 17 tons per shift by each rock drill machine at a cost of 3s. per ton broken.

The company employs 314 whites and 1933 coloured. Working costs at the last quarter of 1912 were reduced to 16s. 5d. per ton.

In 1909 a total of 4265 ft. were driven on the reef; this disclosed an average width of 14 in. averaging 22.3 dwt.

In 1910, 11,295 ft. of development on the reef averaged 11.83 in. in width, assaying 32.71 dwt. During 1910 construction work on the mill was begun.

NEW HERIOT GOLD MINING CO., LTD.

In 1912 the stoping widths for the North Reef, Main Reef, Main Reef Leader and South Reef averaged respectively 50 in., 80 in., 49 in. and 51 in.

Of the development work done for the year about 65.5 per cent. was in reef formation. This disclosed the following:

	Distance exposed, feet	Width, inches	Assay value at 84s. per oz.
Main Reef	107	18	30s. 8d.
Main Reef Leader	1,765	14	100 0
South Reef	682	12	84 5

Remarks.—The property has four reefs. The average of the four as given in the reserves estimate of 1910 is stoping width of 3.87 ft. of 8.41 dwt. ore. At the croppings the reef's dip is 80 deg., but at depth they flatten to 40 deg.

The mill has seventy 1100-lb. stamps and two tubes with capacity of about 12,000 tons per month.

NEW MODDERFONTEIN GOLD MINING CO.

Remarks.—The property has two reefs with values and widths shown above. About 12 per cent. of the broken rock is sorted out and rejected. The dip of the reef is about 20 deg. The mill has 180 stamps and tubes. The intention is to increase to 300 stamps and tubes which will crush about 1,100,000 tons per annum.

Of the development done in 1912, 14,378 ft. was in the reef formation. The vein for this distance averaged 10 in. in width and assayed 186s. 1d.

OPERATIONS 1910 AND 1911

	1911	1910
Revenue from gold	£893,200	£749,975
Working expenditures	511,400	437,137
Working profit	381,800	312,838
Tons mined	644,135	595,506
Tons milled	574,600	534,300
Working cost per ton	17.80s.	16.36s.
Gold recovered per ton	31.10s.	28.07s.
Profit per ton milled	13.30s.	11.71s.
Net profit after taxes and cur. exp	11.20s.	.....

Résumé of Working Revenue Expenditure and Profit from June, 1895, to July 1, 1912.—Ore milled, tons, 3,129,480; ounces gold, 1,170,111; working revenue, £4,915,643; working expenditure, £3,161,369; working profit, £1,754,273; net profit, £1,854,379; value per ton ore milled, 31s. 5d.; cost per ton ore milled, 20s. 3d.; profit per ton ore milled, 11s. 2d.

NOURSE MINES, LTD.

Notes.—The property has three reefs separated at the outcrop by 50 ft. and 25 ft. respectively. The dip at surface is 80 deg. and at depth 40 deg.

The stoping widths, reef widths and values are:

Main reef	56 in.	32 in.	36s.	9d.
Main reef leader	43 in.	14 in.	73s.	8d.
South reef leader	49 in.	16 in.	81s.	0d.

The mill has 260 stamps and seven tube mills with capacity of 700,000 tons per annum. Total mill extraction in 1912 was 95.8 per cent.

RANDFONTEIN CENTRAL GOLD MINING CO.

Remarks.—This company is the consolidation of several properties among which are the West Randfontein, Mynpach, Block A Co.'s Ferguson, Van Hulsteyn Johnstone, East Randfontein and Randfontein South.

There are four reefs under development. The ore is being hoisted through five main shafts on the northern section and the same number on the southern section. A main central power plant supplies 20,000 electrical kilowatts. The reserves are calculated on a milling width of 30 in. which averages from 7 to 7.2 dwt. per ton. The mills (5 in number) have a total of 1000 stamps and tube mill operating. It is stated that with additional tubes and treatment tanks the milling capacity will be increased to 3,100,000 or 3,500,000 tons per annum. Ore reserves Dec. 31, 1912, amounted to 7,600,000 tons valued at 6.2 dwt. The water pumped at the various sections varies from 13,000,000 gal. to 146,000,000 gal. In 1911 the ten main shafts on the property had an average depth of 1631 ft. The Randfontein South Gold Mining Co., Ltd., was absorbed by the Randfontein Central Gold Mining Co., Ltd., in 1911.

RANDFONTEIN SOUTH GOLD MINING CO., LTD.

Remarks.—The absorption of this company by the Randfontein Central Gold Mining Co., Ltd., took place in 1911.

Mine operations are conducted on five sections, No. 1 Stubbs, No. 1 Porges, No. 2 South, and No. 3 North and No. 4 Robinson.

No. 1 *Stubbs.*—Main shaft 983 ft. deep. Development for year, 1977 ft.

No. 1 *Porges.*—Tons mined during year, 332,497. Development in year, 10,309 ft. Water pumped during year, 61,327,982 gal. Shaft down to seventeenth level.

No. 2 *South.*—Tons mined, 310,847. Shaft down to sixteenth level. Development for year, 5465 ft. Water pumped, 111,575,824 gal.

No. 3 *North.*—Tons mined 317,606. Depth of shaft, 2272 ft. (vertical). Water pumped, 75,000,000 gal.

No. 4 *Robinson.*—Shaft to 1700 ft. vertical. Water pumped, 259,900,000 gal.

ROBINSON DEEP GOLD MINING CO.

Remarks.—The property is operated through two main shafts which cut the reefs at about 1806 ft. and 2385, respectively. The Main Reef Leader and South Reef are the principal producers of ore. The reserves are based upon stoping widths of 48 in. for Main Leader and 30 in. for South Reef. The mills have a total of 300 stamps and tubes.

ROBINSON GOLD MINING CO., LTD.

Remarks.—Of the three reefs, until lately only the Main Reef, Leader and South Reef have been mined. The Main Reef and Leader Reef lie

very close together, in fact, the latter rests upon the Main Reef so that in working the Leader Reef portions of the Main Reef are broken with it. This gives a stoping width of about 80 in. The South Reef, being some distance from the others, is worked separately, with a stoping width of about 64 in.

1912	Width	Value
Main Reef	28 in.	28s. 2d.
Main Reef, Leader,	35 in.	44s. 3d.
South Reef	22 in.	76s. 2d.

The mill has 250 stamps and six tubes with the usual cyanide equipment.

The mine is one of the earliest producers of the Rand, and for a long time was considered the premier mine of the district.

RESULTS OBTAINED FROM JAN., 1888, TO DEC. 31, 1912

Tons mined	7,170,533	Yield per ton milled	13.783 dwt.
Tons sorted out	1,196,808	Working revenue	£17,300,361
Per cent. sorted out	16.69	Working expenditures	5,866,933
Tons milled	5,971,075		
Gold ounces	4,115,137	Working profit	11,433,428
		Revenue per ton	57s. 11.36d.
		Cost per ton	19 7.814
		Profit per ton	38 3.553.

ROSE DEEP, LTD.

Notes.—The Rose Deep No. 1 shaft intersects the South Reef at 860 ft., dip of reef 29 deg., and the Main Reef at 900 ft. The Main Reef Leader lies equidistant between the other two. The width, stoping width and assay value for these are as follows:

Main Reef	21 in.	9.4 dwt.	61 in.
Main Reef Leader	16 in.	11.0 dwt.	34 in.
South Reef	19 in.	11.6 dwt.	54 in.
Stoping Width (rough average)			57 in.

The crushing plant consists of 300 stamps.

Since 1907 when operation began, to Dec. 31, 1912, the following results have been obtained.

Tons milled	5,184,187	
Average cost	18s.	6.23d.
Average value per ton	£1 9s.	11.5d.
Profit	£2,966,114	
Profit per ton	£0 11	5.3
Net profit	£2,963,506	

SUB NIGEL, LTD.

	1912	1911
Stamps dropping	30	30
Days running	345	331
Duty per stamp	5.05	5.00
Tube mills	1	1
Days running	352	341
Development, feet	5269	7307
Water pumped, gallon	23,340,580	16,841,250
Ave. stoping w'd, inches	38.98	39.42

The reef was encountered at a depth of 1028 ft. The thickness was 8 in. to 10 in. of 9 to 10 dwt. rock.

The crushing plant consists of 30 stamps and one tube mill, which it is contemplated to increase.

Ore reserves, 8.9 dwt.

VILLAGE DEEP, LTD.

Remarks.—The mine operates through three shafts. Two are five-compartment and the third a seven-compartment. In No. 1 shaft the reefs were encountered as follows: South Reef at 2011 ft. depth. Main Reef and Leader at 2075 ft. In the new seven-compartment shaft, South Reef was cut at 3815 ft. depth, Main Reef Leader at 3894 ft., and Main Reef at 3904 ft.

The average width and value of the reefs for last quarter of 1911 were: Main Reef Leader, 22-in., 20.4 dwt., 64-in. stoping width. South Reef, 19-in., 14.3 dwt. 55 in. stoping width.

The mill has 180 stamps and six tubes. The mill is being increased to have a capacity of 600,000 tons per annum. Electric power is now used throughout.

The ore is trammed by an endless rope system from the shafts to the mill, distances of 1800 and 3222 ft. From 12 to 15 per cent. waste is sorted out.

The following show results obtained since commencement of reduction operations (Jan 1, 1905, to Dec 31, 1912).

Tons mined	3,751,136
Tons sorted out	586,626
Tons milled	3,192,027
Revenue per ton	27s. 1.5d.
Cost per ton	19s. 11.17d.
Profit per ton	7s. 1.8d.
Working revenue	£4,330,088
Working expenditures	3,188,519
Working profit	£1,141,569

VILLAGE MAIN REEF GOLD MINING CO., LTD.

Remarks.—The principal reefs are the Leader and South. They are 100 ft. apart and dip about 30 deg.

For 1911 the widths and assay values were:

Leader Reef..... 12 in. 38.7 dwt. 48 in. stoping width
South Reef..... 14 in. 25.5 dwt. 54 in. stoping width

The mill has 220 stamps and tube mill accessory.

WITWATERSRAND DEEP, LTD.

The cost of stoping during 1912 was as follows:

	Machine stoping			Hand stoping		
Cost per fathom	£5	12	1.73	£3	16	0.92
Cost per ton	0	7	4.58	0	6	1.08

The water pumped in 1912 amounted to 719,877,400 gal. costing £38,955 or 1s. 8.73d. per ton milled after crediting £11,253 for sale of water and charging £2,519 for laying pipe.

RESULT OF OPERATIONS FROM 1902 TO 1911 INCLUSIVE

Tons mined	3,529,430
Tons milled	3,000,381
Screen value, dwt	8.19
Cost per ton	18s. 5.71d.
Profit per ton	13s. 6.91d.

Remarks.—The reefs have been faulted and are consequently classed as two series, the North and South. Two shafts, one east and one west, develop the series.

In the North series the Main Reef and Leader are close enough to be worked together, forming a stoping width of about 6 ft. In the south series the Leader Reef is worked alone owing to the non-pay values of the main reef. The ore reserves are based upon a stoping width of from 48 in. to 50 in. with an assay value of approximately 7.16 dwt. per ton. The mill has 245 stamps and tube accessory.

Large amount of water pumped. Capacity of pumps 3,000,000 gal. per 24 hours.

Average stoping width 50 in.

WOLHUTER GOLD MINES, LTD.

Remarks.—The three reefs average in thickness as follows: Leader 4 ft.; South 4 ft. and Main Reef 4.5 ft. to 5 ft. The average dip at depth being about 30 deg.

The property is developed by two inclined shafts in the outcrop and one vertical shaft in the dip ground.

During the year ended Oct. 31, 1912, the total footage developed was as follows:

Average width, reef	24.1 in.
Average value, reef	12.7 dwt.
Average stope width	49.5 in.
Average stope value	6.2 dwt.

The mill has 120 stamps with tubes and cyanide plant with room allowed for an additional 40 stamps.

MYSORE GOLD MINING CO., LTD.

Vein varies from 1 ft. to 6 ft. Working by shafts to a depth of about 4000 ft.

The mines have been operating since 1884. The total tonnage milled is 3,314,787 with a total gross production of £13,472,641.

OOREGUM GOLD MINING CO. OF INDIA, LTD.

The mine is worked through inclined shafts. Greatest depth 4610 ft. Width of vein varies from 9 in. to 3.5 ft. During the year 131,433,542 gal. water were pumped. The mine has operated since 1888 producing 1,522,612 oz. standard gold from the treatment of 2,103,152 tons of ore. Total dividends declared £1,964,838.

NUNDYDROOG COMPANY, LTD.

Remarks.—Mine developed to 2900 ft. level. Vein narrow averaging from 8 in. to 1½ ft. Method of treatment. Milling and cyanide property has electric power. Ton = 2,000 lbs.

KAPSAN MINING CONCESSIONS

The mine is entered by shaft to vertical depth of 450 ft. and inclined depth of ore-body of 1020 ft.

The mine is in course of development. It is proposed to erect a pyritic smelting plant of 100 tons' capacity. The mine is 81 miles by cart-road from nearest seaport.

The government charges a land tax of 25 cents per seven-eighth acre per year, and 1 per cent. of gross output as royalty.

SEOUL MINING CO.

Remarks.—Mine is operated through shaft to depth of about 700 ft. The ore-bodies are large lenticular masses of gold, copper and bismuth-bearing quartz. About 65 per cent. of the gold content is native and recovered by amalgamation.

The mill consists of 40 stamps, Pierce amalgamators, concentrating tables and slime tables. The high-grade ore is shipped to Tacoma, Washington, U. S.

The conditions for cheap operations are exceptionally good. Native labour is cheap and efficient.

THE SPASSKY COPPER MINE, LTD.

The property has good widths of high-grade ore and as a mine gives much promise.

Average width of ore 14 ft.

Mine operated through shafts to depth of 490 ft. Company operated its own coal mine and railroad.

The smelter consists of three blast furnaces and converting plant.

The reports do not give full data on costs.

BRITISH BROKEN HILL PROPRIETARY CO., LTD.

General Remarks.—The property is reached by rail from Adelaide or Port Pirie. The ore-bodies are large masses of sulphides occurring in schist formation. The ore is a lead and zinc combination carrying silver values. The mine is operated by shafts to a depth of about 1000 ft. The milling method consists of crushing and concentration. The lead values are removed mainly in the first stage and the tails reconcentrated to remove the zinc. The flotation process of the Minerals Separation Co. is being installed.

BROKEN HILL SOUTH SILVER MINING CO.

Ore-bodies worked by square-set.

Massive deposits up to several hundred feet long by 200 ft. wide.

Developed to 1200 ft. in depth.

MOUNT BOPPY GOLD MINING CO.

Sixty-head stamp mill. Higher cost per ton in 1911 due to advance in wages and reduced output in consequence of cessation of work. The cost in 1910 was 19s. 0.92d. Developed to 700-ft. level. Diminished output 1912 due to shortage of water arising from drought.

ASSOCIATED NORTHERN BLOCKS (W-A.), LTD.

	1912
Victorious leases:[1]	
Tons mined, oxidized	5,007
Tons treated, oxidized	5,007
Ounces, gold	1,251
Value, gold	£5, 316 2s. 8d.
Cost per ton:	s. d.
Ore extraction	4 2.142
Milling	5 3.016
General expenses	1 0.320
Total	10 5.478
Development, feet	3,089
Cost per foot	39s. 6.051d.

[1] Month of September in which month production was begun.

Remarks.—The reduction plant is of 300 tons daily capacity. This plant contains rock-breakers Huntington Mills, Amalgamating Pans, Pulp Thickeners, Agitators, Vacuum Filters, Clarifiers, etc. Lode average, around 4 ft. Property developed to fourth level.

GREAT BOULDER PERSEVERANCE GOLD MINING CO.

Year Ending Dec. 31.	1912	1911	Aug. 1–Dec. 1, 1910
Grade ore reserves and value	5.63 dwt. 23s. 11d.	5.63 dwt. 23s 11d.	5.71 dwt. 24s. 3d.
Tons of waste to old stopes.	15,667	11,197	31,720
Dev. (cost per foot):	8320 feet	8660 feet	5242 feet
Shaft sinking, per foot..	.....	£18 12 1	£1812 6
Driving shafting, per ft.	£2 6 3.7	£2 13 2	£3 0 9
Cross cutting, per foot..	£2 15 7.0	£2 19 4	£3 14 9
Winzes & rises, per foot.	£2 16 10.6	£3 5 2	£4 7 9
Plat cutting, per foot...	£4 19 11.3	£5 6 8	£5 12 5
Depth shaft, 2228.....	.....	.....	.....

GREAT FINGALL CONSOLIDATED, LTD.

Remarks.—**Accessibility.**—600 miles by rail from Perth.

Character of ore.—Free milling.

Character of ore-body.—Quartz, reef.

Width of ore-body.—8 ft. to 13 ft.

Method of opening.—"Shrinkage" stoping upper level; "rills" and "flat back" bottom levels.

Method of mining.—Shaft and levels. Bottom levels driven off a main internal shaft.

Depth of mine.—2280 ft. vertically.

Method of ore reduction.—40 stamp mill. Fine grinding in pans. Vacuum slimes plant.

General Conditions.—Normal Western Australia.

KALGURLI GOLD MINES, LTD.

Remarks. Accessibility.—Railway to the mine from Perth.

Character of ore.—Gold contained in sulphide and tellurides.

Character of ore-body.—A "chimney" which is in places of greater width than length—no defined walls, the ore being mined to its payable limits.

Method of opening.—Perpendicular shafts, cross-cuts and drives.

Method of mining.—Mostly overhead stoping—in places on shrinkage system—stopes filled in with residue.

Depth of mine.—1850 ft.

Amount water pumped.—Very little.

Method of ore reduction.—Crushed in ball mills, roasted, amalgamation and filter pressing, the ore being mostly reduced to a slime.

General Conditions.—Hot weather, climate fairly good. Wages: rock drill men in shafts, winzes and rises 14/4; rock drill men elsewhere 13/4; hammer and drill men in shafts, winzes and rises 13/4; hammer and drill men elsewhere 12/6; bracemen 13/4; firemen 12/–; truckers and shovelers 11/2; minimum wages 10/9; 44 hours week's work. Mine timber from near Perth and firewood locally, 13/9 per cord. Water 7/– per 1000 gal.

LAKE VIEW AND STAR, LTD.

No. stamps, 75
Duty 24 hours, 7.18.
Width lode (arox.), 5 to 6 ft.
Developed to depth of 2050-ft. level.
Concentrates treated by roasting, sliming in cyanide agitation and filter pressing.
The balance of mill products was ground to slime and cyanided by agitation and filter pressing.

Remarks.—Accessibility.—On railway about 400 miles from coast. Siding into the mine.

Character of ore.—Refractory, occasionally telluride.

Character of ore-body.—Rich shoots occurring in lode formation.

Width of ore-body.—From 3 ft. up to 20 ft. in places.

Method of opening.—Vertical shafts ordinary methods.

Method of mining.—Rill stoping.

Depth of mine.—Lake Vein 2000 ft. Star 1000 ft.

Amount water pumped.—Infinitesimal.

OROYA LINKS, LTD.

Remarks.—Accessibility.—On the railway 400 miles from coast.

Character of ore.—Refractory occasionally telluride.

Character of ore-body.—Rich shoots occurring in lode formation.

Width of ore-body.—From 3 ft. up to 20 ft. in places.

Method of opening.—Vertical shafts.

Method of mining.—Rill stoping.

Depth of mine.—750 ft.

Amount water pumped.—Infinitesimal.

Method of ore reduction.—50 stamps, tube mill. Concentrating roasting concentrates. All sliming. Vacuum filter.

General Conditions.—Leases divided into three sections separated by other companies' mines. Ore reserves confined to one lease but half monthly tonnage treated is recovered from fringes of ore chutes, supposed to be worked out in other leases.

THE SONS OF GWALIA, LTD.

EXPENDITURE ON DEVELOPMENT COST PER FOOT

	1912			1911		
	£	s.	d.	£	s.	d.
Main incline shaft	26	1	.89	21	16	2.22
Flat cutting and shaft bins	0	1	9.17	..	..	.....
Driving	4	0	8.26	3	14	5.29
Cross cutting	3	18	11.36	3	14	10.01
Rising	3	1	3.06	3	6	0.54
Winzing	4	10	1.22	4	4	10.94
Diamond drilling	0	18	10.49	0	17	9.06
Total expenditure			£34,374			£34,527
Equiv. per ton milled		4s.	5.02d.		4s.	2.02d.

Remarks.—Property is situated 500 miles by rail from Perth. The character of ore is free milling—the ore-bodies lenticular. The average width is 9 ft. The mine is developed by inclined shaft and levels, maximum depth 2753 ft. The method of mining is flat back and rill stopes. About 5000 gal. of water per hour are pumped. Property has 50-stamp mill. Treatment is fine grinding in pans, vacuum filter slimes plant. Ore reserves equal to $3\frac{3}{4}$ years' supply for mill. Mine looking very well in the bottom.

YUANMI GOLD MINES, LTD.

Remarks.—Accessibility.—Fifty miles from rail-head which in turn is about 250 miles from seaport.

Character of ore.—Quartz and schist. Sulphides contain .45 per cent. stibnite.

Character of ore-body.—Pay chutes in reef formation.

Width of ore-body.—Varies but averages say 4 ft. 6 in.

Method of mining.—Rill stoping.

Method of opening.—Vertical shaft and usual methods.

Depth of mine.—580 ft. vertical.

Method of ore reduction.—(1250 lb). 20 Head Californian stamp. Amalgamation, all sliming. Vacuum filter. Roasting sulphide ore.

General Conditions.—Power for treatment plant is supplied by 200 b.h.p. Crossley Gas Engine. Cambridge Patent Wood Gas Producer. Consumption of fuel for latter works out at £2 8s. per day.

MOUNT LYELL MINING AND RAILWAY CO., LTD.

General Remarks.—The ore comes from the two mines in about the following proportions and grade of metal content:

	Mt. Lyell Mine	North Mt. Lyell Mine
Ratio tons mined	.5	2 to 3.5
Copper, per cent	0.55	6.2
Silver, ounces	1.8	1.3
Gold, ounces	0.04	0.004

During a part of 1911–12 a labour strike greatly handicapped operations and increased operation costs. The Mt. Lyell mine is operated partly by open pit and partly underground. The North Mt. Lyell is operated mainly underground. A depth of 1100 ft. by shaft is attained. The ore is a copper-iron pyrite occurring in large shoots or masses in a schist and quartzite formation.

The company owns and operates its own railroad and coke works. The ore is smelted in pyritic blast furnaces and the matte converted. The blister copper is shipped to refineries. By-products of acid and fertilizer are sources of additional income. The entire equipment is thoroughly modern.

THE TASMANIA GOLD MIN E, LTD.

One drift was advanced during the year 565 ft. showing 7¾ ft. of 11-dwt. ore. Average width 6 to 10 ft.

Shaft 1500 ft. deep. Number of stamps operating, 40.

Deepest level, 1370 ft. Stamp duty per 24 hours, 4.36 tons.

Method of treatment amalgamation, concentration and cyanide.

KYSHTIM CORPORATION, LTD.

Résumé 1910 Operations.—Total delivery, copper, 1580 tons; total profit, £64,335; ore mined, 89,509 tons; grade copper, 3.38 per cent.; total shipments, 72,515 tons; total blister copper produced, 1674 tons. Cost of producing copper per ton, £28 5s.

Notes on 1911 Operations.—In the last six months of the year the company made the following costs:

Per ton ore: Mining, 5.9s.; smelting, 7.4s.; trans. ore and matte, .6s.; genl. exp., 1.2s.; total, 15.1s.

Per ton blister: Mining, £13.43; smelting, 16.83; trans. ore and matte, 1.34; general expense, 2.72; total, £34.32.

Exchange: In 1912, Rs.9.50 = £1.

ORE RESERVES

CANADA

Name	Date	Tons	Grade
Hedley	12–31–13	413,000	About $10.00.
Hidden Creek	12–31–13	9,000,000	2.3 per cent. cop.
Buffalo	4–30–13	57,330	About 30 oz. sil.
Cobalt Lake	12–31–12	52,036	Containing 2,135,040 oz. sil
Crown Reserve	12–31–12	34,995	About $25.00 per ton.
Kerr Lake	8–31–13	6,019,300 oz.	.....
La Rose	12–31–12	92,206	Containing 2,796,650 oz. sil.
McKinley-Darragh	12–31–13	113,000	Containing 3,210,000 oz. sil.
Nipissing	12–31–12	188,477	Containing 9,643,338 oz. sil.

MEXICO AND SOUTH AMERICA

Dolores	12–31–12	44,500	Ave. $38.22.
Esperanza	12–31–12	100,334 met. tons 51,000 possible ore 362,129 dump tails	Profit $320,000 U. S. Cur. ..... Profit $362,129 U. S. Cur.
Buena Tierra	12–31–12	301,150	No grade.
Braden	12–31–13	78,000,000	Ave. 2.8 per cent. copper.
Chile Copper Co	.....	212,000,000	Ave. 2.18 per cent. copper.

RESUMÉ OPERATIONS 1913–1914

MINES OF AUSTRALIA, NEW ZEALAND, EUROPE AND ASIA

AUSTRALIA

New South Wales

British Broken Hill Prop. Half yr. end. Dec. 31, 1913. Tons treated, 170,080. Per cent. lead, 14.7; zinc, 14.5%; silver, 7.3 oz. Profit, £169,800. Reserves, 3,350,000 tons. No grade stated.

Broken Hill South Silver: Half yr. end. Dec. 31, 1913. Tons treated, 109,284. Per cent. lead, 12.8; zinc, 11.9%; silver, 7.3 oz. Profit, £46,478. Reserves, 1,014,300 tons, av. 13% Pb., 10.9% Zn., 6.5 oz. Ag.

Great Cobar: Yr. End. June 30, 1913. Tons treated, 361,566. Profit, £81,925. Prod. copper tons, 5811. Rec. 2.017 %. Gold, oz. 27,136. Rec., .0942 oz. Total silver, oz. 127,542. Rec. per ton, .4427 oz. Reserves, 2,705,161.

Mount Boppy: Yr. end. Dec. 31, 1913. Tons treated, 64,762. Prod.,25,388 oz. Gold. Profit, £15,604. Reserves, tons 205,387. No grade stated.

Queensland

Mount Morgan: Half yr. end. Nov. 30, 1913. Tons treated, 123,247 and 25,632 Many Peaks. Prod. tons copper, 4354; Gold oz., 54,992. Yield Mt. Morgan, 3.125% cu. 8.5 dwts. gold. Profit, £172,845. Reserves, Smelt. ore, 3,245,000; conc. ore, 3,000,000 tons. No grade.

Western Australia

Assoc. Gold Mines of W. A.: Yr. end. Mar. 31, 1914. Tons treated 127,856. Yield, 23s. 9d. Prod. £152,105.

Assoc. Northern Blocks: Yr. end. Sept. 30, 1913. Profit, £72,995.

Burbanks Main Lode: Yr. end. June 30, 1913. Tons treated, 22,934. Yield, 45s. 7d. Cost 27s. 2d. Profit 18s. 5d. Profit, £21,186.

Great Boulder Perseverance: Yr. end. Dec. 31, 1913. Tons treated, 244,841. Yield, £253,218. Profit, £6896. Reserves, 838,258 tons. 23s. 6d. Cost, 18s. 0.242d.

Great Boulder Proprietary: Yr. end. Dec. 31, 1913. Tons treated, 189,469. Yield, 59s. Profit, £262,178. Reserves, 615,114 tons, 14.5 dwts.

Great Fingall Cons.: Yr. end. Dec. 31, 1913. Tons treated, 64,255. Yield, 25s. 3d. Income, £115,487. Profit, £2803. Reserves, 69,442. 39s. 2d.

Ivanhoe Gold: Yr. end. Dec. 31, 1913. Tons treated, 239,314. Yield, 37s. 10.46d. Cost, 22s. 8.33d. Profit, 15s. 2.13d. Profit, £157,910. Reserves, 991,417 tons. 38s. 6d.

Kalgurli Gold: Yr. end. July 31, 1913. Tons treated, 128,415, averaging 42s. 8d. Yield, 39s. 9d. Profit, £101,961.

Lake View & Star: Yr. end. Feb. 28, 1914. Tons treated, 216,043. Yield £249,761. Profit, £33,090. Reserves tons, Lake, 79,434, 27s. 11d. Star 368,604, 26s. 7d.

Oroya Links: Yr. end. Dec. 31, 1913. Tons treated, 139,130. Yield, 21s. 6d. Profit, £15,462. Reserves, 146,775 tons, 24s. 3d.

Sons of Gwalia: Yr. end. Dec. 31, 1913. Cost per ton, 18s. 3d.

South Kalgurli: Yr. end. Mar. 31, 1914. Tons treated, 124,670. Prod., £133,806. Profit, £6572.

Yuanmi Gold: Yr. end. June 30, 1913. Profit, £57,080. Yuanmi: Tons treated, 64,530. Yield, 34s. 0.69d. Cost, 14s. 3.5d.

Oroya: Tons, 59,680. Yield, 35s. 11.45d. Cost, 21s. 1.84d. Reserves, 116,768 tons aver. 36s. 8d.

New Zealand

Blackwater Mines: Yr. end. Dec. 31, 1913. Tons treated, 45,053. Yield, 38s. 7.80d. Cost 21s. 2.78d. Profit, 17s. 5.02d. Profit, £34,982. Reserves, 104,727 tons, 9.89 dwt.

Cons. Goldfield of N. Z.: Yr. end. Dec. 31. 1913. Tons treated, 23,661. Yield, 31s. 11.04d. Cost, 19s. 2.99d. Profit, 12s. 8.05d. Profit, £18,456. Reserves, 25,764 tons, 10.41 dwt.

Progress Mines of N. Z.: Yr. end. Dec. 31, 1913. Tons, 34,996. Yield, £1 3s. 10.06d. Cost, 19s. 0.91d. Profit, 4s. 9.15d. Profit, £18,492.

Talisman Cons.: Yr. end. Feb. 28, 1914. Tons treated, 41,680. Yield, £5 7s. 7d. Cost, £2 7s. Profit, £126,292. Tons, 37,513, £5 5s. 6d.

Waihi Gold: Yr. end. Dec. 31, 1913. Tons treated, 184,146. Assay value, gold, 84s. Silver, 2s. Profit, £104,743. Reserves, 764,732 tons. No grade.

Tasmania

Mount Lyell: Yr. End. Dec. 31, 1913. Tons treated, 143,640. Mt. Lyell Mine: tons smelted, 89,661; 0.47% Cu; 1.83 oz. Ag; .039 oz. Au. North Mt. Lyell: Tons smelted 36,339; 5.97% Cu; 1.13 oz. Ag; .002 oz. Au. Cost per ton, £1 2s. 2.21d. Profit, £41,943. Prod. 2442 tons copper; 187,097 oz. silver; 4050 oz. gold. Reserves, Mt. Lyell, 2,202,335 tons; .531% Cu; 1.96 oz. Ag; .0275 oz. Au. North Mt. Lyell reserves 1,086,112 tons, 6.0% Cu; 1.33 oz. Ag; .005 oz. Au.

Tasmania Gold: Yr. end. Sept. 30, 1913. Tons treated, 53,812. Prod., oz. 21,174. Loss, £3,028.

INDIA

Champion Reef: Yr. end. Sept. 30, 1914. Tons treated, .220,511. Yield, £510,736. Cost, 26s. 6d. Profit, £218,000. Ore reserves, 404,125 tons.

Nundydroog: Yr. end. Dec. 31, 1913. Tons treated, 90,650. Yield, 17 dwt. 16 grs. Cost, £1 10s. 4d. Profit, £144,098. Reserves, 150,650 tons.

Mysore: Yr. end. Dec. 31, 1913. Tons treated, 302,662. Yield, 15 dwt. 15 grs. Cost, £1 3s. 6.56d. Profit, £490,268. Reserves, 1,377,102 tons.

Ooregum: Yr. end. Dec. 31, 1913. Tons treated, 153,636. Yield, £360,888. Reserves, 186,947 tons.

EUROPE & SIBERIA

Kyshtim: Yr. end. May 1, 1914. Tons, 361,000. Cost per ton refined, £36, 16s. Prod. Cu, 7971 long tons. Profit, £311,578. Reserves, 356,000 tons, 3% Cu.

Spassky: 15 mos. end. Dec. 31, 1913. Tons, 43,591. Grade, 22% Cu. Profit, £226,318. Reserves, 12,643 tons 20% Cu.

PROPERTIES NOT FOUND IN BOOK PROPER

TEMISKAMING MINING CO.

COBALT, CANADA

Yr. ended Dec. 31, 1913: Silver, oz. 739,726. Net profit, $117,574. Stoped, 300,182 cu. ft. Cost to surface $5.23. Av. grade, 26.4 oz. Tons shipped, 55.4. Assay value, 4619 oz. Tons treated, 32,307. Av. per ton, 18.5 oz. Silver oz. produced, 483,796. Tons conc. 936. Rec. per cent., 81. Ratio of conc., 62–1. Cost per ton treated, $2.52. Cost per oz., 16.8¢. Total cost per ton, $9.60. Per oz., 41.9¢. Net. aft. revenue, $9.54 and 41.7¢. Total dev. to date 21,852 ft.

TRETHEWEY SILVER COBALT

COBALT, CANADA

Yr. ended Dec. 31, 1913: Prod., 619,427 oz. silver. Gross value, $365,565. Net aft. mkt., etc., $334,769. Operating exp., $204,072. Net profit, $130,696. Tons shipped, 587. Total silver contents 599,035 oz. Cost mkt. 5.27¢ per oz. Tons treated mill. 35,282. Value 21.24 oz. Cost per ton: Dev., $1.07; Break and stoping, $2.28. Cost per ton milled, $1.46. Genl., $0.93. Markt. ore conc. and bull., $0.90. Total aft. prospecting, int., etc., $6.65. Total dev. to date, 20,984 ft.

THE LUCKY TIGER COMBINATION GOLD MINING CO.

YZABAL SONORA, MEXICO

U. S. Currency—2000 lb. tons

Operations, 1912: Income, $1,683,973. Oper. Exp., $947,939. Oper. profit, $736,034. Ore broken, 49,480. High grade sorted, 1,152 tons. This ore is high in silver and averaged 348 oz. Ore milled, 67,832. Averaging gold, 0.138 oz. and silver, 28.25 oz. Costs: Min., $2.541; Dev., $0.715; Trans., $.112; Mill., $4.81; Genl. $.738; Mkt. taxes and conc., $3.287; Mkt. bull $.784; Total $12.98.

The mine is opened by tunnel and shaft. Vein formation not of great width. Ore is concentrated. Conc. and high grade shipped. Tailings cyanided. Mine is 30 miles from Yzabal. Railway at Yzabal. Property 60 miles south of U. S. border.

AMPARO MINING COMPANY

ETZATLAN JALISCO, MEXICO

U. S. Currency

Operations year ending Mar. 27, 1913. Gross Prod., $889,225. Total profit, $358,131. Metric tons milled, 92,365. Value rec., $9.627. Recovery, 90.7. Cost per metric ton: Min. and dev., $2.498; Ore to mill, $.211; Mill, $1.621; Mkt., $.151; Dumps, $0.083; Genl., $.616; Dep., $.442. Phila. office, $.098; Taxes U. S. State and Income, $.142; Total, $5.862; Total aft. int., $5.85. Ore reserves, 559,099 tons.

Property located several miles from railway. Has wagon haul. Mine opened by shaft to 1300 ft. Ore silver-gold. Mining by shrinkage system. Treatment, concentration and cyaniding. Concentrates shipped to Monterey.

OROYA LEONESA, LTD.

SAN RAMON, NICARAGUA, C. A.

Revolution and inadequate labor supply seriously interfered with operations. We give below operations for Mar. 1913 which seems to be an average month for 1913.

Tons treated, 1906. Grade ore, 37/2. Tailings, 6/9. Recovery, 81.83. Total yield, £2093. Per ton, 21/10. Working cost per ton, 23/5½.

Property located 9 miles from Matagalpa, 120 miles from R. R. at Leon. Ore occurs in fault fissure. Vein width approx., 5 ft. Values, $10 U. S. currency. Ore is oxides of iron and manganese with quartz. Dev. by tunnel. Mill is 20 stamp and cyanide plant. Power from gas plant. Haulage by ox cart. Ore reserves 95,358 tons, 39.7s.

PREMIER (TRANSVAAL) DIAMOND MINING CO., LTD.

SOUTH AFRICA

Operations year ending Oct. 31, 1912: Income, £2,004,943. Profit, £840,656. Loads hauled (16 cu. ft.), 10,404,378. Loads washed, 9,707,098. Carats found, 1,992,474. Yield per load carats, .205. Value per load, £0 4s. 1.57d. Costs: Mining and tramming, 1s. 3.84d.; Sorting and washing, 0s. 4.896d.; Compound expenses, 0s. 3.575d.; Genl. and motive power, 0s. 3.30d.; Per load mined and washed, 2s. 3.667d.; Total inc. genl. office ex., 2s. 4.74d.; Number natives employed, 13,363. Whites, 803.

The workable area is approximately 80 acres in extent. Property is worked by open cut mining.

UTAH APEX MINING CO.

BINGHAM, UTAH, U. S. A.

Operations 1913: Receipts: Shipping Ore, $453,549. Mill Ore, $238,713. Total after royalties, $702,756. Expenses, $483,054. Profit, $217,702. Lbs. lead prod., 25,376,222. Silver, oz., 470,556. Tons dry: Mined, 119,342; Shipped, 71,951; Milled, 47,390. Tons concentrates, 13,735. Grade shipping ore: Lead, 12.3%; Silver, 5.2 oz. Cost per ton combined ore: Mining, $2.588, Dev. $.882, Genl. Exp., $.233.—Total, $3.703.

ST. JOHN DEL REY MINING CO., MORRO VELHO, MINAS GERAES

BRAZIL, S. A.

Morro Velho Mine, tons 2240 lbs.

Year ending Feb. 28, 1913: Tons stamped, 172,208; av. 6.38 Oitavas. Oz. gold, 92,906. Value silver and gold, £396,109. Profit, £118,471. Yield per ton, Oitavas 5.96. Yield

first process, 24s. 9d.; second process, 21s. 3d.; total, 46s. 0d. Realized per Oitava refined 9s. 9d. Extraction first process, 50.62%; second, 42.73%; total, 93.35%. Cost per ton min. mill. and working cost Brazil, 29s. 4¾d. Dev., 6¼d. London exp., 3½d. State and Fed. gov. duties and transport charges, 2s. 0¼d. Total cost, 32s. 2¾d. Profit, 15s. 9¼d.

Year ending Feb. 28–14: Tons, 174,000. Yield, 47s. 7d. Yield, 97,208 oz. Cost, £283,166. Profit, £131,244. Ore reserves, tons 887,400.

Remarks.—Property worked since 1834. Depth mine Feb. 4, 1913, 5226 ft. Depth to surface vertical line over shaft, 5596 ft. These are probably deepest workings in the world, exceeding slightly the Tamarack's which are over a mile. Mill consists of 130 stamps and 7 tubes.

BACKUS & JOHNSTON CO.

Casapalca, Peru

Year ending Dec. 31, 13: Smelting profit, £65,689. Tons received at smelter, 91,266, containing 2,259,130 oz. silver, and 5163 short tons copper. In addition 8260 tons high-grade ore were shipped to N. Y. Could not be profitably handled without converters. Tons smelted, 86,157. Matte produced, 8104. Net value, £507,224. In 1913 Casapalca prod. 20,800 tons of dressed ore and conc. and morococha, 49,763 tons.

Property is located 20 miles from Casapalca, Peru. Company operated Natividad and Casapalca mines. Mines carry high-grade copper and silver ores in vein formation. Width moderate. Casapalca opened by tunnel. Has 2000 ft. backs. Lode proven for over 2000 meters. Has 300-ton mill and 500-ton smelter. Converter plant and hydro-elect. plant installed in 1913.

CERRO DE PASCO

Peru, South America

Cerro de Pasco Mining Co. is the largest copper producer in South America. Production 1913, 43,865,329 lbs. of copper. Property located 228 miles by rail from Callao at an altitude of 14,300 ft. The mines have been producers for several hundred years, having been formerly worked for their silver ores. The company's holdings include a large number of mines, opened by shafts and tunnels. The method of mining is square setting, Oregon fir and native timber being used.

The ore occurs principally in fissure veins, the greatest mineralization occurring at the intersection of the main vein system with cross veins, where the deposits are large and irregular. The geology of the district is very complex, the predominating rocks being limestones and rhyolites. The ores are mostly primary, though secondary ores are present. Chalcopyrite and enargite are common, though various arsenides and antimonides of copper are to be found. The ruby silvers are common, also galena and sphalerite.

The ores are smelted direct. Smelter 9 miles from mine. Plant consists of 5 blast furnaces, 5 reverberatory and 3 basic converters. Hydro-electric plant generating 12,000 horsepower is located at Oroya, 70 miles from smelter. Company owns and operates coal mines within 20 miles of smelter; make their own coke. Company also owns Cerro de Pasco Ry. connecting property with Central Ry. of Peru at Oroya. Cost data and silver and gold contents not available.

WALLAROO AND MOONTA

South Australia

Year ending Dec. 31, 13:* Production smelter, 7112 tons refined copper, 2161 oz. gold and 1000 oz. silver. Profit, $259,000. Ore mined, 161,874 tons 3% copper. Sorted to 60,649

tons 8.54%, and 621 tons 12.29%. Old tails treated, 52,789 tons by leaching. Prod. 965 tons, 78.3% Cu.

*Costs.—Min., $5.60. Ore Dressing, $1.42. Trans., $.25. Smelt., $1.98. Genl. Exp., $.18. Flotation process employed on tails. Depth Wallaroo mine shaft 1913, 2550 ft.

* Total Copper Prod. to end 1913: 283,682 tons. Ore mined, 10,200,000 tons 3% Cu. Total dividends, $10,704,000.

Remarks.—Company operates two mines, Wallaroo and Moonta, situated on York Peninsula, South Australia. Veins are fissures in schist and porphyry varying from few feet to 20 and 25 ft. in width. Veins are productive for great length. Shoots are short. Ore principally chalcopyrite. Ore is sorted. Method mining overhand stoping and filling.

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THE ZINC CORPORATION, LIMITED

Year ending Dec. 31, 1913: Net profit, £22?,680. Lead concentrator treated 162,956 tons av. 14.7% Pb., 2.6 oz. Ag., and 8.95% Zn. Produced 30,680 tons Conc., av. 66.2% Pb., 9.27 oz. Ag., 6.4% Zn. and 36,536 tons zinc middlings av. 15,6% Zn., 1.9 oz. Ag., and 5.1% Pb. The Lyster process is employed. Extraction lead av. 84.7%. The zinc concentrator treated 350,120 tons tailings, av. 14.6% Zn. 5.95 oz. Ag., and 5.7% Pb. This yielded 102,850 tons. Flotation Conc. av. 44.2% Zn, 12.1 oz. Ag., and 12.5% Pb. This product was retreated by the Horwood Process.

Costs.—Mining Dept. 15s. 8.93d. Tailings at zinc conc., 10s. 2d., of which 9d. was cost wood plant. Ore Reserves 971,784 tons av. 14.8% Pb. 2.4 oz. Ag., 9.5% Zn.

OPERATING RESULTS 1913–1914

ALASKA MEXICAN

1913 Operations: Gross prod., $496,007. Profit, $171,797. Tons milled, 227,112. Value per ton rec., $2.156. Value free, $.9923. Gross value, $2.30. Value sulph., $1.16. Profit per ton, $.7564. Cost per ton: Min. and dev., $.907; Mill,. $.251; Sulph. exp., $.0923; Total cost, $1.4276. Develop., ft. 2464.

ALASKA TREADWELL

1913 Operations: Gross prod., $2,358,422. Gross profit, $2,421,015. Profit, $1,223 438. Tons milled, 886,057. Value rec. per ton, $2.66. Value, per ton free, $1.3787. Per ton sulph., $1.283. Gross per ton, $2.84. Profit per ton, $1.408. Cost per ton: Min. and dev., $.8271; Mill., $.2476; Sulph. exp., $.088; Total cost, $1.2533.

ALASKA UNITED

1913 Operations: Ready Bullion Claim . . . Gross Prod., $511,391. Profit, $187,789. Tons milled, 222,992. Value rec., $2.29. Free gold, $1.203 Sulph., $.089. Gross value, $2.48. Profit, $.842. Cost per ton: Min. and dev., $1.03; Milling, $.267; Sulph., $.105; Total, $1.45.

700 Claim: Gross prod. $532,153. Profit, $206,483. Tons milled, 225,135. Value rec., $2.36. Free gold, $1.26. Sulph., $1.10. Profit, $.9159.

Cost per ton: Min. and dev., $1.058; Mill., $2.255; Sulph., $.088; Total, $1.444.

BUFFALO MINES

1913 Operations: Prod., $1,385,473. Profit, $891,192. Oz. silver 2,235,852. Mill ore, 55,783 tons. Av. oz. silver, 45.83. Rec., 82.64. Ore shipped, 35.5 tons. Cost per oz., $.2241.

BUTTE AND SUPERIOR

1913 Operations: Income after freight and penalties, $2,676,652. Expenses, $1,738,858. Net profit, $937,794. Tons treated, 296,940. Lb. zinc in conc., 102,102,868. Grade, 49 per cent. Tons lead conc., 2,269. Grade, 39.4 per cent. Per cent. zinc conc., 49 per cent. Grade ore, 19.89 per cent. zinc, 1.69 per cent. lead. Recovery zinc, 86.43 per cent. Costs: Mining, $3.09; Milling, $2.69; Miscl., $.069; Total $5.856. Profit per ton, $3.158.

CALUMET AND HECLA

1913 Operations: Prod., 45,016,890 lb. Tons stamped, 2,035,625. Lb. per ton, 22.11. Price copper, 15.77¢. Cost at mine, $2.38. Cost per lb., 14.25¢.

Conglomerate Lode: Lb., 32,731,768. Tons, 1,175,259. Pounds, 27.85. Mine cost, $2.99. Per lb., 12.67¢.

Osceola Lode: Prod., 12,051,238 lb. Tons 842,162. Pounds 14.31. Mine cost, $1.53. Per lb., 12.62¢.

Kearsarge Lode: Pounds, 233,915. Tons 18,203. Stamp Mills: Prod.. 1,529,097. Tailings crushed, 388,164. Lb. copper per ton treated, 11.92. Lb. saved, 3.94. Cost per lb., 5.87¢.

DOME MINES COMPANY, LTD.

Year ended March 31, 1914. Gross, $1,204,597. Profit after operating cost, $756,433. Net earnings, $591,779. After dep., $457,695. Tons mined 163,177. Sent to mill, 144,281 tons. Of this 121,800 were from surface pits, 4,782 underground and 17,699 development. Tons milled, 145,305. Value $8.77. Rec. $8.29. Rec. 94.5 per cent. By amal. 60.7 per cent. By cyanide 39.3 per cent. Stamp duty, 10.6 tons. Cost per ton milled: Min.. $0.68; Hoisting, $.07; Crush. and convey., $.25; Stamp. tube and amal., $.86; Thick cyanide and precip., $.50; Ref. $.08; Genl., $.64; Total, $3.08. Develop., $1.11.

GOLDFIELD CONSOLIDATED

Year ending Dec. 31, 1913. Prod., $4,942,828. Profit, $2,731,944. Tons milled, 330,217. Value per ton, $14.88. Rec., $13.69. Cost per ton: Stop-

ing and dev., $3.41; Trans., $.08; Mill., $1.51; Conc., $.31; Markt. bullion $.05; Markt. shipping ore, $.44; Genl. exp., $.31; Taxes, $.54; Total, $6.34 Total aft. misc., $6.28. Operat. profit, per ton, $7.86. Net prof. less const. $7.82. Dev. ft., 38,696.

GREENE-CANANEA

1913 Operations: Total lb. copper, 44,480,514. Total net income $2,244,990. Copper, price, 15.1¢. Cost per lb., 9.63¢.

GREENE-CONSOLIDATED

1913 Operations: Total copper, 44,480,514. Domestic, 40,641,484. Gross value, $7,576,138. Net profit $2,186,260. Copper metal, 15.01¢. Ore treated, 757,460 tons. Ore milled, 343,081. Rec. cop. dom. ore, 2.405 per cent. Costs: Mining total, $2.89. Milling, etc., $.716; Smelting, $2.545, Total cost per lb., 9.547¢.

NIPISSING MINING CO.

Year ending Dec. 31, 1913. Silver, oz. 4,552,173. Value, $2,756,612. Profit, $1,660,271. Tons ore and conc., shipped 1,328. Tons treated high grade mill, 1200. Av. 2254 oz. Tons treated Custom mill, 77,240. Av. oz. 27.18. Ext. per cent., 91.85. Profit on production, 60.2 per cent. Price silver, 60.26¢. Cost, per oz.: Min.; $.1489; Conc. and mill., $.0811 Dep., $.0135; Markt., .0052; Corp. exp., $.0026; Total, $.2513; Total aft. income, $.2409. In 1913 the low grade was treated in the Company's low grade mill at a cost of $4.132 per ton ore.

UTAH CONSOLIDATED

1913 Operations: Total income, $2,151,435. Expenses, $1,554,965. Operating profit, $596,470. Profit aft. dev., $636,470. Copper, lb. 7,710,668. Lead, lb. 19,208,063. Tons mined and shipped, 251,966. Copper ore shipped, 181,077. Grade, 1.98 per cent. Lead ore shipped, 70,889 tons. 15.05 per cent. Cost per ton: Min., $2.51; Exp. and dev., $.63; Trans. and smelt., $2.48; Genl., $.17; Ref. frt. etc., $.37; Total, $6.16. Development, 20,510 ft.

ALPHABETICAL INDEX