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# THE GOLD MINING INDUSTRY OF CANADA

# WITH SPECIAL REFERENCE TO

# MINING COSTS

by

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# CHAPTER 1

## Introduction

# THE GOLD MINING INDUSTRY OF CANADA

## With Special Reference to

## MINING COSTS

### Chapter 1
### Introduction

In early times gold was probably first used for ornamental purposes. Its distribution, though fairly widespread in different continents, was yet rare enough in certain places to give it special value as soon as its utility for ornamental purposes was appreciated. Its bright yellow colour, its malleability and its resistance to corrosion no doubt gave it special attractiveness compared with other metals as inorganic substances. Its utility as a personal ornament, or even as a substance for the manufacture of utensils and decorative effects gave it utility in exchange. As a medium of exchange gold had to compete, of course, with other metals such as silver and copper and with other measures of value according to the culture and resources of the primitive group.

As the wearing of gold ornaments became recognized by primitive peoples, their use began to be an indication of chieftanship and a prerogative of the powerful, gradually becoming linked with the idea of divinity - with priest and king regarded as the representatives on earth of divine authority. The earliest positive trace we have of this practise is found among the ancient Egyptians who used to adorn their temples profusely with gold.

The earliest records of gold mining are in Egypt where we gain our information from pictorial rocks dating back as early as 2500 B.C; this depicts the washing of gold from auriferous sands in basins of hollowed stone. The separation of gold from deposits of solid rock would undoubtedly come later than the winning of it from gravels. According to the writings of Diodorus, the Sicilian, hard rock mining was well establish-ed in Egypt in 59 B.C. and he says that the methods he describes were very ancient even at that time. The rock containing the gold was first broken with hammers and then ground into a powder by hand, after which it was placed on tables and the waste rock washed away by a stream of water. What was left was melted with a flux and lead in a crucible to purify it.

Probably the first great advance in the primitive metallurgy of gold was the employment of mercury as an aid in separating it from the waste rock. The origin of this method is not known but it has been mentioned by writers at the beginning of the Christian era. There are few references made to the use of mercury in the metallurgy of gold during the Middle Ages.

Various contrivances for the crushing and amalgamation process appeared in the sixteenth century; one of the earliest being introduced into America for the treatment of gold ores as early as 1557. The first process by which gold was extracted chemically from the rock and then regained by precipitation, was the chlorination process introduced in 1848. This process, now almost entirely replaced by the cyanide treatment, was at one time used quite extensively, mostly in Australia.

## Table No. 1

### Gold Production for the World Since the Discovery of America

| Year | Russia fine ounces | Transvaal fine ounces |
|---|---|---|
| 1493 - 1600 ..... | ..... | ..... |
| 1601 - 1700 ..... | ..... | ..... |
| 1701 - 1800 ..... | ..... | ..... |
| 1801 - 1840 ..... | ..... | ..... |
| 1841 - 1850 ..... | ..... | ..... |
| 1851 - 1860 ..... | ..... | ..... |
| 1861 - 1870 ..... | ..... | ..... |
| 1871 - 1880 ..... | ..... | ..... |
| 1881 - 1890 ..... | ..... | 1,070,651- |
| 1891 - 1895 ..... | ..... | 6,870,158 |
| 1896 - 1900 ..... | ..... | 12,578,869 |
| 1901 - 1905 ..... | ..... | 15,632,908 |
| - 1906 ..... | ..... | 5,792,823 |
| - 1907 ..... | ..... | 6,450,740 |
| - 1908 ..... | ..... | 7,056,266 |
| - 1909 ..... | ..... | 7,295,108 |
| - 1910 ..... | ..... | 7,527,108 |
| - 1911 ..... | ..... | 8,249,461 |
| - 1912 ..... | ..... | 9,107,512 |
| - 1913 ..... | 1,583,677 | 8,798,336 |
| - 1914 ..... | 1,733,914 | 8,394,322 |
| - 1915 ..... | 1,382,450 | 9,093,902 |
| - 1916 ..... | 1,089,885 | 9,296,618 |
| - 1917 ..... | 871,265 | 9,018,084 |
| - 1918 ..... | 554,588 | 8,418,292 |
| - 1919 ..... | 173,610 | 8,331,294 |
| - 1920 ..... | 73,945 | 8,158,226 |
| - 1921 ..... | 65,907 | 8,128,681 |
| - 1922 ..... | 191,614 | 7,009,767 |
| - 1923 ..... | 305,425 | 9,148,771 |
| - 1924 ..... | 546,550 | 9,574,918 |
| - 1925 ..... | 632,390 | 9,597,573 |
| - 1926 ..... | 760,605 | 9,954,762 |
| - 1927 ..... | 688,492 | 10,122,459 |
| - 1928 ..... | 385,800 | 10,354,157 |
| - 1929 ..... | 707,300 | 10,412,326 |
| - 1930 ..... | 1,501,083 | 10,716,349 |
| - 1931 ..... | 1,655,725 | 10,877,708 |
| - 1932 ..... | 1,938,000 | 11,557,858 |
| - 1933 ..... | 2,700,000 | 11,012,340 |
| - 1934 ..... | 3,858,000 | 10,479,194 |
| - 1935 ..... | 4,784,030 | 10,773,041 |
| - 1936 ..... | 6,500,000 | 11,355,094 |
| - 1937 ..... | 5,900,000 | 11,734,553 |
| - 1938 ..... | 5,800,000 | 12,161,375 |
| TOTAL | ... | 340,091,604 ounces |

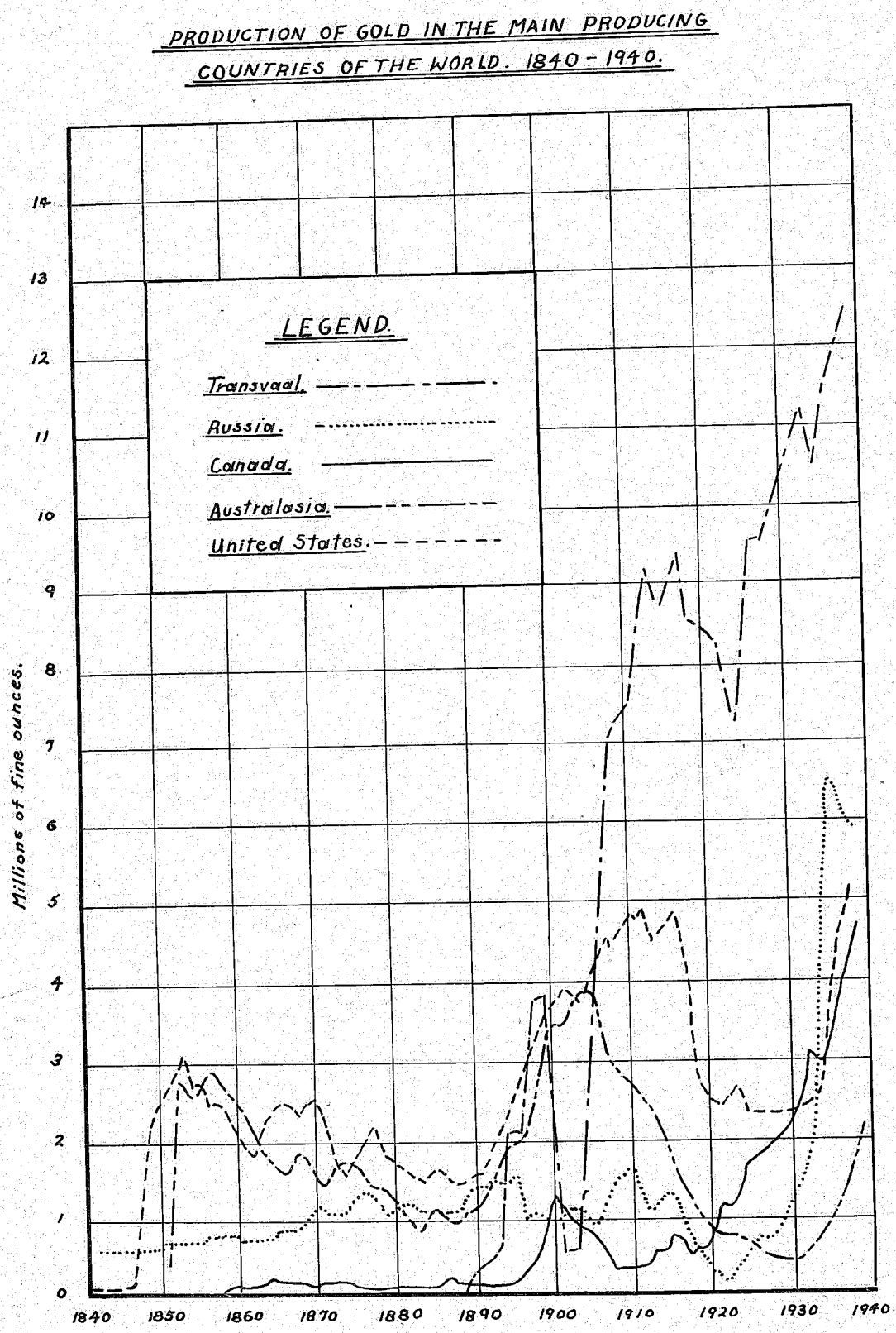
Table No. 1

Gold Production for the World Since the Discovery of America

| United States | Canada Since 1858 | World since the Discovery of America |
|---|---|---|
| Fine ounces | Fine ounces | |
| ... | ... | 24,266,820 |
| ... | ... | 29,330,445 |
| ... | ... | 61,088,215 |
| ... | ... | 20,488,552 |
| 1,187,170 | ... | 17,605,018 |
| ... | 220,039 | 64,482,933 |
| 58,279,778 | 1,477,999 | 61,098,343 |
| 15,281,264 | 904,093 | 55,670,618 |
| 15,808,339 | 584,102 | 51,280,184 |
| 99,106,834 | 291,564 | 39,412,825 |
| 15,728,572 | 3,469,791 | 62,234,698 |
| 19,393,722 | 4,592,261 | 78,033,650 |
| | 556,415 | 19,471,080 |
| | 405,517 | 19,977,260 |
| 22,993,218 | 476,112 | 21,422,244 |
| | 453,865 | 21,965,111 |
| | 493,707 | 22,022,180 |
| 4,687,053 | 473,159 | 22,397,136 |
| 4,520,719 | 611,885 | 22,605,068 |
| 4,299,784 | 802,973 | 22,556,347 |
| 4,572,976 | 773,178 | 21,652,883 |
| 4,887,604 | 918,056 | 22,846,608 |
| 4,479,057 | 930,492 | 22,032,542 |
| 4,051,440 | 738,831 | 20,346,043 |
| 3,320,784 | 699,681 | 18,588,127 |
| 2,918,628 | 766,764 | 17,339,679 |
| 2,476,166 | 765,007 | 16,146,830 |
| 2,422,006 | 926,329 | 15,997,692 |
| 2,422,006 | 926,329 | 15,997,692 |
| 2,363,075 | 1,263,364 | 15,496,859 |
| 2,502,632 | 1,233,341 | 17,845,349 |
| 2,528,900 | 1,525,382 | 18,619,481 |
| 2,411,987 | 1,735,735 | 18,673,178 |
| 2,335,042 | 1,754,228 | 19,117,568 |
| 2,197,125 | 1,852,785 | 19,058,736 |
| 2,233,251 | 1,890,592 | 18,885,849 |
| 2,208,386 | 1,928,308 | 19,207,452 |
| 2,285,603 | 2,102,068 | 20,903,736 |
| 2,395,878 | 2,693,892 | 22,284,290 |
| 2,449,032 | 3,044,387 | 24,098,676 |
| 2,556,246 | 2,949,309 | 25,400,295 |
| 3,091,183 | 2,972,074 | 27,372,374 |
| 3,609,283 | 3,284,890 | 29,999,245 |
| 4,357,394 | 3,748,028 | 32,930,554 |
| 4,804,540 | 4,096,213 | 54,740,055 |
| 5,106,109 | 4,725,117 | 37,942,685 |
| 249,850,780 | 65,131,533 | 1,294,935,511 |

Source;- The Gold Mining Industry of Canada, Ottawa, 1938

Figure 1.


PRODUCTION OF GOLD IN THE MAIN PRODUCING COUNTRIES OF THE WORLD. 1840 - 1940.
LEGEND.
Transvaal.
Russia.
Canada.
Australasia.
United States.
Millions of fine ounces.
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
1840
1850
1860
1870
1880
1890
1900
1910
1920
1930
1940

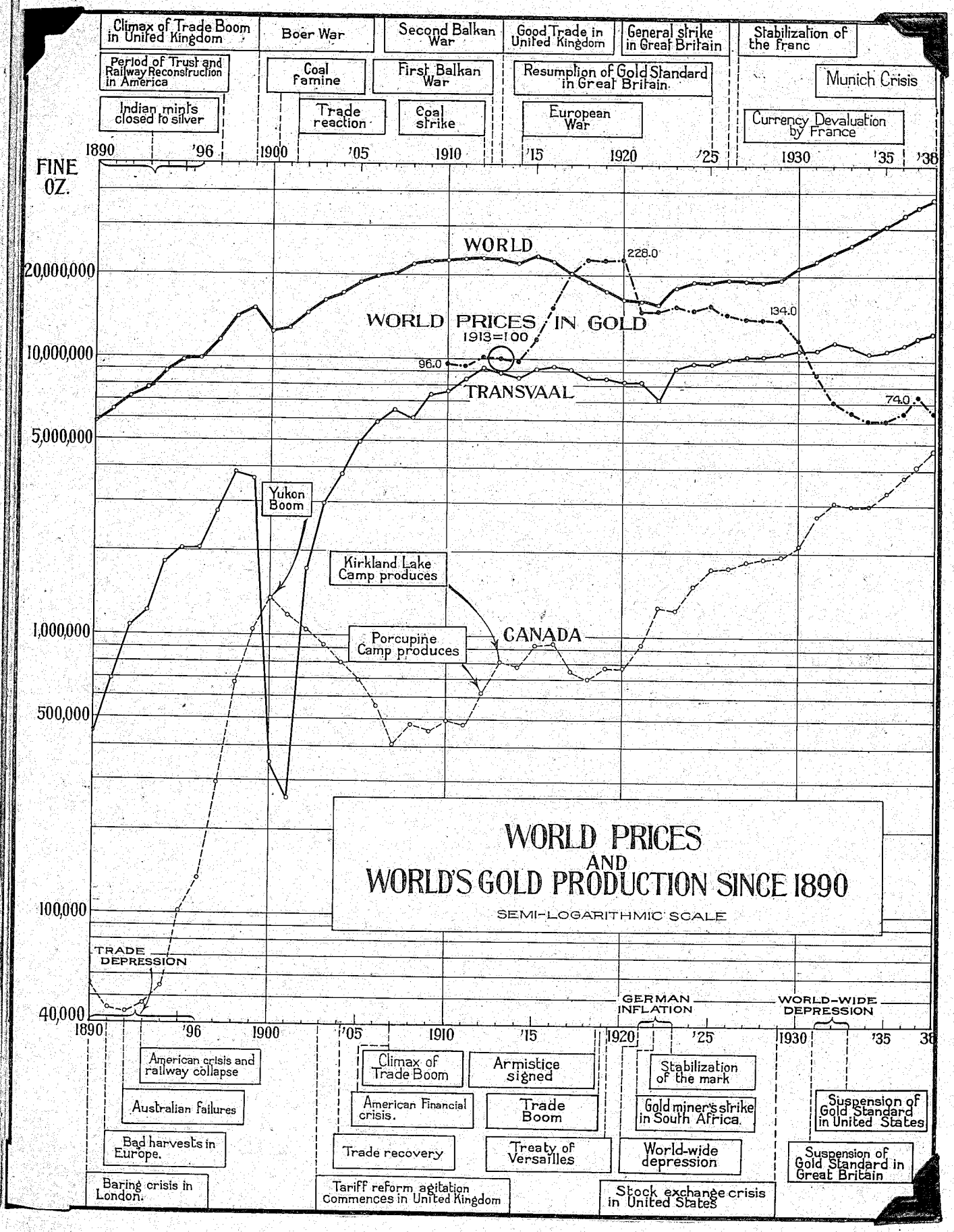
The cyanide process was first used successfully in the Rand in the year 1890. Its introduction proved to be so successful that within a few months its use extended to nearly all parts of the world where gold was mined. Today it is the most important method used for the extraction of gold from its ores; and were it not for the cyanide process it would be impossible for most of the world's largest gold mines to be worked at a profit.

Eras of World Gold Production

The long time trend of gold production could, until quite recently, be represented by an upward curve, with minor fluctuations up and down which would represent the discovery of new gold fields and the depletion of old ones. The definite upward swing of gold production since the World War has not been so much the result of the discovery of new fields as the increased demand of the world for gold since that time. (See Fig. 1).

We have little information on the magnitude of gold production previous to the discovery of America but probably it was small in proportion to that of recent years. The first great era of gold production of which we have record, took place when the gold from the New World poured into Spain and unbalanced the economic and political structures of Europe for a time. The next period of noticeable production increase came after the discovery of the rich placers in California and Australia between 1850 and 1875. The third period began about 1890 when the successful application of the cyanide

Figure 2.


WORLD PRICES
AND
WORLD'S GOLD PRODUCTION SINCE 1890
SEMI-LOGARITHMIC SCALE
FINE OZ.
20,000,000
10,000,000
5,000,000
1,000,000
500,000
100,000
40,000
WORLD
WORLD PRICES IN GOLD
1913=100
228.0
134.0
96.0
74.0
TRANSVAAL
CANADA
Yukon Boom
Kirkland Lake Camp produces
Porcupine Camp produces
TRADE DEPRESSION
GERMAN INFLATION
WORLD-WIDE DEPRESSION
1890
'96
1900
'05
1910
'15
1920
'25
1930
'35
'38
Climax of Trade Boom in United Kingdom
Boer War
Second Balkan War
Good Trade in United Kingdom
General strike in Great Britain
Stabilization of the franc
Period of Trust and Railway Reconstruction in America
Coal famine
First Balkan War
Resumption of Gold Standard in Great Britain
Munich Crisis
Indian mints closed to silver
Trade reaction
Coal strike
European War
Currency Devaluation by France
American crisis and railway collapse
Australian failures
Bad harvests in Europe.
Baring crisis in London.
Climax of Trade Boom
American Financial crisis.
Trade recovery
Tariff reform agitation Commences in United Kingdom
Armistice signed
Trade Boom
Treaty of Versailles
Stabilization of the mark
Gold miner's strike in South Africa.
World-wide depression
Stock exchange crisis in United States
Suspension of Gold Standard in United States
Suspension of Gold Standard in Great Britain

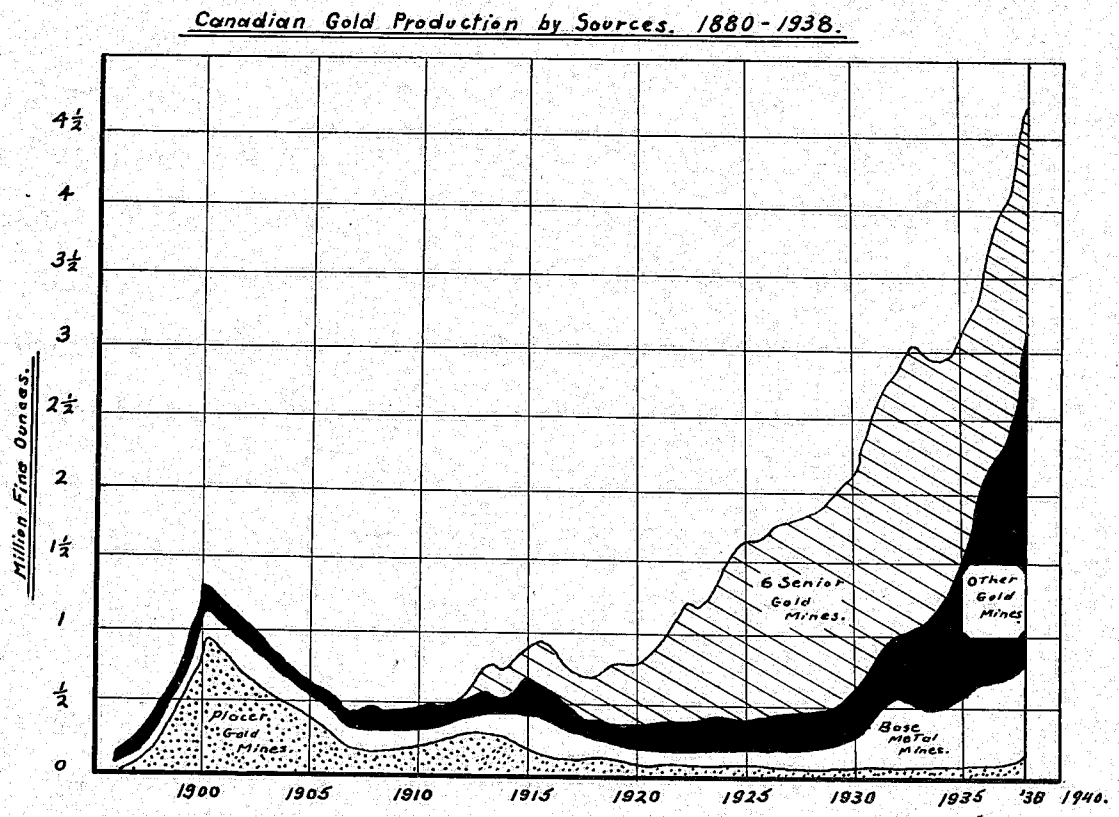
process to the Rand ores in Africa made it possible to work at a profit the world's largest known deposit of gold. During this period other important discoveries were made in the Yukon Alaska, Nevada and Colorado, resulting in the peak of annual world production up to that time;namely, 22,718,154 ounces which were produced in 1915.

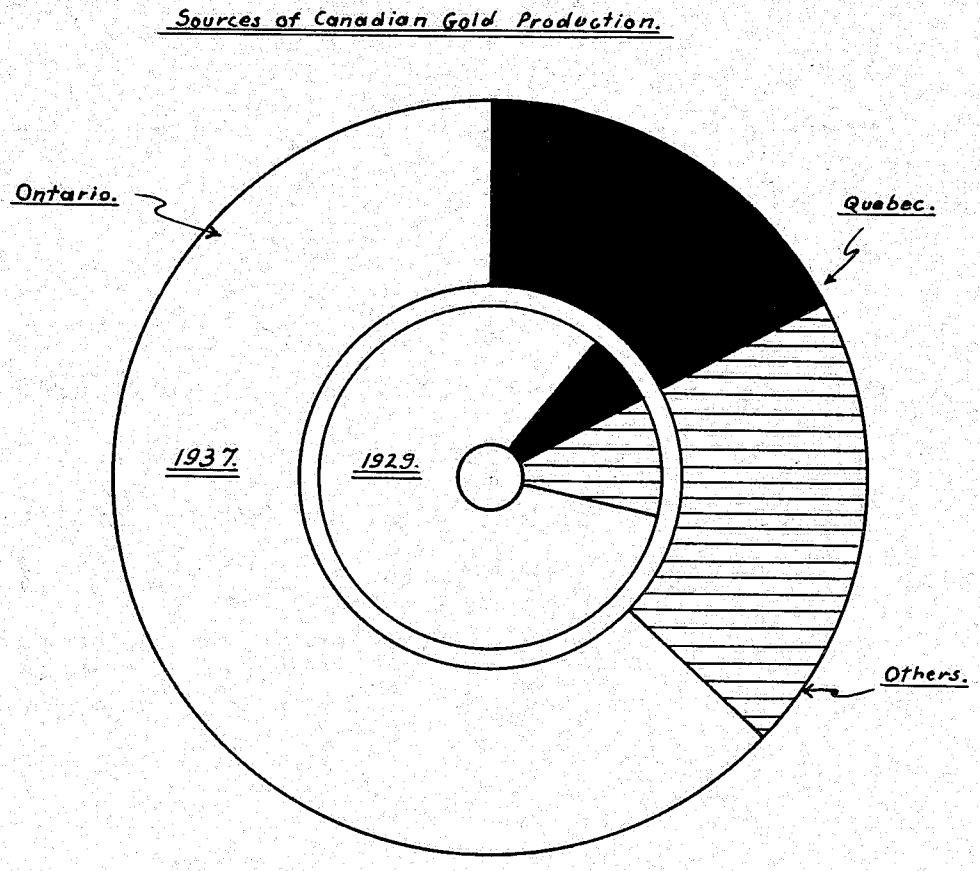
The production dropped from 1915 to 1922; then there was a gradual increase due chiefly to increasing production in South Africa and Canada, and in the year 1932 the 1915 peak was passed. Since then the annual production of gold has been increasing each year. At present we are in a fourth period of intensified gold production; this fourth rise in gold production probably results from Britain & United States leaving the gold standard in 1931 and 1933 respectively and the subsequent guarantee of a new price of $35.00 per ounce by the United States. It is apparent from Fig. 1 that South Africa produces by far the largest amount of gold of any continent, over one half of the total world production since 1920. Canada ranked third in the production of gold in the world from 1918 to 1934 and fourth from 1934 to the present, being passed in production by Russia in 1934.(See Fig.1).

Gold Mining in Canada

Gold is said to have been discovered first in Canada in the valley of the Chaudiere River in the province of Quebec as early as 1823 or 1824 but it was not mined until nearly 25 years later. Important discoveries of placer deposits were made in 1858 in British Columbia and in 1862 lode deposits

Figure 3.


Canadian Gold Production by Sources. 1880 - 1938.
Million Fine Ounces.
4½
4
3½
3
2½
2
1½
1
½
0
1900
1905
1910
1915
1920
1925
1930
1935
'38
1940.
6 Senior Gold Mines.
Other Gold Mines
Placer Gold Mines.
Base Metal Mines.


Sources of Canadian Gold Production.
Ontario.
Quebec.
1937.
1929.
Others.

were found in Nova Scotia. Up to 1895 the greater part of the gold produced in Canada came from the British Columbia placers. In 1896 there began the second period of intensified gold production in Canada with the discovery of rich gravels in the Yukon. Between 1898 and 1905, gold to the value of $100,000,000 is said to have been taken from the creeks of that region. Moreover, during this period the rich lode gold deposits of Rossland, Southern British Columbia and the Lake of the Woods district in Ontario were discovered. The peak of production in this second period was reached in 1900, when Canada's gold output reached 1,350,057 ounces, the largest annual output recorded up to that time. Between 1900 and 1907 production decreased to 405,517 ounces in 1907.

In 1909 the Porcupine gold camp was discovered and three years later in 1912 the Kirkland Lake area was opened up,these two discoveries marking the entrance of Canada upon her third important stage of gold mining activity. Today Ontario is still by far the largest producer of gold, producing over 75% of the total gold mined in Canada,Quebec and British Columbia ranking second and third respectively.(See Fig. 3). The success of these two mining camps led to intensified prospecting, not only in Ontario, but in Quebec and Manitoba as well. Discoveries made in Manitoba in 1911 and 1924 brought that agricultural province to the fore as one of Canada's important mining areas. In British Columbia during this period the Premier and Pioneer mines were brought into production.

Table No. 2

Fine Gold Content of Shipments to the Royal Canadian Mint at Ottawa

| From | Fine ounces of gold |
|---|---|
| Northwest Territories ..... | 4,455.32 |
| British Columbia ..... | 309,947.11 |
| Alberta sundries ..... | 32.05 |
| Saskatchewan Sundries ..... | .... |
| Manitoba ..... ..... | 99,715.19 |
| Ontario ..... | 2,840,980.67 |
| Quebec ..... | 944,161.06 |
| Nova Scotia ..... ... | 26,399.29 |
| Vancouver Assay Office (x)..... | 157,663.06 |
| Total Primary | 4,383,353.75 |
| Other | |
| Foreign Gold Coin ..... | 11.11 |
| Jewellery and scrap ..... | 14,489.84 |
| TOTAL - ALL RECEIPTS | 4,397,854.70 |

(x) Largely from Yukon.
Source- Gold Mining Industry of Canada, Ottawa, 1938

The beginning of the fourth and most important period of gold production in Canada may be dated from 1931 when Great Britain went off the gold standard. Since that time the rise in the price of gold has given an added impetus to an unprecedented activity in the industry. Of the total recorded production of gold in Canada from 1858 to 1934, nearly 73% ~~has~~

has been won since 1909, the Porcupine and Kirkland Lake camps in Ontario being by far the most important producers. Not only is there increased activity in the producing mines, but also extensive surveys are being carried on in search of new and richer gold fields. Along with the increase in the value of the gold produced there has been a marked increase in the total number of ounces produced.(See Fig.1 & 2).From the rapid pace of development which shows no signs of any letup, it appears that the gold mining industry of Canada has a promising future.[1]

Period of Study

The statistical work in this study has been confined to the progress of the gold mining industry in Canada since 1928 as the information necessary for the research work on costs was not available for previous years. The discussion will be confined to the auriferous quartz branch of the industry entirely, which has produced about 97 to 98% of the total gold produced in Canada for the past few years.

There are many phases of the industry which could profitably be studied. A complete history of the Gold Industry in Canada would afford an excellent opportunity to relate the movement of peoples to the discovery of new gold areas. A study of mining technique extending into the fields of engineering and chemistry would be an excellent field for a graduate engineer. A thesis on the problems of taxation in Gold Mining would be

1.Data on the History of Gold, adapted from "Gold in Canada" by A.H.A Robinson,Dept. of Mines,Canada, Ottawa- 1935.

very acceptable at this time and it is to be hoped that in the near future this research work will be done. The purpose of the present study is to present a review of the industry in general with particular emphasis on the costs of mining in the more important gold producing mines of Canada.

It was originally the object of the author to trace the development of the industry from the decade prior to the rise in the price of gold in 1933, up to the present day. A comparison was hoped to have been made between the two periods of time showing the increase in the capital invested, the increased production, mining costs ~~and~~ etc. A comparison between lines of trend fitted for different factors for the two periods should have revealed some interesting facts as to the theory of costs and marginalism. Unfortunately it was not possible to obtain the necessary information for a study of this ~~type~~. Up to 1937 the "Statistics Act" forbade the government, which had most of this information on record, to show the costs of individual mines to any outside source, though in the past few years several of the larger mines have given the government permission to do so.

Source of Material

The statistical information in the thesis has been obtained entirely from the balance sheets and annual reports of some 42 gold mines in Canada. As this is the first time that this information has ever been computed and tabulated, the obtaining of the data was by far the most difficult part of the completed work. Some figures on the production of gold in ounces for the individual mines were obtained from the

government reports as very few of the annual reports of the mines stated their annual gold production in ounces. Also, for the past three or four years, mining costs have been published for certain mines throughout Canada by the Dominion Bureau of Statistics but a difference was found between these costs and the costs based on the information contained in the original mine reports. This discrepancy might be explained by the difference in the methods of calculating the costs, but on the other hand, the difference might be due to propaganda purposes, the costs as given to the Bureau of Statistics by the mines themselves being lower generally than those computed on the original data. None of the government figures was used in this report. The methods by which the various costs were obtained will be dealt with in Chapter 111.

Limitation of Material.

As stated previously, the data which are published on gold mining in Canada are confined to the last decade and for this reason we are not able to make a conclusive comparison of the structure of the industry before the change in the price of gold, to that after it. To complicate the situation still further, some mines are continually changing hands and it is difficult to trace their development for a period of many years. Many of the owners of small mines and some of the directors of the larger ones refused to divulge any information whatsoever, possibly fearing that this survey was perhaps instigated by some commission or holding company which might buy them out or dispute some of their new mining property rights.

The information on the mines which were depleted previous

to 1934 was not filed with the government and so it is impossible to present a completed picture of the industry for the years previous to that date. However we are fortunate in having information on some 18 mines from 1928 to 1938 which should give us some idea of the changes which took place in the structure of these mines, due to the rise in the price of gold in 1933. From this I believe we might draw some conclusions as to the effect of the rise in the price of gold on the industry as a whole.

Relative Significance of the Gold Industry in Canada

Table No. 111

Summary of Main Branches of Net Value of Production

| | 1936 | 1937 | Percentage of total Net Value |
|---|---|---|---|
| Agriculture ..... | $679,541,000 | $678,955,000 | 22.86% |
| Forestry ..... | 231,937,561 | 284,504,031 | 9.58 |
| Fisheries ..... | 54,234,063 | 34,439,481 | 1.16 |
| Trapping ..... | 9,214,325 | 10,477,096 | 0.35 |
| Mining(Total) ... | 291,972,359 | 372,796,027 | 12.55 |
| Gold Quartz .... | 88,210,233 | 97,961,278 | 3.30 |
| Other mining ... | 203,762,126 | 274,834,749 | 9.25 |
| Electric Power ... | 133,561,387 | 140,963,914 | 4.75 |
| Construction ... | 135,851,162 | 176,029,679 | 5.92 |
| Custom and Repair | 70,930,000 | 79,055,000 | 2.66 |
| Manufactures,[1] | 1,041,378,120 | 1,193,399,282 | 40.17 |
| GRAND TOTAL | $2,628,419,977 | 2,970,617,510 | 100.00 |

1. General Statistics Branch, Dominion Bureau of Statistics, (1937 Survey of Production Report.)

## Table No. 1V

### Statistics Relating to Certain Specified Canadian Industries, 1923, 1928, 1934, 1937 & 1938

| Industry | | Electricity Purchased | Employees | Salaries & Wages |
|---|---|---|---|---|
| | | **Total Mining Industry** | | |
| 1923 | ... | $ 5,861,740 | 66,952 | $ 91,334,877 |
| 1928 | ... | 9,072,073 | 89,448 | 115,954,022 |
| 1934 | ... | 11,510,481 | 73,505 | 88,126,186 |
| 1937 | ... | 16,135,702 | 105,414 | 144,292,384 |
| 1938 | ... | Data not available | | |
| | | **Auriferous Quartz Mining Industry** | | |
| 1923 | ... | 922,258 | 5,524 | 8,961,434 |
| 1928 | ... | 2,002,062 | 9,066 | 14,615,990 |
| 1934 | ... | 3,091,147 | 17,762 | 27,156,887 |
| 1937 | ... | 5,031,691 | 29,140 | 48,219,318 |
| 1938 | ... | 5,333,427 | 29,647 | 50,462,092 |
| | | **Pulp and Paper Industry** | | |
| 1923 | ... | 4,270,911 | 29,234 | 38,382,845 |
| 1928 | ... | 12,143,8744 | 33,614 | 47,322,648 |
| 1934 | ... | 15,229,289 | 26,993 | 33,307,043 |
| 1937 | ... | 18,607,852 | 33,205 | 48,757,795 |
| 1938 | ... | 16,763,639 | 30,943 | 42,619,511 |
| | | **Automobile Industry** | | |
| 1923 | ... | 125,000 | 9,305 | 14,998,267 |
| 1928 | ... | 244,807 | 16,749 | 29,548,114 |
| 1934 | ... | 140,245 | 9,674 | 12,938,933 |
| 1937 | ... | 231,424 | 14,946 | 22,138,991 |
| 1938 | ... | 261,583 | 14,872 | 20,993,362 |
| | | **Chemical Industry** | | |
| 1923 | ... | 1,439,909 | 15,149 | 18,433,679 |
| 1928 | ... | 2,043,930 | 16,130 | 20,290,417 |
| 1934 | ... | 2,145,533 | 17,130 | 20,919,740 |
| 1937 | ... | 3,106,557 | 21,968 | 28,612,719 |
| 1938 | ... | ... | 21,829 | 29,338,144 |
| | | **Primary Iron & Steel Industry** | | |
| 1923 | ... | 722,770 | 6,049 | 10,816,201 |
| 1928 | ... | 1,251,820 | 9,057 | 15,470,836 |
| 1934 | ... | 1,148,554 | 7,400 | 9,009,512 |
| 1937 | ... | 2,287,761 | 14,054 | 19,926,498 |
| 1938 | ... | Data not complete | | |

Source. The Gold Mining Industry of Canada, Ottawa, 1938

On examination of Table 111, the auriferous quartz branch of the gold mining industry of Canada, when taken by itself, ranks eighth in the net value of production of all Canadian industries, being 3.30% of the total net value of production of all industries in 1937. Table 1V indicates that the auriferous quartz gold industry for the same year ranked third as a consumer of electricity for the group of industries so considered, and fourth in the number of employees engaged; and fourth again in the total amount of salaries and wages paid in comparison with the main industries of Canada.

The number of Canadian gold mining firms reporting mining operations in 1938 totalled 535 as compared with 631 in 1937; 80 in 1929 and 65 in 1923. During the year under review there were 550 properties in operation as compared with 659 in 1937; in 1938, 226 mines reported production as against 189 in 1937 and 33 in 1923.(See Table V). The gross value of the output for the entire industry including the value of all recoverable metals, gold, silver etc, totalled $143,146,911 in 1938 as compared with $122,676,105 in 1937. Employees in the lode mining gold industry totalled 29,647 as compared with 29,140 in 1937 and 5,524 in 1923. Salaries and wages paid increased from a total of $48,219,318 in 1937 to $50,426,092 in 1938 and fuel and purchased electricity consumed by the industry during 1938 amounted to $7,494,573, while the cost of explosives, drill steel and other process supplies used in the same period amounted to $18,314,500. (See Table V).

Canadian gold mining companies paid over forty millions of dollars in 1937 for consumable stores, equipment, electric

## Table No. V

## Principal Statistics of the Auriferous Quartz Mining Industry in Canada

| Year | No. of Ops. | No. of Plts. | Capital employed | No. of employees | Salaries & Wages | Cost of fuel & electricity |
|---|---|---|---|---|---|---|
| 1923 | 65 | 65 | 77,574,976 | 5,524 | 8,961,434 | 1,497,197 |
| 1924 | - | - | ---- | ----- | ------- | ----- |
| 1925 | 52 | 52 | 84,964,062 | 7,052 | 11,931,948 | 1,836,050 |
| 1926 | - | - | ---- | ---- | ------- | ----- |
| 1927 | 72 | 76 | 118,381,468 | 8,022 | 12,935,719 | 2,222,085 |
| 1928 | 98 | 100 | 147,693,710 | 9,066 | 14,615,990 | 2,554,657 |
| 1929 | 80 | 85 | 135,166,105 | 8,660 | 14,258,733 | 2,579,481 |
| 1930 | 54 | 56 | 119,758,057 | 8,401 | 14,034,620 | 2,364,103 |
| 1931 | 68 | 69 | 109,933,164 | 9,636 | 16,467,165 | 2,700,326 |
| 1932 | 100 | 100 | 58,167,335 | 10,442 | 17,686,584 | 3,031,494 |
| 1933 | 214 | 216 | 158,599,931 | 12,823 | 20,536,012 | 3,330,137 |
| 1934 | 408 | 416 | 214,068,359 | 17,762 | 27,156,887 | 4,249,296 |
| 1935 | 377 | 384 | 193,728,802 | 19,834 | 31,523,907 | 5,002,274 |
| 1936 | 580 | 607 | 256,018,578 | 25,097 | 39,826,742 | 6,076,365 |
| 1937 | 631 | 659 | 269,195,649 | 29,140 | 48,219,318 | 7,345,401 |
| 1938 | | | | | | |
| N.S. | 22 | 22 | 1,466,958 | 508 | 507,806 | 83,714 |
| Que. | 168 | 169 | 47,027,201 | 5,471 | 8,407,383 | 1,525,816 |
| Ont. | 184 | 188 | 167,836,682 | 18,528 | 32,855,073 | 4,760,388 |
| Man. | 12 | 12 | 6,753,690 | 744 | 1,269,044 | 235,780 |
| Sask. | 5 | 6 | 556,786 | 210 | 358,005 | 90,244 |
| B.C. | 128 | 137 | 23,594,496 | 5,879 | 6,494,431 | 686,023 |
| N.W.T. | 15 | 15 | 3,966,489 | 304 | 569,660 | 112,608 |
| Yukon | 1 | 1 | 1,500 | 3 | 690 | ... |
| CANADA | 535 | 550 | 251,203,802 | 29,647 | 50,462,092 | 7,494,573 |

## Table No. V

## Principal Statistics of the Auriferous Quartz Mining Industry in Canada

| Cost of Process Supplies | Value of Freight Paid, ore. | Smelter & Refinery Costs | Gross value of bullion, ore, etc | Net Value of bullion, ores, etc |
|---|---|---|---|---|
| --- | --- | --- | $25,021,837 | --- |
| --- | --- | --- | --- | --- |
| --- | --- | --- | 35,035,361 | --- |
| --- | --- | --- | --- | --- |
| --- | --- | --- | 37,452,995 | --- |
| --- | --- | --- | 36,655,330 | --- |
| --- | --- | --- | 37,275,986 | --- |
| --- | --- | --- | 39,771,739 | --- |
| --- | --- | --- | 49,144,578 | --- |
| --- | --- | --- | 48,645,772 | --- |
| --- | --- | --- | 69,151,535 | --- |
| --- | --- | --- | 83,761,440 | --- |
| 11,591,757 | --- | --- | 91,714,805 | 85,120,774 |
| 13,806,419 | --- | --- | 108,093,017 | 88,210,233 |
| 16,230,722 | 480,090 | 658,614 | 122,676,105 | 97,961,278 |
| 226,186 | 2,889 | 11,401 | 937,504 | 613,314 |
| 2,859,264 | 76,649 | 438,177 | 20,315,407 | 15,415,501 |
| 11,756,920 | 113,310 | 1,160,724 | 99,364,867 | 81,573,525 |
| 425,765 | 8,257 | 43,789 | 3,653,893 | 2,940,302 |
| 71,542 | --- | --- | --- | (-161,786) |
| 2,684,212 | 388,164 | 618,709 | 18,635,187 | 14,258,079 |
| 290,211 | 838 | 2,825 | 240,053 | (-166,429) |
| 400 | --- | --- | --- | (-400) |
| 18,314,500 | 590,107 | 2,275,625 | 143,146,911 | 114,472,106 |

Source - The Gold Mining Industry of Canada, Ottawa, 1938.

power, fuel, freight and insurance according to a special survey recently completed by the Mining, Metallurgical and Chemical branch of the Dominion Bureau of Statistics at Ottawa. It is an increase of 40% when compared with the figure for 1935, the last year in which a similar survey was made. This is a fair indication of the rapid rate at which the industry is expanding.

There has been a sharp increase in the number of active operators and in the number of operating plants since 1933 when the price of gold was raised. From 1923 to 1932 the number of plants operating remained fairly steady with only a slight rise in 1928, but there was an increase from 100 in 1932 to 216 in 1933 rising to 659 in 1937 and falling off to 550 in 1938. The same spectacular advance is apparent in the capital employed in the industry, rising from $58,167,335 in 1933 to $158,599,931 in 1934 up to $269,145,679 in 1937. The increase is not so marked in the number of employees or in the wages paid, but it is apparent in the cost of fuel and electricity consumed by the industry and the value of the bullion produced. (See Table V). On examination of the above figures there appears to be little doubt but that the increase in the price of gold in 1933 was the most important factor in placing the Canadian gold industry where it is today.

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# CHAPTER 11

## The Financial Outlook
## of the
## New Gold Mining Development in Canada

Table No. VI

OPERATING & FINANCIAL DATA ON NEW CANADIAN MINES

| Name | Ore Reserves As of Date | Ore Reserves Tons(000) | Ore Reserves $ Per Ton | Recent Tons Per Day | Production $ Per Ton |
|---|---|---|---|---|---|
| Algoma | | | | 227 | $ 2.88 |
| Argosy | | | | 105 | 15.00 |
| Arntfield | 12/31/37 | 139 | 5.00 | 260 | 3.44 |
| Bankfield | 11/30/38 | 79 | 13.33 | 133 | 13.56 |
| Beattie | 12/31/38 | 4,541 | 4.87 | 1,671 | 3.97 |
| Belleterre | 3/31/38 | 234 | 9.88 | 170 | 8.13 |
| Bidgood Kirkland | 12/31/38 | 33 | 10.93 | 145 | 13.41 |
| Big Missouri | | | | 670 | 3.22 |
| Bralorne | 12/31/38 | 600 | 18.48 | 500 | 19.95 |
| Buffalo Ankerite | 12/31/38 | 494 | 8.21 | 993 | 8.21 |
| Canadian Malartic | 12/31/38 | 380 | 5.32 | 660 | 5.10 |
| Cariboo Gold Quartz | 12/31/38 | 302 | 15.33 | 285 | 13.60 |
| Central Patricia | 12/31/38 | 373 | 16.28 | 304 | 15.48 |
| Cline Lake | 6/37 | 412 | 11.30 | 200 | 11.00 |
| Con. Group | | | | 100 | 35.00 |
| Darwin | | | | 45 | 17.48 |
| Delnite | 3/31/38 | 21(2) | 5.88 | 227 | 7.10 |
| East Malartic | | | | 727 | 4.40 |
| Eldorado | 12/31/38 | 88,886,386(2) | | 63 | 59.00 |
| Francoeur | 9/38 | 139 | 9.20 | 150 | 6.30 |
| Gods Lake | 12/31/38 | 148 | 10.50 | 190 | 10.98 |
| Gold Belt | 6/38 | 83 | 21.95 | 152 | 14.83 |
| Gold Eagle | 10/37 | 40 | 11.50 | 129 | 8.08 |
| Golden Gate | 10/12/37 | 24 | 19.70 | 50 | 18.00 |
| Gunnar | 12/31/38 | 67 | 13.36 | 146 | 11.33 |
| Gurney | 12/31/38 | 74 | 12.60 | 132 | 12.60 |
| Hallnor | | | 3.20 | 320 | 38.50 |
| Hard Rock | 11/ 5/37 | 170 | 11.50 | 175 | 9.76 |
| Hedley Mascot | early '37 | 318 | 17.00 | 180 | 13.13 |
| Island Mountain | 12/31/38 | 56 | 13.65 | 126 | 13.90 |
| Kerr Addison | 12/31/38 | 1,728 | 6.31 | 583 | 6.64 |
| Kootenay Belle | 4/30/38 | 72 | 16.45 | 130 | 13.80 |
| Laguna | 12/31/38 | 11 | 18.03 | 88 | 18.64 |
| Lamaque | 12/31/38 | 742 | 11.20 | 1,060 | 12.09 |
| Lapa Cadillac | 1/26/38 | 145 | 8.24 | 203 | |
| Leitch | 12/31/38 | 67 | 26.37 | 88 | 22.16 |
| Little Long Lac | 12/31/38 | 394 | 17.92 | 271 | 16.34 |
| Macassa | 12/31/38 | 344 | 15.78 | 332 | 15.37 |
| MacCleod Cockshutt | 9/30/38 | 304 | 8.99 | 407 | 7.59 |
| Madsen Red Lake | 12/31/38 | 343 | 6.16 | 329 | 7.99 |
| Matachewan | 12/31/38 | 249 | 6.23 | 430 | 5.40 |
| McKenzie Red Lake | | | | 164 | 15.69 |
| McWatters | 12/31/38 | 53 | 10.60 | 85 | 9.85 |
| Moneta Porcupine | 3/31/38 | 176 | 21.75 | 147 | 18.57 |

## OPERATING & FINANCIAL DATA ON NEW CANADIAN MINES

| Total Reported Earnings To Date | $ (000) | $ (000) Cost of Pre-Production Development | Present Plant |
|---|---|---|---|
| 12/31/38 | (d) 163 | 720 | 347 |
| 12/31/38 | 193 | 495 | 421 |
| 12/31/38 | 2,171 | 243 | 2,435 |
| 12/31/36 | 1,107 | | |
| | | 581 | 329 |
| 10/31/38 | 50 | | |
| 12/31/38 | 5,400 | 347 | 1,091 |
| 6/30/38 | 2,191 | | 1,618 |
| 12/31/38 | 523 | 494 | 773 |
| 12/31/38 | 1,157 | 414 | 759 |
| 12/31/38 | 1,832 | 312 | 670 |
| 3/31/38 | (d) 24 | 343 | 406 |
| 12/31/38 | (d) 6 | 402 | 154 |
| 12/31/38 | 856 | 549 | 1,344 |
| 12/31/38 | 126 | 529 | 659 |
| 12/31/38 | 522 | 485 | 393 |
| | | 615 | 217 |
| 12/31/38 | 919 | 470 | 470 |
| 12/31/38 | 225 | 559 | 235 |
| 12/31/38 | 221 | 494 | 567 |
| 12/31/38 | 326 | | |
| 12/31/38 | 147 | 282 | 322 |
| 12/31/38 | 3,283 | 1,003 | 1,828 |
| | | 237 | 81 |
| 12/31/38 | 254 | 153 | 281 |
| 12/31/38 | 1,965 | 235 | 723 |
| 12/31/38 | 2,663 | 293 | 570 |
| 9/30/38 | 149 | 321 | 148 |
| | | 174 | 192 |
| 12/31/38 | 48 | 174 | 424 |
| 12/31/38 | 135 | 129 | 310 |
| 12/31/38 | 556 | 202 | 296 |
| 3/31/38 | 134 | 383 | 386 |

Table No. V1

OPERATING & FINANCIAL DATA ON NEW CANADIAN MINES

| Name | Ore Reserves As of Date | Ore Reserves Tons(000) | Ore Reserves $ Per Ton | Recent Tons Per Day | Production $ Per Ton |
|---|---|---|---|---|---|
| Morris Kirkland | | | | 93 | $ 5.72 |
| New Golden Rose | 12/31/37 | 48 | 9.45 | 103 | 9.29 |
| Northern Empire | 9/ 1/38 | 220 | 12.81 | 159 | 12.27 |
| O'Brien | 10/ 1/38 | 128 | 16.80 | 154 | 24.44 |
| Omega | 3/31/38 | 515 | 5.72 | 4944 | 4.94 |
| Pamour Porcupine | 12/31/38 | 1,749 | 5.57 | 1,505 | 7.28 |
| Perron | 12/31/38 | 300 | 10.09 | 340 | 10.47 |
| Pickle Crow | | | | 321 | 23.59 |
| Powell Rouyn | 3/31/38 | 705 | 5.95 | 555 | 5.75 |
| Privateer | 12/31/38 | 68 | 30.80 | 80 | 70.00 |
| Raven River | 12/ 38 | 25 | 7.00 | 66 | 8.21 |
| Ross | 12/31/38 | 590 | 7.95 | | |
| St. Antony | | | | 94 | 6.02 |
| Sand River | 12/31/38 | 33 | 14.00 | 100 | 12.35 |
| San Antonio | 12/31/38 | 344 | | 319 | 8.81 |
| Shawkey | 7/31/37 | 77 | | | |
| Sheep Creek | 5/31/38 | 86 | 13.76 | 152 | 16.74 |
| Sigma Mines | 12/31/38 | 637 | 7.65 | 668 | 7.85 |
| Sladen Malartic | 12/31/38 | 327 | 4.44 | 313 | 5.63 |
| Stadacona Rouyn | 3/31/38 | 177 | 5.60 | 400 | 5.42 |
| Straw Lake Beach | 12/31/37 | 19 | 20.17 | 55 | 7.99 |
| Sturgeon River | 12/31/38 | 34 | 12.00 | 74 | 17.27 |
| Sullivan Cons. | 12/31/38 | 192 | 10.75 | 153 | 13.66 |
| Thompson Cadillac | 12/31/38 | 17 | | 199 | 4.88 |
| Waite Amulet | 12/31/38 | 4,253 | (3) | 420 | |
| Wesko | | | | 96 | 10.41 |
| Ymir Yankee Girl | | | | 115 | 11.60 |
| Young Davidson | | 3,500 | | 960 | 3.44 |

(1) Company reports broken ore only. (2) No tonnage reported.

(3) Waite Amulet is included in the above in spite of its record of production in 1928-30, because the discovery of new ore bodies in 1938 has in effect created a new mine. The grade of the new ore is reported as 6.24 per cent copper, 4.65 per cent zinc, 1.62 oz. silver, and 0.05 oz. gold.

(d) Deficit.

## OPERATING & FINANCIAL DATA ON NEW CANADIAN MINES

| Total Reported Earnings To Date | $ (000) | $ (000) Cost of Pre-Production Development | Present Plant |
|---|---|---|---|
| 10/1/38 | 1,275 | 431 | 669 |
| 3/31/38 | 35 | 942 | 757 |
| 12/31/38 | 2,179 | 533 | 1,362 |
| 12/31/38 | 560 | 139 | 366 |
| 12/31/38 | 3,752 | 140 | 847 |
| 3/31/38 | 51 | 266 | 177 |
| 12/31/38 | 255 | | |
| 12/31/38 | | | |
| 12/31/38 | (d) 34 | | |
| 12/31/38 | 2,072 | 445 | 1,532 |
| 7/31/37 | (d) 5 | 166 | 378 |
| 5/31/38 | 579 | 149 | 230 |
| 12/31/38 | 705 | 726 | 895 |
| 12/31/38 | 161 | 219 | |
| 12/31/37 | 163 | | |
| 12/31/38 | (d) 3 | | |
| | | 245 | 130 |
| 12/31/38 | 758 | 316 | |
| 7/31/38 | (d)218 | 87 | 292 |
| | | 995 | 699 |
| 3/31/38 | 928 | | 819 |

## Table No. V11

## RESULTS OF CANADIAN NEW MINE DEVELOPMENT 1933-1939

| | First Class Mines No. of Mines |
|---|---|
| **Development** | |
| Total preproduction development cost | 25 |
| Preproduction development cost per mine | 25 |
| Preproduction development cost per present daily ton | 25 |
| **Plant** | |
| Total cost of plant | 25 |
| Cost of plant per mine | 25 |
| Cost of plant per present daily ton | 25 |
| **Total Capital Investment** | |
| Total preproduction development cost plus plant cost | 25 |
| Preproduction development cost plus plant cost per mine | 25 |
| Preproduction development cost plus plant cost per present daily ton | 25 |
| **Production** | |
| Total daily tons capacity | 28 |
| Average daily tons capacity per mine | 28 |
| Average grade per ton | 25 |
| Gross dollars per day | 25 |
| Gross dollars per year | 25 |
| Average dollars per day per mine | 25 |
| **Earnings** | |
| Total earnings to date | 21 |
| Total earnings to date per mine | 21 |
| Total current earnings per month | 22 |
| Average current earnings per mine per month | 22 |
| Average current earnings per ton of ore | 21 |
| **Market Valuation** | |
| Total market valuation | 27 |
| Average market valuation per mine | 27 |

## RESULTS OF CANADIAN NEW MINE DEVELOPMENT
## 1933-1939

| First-Class Mines | | Second-Class Mines |
|---|---|---|
| Item | No. of Mines | Item |
| $ 10,343,000 | 19 | $ 6,860,000 |
| 414,000 | 19 | 379,000 |
| 825 | 18 | 1,570 |
| 20,508,000 | 19 | 6,939,000 |
| 820,000 | 19 | 366,000 |
| 1,540 | 18 | 1,490 |
| 30,851,000 | 19 | 13,799,000 |
| 1,240,000 | 19 | 730,000 |
| 2,365 | 18 | 3,060 |
| 14,045 | 72 | 11,965 |
| 502 | 72 | 165 |
| $11.03 | 32 | $7.50 |
| 131,000 | 32 | 50,400 |
| 45,800,000 | 32 | 17,650,000 |
| 5,210 | 32 | 1,580 |
| 28,479,000 | 20 | 3,829,000 |
| 1,350,000 | 20 | 191,500 |
| 1,227,000 | . | . |
| 56,000 | . | . |
| 3.99 | . | . |
| $223,000,000 | 47 | $44,000,000 |
| 8,750,000 | 47 | 945,000 |

. Data not available

- continued

Table No. V11

RESULTS OF CANADIAN NEW MINE DEVELOPMENT
1933-1939

| | First-Class Mines No. of Mines |
|---|---|
| **Total Earnings Ratios** | |
| Total earnings to date per dollar of preproduction development cost..... .. | 20 |
| Total earnings to date per dollar of present plant cost ..... | 20 |
| Total earnings to date per dollar of preproduction development cost plus present plant cost.. | 19 |
| **Market Valuation Ratios** | |
| Market valuation per dollar of preproduction development cost ..... | 25 |
| Market valuation per dollar of present plant cost ..... | 25 |
| Market valuation per dollar of preproduction development cost plus present plant cost ..... | 24 |
| Market valuation per dollar of current annual earnings ..... | 21 |

-continued

RESULTS OF CANADIAN NEW MINE DEVELOPMENT
1933-1939

| First Class Mines | | Second-Class Mines |
|---|---|---|
| Item | No. of Mines | Item |
| $3.48 | 14 | $0.30 |
| 1.49 | 14 | 0.41 |
| 1.20 | 14 | 0.15 |
| $20.60 | 15 | 3.45 |
| 10.55 | 15 | 3.23 |
| 7.35 | 15 | 1.70 |
| 15.40 | . | . |

. Data not available

## Chapter 11

## The Financial Outlook of the New Gold Mining Development in Canada

The material for this chapter has been taken from research work carried out by Mr. Jesse L. Maury, Mining Engineer, The Lehman Corp. New York City; Associate A.I.M.E. His article on the financial results of the Gold Mining Industry of Canada which has been published in the Mining and Metallurgy magazine, is well worth a close scrutiny by anyone interested in the industry.

Since 1933, there appears to have been some 162 new gold mines developed and they have shown sufficient promise to warrant the proposal or construction on each property of a mill of 50 tons or more daily capacity. 59 of these mines however, have been failures, and it is the remaining 103 mines which have been used in this study. These mines have been divided into two categories;First-Class and Second-Class. Roughly speaking, the First-Class mines are those with a present worth in excess of $3,000,000 or which promise to attain such a value. The First-Class group includes 28 mines, the Second-Class group contains 75.

Unfortunately complete information was not available for each of the mines. In discussion, calculations based on any information which was incomplete were noted and the missing factors were indicated.

Table VI indicates data obtained for 72 of the First-Class and Second-Class mines and were sufficient to indicate the

extent and character of their operations. "Cost of Preproduction Development" is the balance sheet item usually shown as "Development" as reported at the nearest date to the beginning of production. "Cost of Present Plant" is the balance sheet item ordinarily given as "Plant and Equipment" at the latest date available and without deductions for depreciation; that is the gross investment in the plant to date. The cost of the property is not included.

In Table VII are listed the conclusions drawn from the assembled figures. The more diagnostic of these conclusions are described by the writer as follows,-

Total New Producing Mines 162 mines have shown sufficient promise to warrant the proposal or construction of a mill.

| | | | |
|---|---|---|---|
| Of these .... | First-Class ..... | 28 ..... | 17 per cent |
| | Second-Class .... | 75 ... | 46 " " |
| | Failure ..... | 59 ... | 37 " " |

It must be remembered that these figures do not include many new prospects which never reached the mill stage.

Preproduction Development Expense It was possible to obtain this information for 44 mines and at the date production began this expense totalled $17,000,000 or $390,000 per mine.

| | First-Class | Second-Class |
|---|---|---|
| Cost per Mine | $414,000 | $379,000 |
| Cost per daily ton present cap. | 825 | 1,570 |

These figures uphold the criterion that low development costs per ton are essential for a First-Class mine.

Plant Cost The present gross plant cost of 44 mines is

$27,500,000 or $620,000 per mine.

| | First-Class | Second-Class |
|---|---|---|
| Cost per mine | $820,000 | $366,000 |
| Cost per daily ton present capacity | 1,540 | 1,490 |

The author explains the higher cost per First-Class mine by reference to the higher average tonnages listed below.

Preproduction Development Plus Plant Cost

The combined capital investments for 44 mines totalled $44,500,000 or $1,010,000 per mine.

| | First-Class | Second-Class |
|---|---|---|
| Capital investment per mine | $1,240,000 | $730,000 |
| Capital investment per ton daily cap. | 2,365 | 3,060 |

Production

One hundred of the mines have a present total capacity of 26,000 tons a day, or an average per mine of 260 tons per day. The ore produced by the 57 of them averages $9.75 a ton;to gross an average of $3,200 a day each or a total of $63,500,000 a year.

| | First-Class | Second-Class |
|---|---|---|
| Average daily tons capacity | 502 | 165 |
| Average grade | $11.03 | $7.50 |
| Average gross per mine per day | 5,210 | 1,580 |

In general 500 tons a day of $11.00 ore appear to constitute a highly profitable mine; 165 tons of $7.50 ore are a marginal mine.

Earnings

Forty-one of the mines have earned a total of $32,500,000 or $788,000 per mine. Twenty-two if these (all in the First-Class group) are earning currently $1,227,000 a month or $56,000 per mine per month. Twenty-one of these First-Class mines are earning an average of $4.00 per ton of ore. Total earnings have been divided as follows,-

| | First-Class | Second-Class |
|---|---|---|
| Total earnings to date | $28,479,000 | $3,829,000 |
| Earnings per mine | 1,350,000 | 191,000 |

Market Valuation

Market valuations for 74 of the mines have been created which total $267,000,000 or $3,610,000 a mine. Separated the figures are

| | First-Class | Second Class |
|---|---|---|
| Total market valuation | $223,000,000 | $44,000,000 |
| Valuation per mine | 8,750,000 | 945,000 |

Dividends

Fifteen of the First-Class mines have paid dividends totalling $17,500,000 or $1,179,000 per mine.

Total Earnings Ratios

The ratios of total earnings to date to the indicated investment accounts are listed next. The last column actually applies to only nineteen First-Class mines and fourteen Second-Class mines, instead of the 20 and 14 indicated.

Total Earnings to Date per Dollar

It is interesting to note here that the First-Class Mines have already "paid out" capital investment plus twenty per cent.

| | Preproduction development cost | Present plant cost | Preproduction development plus present plant cost |
|---|---|---|---|
| 34 mines | $ 2.16 | $ 1.05 | .77 |
| 20 First-Class | 3.48 | 1.49 | 1.20 |
| 14 Second-Class | .30 | .41 | .15 |

Market Valuation Ratios

Forty-two of the mines have market values averaging $13.50 per dollar of preproduction development expenses; or $8.68 per dollar of present plant cost. Forty of the mines have market valuations averaging $5.53 per dollar of preproduction development plus present plant.

Analysed

| | Preproduction development cost | Present plant cost | Preproduction development cost plus present plant cost |
|---|---|---|---|
| 25 First-Class Mines | $20.60 | $10.55 | $ 7.35 |
| 15 Second-Class " | 3.45 | 3.23 | 1.70 |

The ratio of market valuation to current annual earnings of the First-Class mines is 15.

Independent of dividends of nearly $100,000,000 annually, and of purchases of supplies of about the same amount, the Canadian Mining Industry has a reservoir of working capital represented by an excess of current assets over current liabilities of more than $220,000,000 according to a survey completed by the "Northern Miner" in September 1939.

Although these figures do not take account of the great number of prospects that never become mines, or that have not yet come to definite development, the conclusion that the

recent Canadian mine development on the whole had been profitable is inescapable. It seems reasonable to hope that the rewards gained in the more valuable quarter of the successful mines will provide a stimulus to prospecting and exploration for years to come. Canada had entered her fourth period of activity in the gold mining industry and it appears that it will by far surpass any previous development.

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# CHAPTER 111

## The Statistical Procedure of the Analysis of Mining Costs

## Chapter 111

### The Statistical Procedure of the Analysis of Mining Costs

In this chapter we are interested primarily in an analysis of the costs of gold mining, endeavouring to reveal whether or not the costs of gold mining have varied appreciably during the period of 1928 to 1938. Furthermore, if there has been any significant change in the costs of mining gold, what has been the effect of this change on the gold mining industry as a whole? The data which have been assimilated for this report are excellent material for numerous studies in statistics and economics. Tests of variance between samples of mines and the correlations between various types of ~~of~~ financial organizations and their profits and losses, open fields which students in statistics and economics may well investigate in the future.

In the study of costs in this work, the data have been divided into two groups, i.e. A and B.

Group A includes eight gold mines (See Table V111) which have been operated continuously from 1928 to 1938, during which period the price of gold rose in 1933 from $20.67 to $35.00 per ounce. The object of treating these eight mines separately is to determine whether or not the new price of gold affected their costs appreciably. Did their mining costs rise, and if they did was it due to mining poorer ore or simply because there was less need for preventing waste and maintaining high efficiency?

## Table No. V111

### Mines Included in Group A

| Mine Number | Name | Province |
|---|---|---|
| 3 | Sylvanite | Ontario |
| 4 | Teck-Hughes | Ontario |
| 6 | Wright-Hargreaves | Ontario |
| 10 | Dome | Ontario |
| 11 | Hollinger Consolidated | Ontario |
| 13 | Kirkland Lake | Ontario |
| 14 | Lake Shore | Ontario |
| 18 | McIntyre Porcupine | Ontario |

## Table No. 1X

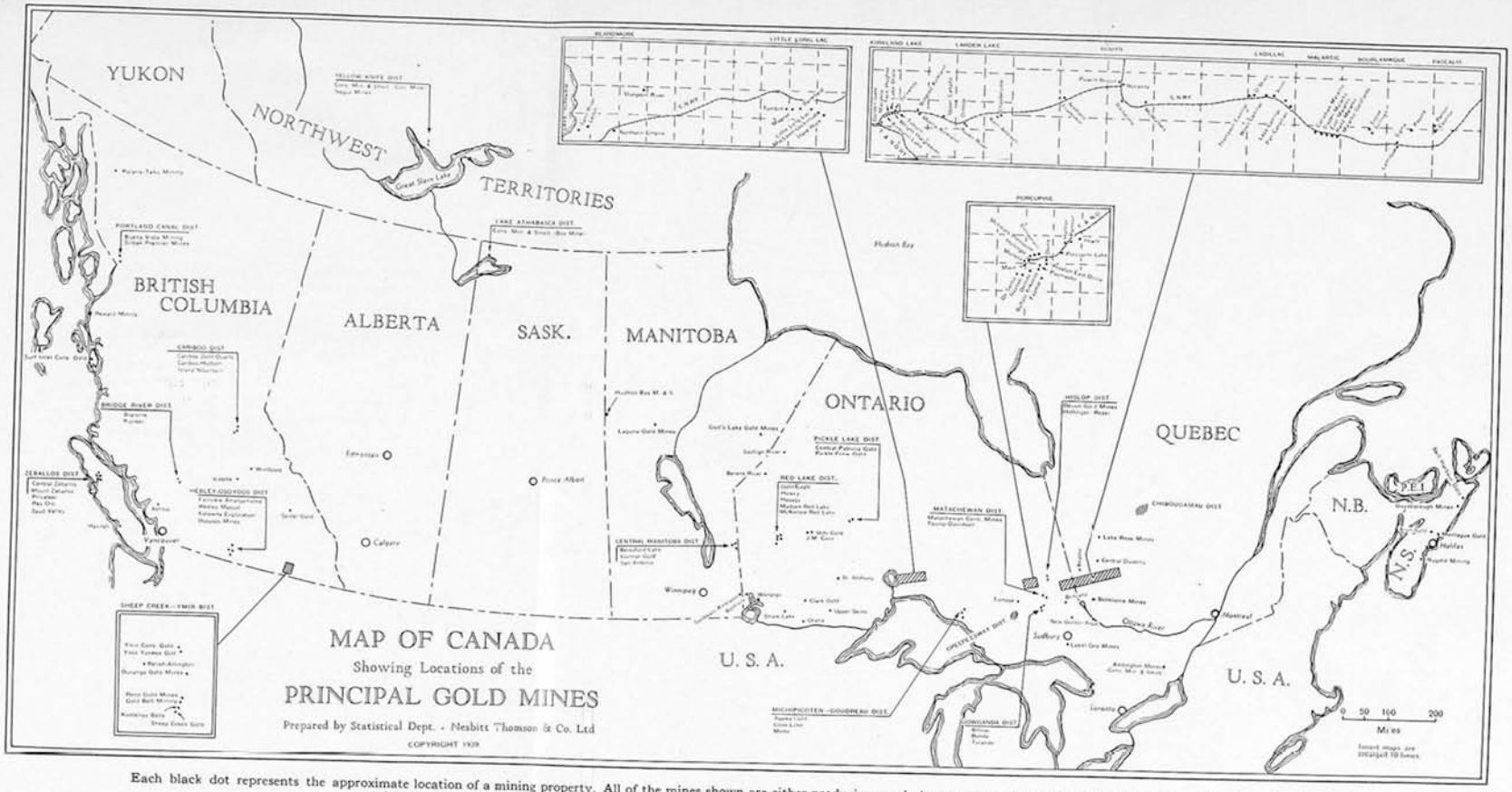
### Mines Included in Group B

| Mine Number | Name of Mine | Province |
|---|---|---|
| 1 | Pickle Crow | Ontario |
| 2 | St. Anthony | Ontario |
| 3 | Sylvanite | Ontario |
| 4 | Teck-Hughes | Ontario |
| 5 | Toburn | Ontario |
| 6 | Wright-Hargreaves | Ontario |
| 7 | Buffalo-Ankerite | Ontario |
| 8 | Central Patricia | Ontario |
| 9 | Coniarum | Ontario |
| 10 | Dome | Ontario |
| 11 | Hollinger Consolidated | Ontario |
| 12 | Howey | Ontario |
| 13 | Kirkland Lake | Ontario |
| 14 | Lake Shore | Ontario |
| 15 | Leitch | Ontario |
| 16 | Little Long Lac | Ontario |
| 17 | Macassa | Ontario |
| 18 | McIntyre Porcupine | Ontario |
| 19 | McKenzie Red Lake | Ontario |
| 20 | Moneta Porcupine | Ontario |
| 21 | Pamour | Ontario |
| 22 | Omega | Ontario |
| 23 | Paymaster Consolidated | Ontario |
| 24 | Arntfield | Quebec |
| 25 | Beattie | Quebec |
| 26 | Canadian Malartic | Quebec |
| 27 | Lamaque | Quebec |
| 28 | McWatters | Quebec |
| 29 | O'Brien | Quebec |
| 30 | Perron | Quebec |
| 31 | Sigma | Quebec |
| 32 | Siscoe | Quebec |
| 33 | Sullivan | Quebec |
| 34 | God's Lake | Manitoba |
| 35 | Gunnar Gold | Manitoba |
| 36 | San Antonio | Manitoba |
| 37 | Bralorne | British Columbia |
| 38 | Cariboo Gold Quartz | British Columbia |
| 39 | Hedley Mascot | British Columbia |
| 40 | Island Mountain | British Columbia |
| 41 | Kootenay Belle | British Columbia |
| 42 | Pioneer | British Columbia |

Figure 4.

MAP OF
CANADIAN
GOLD MINES

Figure 4.




Each black dot represents the approximate location of a mining property. All of the mines shown are either producing regularly now or are expected to be producing soon. No attempt has been made to show the locations of all the large number of properties now under active development. Exact locations are not guaranteed.

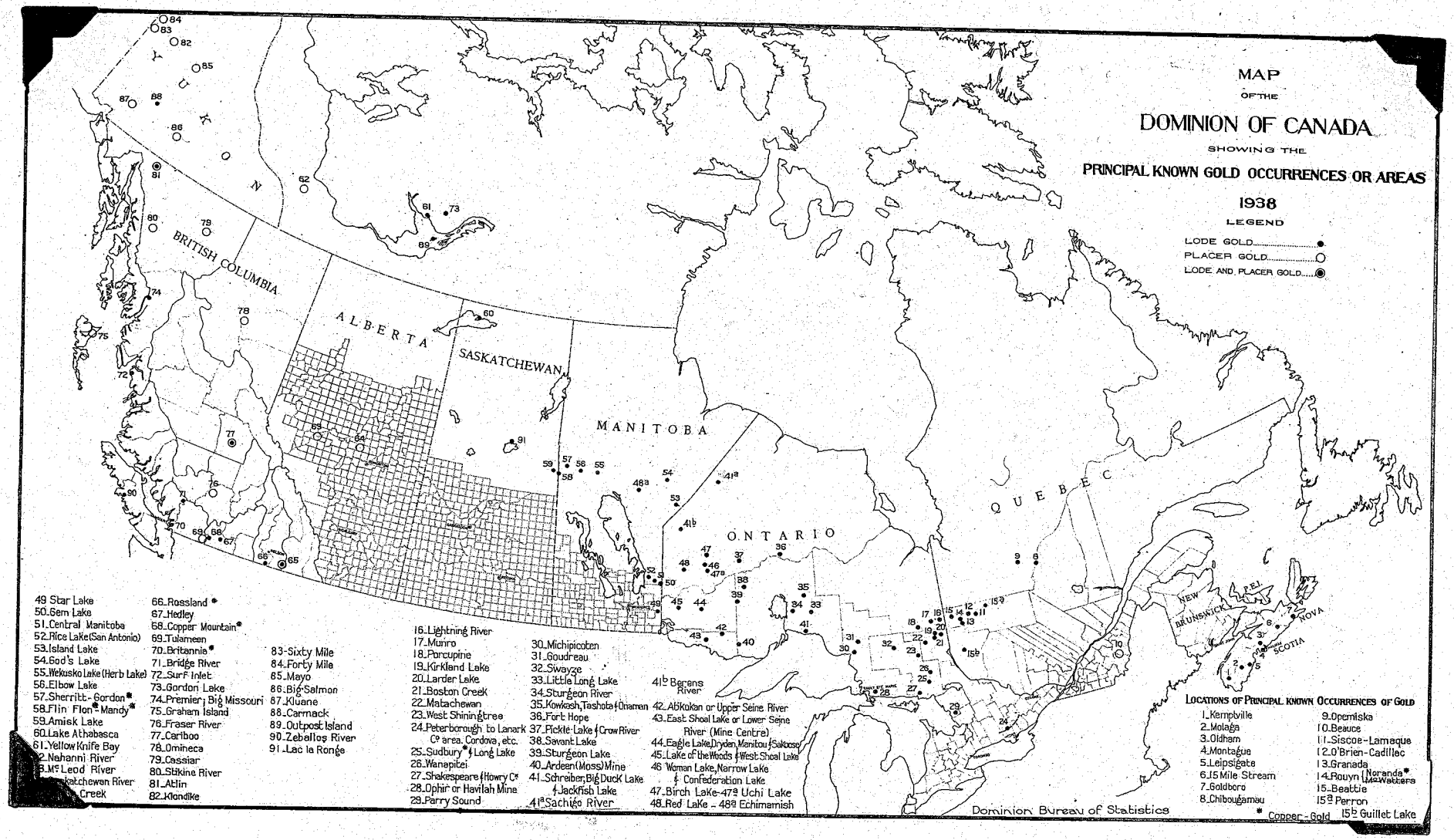

MAP
OF THE
DOMINION OF CANADA
SHOWING THE
PRINCIPAL KNOWN GOLD OCCURRENCES OR AREAS
1938
LEGEND
LODE GOLD
PLACER GOLD
LODE AND PLACER GOLD
YUKON
BRITISH COLUMBIA
ALBERTA
SASKATCHEWAN
MANITOBA
ONTARIO
QUEBEC
NEW BRUNSWICK
P.E.I.
NOVA SCOTIA
49 Star Lake
50_Gem Lake
51_Central Manitoba
52_Rice Lake (San Antonio)
53_Island Lake
54_God's Lake
55_Wekusko Lake (Herb Lake)
56_Elbow Lake
57_Sherritt-Gordon*
58_Flin Flon* Mandy*
59_Amisk Lake
60_Lake Athabasca
61_Yellow Knife Bay
2_Nahanni River
3_Mc Leod River
Saskatchewan River
Creek
66_Rossland*
67_Hedley
68_Copper Mountain*
69_Tulameen
70_Britannia*
71_Bridge River
72_Surf Inlet
73_Gordon Lake
74_Premier; Big Missouri
75_Graham Island
76_Fraser River
77_Cariboo
78_Omineca
79_Cassiar
80_Stikine River
81_Atlin
82_Klondike
83-Sixty Mile
84_Forty Mile
85_Mayo
86_Big Salmon
87_Kluane
88_Carmack
89_Outpost Island
90_Zeballos River
91_Lac la Ronge
16_Lightning River
17_Munro
18_Porcupine
19_Kirkland Lake
20_Larder Lake
21_Boston Creek
22_Matachewan
23_West Shining tree
24_Peterborough to Lanark Co area, Cordova, etc.
25_Sudbury* & Long Lake
26_Wanapitei
27_Shakespeare (Howry Co)
28_Ophir or Havilah Mine
29_Parry Sound
30_Michipicoten
31_Goudreau
32_Swayze
33_Little Long Lake
34_Sturgeon River
35_Kowkash, Tashota & Onaman
36_Fort Hope
37_Pickle Lake & Crow River
38_Savant Lake
39_Sturgeon Lake
40_Ardeen (Moss) Mine
41_Schreiber, Big Duck Lake & Jackfish Lake
41a Sachigo River
41b Berens River
42_Abikokan or Upper Seine River
43_East Shoal Lake or Lower Seine River (Mine Centre)
44_Eagle Lake, Dryden, Manitou & Sakoose
45_Lake of the Woods & West Shoal Lake
46 Woman Lake, Narrow Lake & Confederation Lake
47_Birch Lake-47a Uchi Lake
48_Red Lake - 48a Echimamish
Locations of Principal Known Occurrences of Gold
1_Kempville
2_Malaga
3_Oldham
4_Montague
5_Leipsigate
6_15 Mile Stream
7_Goldboro
8_Chibougamau
9_Opemiska
10_Beauce
11_Siscoe-Lamaque
12_O'Brien-Cadillac
13_Granada
14_Rouyn (Noranda* Mazwattera)
15_Beattie
15a Perron
15b Guillet Lake
* Copper-Gold
Dominion Bureau of Statistics

Figure 5.

Group B includes all the mines of Group A and those mines which operated spasmodically or only came into production after 1928.(See Table 1X). The object here was to get as large a sample as possible of the mining companies of Canada and to see (1) whether the stimulation of the new gold price kept some of the poorer gold mines in operation and (2) whether the mining costs of these marginal and new mines were above those of the mines included in Group A.

Profits and Losses

It is true that the new price of gold gave very large profits to the industry. On the other hand, with the expansion of the industry, and the inclusion of the near marginal mines that would otherwise have not been able to operate except for the higher price, did the characteristic emergence of losses begin to occur after a year or two?

The Sample

As stated previously, all the information on which this section of the thesis is based was taken from some 250 balance sheets and annual reports of 42 mines throughout Canada. The compiling and tabulating of the following data were by far the most difficult part of the thesis.

The mines dealt with were taken from the more important gold fields in the Dominion,(See Figs. 4 & 5) and were chosen to represent a fair sample of the auriferous quartz industry of Canada. Table X11 gives the distribution of the mines by provinces and years.

As it was impossible to obtain information for the

## Table No. X

### Number of Mines Reporting each Year

| Year | Number |
|---|---|
| 1928 | 8 |
| 1929 | 9 |
| 1930 | 11 |
| 1931 | 11 |
| 1932 | 14 |
| 1933 | 16 |
| 1934 | 20 |
| 1935 | 34 |
| 1936 | 38 |
| 1937 | 41 |
| 1938 | 42 |

## Table No. XI

### Number of Years each Mine Reported

| Number of Years | Number of Mines Reporting for this Period | |
|---|---|---|
| 11 | 8 | |
| 10 | 1 | |
| 9 | 2 | |
| 8 | 0 | |
| 7 | 2 | |
| 6 | 2 | |
| 5 | 5 | |
| 4 | 15 | |
| 3 | 3 | |
| 2 | 3 | |
| 1 | 1 | 42 |

Table No. XII

Territorial Composition of Yearly Sample

(Group B. Number of Mines)

| Province | 1928 | 1929 | 1930 | 1931 | 1932 | 1933 | 1934 | 1935 | 1936 | 1937 | 1938 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Ontario | 8 | 8 | 10 | 10 | 10 | 11 | 13 | 19 | 20 | 22 | 23 |
| Quebec | | 1 | 1 | 1 | 1 | 2 | 2 | 8 | 9 | 10 | 10 |
| Manitoba | | | | | 1 | 1 | 1 | 2 | 3 | 3 | 3 |
| British Columbia | | | | | 2 | 2 | 4 | 5 | 6 | 6 | 6 |
| TOTAL | 8 | 9 | 11 | 11 | 14 | 16 | 20 | 34 | 38 | 41 | 42 |

# Pioneer Gold Mines of B.C. Limited

(Non-Personal Liability)

## Tenth Annual Report

For the Year Ending March 31st, 1938

# Pioneer Gold Mines of B. C.
## Limited
(Non-Personal Liability)

# Tenth Annual Report
## For the Year Ending March 31st, 1938

LOCATION OF MINE
Cadwallader Creek, Bridge River, B. C.
P. O. Pioneer Mines, B. C.

HEAD OFFICE
605 Rogers Building
Vancouver, B. C.

DIRECTORATE

| | | |
|---|---|---|
| COL. VICTOR SPENCER | President | All of Vancouver, B.C. |
| ALFRED E. BULL | Vice-President and Secretary-Treasurer | |
| HOWARD T. JAMES, M.E., PH. D. | Managing Director | |
| DR. R. B. BOUCHER | | |
| DR. FRANCIS J. NICHOLSON | | |
| MAJ.-GEN. D. M. HOGARTH, Toronto | | |
| THOMAS FORTUNE RYAN, 3RD, San Francisco | | |
| CHAS. D. KAEDING, Toronto | | |

*Auditors*
RIDDELL, STEAD, GRAHAM & HUTCHISON
Vancouver, B. C.

*Registrar and Transfer Agent*
THE CANADA PERMANENT TRUST COMPANY
Vancouver, B. C., and Toronto, Ont.

*Transfer Agent*
THE MARINE MIDLAND TRUST COMPANY
New York

*Registrar*
IRVING TRUST COMPANY
New York

*Solicitors*
HARRIS, BULL, WILSON & BULL
Vancouver, B. C.

# PIONEER GOLD MINES OF B. C. LIMITED

**(Non-Personal Liability)**

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## DIRECTORS' REPORT

To The Shareholders of

Pioneer Gold Mines of B. C. Limited (N.P.L.)

Your Directors herewith present the Tenth Annual Report accompanied by the Balance Sheet, Profit and Loss Statement and Surplus Account, for the Fiscal Year ending March 31st, 1938, and the Auditors' Report.

The details of mine work done during the year and present condition of the property are embodied in the Managing Director's Report herewith.

During the year 151,647 tons of ore were mined, but as against this extraction, 121,654 tons of new ore were developed during the year, so that the total ore reserves on the 31st of March, 1938, were estimated at 568,488 tons, having an average grade of .422 ounces per ton.

Approximately 13.5 per cent. of the 151,647 tons mined and hoisted was discarded in the sorting plant, and the remainder 130,701 tons were crushed and milled, and produced $2,127,889.35 in gold.

The amount recovered from ore mined and milled equalled $14.22 per ton, as against $14.49 per ton last year.

Before the end of the Financial Year it was decided to sink a shaft a further three levels, from the 26th level to the 29th level, and this work is now being carried on.

After payment of all expenses of operations, the dividend of 40c per share, and providing for income taxes to both Dominion and Provincial Governments, the Company has added $147,166.14 to its surplus profits account, bringing the same up to $671,828.84, and the cash position of the Company at the end of the year has increased to $1,291,542.50 as against $1,084,083.85 the previous year.

The Company has staked claims and taken options on other properties in Zeballos Area, Vancouver Island, near Alberni, in the Salmo District, in the Cariboo near Barkerville, and in Yellowknife District, N. W. T. Prospecting is being done on two of the properties in the Zeballos District, and the other properties will be prospected as soon as the snow conditions permit it.

The Directors take this opportunity of expressing their appreciation of the work done by Howard T. James as Managing Director of the Company; and also the work of the present General Superintendent, E. F. Emmons; the Assistant Superintendent, R. O. Udall; and the Mill Manager, Paul Schutz; Chief Accountant, Ross Thompson; and the other office, mill and underground staff.

Dated the 6th day of May, 1938.

By Order of the Board,

VICTOR SPENCER, President.

ALFRED E. BULL, Secretary-Treasurer.

# PIONEER GOLD MINES OF B. C. LIMITED

**(Non-Personal Liability)**

## MANAGING DIRECTOR'S REPORT

The President and Directors,
Pioneer Gold Mines of B. C. Limited,
605 Rogers Building, Vancouver, B. C.

Sirs:—

I beg to submit the following report on the Company's operations during the Fiscal Year ending March 31st, 1938.

**MINE—Development.**

Development footage for the year amounted to 19,725.8 feet, and included 14,663.8 feet of drifting, 2,334.9 feet of crosscutting, 2,336.1 feet of raising and an equivalent drift footage of 391 feet of shaft stations and pockets in connection with No. 4 Shaft which is to be sunk from the 26th to the 29th level. In addition 14,732 feet of diamond drilling was completed during the year.

Of the total drift footage, 78.5%, or 11,505.4 feet was on the main vein, chiefly below fourteen level, and 40.4% of this footage was in ore. The greater amount of drifting has been done in the central section of the vein, which to date has been the most productive in the lower section of the mine. Twenty level is the only level below fourteen which has been driven essentially the full length of the vein. To the east no commercial ore was found in the 817 feet of drift, although the vein was strong to within about 150 feet of the hanging wall argillites. Above fourteen level some very valuable ore bodies have been found in this section of the vein, and it is proposed to explore the whole east end section again on twenty-five level during the coming year. At the west end of twenty level, in a footwall branch of the main vein, high erratic values have been found over narrow widths for a length of 300 feet. At present twenty-one level is being driven towards this section of the vein with the hope of finding more consistent values.

A little over 3,000 feet of drifting has been done on seven branch or parallel veins, but none of this work was successful in disclosing any important commercial possibilities. About twenty-five per cent. of this work was on the "J" vein, which at one time was thought to have possibilities of becoming an important producer because of its structural similarity to the main vein. Development results, however, have been so disappointing, both in drifting and diamond drilling, that no further work on the vein is contemplated. The Countless vein has also received a considerable amount of attention on five level, but without finding any indication of commercial ore. On the footwall vein, and "27" vein, small amounts of marginal ore have been found, but in both of these, tonnage possibilities are small and the grade of ore marginal. Other secondary veins have failed to give any indication of commercial possibilities.

Although considerable drifting remains to be done above twenty-six level, the present bottom level of the mine, work has been started on an internal shaft which is to be sunk from the 26th to the 29th level. The shaft is being collared immediately to the hanging wall of the main vein on twenty-six level, and will pass through a non-commercial section of the vein at about twenty-seven level.

## PRODUCTION.

During the year 151,647 tons averaging .417 ounces per ton were mined. Allowing for waste sorted on grizzlies and correcting for ore in transit, 149,639 tons of this were hoisted to the surface and delivered to the coarse ore bins. From ore hoisted, 19,037 tons of waste averaging .02 ounces per ton were discarded in the picking plant and returned to the mine for back fill, leaving 130,602 of .480 ounce ore as the amount delivered to the mill bins. Slightly over 19% of the tonnage mined was from development work, 7% was from sills and the remaining tonnage was from stopes. (3).

Since opening up the lower levels it has been found necessary to make a change in our mining methods, particularly in the east end of the mine below 14 level. In the past essentially all ore has been mined by the shrinkage stope method, and only in rare instances has it been necessary to resort to cut and fill methods because of local ground conditions. Below fourteen level, however, particularly at the east end of the mine where the vein is in greenstone, the walls are not strong enough to permit shrinkage stope mining without excessive dilution, and it has been found necessary to mine with filled rill stopes. This is a more expensive method of mining on a per ton basis, but the cost per ounce of gold is lower than it would be by mining an excessive tonnage of lower grade material in shrinkage stopes.

## ORE RESERVES.

The estimated ore reserves, as at March 31st, 1938, amount to 568,488 tons, having an average grade of .422 ounces per ton. This compares with estimates of 597,481 tons of .425 ounce ore of a year ago, but at that time only 386,466 was regarded as positive ore, whereas in the present estimate 532,805 tons is fully developed ore, and only 36,683 tons is in the probable class. Although ore reserves are 28,993 tons less than a year ago, our extraction has been 151,647 tons which means that 121,654 tons has been developed during the year. This is a creditable showing since, as pointed out in last year's report, credit was taken at that time for a large part of the ore which was to be expected within the central and most productive part of the main vein above 24 level.

## MILL.

No appreciable changes have been made in mill operation during the past year, although this is the first full year in which the new crushing and sorting plant has been in operation. Because of the finer product resulting from two stage crushing, and the reduced tonnage going to the ball mills because of sorting, it has been possible to shut down a ball mill in No. 1 Unit and do all the primary grinding in No. 2 Unit.

Approximately 13.5% of ore hoisted is discarded in the picking plant, and the remainder is crushed and delivered to the fine ore bins.

Mill results were as follows:—

| | | | | |
|---|---|---|---|---|
| Ore Milled | | | 130,701 | Tons |
| Average Heads Ore Milled | | | 0.480 | Ozs. per Ton |
| Average Tails Ore Milled | | | 0.0153 | " " " |
| Percentage Recovery | | | 96.80 | Per Cent. |
| Total Recovery—Gold | 60,654.491 Ozs. | — | $ 2,122,891.07 | (5). |
| Total Recover—Silver | 11,383.800 " | — | 4,998.28 | |
| | | | $ 2,127,889.35 | (4).+(2) |

## CAPITAL EXPENDITURES—Plant and Equipment.

Capital expenditures on plant and equipment amount to $62,628.11 as listed below. The development of a new townsite on the bench north of the shaft and construction of twenty houses, at a cost of $43,054.31 is the largest item in this account. Sundry camp buildings and equipment include 26 garages which are rented to employees, a new warehouse, carpenter shop, additions to the central heating plant and various additions to buildings and equipment.

The relatively small amount spent on mine equipment was for necessary pumps and motors, mine cars, ventilation and other small incidentals.

Additions to mill buildings and equipment include a new fine ore bin in No. 1 Unit and a magnetic pulley on the feed to the primary crusher.

A general distribution of these expenditures is as follows:

| | |
|---|---|
| Mine Plant and Equipment | $ 2,552.68 |
| Mill Buildings and Equipment | 1,504.12 |
| Power Plant | 165.69 |
| Sundry Camp Buildings and Equipment | 14,901.31 |
| New Townsite | 43,504.31 |
| | $62,628.11 |

### No. 4 Shaft

As mentioned above, a new internal vertical shaft is being sunk from 26 to 29 level. Expense incurred to date, amounting to $12,210.36 is for work above 26 level, such as raising the shaft to the sheaves, cutting stations, ropeway and pocket raises.

### Outside Exploration

For the past year the company has been actively engaged in a search for new properties and has made numerous examinations in British Columbia, the Yukon and North West Territories. Options have been secured on two properties in the Zeballos area on Vancouver Island and a number of additional claims have been staked in the same district. Favourable ground has also been secured in the Yellowknife area, N. W. T. and in the southern part of Vancouver Island.

A small crew has been at work all winter on the Friend Group in Zeballos but nothing has been done as yet on other properties under option because of snow conditions.

Expenditure for the year on Outside Exploration amounts to $17,370.63.

The very excellent and willing co-operation of the staff and employees, and of Mr. Spry, Consulting Metallurgist, is gratefully acknowledged, and I wish to thank all members of the Board of Directors for their never failing and helpful advice during the year.

Respectfully yours,

H. T. JAMES,
Managing Director.

April 30th, 1938.

# PIONEER GOLD MINE

(Non-Per

VANCOUVER

## Balance Sheet as a

### ASSETS

| | | | | |
|---|---|---|---|---|
| CASH ON HAND and IN BANKS—Schedule 1 | | $ 321,898.89 | | |
| GOLD BULLION—ON Hand and In Transit, at Market Value | | 177,140.48 | | |
| INVESTMENTS—Government and Other Securities at Cost—Schedule 2 (Market Value $1,194,630.00) | $1,227,580.35 | | | |
| Interest Accrued thereon | 9,574.75 | | | |
| | | 1,237,155.10 | $1,736,194.47 | |
| LOANS and ACCOUNTS RECEIVABLE, at Book Value | | $ 7,407.94 | | |
| **Less** Reserve for Doubtful Accounts | | 1,187.91 | | |
| | | | 6,220.03 | |
| SUPPLIES and MATERIALS ON HAND, at Cost, as per Certified Inventories | | | 119,952.36 | |
| | | | $1,862,366.86 | (G). |
| PROPERTIES and DEVELOPMENT, at Cost, | | | | |
| Pioneer Mine Property and Development | $1,719,784.67 | | | |
| Options and Exploration Expenditure | 18,747.71 | | | |
| Timber License | 15,910.02 | | | |
| | | $1,754,442.40 | | |
| PLANT, BUILDING, MACHINERY and EQUIPMENT, at Cost—Schedule 3 | | | | |
| Mine Plant and Equipment | $ 333,543.02 | | | |
| Mill Buildings, Plant and Equipment | 350,200.63 | | | |
| Power Plants and Equipment | 247,564.12 | | | |
| Sundry Camp Buildings and Equipment | 336,389.25 | | | |
| | | 1,267,697.02 | 3,022,139.42 | (I). |
| DEFERRED CHARGES | | | 25,247.20 | (H). |
| | | | $4,909,753.48 | (J). |

VICTOR SPENCER, Director.

A. E. BULL, Director.

# B. C. LIMITED

(Non-Personal Liability)

**BRITISH COLUMBIA**

## March 31st, 1938

### LIABILITIES

| | | | | |
|---|---|---|---|---|
| SUNDRY CREDITORS | | | | |
| Salaries and Wages Payable | $19,970.06 | | | |
| Provincial Minerals Tax | 12,034.17 | | | |
| Directors' Fees Payable | 9,000.00 | | | |
| Sundry Accounts Payable | 48,531.47 | | | |
| | | $ 89,535.70 | | |
| RESERVE FOR INCOME TAXES | | 179,941.18 | | |
| DIVIDEND PAYABLE—April 1st, 1938 | | 175,175.00 | | |
| | | | $ 444,651.88 | (K). |
| RESERVES | | | | |
| Depreciation on Plant, Buildings, Machinery and Equipment | | $ 572,346.84 | | |
| Depletion of Mine Properties | | 1,444,175.92 | | |
| | | | 2,016,522.76 | (L). |
| SHARE CAPITAL | | | | |
| Authorized $2,500,000.00 divided into 2,500,000 Shares of $1.00 each. | | | | |
| Issued, fully paid, 1,751,750 Shares | | $1,751,750.00 | | (M). |
| PREMIUM ON SHARES SOLD | | 25,000.00 | | |
| SURPLUS, as per Surplus Account attached | | 671,828.84 | | |
| | | | 2,448,578.84 | |
| | | | $4,909,753.48 | |

**REPORT TO SHAREHOLDERS**

We report to the shareholders that in accordance with Section 148 of the Companies Act of British Columbia we have made an examination of the Accounts of Pioneer Gold Mines of B. C. Limited (Non-Personal Liability), for the year ended March 31st, 1938, and we have made an examination of the Balance Sheet of the Company as at March 31st, 1938, and of the Profit and Loss and Surplus Statements for the year ended March 31st, 1938. In connection therewith we examined or tested accounting records of the Company and other supporting evidence, and we have obtained from officers and employees of the Company all the information and explanations we have required. We have also made a general review of the accounting methods and of the operating and income accounts for the year.

In our opinion, based upon such examination, the above Balance Sheet and Profit and Loss and Surplus Statements are properly drawn up in accordance with accepted principles of accounting consistently maintained by the Company during the year under review, subject to the revised provision for depletion calculated on estimated ore reserves, so as to exhibit a true and correct view of the state of the Company's affairs according to the best of our information and the explanations given to us and as shown by the books of the Company. We are of the opinion that the provision for reserves for depreciation and depletion during the current year are adequate, and that such accumulated reserves as shown in the Balance Sheet are sufficient under the circumstances.

Vancouver, B. C.
April 26th, 1938.

RIDDELL, STEAD, GRAHAM & HUTCHISON,
Chartered Accountants.

# PIONEER GOLD MINES OF B. C. LIMITED

(Non-Personal Liability)

VANCOUVER, B. C.

## PROFIT AND LOSS STATEMENT

### For the Year Ended March 31st, 1938

| | | | | |
|---|---|---|---|---|
| **Production** from 149,639 Tons Hoisted: | | | $2,127,889.35 | |
| Gold Bullion | | | 60,063.16 | |
| **Miscellaneous Income**—Schedule 4 | | | | |
| | | | $2,187,952.51 | |
| **Cost of Production** | | $637,601.52 | | (6)+(7). |
| Mining and Development | | 39,277.68 | | |
| Provincial Minerals Tax | | 43,942.05 | | (incl. under 6+7). |
| Ore Transportation | | 143,561.86 | | (10). |
| Milling | | 6,167.51 | | (12). |
| Refining | | 28,369.50 | | |
| Marketing | | | | |
| Administrative and General Charges—Schedule 5: | | | | |
| Management Salaries and Directors' Fees | $16,200.00 | | | |
| Vancouver and Mine Office Salaries and Expense | 20,703.34 | | | |
| Transfer Fees and Expense | 13,547.85 | | | |
| General Expense—Sundry | 41,709.77 | 92,160.96 | | (9). |
| **Total Cost of Bullion Produced** | | | 991,081.08 | |
| **Profit before Depreciation, Depletion and Income Taxes** | | | $1,196,871.43 | |
| **Deduct:** | | | | |
| Depreciation | | $112,245.92 | | (15). |
| Depletion | | 72,574.92 | | (17). |
| | | | 184,820.84 | |
| **Profit before Income Taxes** | | | $1,012,050.59 | |
| **Deduct:** | | | | |
| Dominion and Provincial Income Taxes | | | 164,184.45 | (16). |
| **NET PROFIT** for the **Year** ended **March 31st, 1938,** carried to Surplus Account | | | $ 847,866.14 | (F). |

## SURPLUS ACCOUNT as at March 31st, 1938

| | | |
|---|---|---|
| By Balance, carried forward as at March 31st, 1937 | | $ 524,662.70 |
| **Add** Net Increase in Surplus Account for the year ended March 31st, 1938, as per Profit and Loss Statement | | 847,866.14 |
| | | $1,372,528.84 |
| **Deduct** Dividends declared during year: | | |
| Dividend No. 26 at rate of 10% paid July 2nd, 1937 | $175,175.00 | |
| Dividend No. 27 at rate of 10% paid October 1st, 1937 | 175,175.00 | |
| Dividend No. 28 at rate of 10% paid January 3rd, 1938 | 175,175.00 | |
| Dividend No. 29 at rate of 10% payable April 1st, 1938 | 175,175.00 | 700,700.00 (B). |
| **BALANCE AT CREDIT OF SURPLUS ACCOUNT** as at **March 31st, 1938,** as shown in attached Balance Sheet | | $ 671,828.84 |

THE CLARKE & STUART CO. LTD., VANCOUVER, B.C.

mines which had become depleted before 1937, the years previous to that date are not complete for Group A.(See Tables X & XI). However, as the number of mines operating in those years was also considerably less than the number operating today, assumptions based on the early years of the study should not be too incorrect. The ratio of the size of the sample to the total universe treated is approximately the same as for most of the years. There is a discrepancy in that Ontario and Quebec are the only provinces represented in the early years until the entrance of British Columbia in 1932, as there were mines operating in British Columbia and in the other provinces from 1928 to 1932 but it was not possible to obtain any information on them. (See Table XII).

Calculations

After determining which mines would be included in the survey, the next step was to obtain the annual reports and balance sheets of each individual mine for as many years as possible. These were obtained by mail, by personal interviews and from various mining publications.(See Bibliography).

Facing this page is the Annual Report for 1938 of the Pioneer Gold Mine which contains the basic data from which all the information pertaining to that mine for that year may be calculated. Below are the data which were noted or calculated for each mine from reports similar to this one.(See Figs. 6 & 7 for the fields into which the master card was drawn).

1. Year ----- 1938 (Taken from Annual Report, Page 1).
2. Mine Number ---42 (See Table IX). Mines coded numerically.

Figure 6.

*Master Card, No. 1.*

FORM T-1572 REV. END.

NUMERICAL INTERPRETER 45 POSITIONS

ALPHABETICAL INTERPRETER 60 POSITIONS

Master Card No. 1.

## INTERPRETER SPACING

PR'T'G PUNCH

| 1 | Year | Mine No. | Tonnage Milled during the year. | Average recovery per ton. | No. of oz. of gold produced. | Direct Mining Costs per ton. Development. | Mining. | Total. | Costs per ton of ore milled. General expense | Milling | Total direct operating costs. | Overhead | Total direct op. costs + overhead. | Development. | Depreciation. | Taxes. | Extra Exp. incl depletion | Total cost per ton of ore milled | Costs per ounce of gold produced. Direct cost. | Total cost. | Value of bullion recovered. | No. of Card |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |
| 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 |
| 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 |
| 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 | 7 |
| 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |

LICENSED FOR USE UNDER PATENT 1,772,492

SCALE APPROXIMATELY DOUBLE SIZE—ACTUAL CARD SIZE 3¼x7⅜

Customer Name _____ Date _____

Order No. _____ Industry Code No. _____

—— Check Type of Corner Cut Wanted ——

| | Upper Left | Upper Right | Lower Left | Lower Right |
|---|---|---|---|---|
| ⅜ | ☐ | ☐ | ☐ | ☐ |
| 60°-¼ | | | | |
| ¼ | | | | |

If all Corners to be Square Check Here. ☐

—— IMPORTANT ——

THESE QUESTIONS **MUST** BE ANSWERED BEFORE WE CAN COMPLETE THE ELECTRO

| | Yes | No |
|---|---|---|
| Is This a Revision of Form in Use? | ☐ | ☐ |
| What is Present Form No. _____ | | |
| May We Scrap Old Electro? | ☐ | ☐ |
| If Old Electro is Not Scrapped, Note on Margin Below Reason For Maintaining Type. | | |
| Is Card to Have Stub? | ☐ | ☐ |
| Is Consecutive Prepunching Required? | ☐ | ☐ |
| Is Repetitive Prepunching Required? | ☐ | ☐ |
| Is Prenumbering Required? | ☐ | ☐ |
| Is Padding Required? | ☐ | ☐ |
| Are Proofs Desired? | ☐ | ☐ |

Is Card to be Interpreted?

If so Please Indicate.

45 - Numerical ☐

60 - Alphabetical ☐

80 - Printing Punch ☐

Figure 7.

Master Card No. 2.

FORM T-1572 REV. END.

Master Card, No. 2.

## INTERPRETER SPACING

NUMERICAL INTERPRETER 45 POSITIONS

ALPHABETICAL INTERPRETER 60 POSITIONS

PR'T'G PUNCH

| Year | Mine No. | Dividends paid. | Per Loss per Ton. | Amount to Restore Loss per Ton. | Per Ton for Year | Amount of profit or loss for the year. | Current Assets | Deferred Assets. | Fixed Assets | Total Assets | Current Liabilities. | Accruals. | Fixed Liabilities. | No. of Tons |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | The Balance Sheet. | | | | | | | | |
| A | A | B | C | D | E | F | G | H | I | J | K | L | M. | X |

LICENSED FOR USE UNDER PATENT 1,772,492

SCALE APPROXIMATELY DOUBLE SIZE—ACTUAL CARD SIZE 3¼x7⅜

Customer Name _____ Date _____

Order No. _____ Industry Code No. _____

Check Type of Corner Cut Wanted

3/8 60° 1/4 1/4

| | Upper | | Lower | |
|---|---|---|---|---|
| | Left | Right | Left | Right |
| | ☐ | ☐ | ☐ | ☐ |

If all Corners to be Square Check Here. ☐

IMPORTANT

THESE QUESTIONS **MUST** BE ANSWERED BEFORE WE CAN COMPLETE THE ELECTRO

| | Yes | No |
|---|---|---|
| Is This a Revision of Form in Use? | ☐ | ☐ |
| What is Present Form No. _____ | | |
| May We Scrap Old Electro? | ☐ | ☐ |
| If Old Electro is Not Scrapped, Note on Margin Below Reason For Maintaining Type. | | |
| Is Card to Have Stub? | ☐ | ☐ |
| Is Consecutive Prepunching Required? | ☐ | ☐ |
| Is Repetitive Prepunching Required? | ☐ | ☐ |
| Is Prenumbering Required? | ☐ | ☐ |
| Is Padding Required? | ☐ | ☐ |
| Are Proofs Desired? | ☐ | ☐ |

Is Card to be Interpreted?

If so Please Indicate.

45 - Numerical ☐

60 - Alphabetical ☐

80 - Printing Punch ☐

3. The Total Tonnage Treated by the Mill During the Year.

130,602 tons. This figure was obtained by taking the tonnage hoisted(page 4 of the Report) and subtracting the waste(19,037 tons) from it, leaving a total of 130,602 tons milled for the year.

4. Average Recovery per Ton of Ore Milled

$16.29. This was obtained by taking the total value of the bullion recovered ($2,127,889, page 4) and dividing it by the number of tons milled(130,602 tons, from Part 2 above) giving the average recovery per ton. In this case the value of the silver bullion was not sufficiently large to warrant any correction for it.

5. The Number of Ounces of Gold Produced

60,654,491 oz. This figure was taken from page 4 of the Annual Report.

Direct Mining Costs per Ton of Ore Milled

6. Development Work

7. Mining

The expenditures for these two operations were combined in this report under the heading of "Mining and Development" giving a total expenditure of $637,601,52(page 8). This figure when divided by the tons milled gave us a cost of $3.48 per ton of ore milled. Also included under this heading was the expense entitled "Ore Transportation"($43,942.05,page 4) which when figured on a per ton basis came to 36 cents.

8. Total The total direct cost per ton of ore milled was obtained by adding the two "per ton" figures above together,

giving us a total direct mining cost of $5.21 per ton of ore milled.

Costs per Ton of Ore Milled

9. General Expense. The expenditures taken under this heading were those coming under the heading "Administrative and General Charges" (page 8), and totalled $92,160.96. Dividing by the number of tons milled, a figure of 70 cents for the cost per ton under this category was obtained.

10. Milling Cost. This figure($143,561.85,page 8) was divided by the tons milled to give a cost per ton milled of $1.09

11. Total Direct Operating Cost. On adding the figures under the headings 6, 7, 9 and 10 the direct cost per ton of ore milled was $7.00

12. Overhead. Under this heading the expenditures entitled "Refining" and "Marketing"(page 8) were included and brought to a per ton basis, they gave an overhead cost per ton of 26¢.

13. Total Direct Costs Including Overhead. Obtained by adding the figures in Sections 11 and 12, giving a total direct cost of $7.26 per ton of ore milled.

14. Development Work. There was no expenditure for development work in 1938.

15. Depreciation. This expenditure was $112,245.12(page 8), and on a per ton basis was 86 cents per ton.

16. Taxes. The amount paid in taxes in 1938 was $164,184.45 (page 8) and on a per ton basis was $1.55 per ton.

17. Extra Expenditures Including Depletion. This item was for depletion only and amounted to $72,574.92(page 8). On a per ton basis it came to 54 cents per ton.

18. The Total Cost per Ton of Ore Milled. The value for this section was obtained by adding the figures in sections 13,14, 15,16 and 17. For this year the total cost per ton of ore milled was $10.22.

## Cost per Ounce of Gold Produced

In order to arrive at the production cost per ounce of gold it has been necessary to work out the ratio between milling costs per ton of ore and the gold recovery value per ton of ore. The ratio of gold recovery per ton in terms of dollars divided into the fixed or selling price of gold gives the ounce recovery per ton. In this way the cost of production per ounce of gold is thereby determined.

(a) $$\frac{\text{Market Price per ounce of gold}}{\text{Value of gold recovery per ton}}$$

This ratio gives in ounces the production of gold per ton of ore.

The cost of producing one ton of ore may then accordingly be equated with the ounces(or fraction thereof) of gold recovered per ton of ore milled.

(b) $$\frac{\text{Market Price per ounce of gold} \times \text{Cost of producing one ton of ore}}{\text{Value of gold recovery per ton}}$$

= Cost of producing one ounce of gold.

19. Direct Cost per Ounce of Gold Produced. This figure was obtained by taking the figure in Section 13(the direct cost of mining,including overhead) and multiplying it by $35.00(the price of gold). The product was then divided by the average recovery per ton and the result was the direct cost of producing an ounce of gold.

(e.g.) Cost per ounce of gold produced =

$$\frac{\text{cost of producing a ton of ore x the price of gold}}{\text{average recovery per ton}}$$

The result for this calculation came to $15.60 per ounce of gold produced in 1938.

20. Total Cost per Ounce of Gold Produced. The same procedure was performed as in Section 19,only substituting the Total Cost of producing a ton of gold(Section 18) in place of the direct cost(Section 13).

(e.g.) Cost per ounce of gold produced =

$$\frac{\text{total cost of producing a ton of ore x the price of gold}}{\text{average recovery per ton}}$$

The result of this computation was a total cost of $21.97 per ounce of gold produced.

21. Value of Bullion Produced during the Year. This value was obtained from page 4 of the report -- $2,127,889.35.(As there

were too many figures to punch all the information on one punch card,[1] the data were divided into two parts.

The Second Set of Data were Numbered Alphabetically.

A. Year and Mine Number. Obtained from the report.

B. Dividends paid. The value was obtained from page 8 of the report. For 1938 they amounted to $700,000.

C. Profit or Loss. This section was included to indicate whether the mine made a profit or loss on each ton of ore milled. On the tabulating card a "one" was punched if a profit was made and a "two" was punched if a loss was incurred.

D. The Amount of Profit or Loss per Ton. This result was obtained by subtracting the total cost per ton of ore milled, from the average recovery per Ton (Section 4). The amount for this year was $6.06 per ton.

E. Profit or Loss for the Year. This section was included to perform the same function as Section C. On the tabulating card a "one" was punched if the mine made a profit for the year and a "two" if it made a loss.

F. The Amount of Profit or Loss for the Year. This figure was obtained from page 8 of the Annual Report and the profit for 1938 was $847,866.14.

The Balance Sheet. All of the information for this section was taken from pages 6 and 7 of the Annual Report.

G. Current Assets. Under this section were included the following items;

(a) Cash on hand
(b) Gold bullion
(c) Investments
(d) Loans and Accounts receivable
(e) Supplies and materials on hand

These items gave us a total of current assets of $1,862,366.86

H. Deferred Assets. Deferred charges were included under this

1. See Instruction Book.

section and amounted to $25,247.20

I. Fixed Assets. The following items were taken as fixed assets (a) Properties and development(Properties at actual cost).

(b) Plant, building,machinery and equipment.

These items gave a total of fixed assets of $3022,139.42.

J. Total Assets. These amounted to $4,909,753.48.

K. Current Liabilities. Under this section were included the items, - (a) Sundry Creditors

(b) Reserve for Income Taxes

(c) Dividends payable.

The total current liabilities amounted to $444,651.88.

L. Accruals or Deferred Liabilities. This included the "Reserves." The amount was $2,016,522.76.

M. Fixed Liabilities. This item was taken to represent the fixed capital and so only included the Share capital issued and came to $1,751,750.

The results of the above calculations were tabulated on accounting paper and were then transferred to "punch or tabulating cards" by the use of the International Business Punching Machine. The data were then in a form ready for use in the statistical machines. Figures 6-7 indicate the fields into which the two master cards were divided for this survey. For a complete description of the tabulating card and the use of the International Business Machines in this survey see the accompanying book of instructions.

# CHAPTER IV

## Analysis of Mining Costs

Figures 8 to 22 inclusive

relate to the data of

the Group A Mines.

( 8 mines )

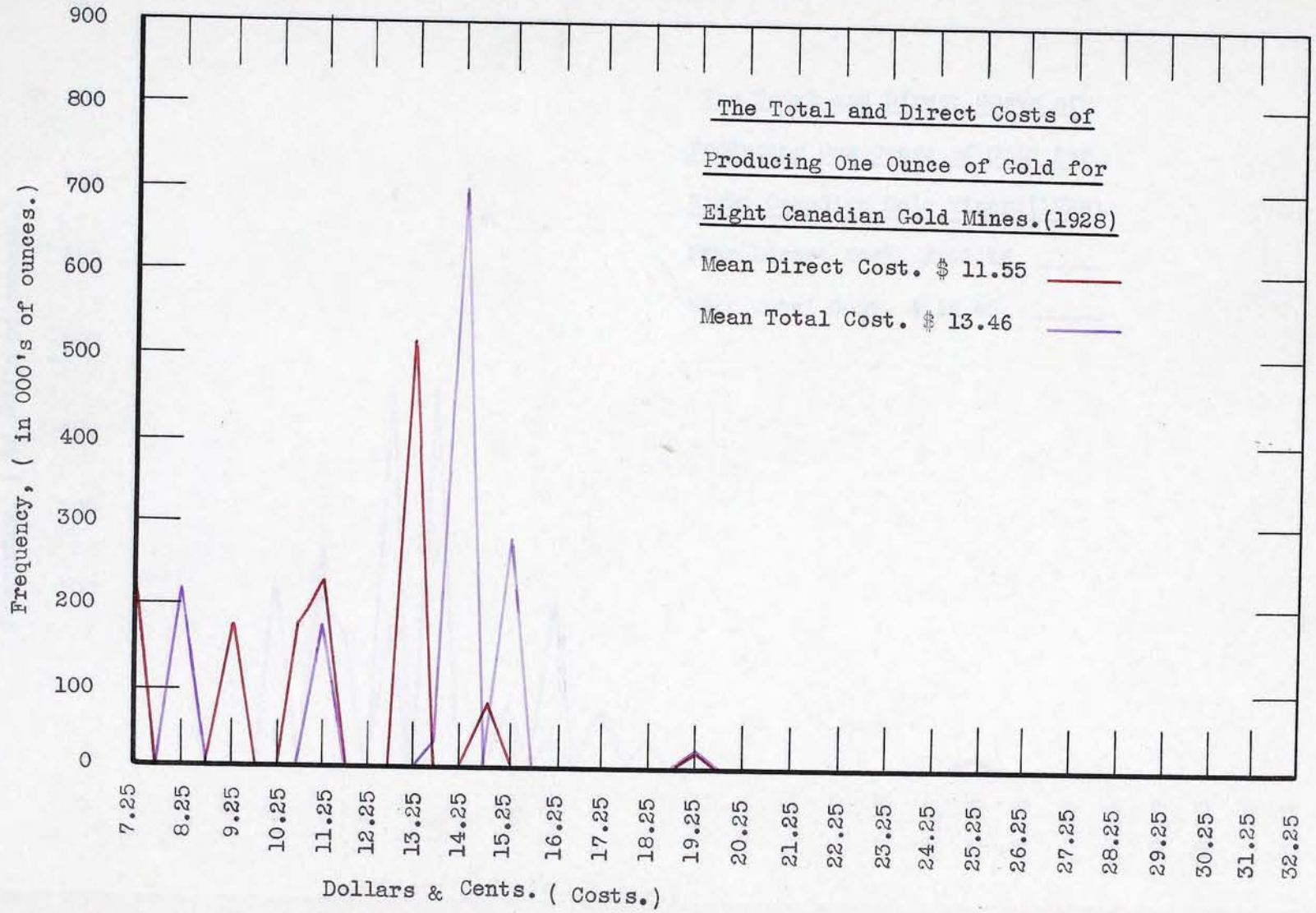

The Total and Direct Costs of
Producing One Ounce of Gold for
Eight Canadian Gold Mines.(1928)
Mean Direct Cost. $ 11.55
Mean Total Cost. $ 13.46
Frequency, ( in 000's of ounces.)
900
800
700
600
500
400
300
200
100
0
7.25
8.25
9.25
10.25
11.25
12.25
13.25
14.25
15.25
16.25
17.25
18.25
19.25
20.25
21.25
22.25
23.25
24.25
25.25
26.25
27.25
28.25
29.25
30.25
31.25
32.25
Dollars & Cents. ( Costs.)

Figure 8.

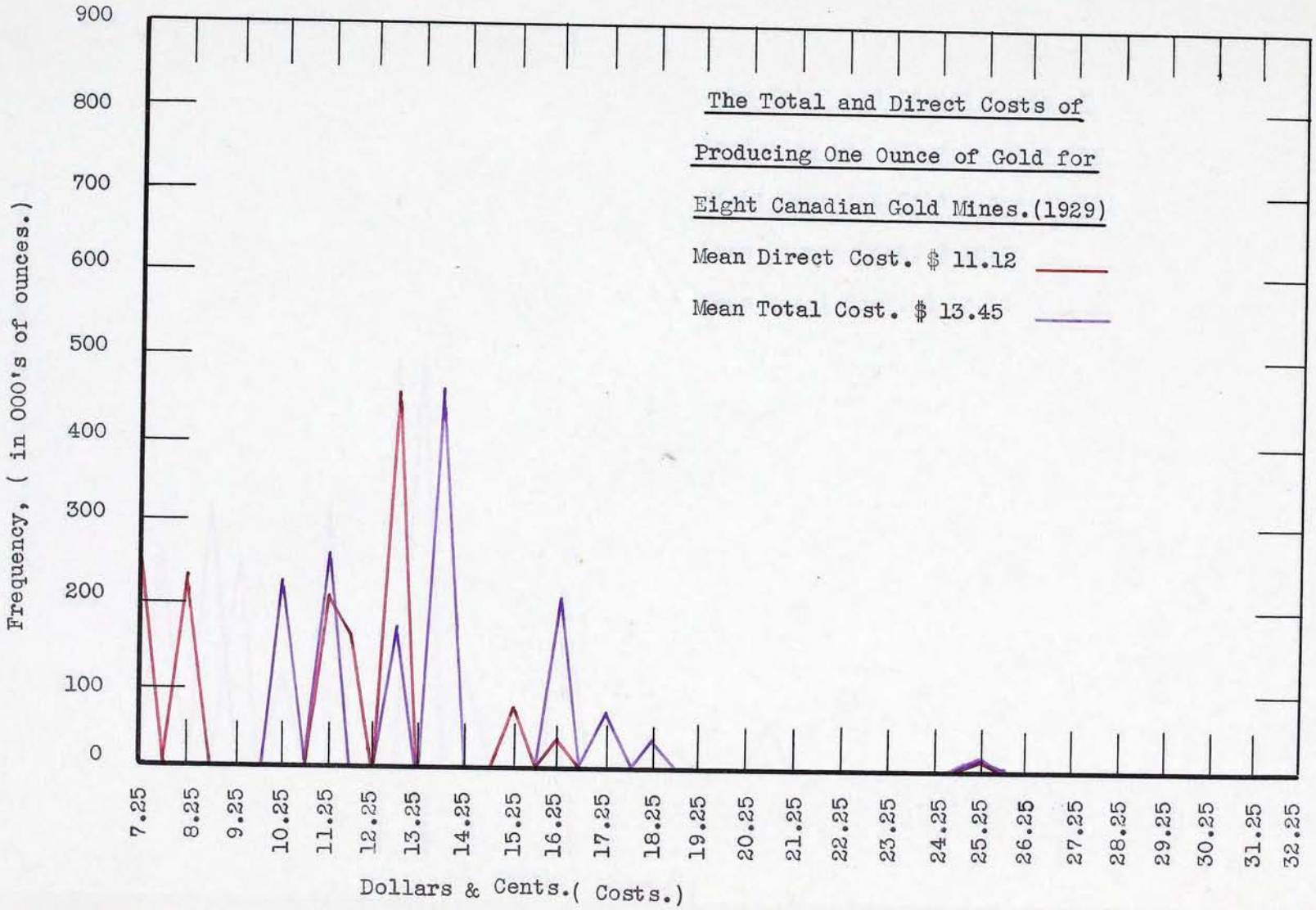

The Total and Direct Costs of
Producing One Ounce of Gold for
Eight Canadian Gold Mines.(1929)
Mean Direct Cost. $ 11.12
Mean Total Cost. $ 13.45
Frequency, ( in 000's of ounces.)
900
800
700
600
500
400
300
200
100
0
7.25
8.25
9.25
10.25
11.25
12.25
13.25
14.25
15.25
16.25
17.25
18.25
19.25
20.25
21.25
22.25
23.25
24.25
25.25
26.25
27.25
28.25
29.25
30.25
31.25
32.25
Dollars & Cents.( Costs.)

Figure 9

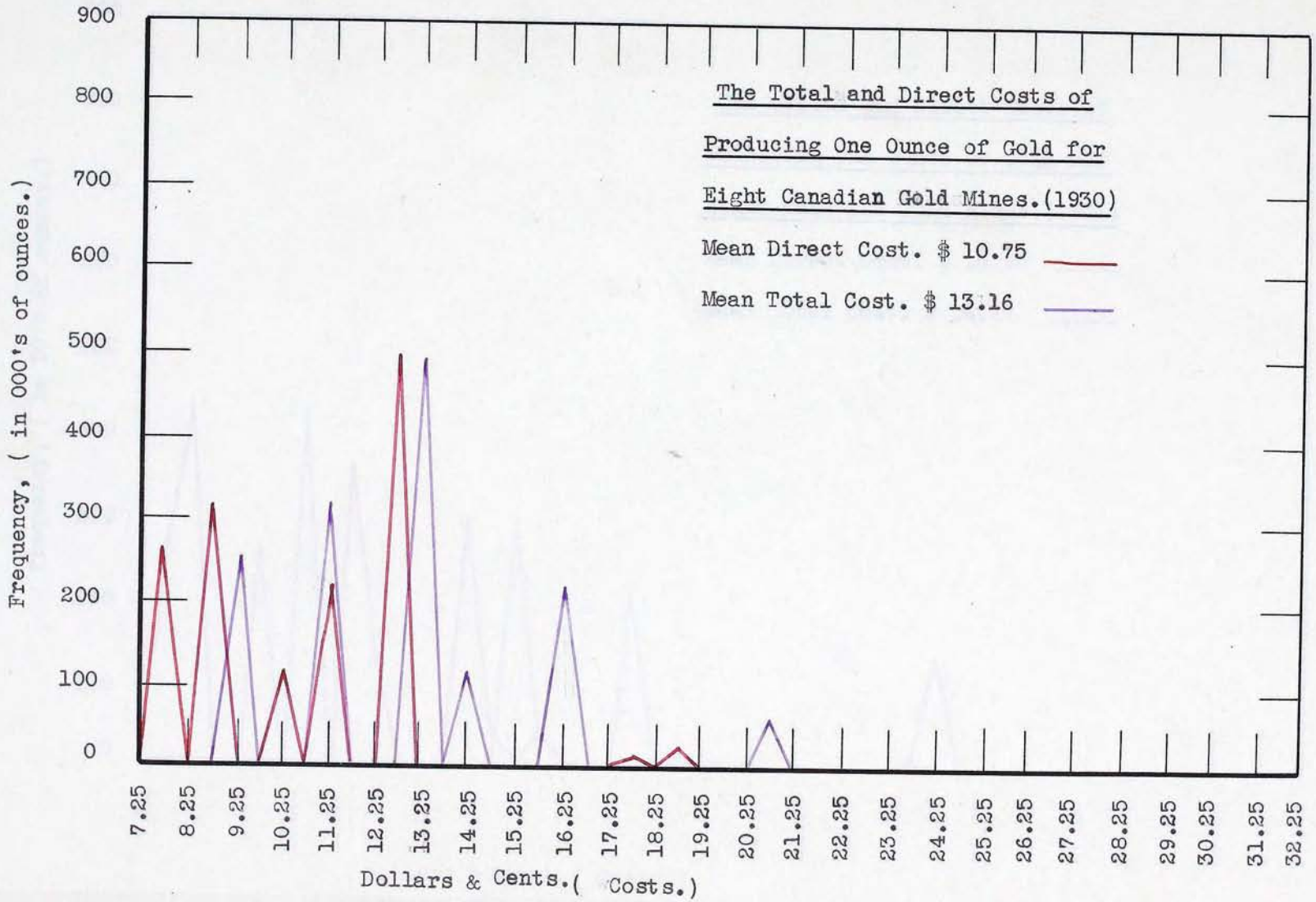

The Total and Direct Costs of
Producing One Ounce of Gold for
Eight Canadian Gold Mines.(1930)
Mean Direct Cost. $ 10.75
Mean Total Cost. $ 13.16
Frequency, ( in 000's of ounces.)
900
800
700
600
500
400
300
200
100
0
7.25
8.25
9.25
10.25
11.25
12.25
13.25
14.25
15.25
16.25
17.25
18.25
19.25
20.25
21.25
22.25
23.25
24.25
25.25
26.25
27.25
28.25
29.25
30.25
31.25
32.25
Dollars & Cents.( Costs.)

Figure 10.

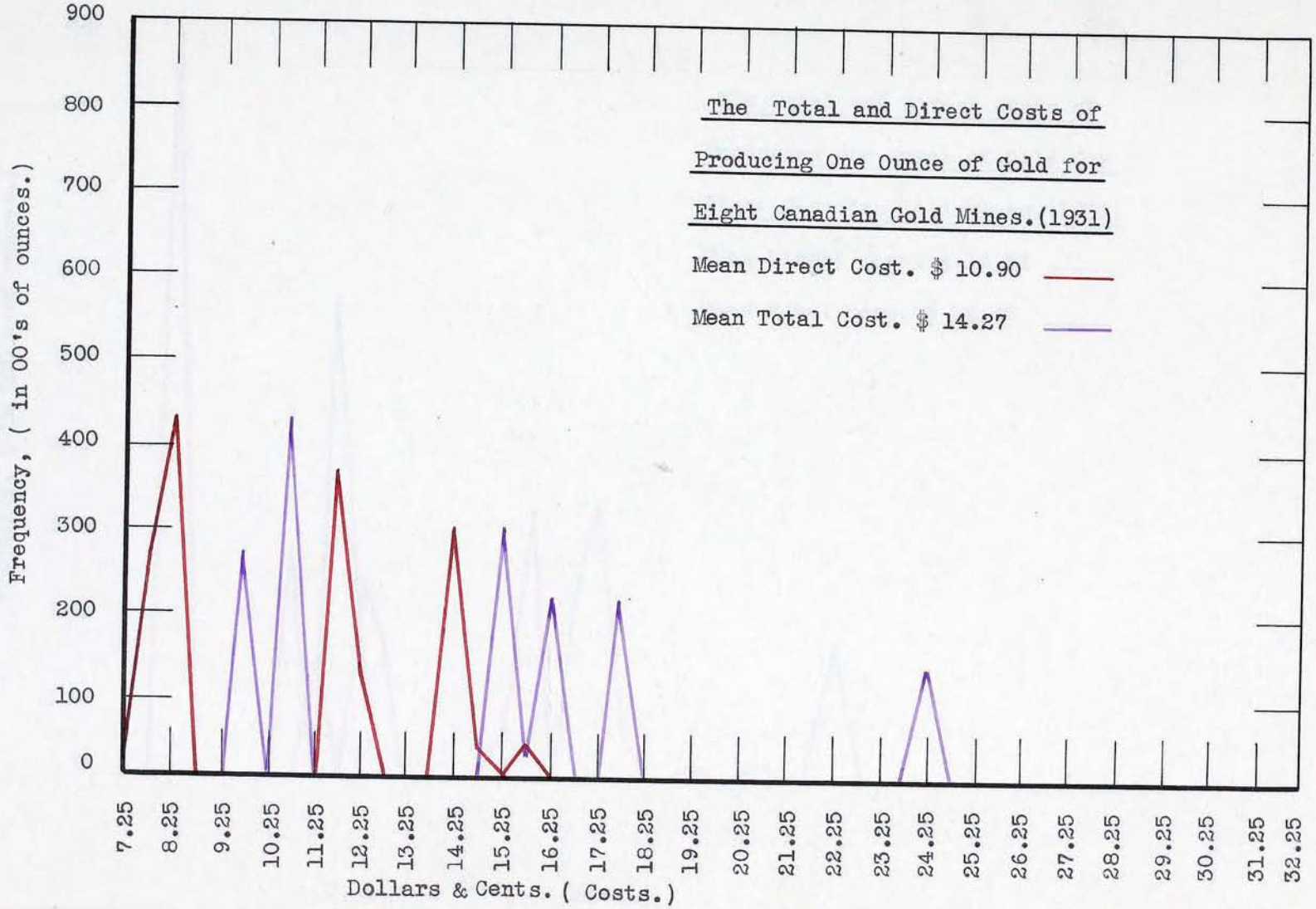

The Total and Direct Costs of
Producing One Ounce of Gold for
Eight Canadian Gold Mines.(1931)
Mean Direct Cost. $ 10.90
Mean Total Cost. $ 14.27
Frequency, ( in 00's of ounces.)
900
800
700
600
500
400
300
200
100
0
7.25
8.25
9.25
10.25
11.25
12.25
13.25
14.25
15.25
16.25
17.25
18.25
19.25
20.25
21.25
22.25
23.25
24.25
25.25
26.25
27.25
28.25
29.25
30.25
31.25
32.25
Dollars & Cents. ( Costs.)

Figure 11.

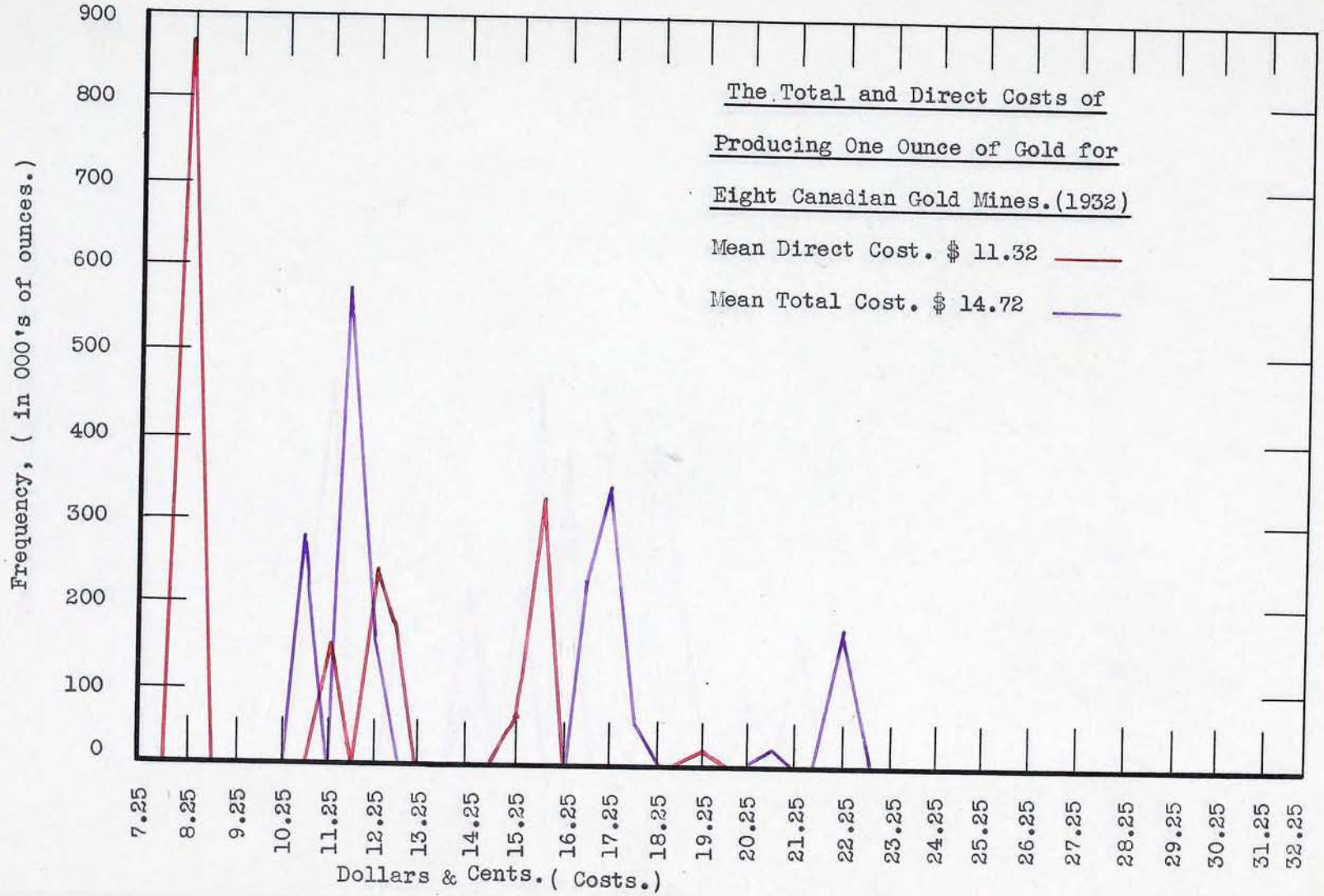
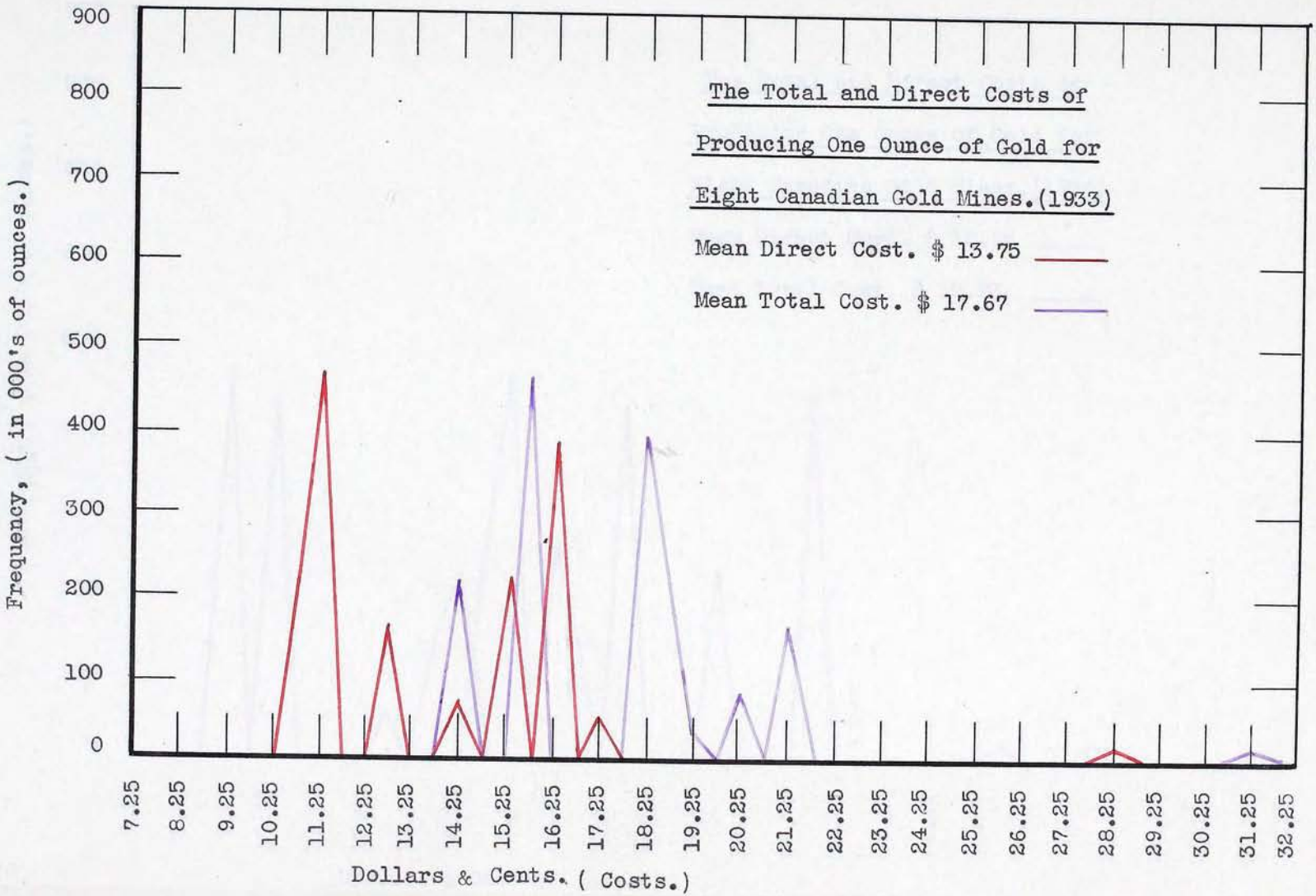

The Total and Direct Costs of
Producing One Ounce of Gold for
Eight Canadian Gold Mines.(1932)
Mean Direct Cost. $ 11.32
Mean Total Cost. $ 14.72
Frequency, ( in 000's of ounces.)
900
800
700
600
500
400
300
200
100
0
7.25
8.25
9.25
10.25
11.25
12.25
13.25
14.25
15.25
16.25
17.25
18.25
19.25
20.25
21.25
22.25
23.25
24.25
25.25
26.25
27.25
28.25
29.25
30.25
31.25
32.25
Dollars & Cents.( Costs.)

Figure 12.


The Total and Direct Costs of
Producing One Ounce of Gold for
Eight Canadian Gold Mines.(1933)
Mean Direct Cost. $ 13.75
Mean Total Cost. $ 17.67
Frequency, ( in 000's of ounces.)
900
800
700
600
500
400
300
200
100
0
7.25
8.25
9.25
10.25
11.25
12.25
13.25
14.25
15.25
16.25
17.25
18.25
19.25
20.25
21.25
22.25
23.25
24.25
25.25
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27.25
28.25
29.25
30.25
31.25
32.25
Dollars & Cents. ( Costs.)

Figure 13.

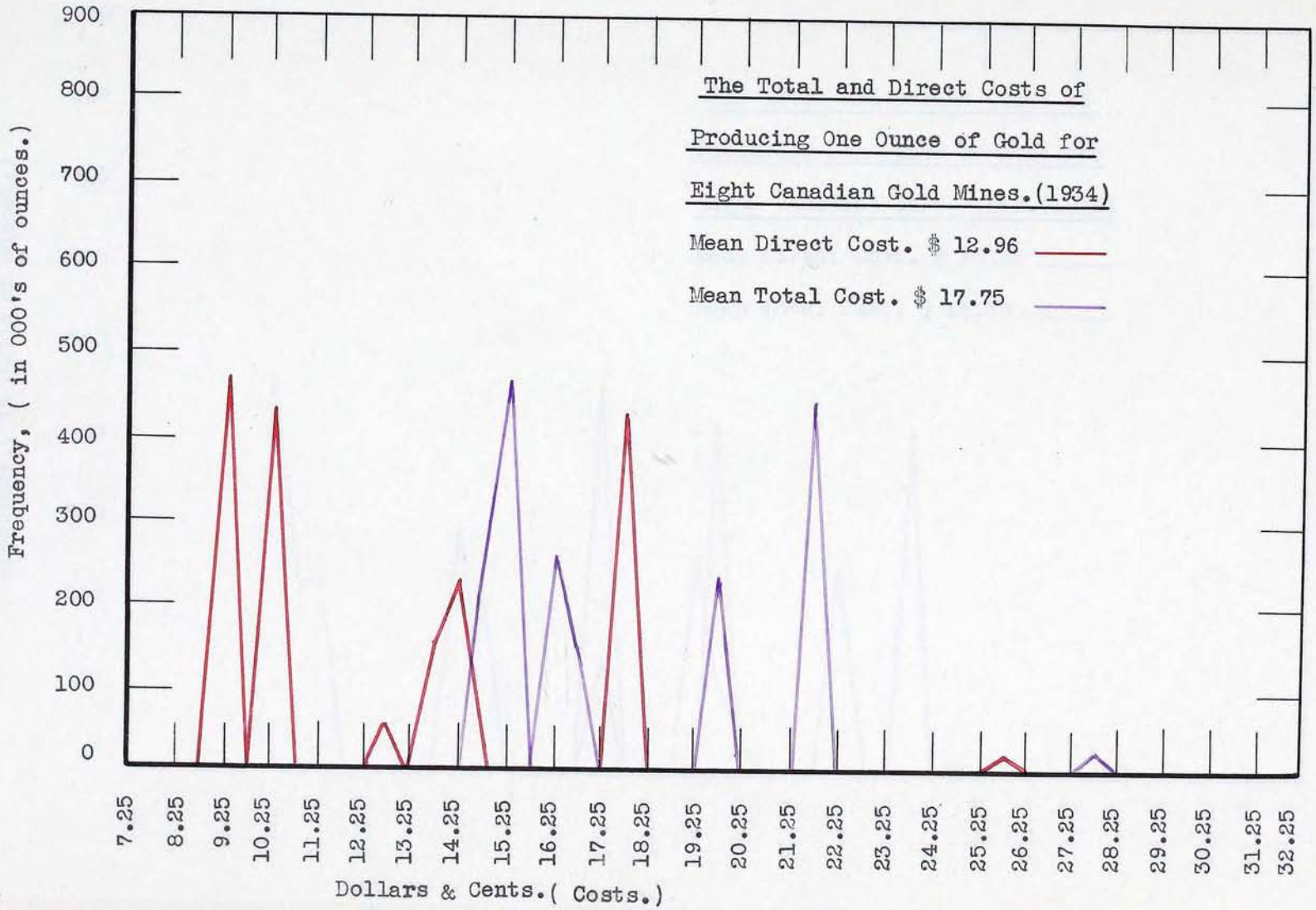
The Total and Direct Costs of
Producing One Ounce of Gold for
Eight Canadian Gold Mines.(1934)
Mean Direct Cost. $ 12.96
Mean Total Cost. $ 17.75
Frequency, ( in 000's of ounces.)
900
800
700
600
500
400
300
200
100
0
7.25
8.25
9.25
10.25
11.25
12.25
13.25
14.25
15.25
16.25
17.25
18.25
19.25
20.25
21.25
22.25
23.25
24.25
25.25
26.25
27.25
28.25
29.25
30.25
31.25
32.25
Dollars & Cents.( Costs.)

Figure 14.

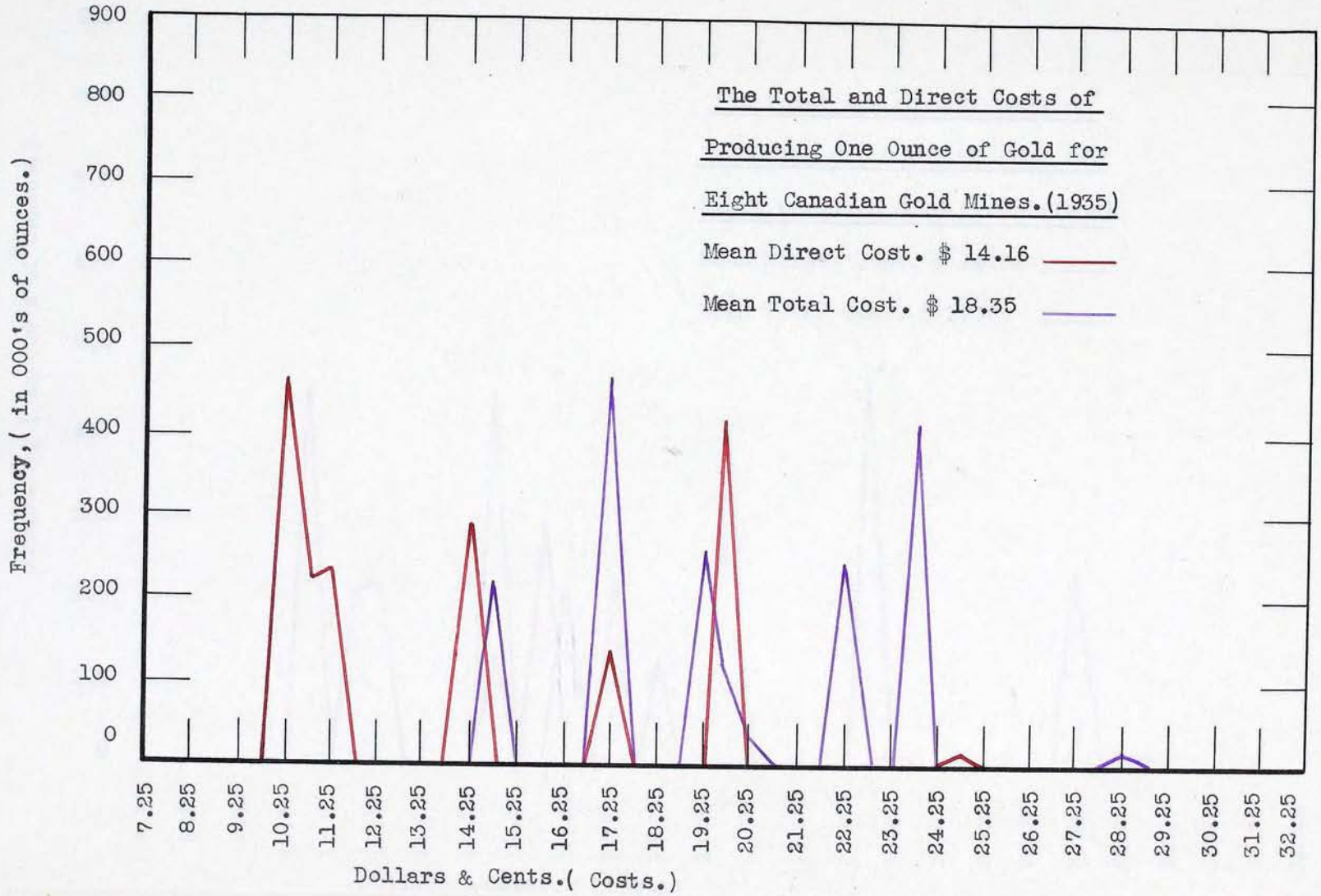
The Total and Direct Costs of
Producing One Ounce of Gold for
Eight Canadian Gold Mines.(1935)
Mean Direct Cost. $ 14.16
Mean Total Cost. $ 18.35
Frequency,( in 000's of ounces.)
900
800
700
600
500
400
300
200
100
0
7.25
8.25
9.25
10.25
11.25
12.25
13.25
14.25
15.25
16.25
17.25
18.25
19.25
20.25
21.25
22.25
23.25
24.25
25.25
26.25
27.25
28.25
29.25
30.25
31.25
32.25
Dollars & Cents.( Costs.)

Figure 15.

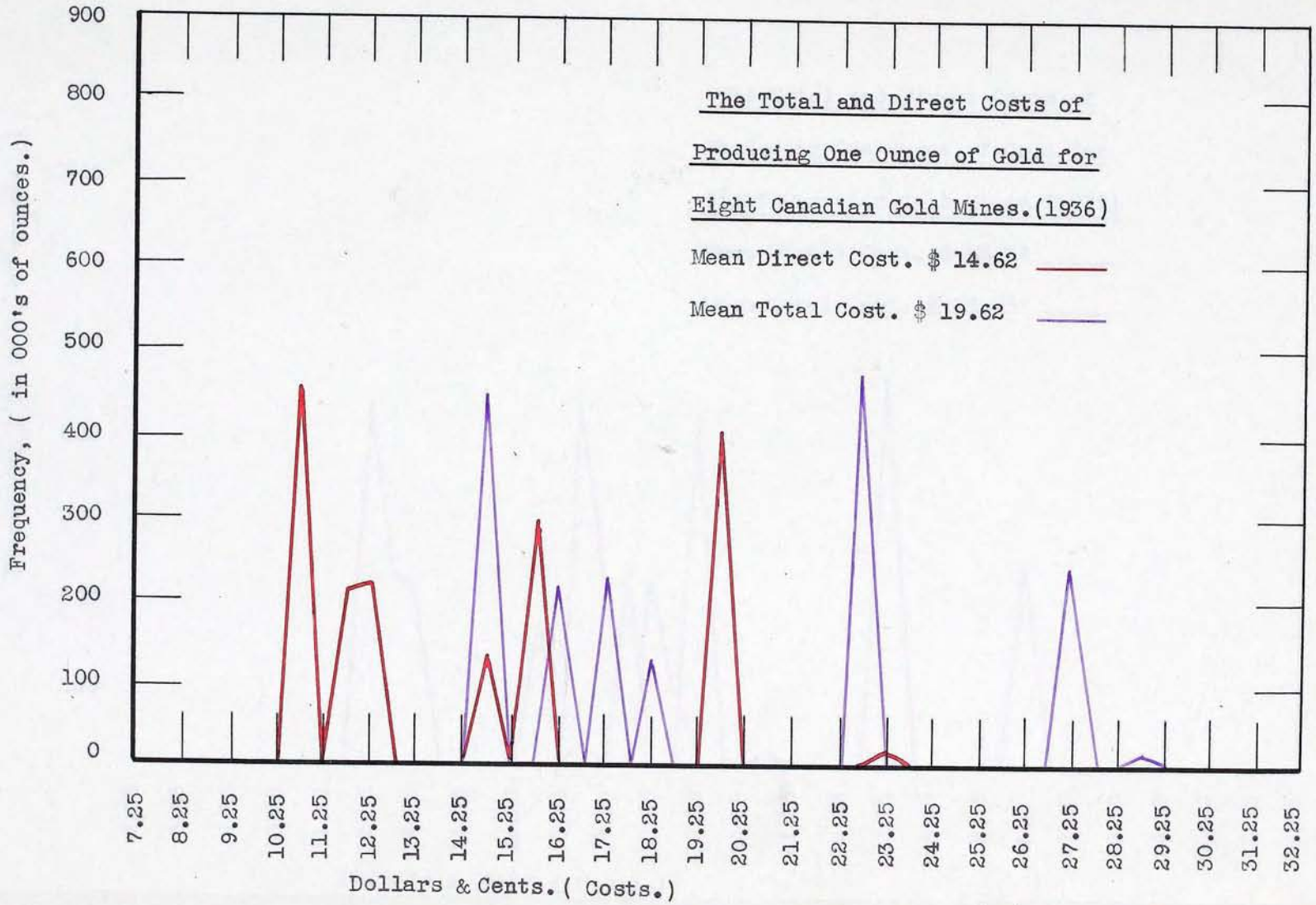
The Total and Direct Costs of
Producing One Ounce of Gold for
Eight Canadian Gold Mines.(1936)
Mean Direct Cost. $ 14.62
Mean Total Cost. $ 19.62
Frequency, ( in 000's of ounces.)
900
800
700
600
500
400
300
200
100
0
7.25
8.25
9.25
10.25
11.25
12.25
13.25
14.25
15.25
16.25
17.25
18.25
19.25
20.25
21.25
22.25
23.25
24.25
25.25
26.25
27.25
28.25
29.25
30.25
31.25
32.25
Dollars & Cents. ( Costs.)

Figure 16.

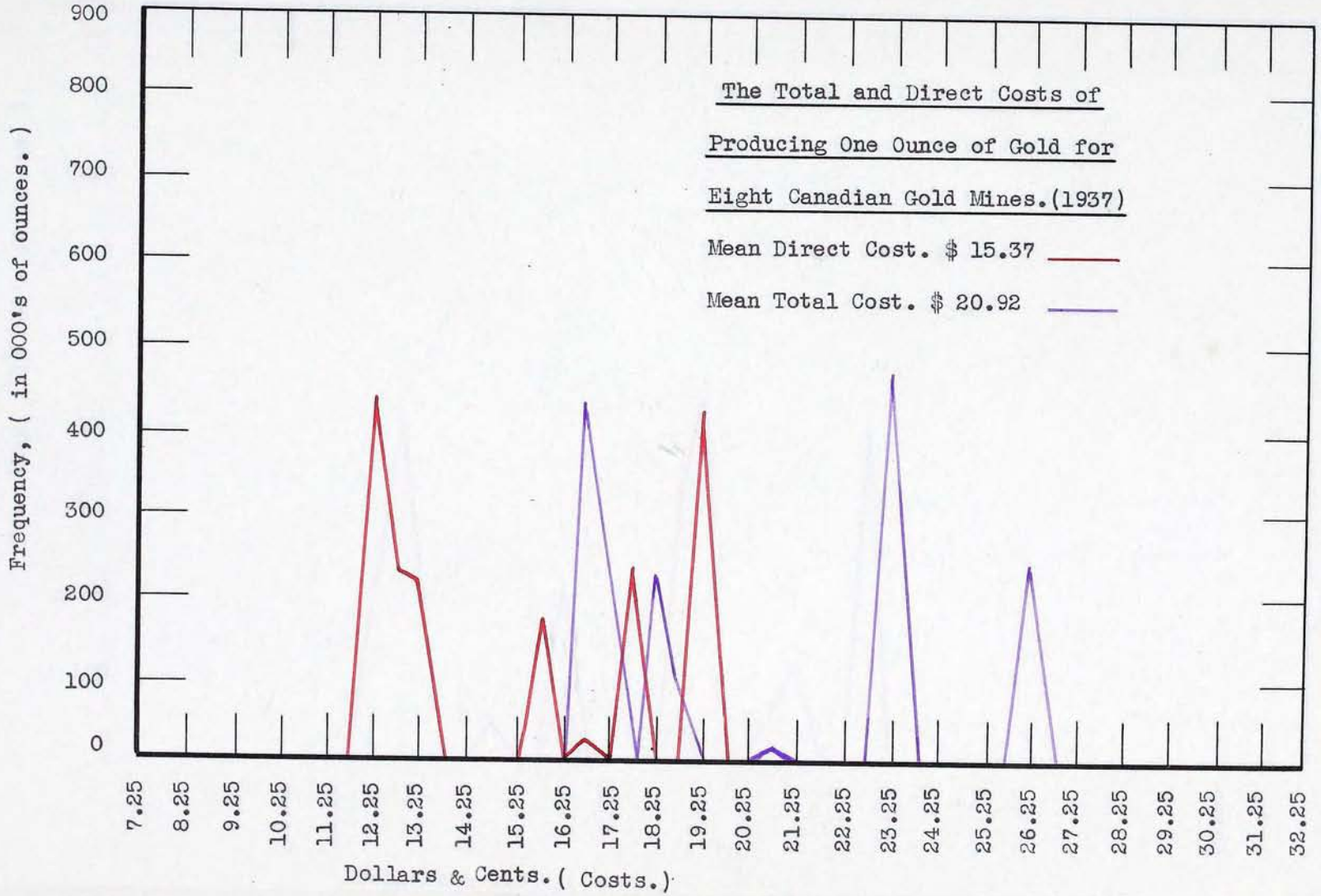
The Total and Direct Costs of
Producing One Ounce of Gold for
Eight Canadian Gold Mines.(1937)
Mean Direct Cost. $ 15.37
Mean Total Cost. $ 20.92
Frequency, ( in 000's of ounces. )
900
800
700
600
500
400
300
200
100
0
7.25
8.25
9.25
10.25
11.25
12.25
13.25
14.25
15.25
16.25
17.25
18.25
19.25
20.25
21.25
22.25
23.25
24.25
25.25
26.25
27.25
28.25
29.25
30.25
31.25
32.25
Dollars & Cents.( Costs.)

Figure 17.

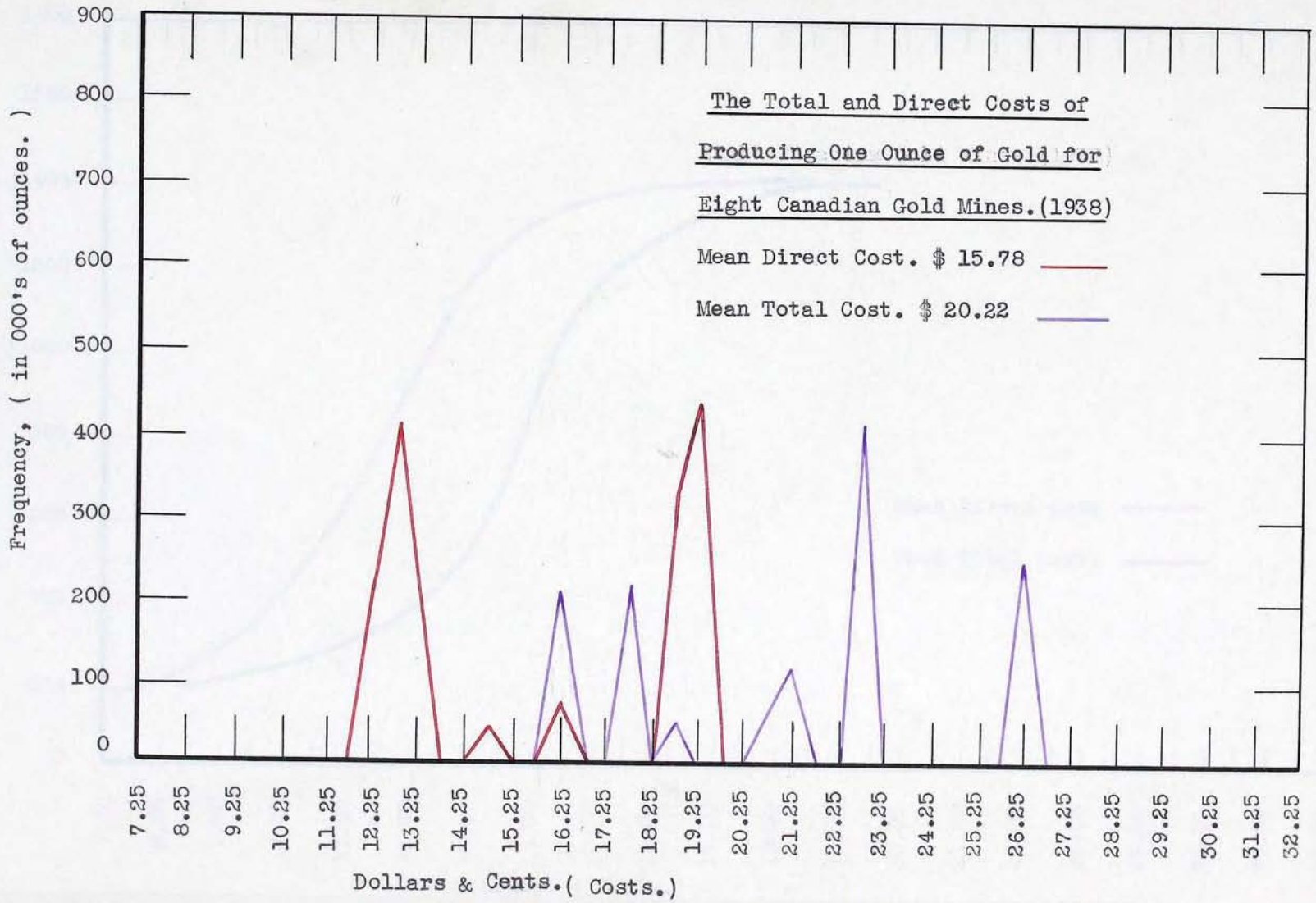
The Total and Direct Costs of
Producing One Ounce of Gold for
Eight Canadian Gold Mines.(1938)
Mean Direct Cost. $ 15.78
Mean Total Cost. $ 20.22
Frequency, ( in 000's of ounces. )
900
800
700
600
500
400
300
200
100
0
7.25
8.25
9.25
10.25
11.25
12.25
13.25
14.25
15.25
16.25
17.25
18.25
19.25
20.25
21.25
22.25
23.25
24.25
25.25
26.25
27.25
28.25
29.25
30.25
31.25
32.25
Dollars & Cents.( Costs.)

Figure 18.

CUMULATIVE CHART OF THE DIRECT AND TOTAL COSTS OF PRODUCING ONE OUNCE OF GOLD FOR EIGHT GOLD MINES. 1928.

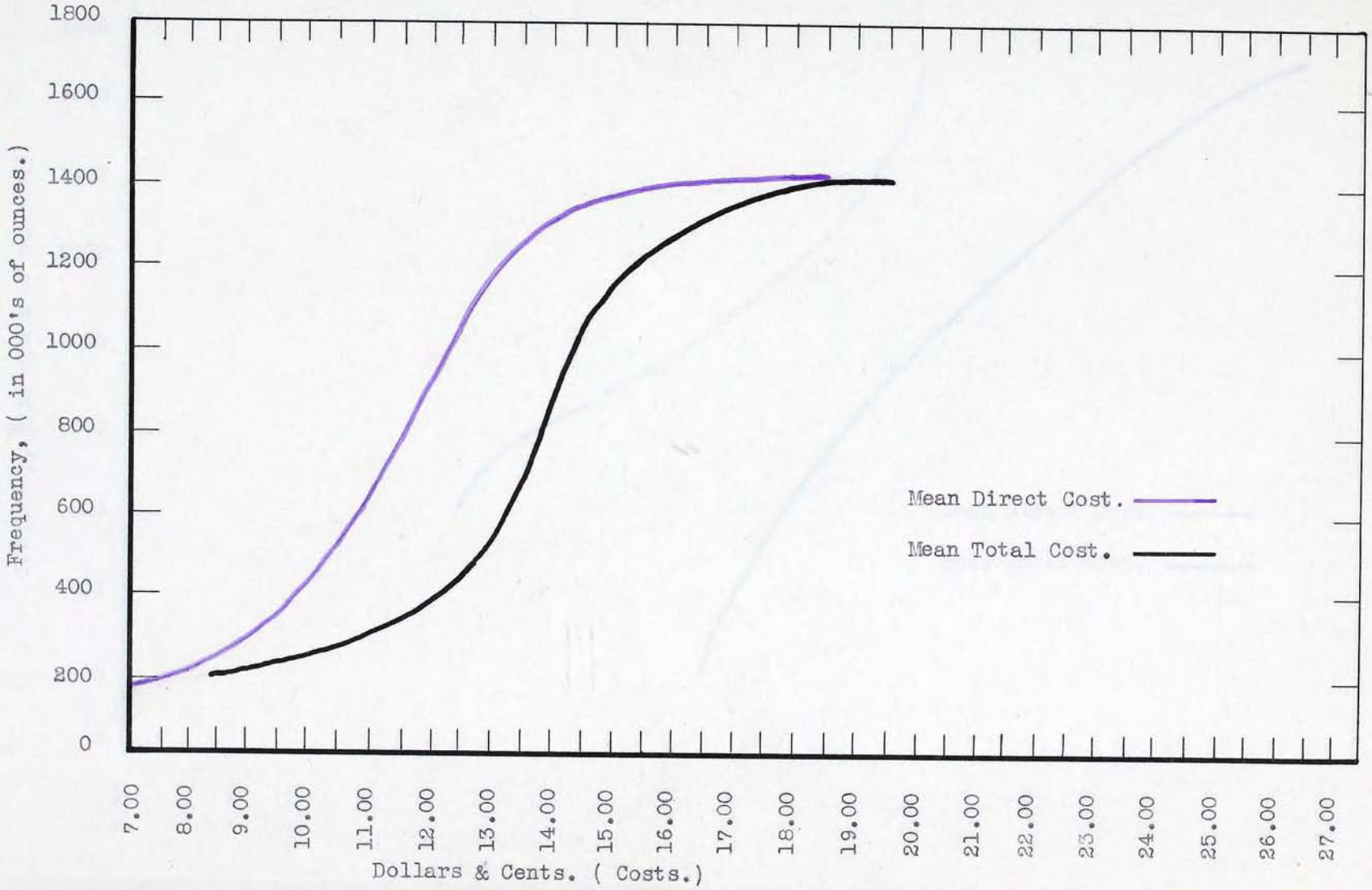


Figure 19.

CUMULATIVE CHART OF THE DIRECT AND TOTAL COSTS OF PRODUCING ONE OUNCE OF GOLD FOR EIGHT GOLD MINES. 1938.

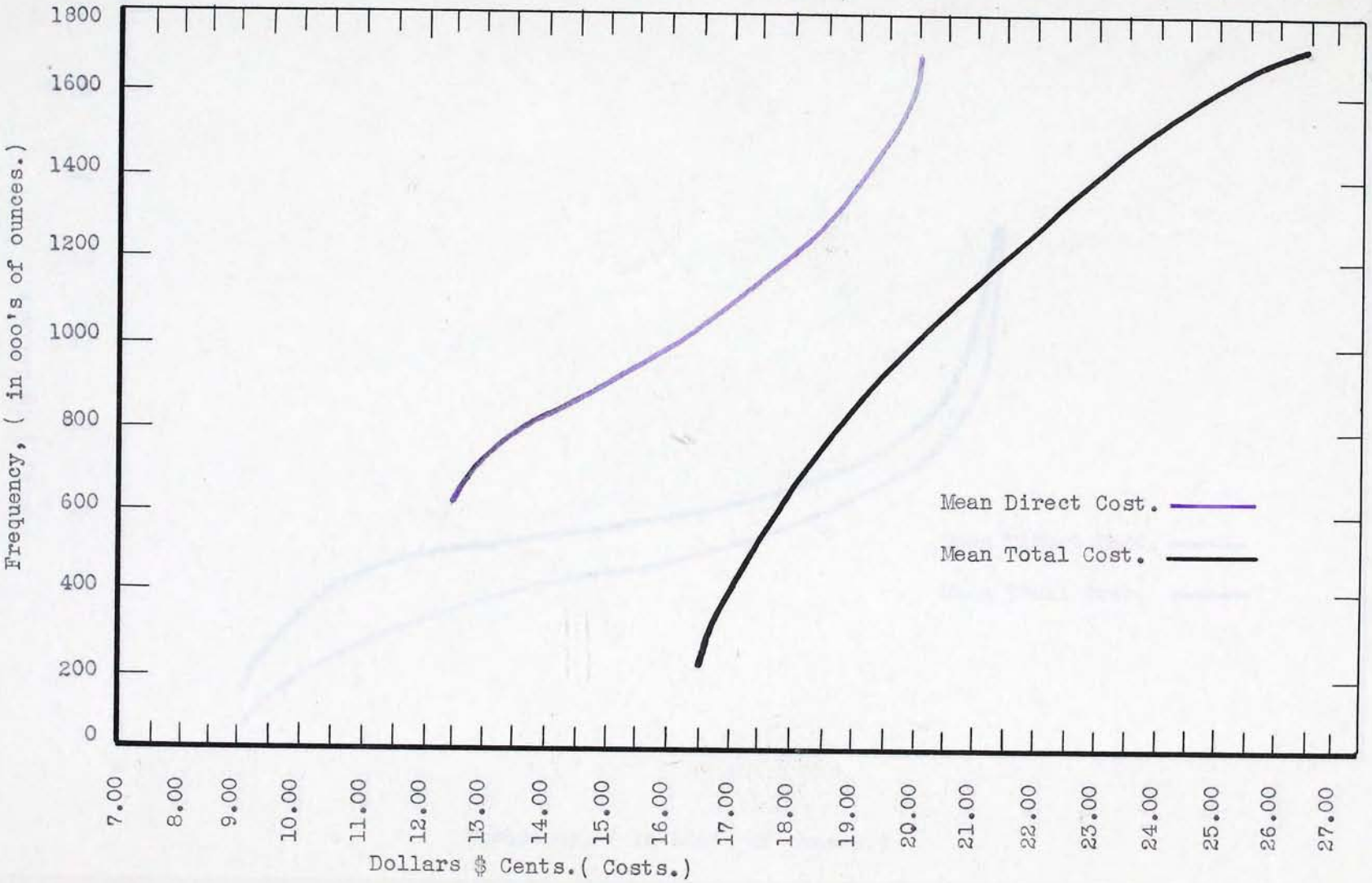


Figure 20.

ECONOMIC CUMULATIVE CHART OF THE DIRECT AND TOTAL COSTS OF PRODUCING ONE OUNCE OF GOLD FOR EIGHT GOLD MINES.1928.

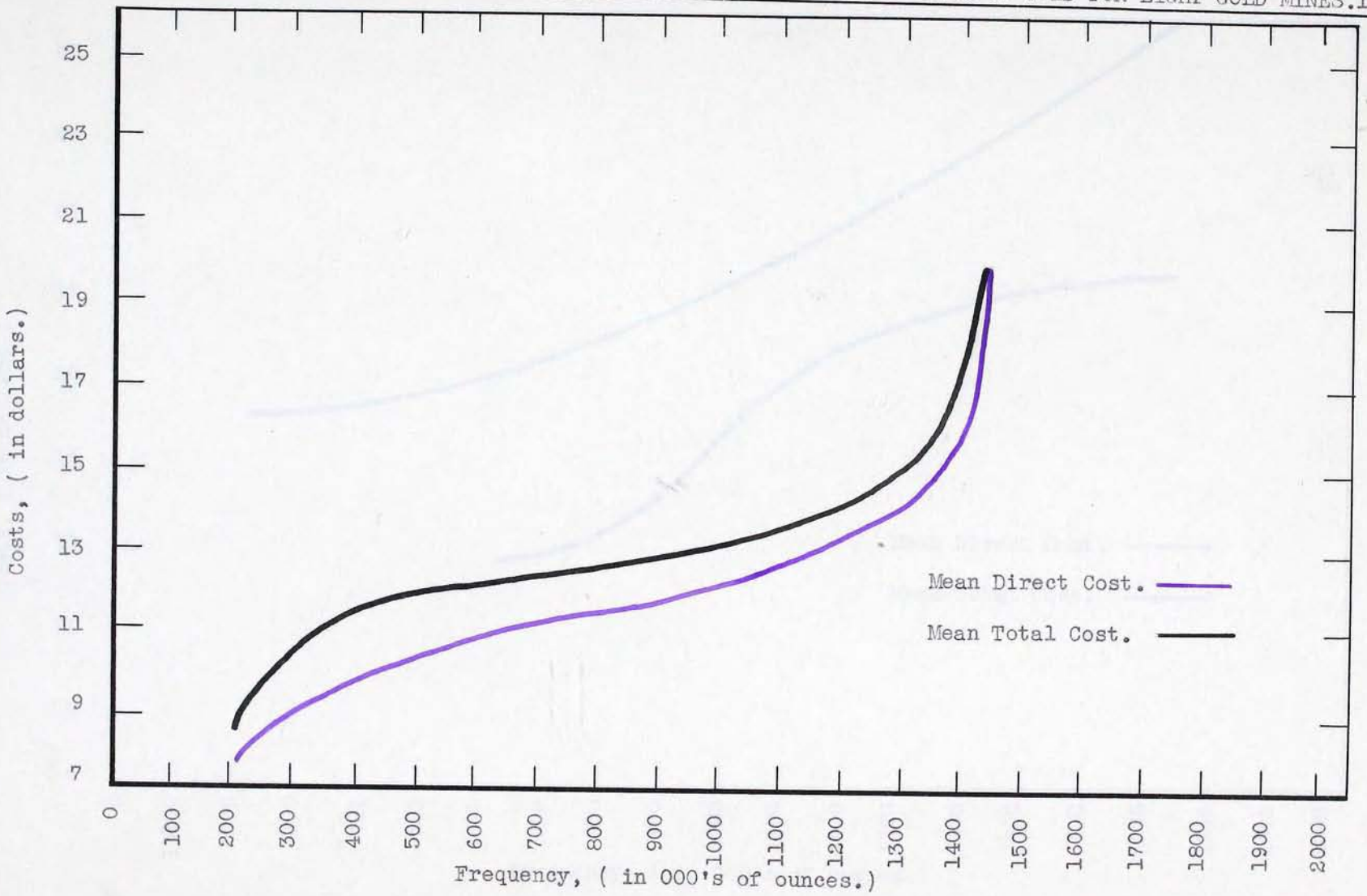


Figure 21.

ECONOMIC CUMULATIVE CHART OF THE DIRECT AND TOTAL COSTS OF PRODUCING ONE OUNCE OF GOLD FOR EIGHT GOLD MINES.1938.

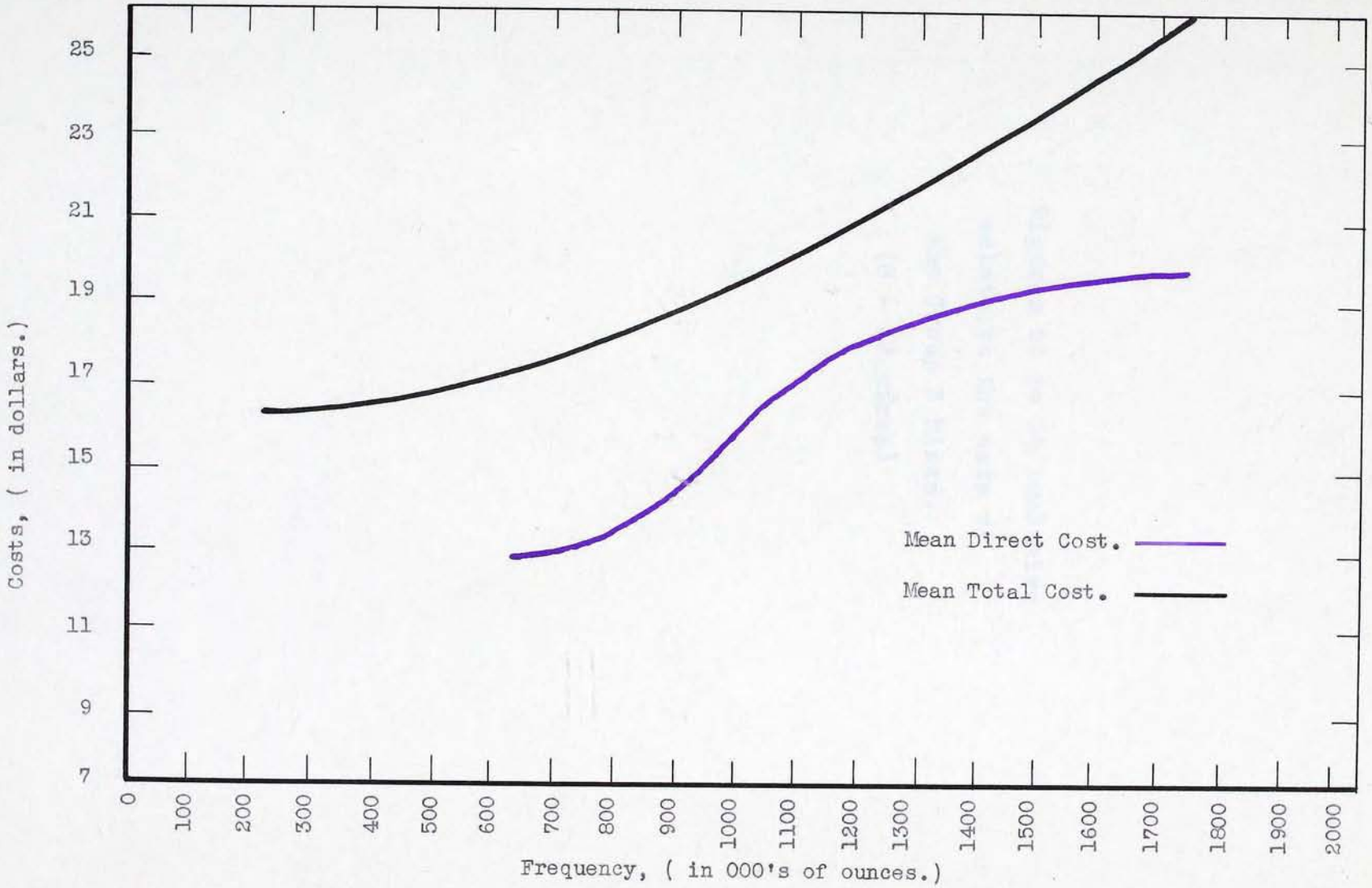


Figure 22.

Figures 23 to 33 inclusive
relate to the data of
the Group B Mines.
(8 - 42 mines)

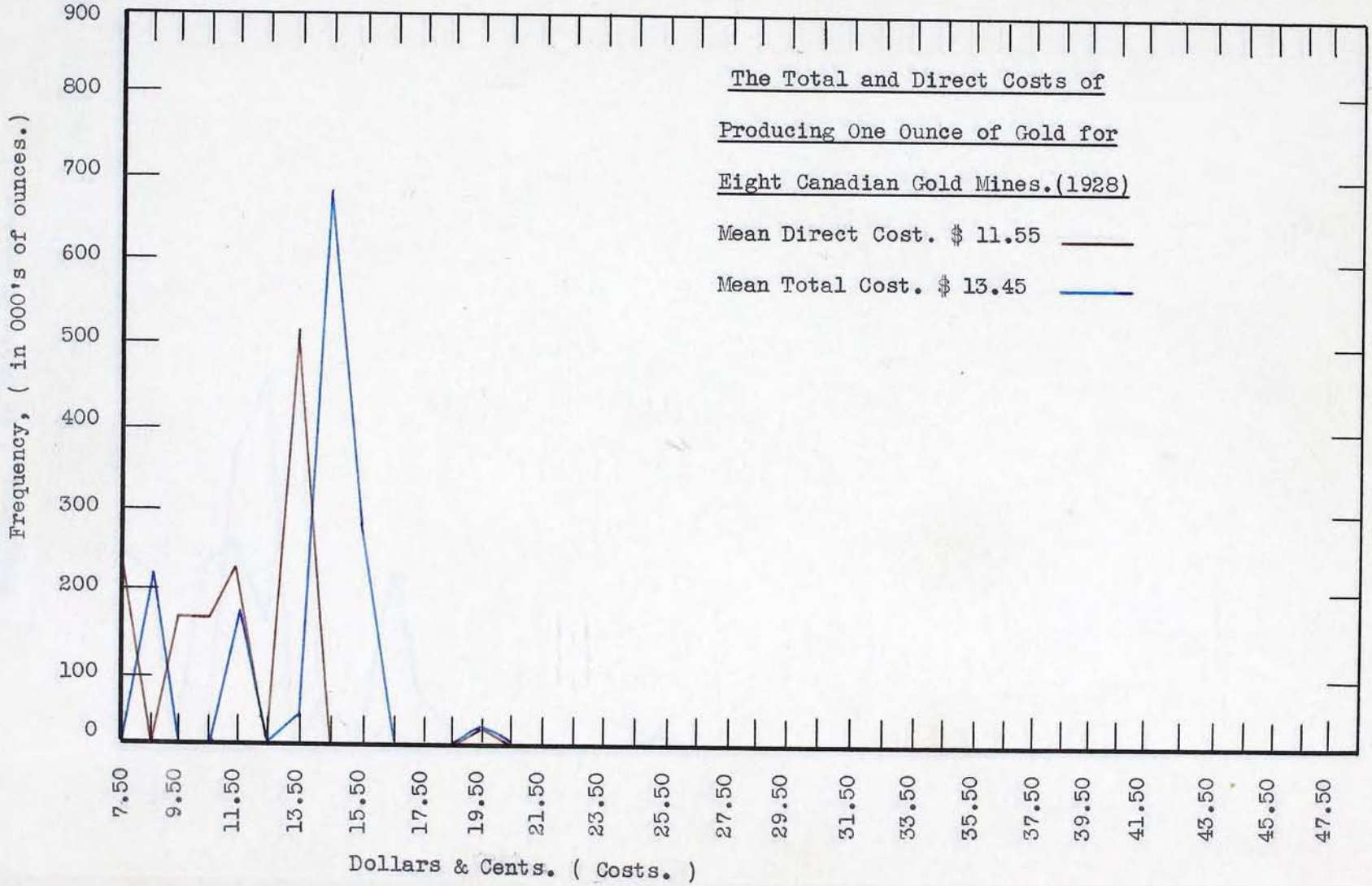
The Total and Direct Costs of
Producing One Ounce of Gold for
Eight Canadian Gold Mines.(1928)
Mean Direct Cost. $ 11.55
Mean Total Cost. $ 13.45
Frequency, ( in 000's of ounces.)
900
800
700
600
500
400
300
200
100
0
7.50
9.50
11.50
13.50
15.50
17.50
19.50
21.50
23.50
25.50
27.50
29.50
31.50
33.50
35.50
37.50
39.50
41.50
43.50
45.50
47.50
Dollars & Cents. ( Costs. )

Figure 23.

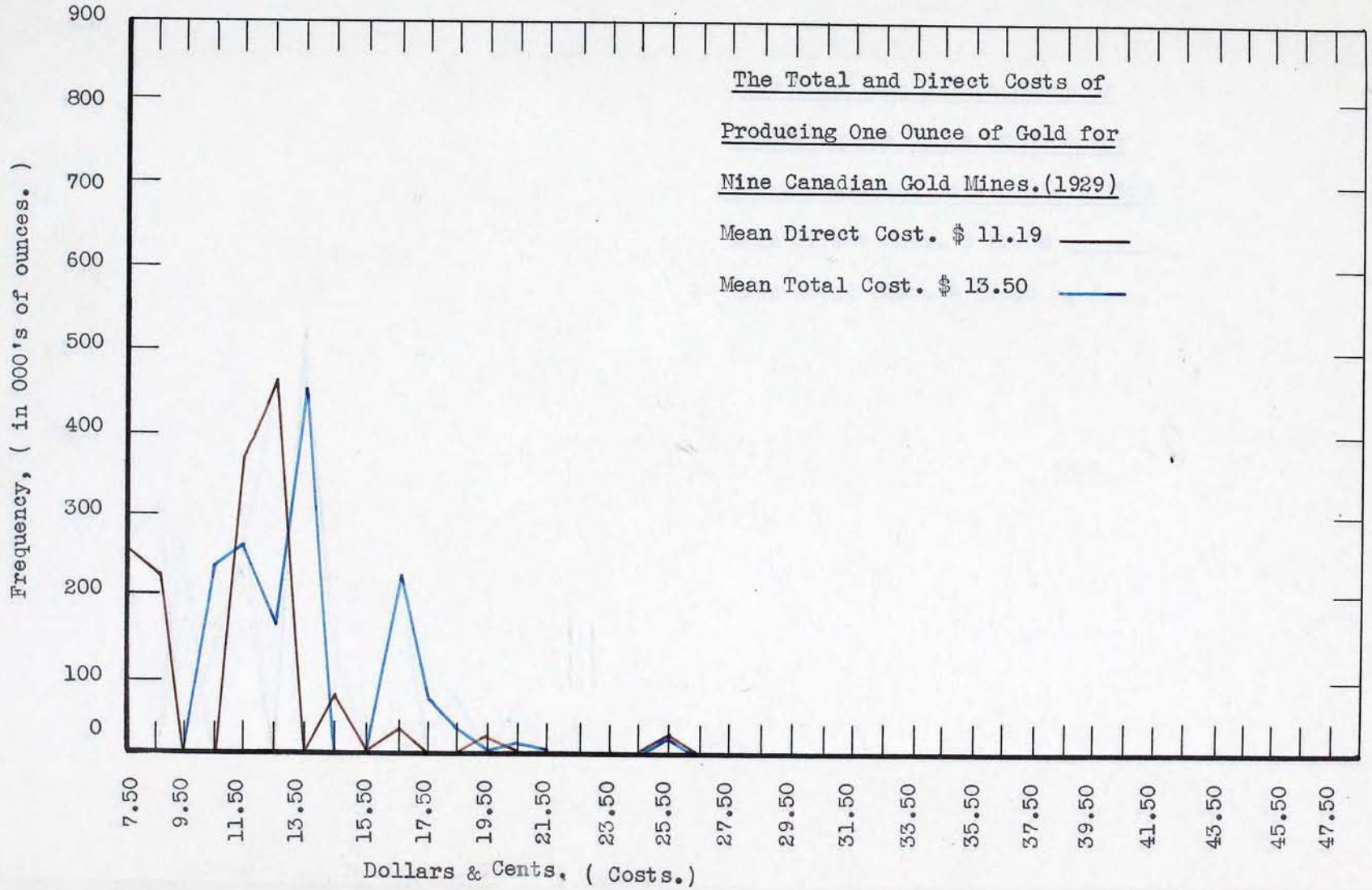
The Total and Direct Costs of
Producing One Ounce of Gold for
Nine Canadian Gold Mines.(1929)
Mean Direct Cost. $ 11.19
Mean Total Cost. $ 13.50
Frequency, ( in 000's of ounces. )
900
800
700
600
500
400
300
200
100
0
7.50
9.50
11.50
13.50
15.50
17.50
19.50
21.50
23.50
25.50
27.50
29.50
31.50
33.50
35.50
37.50
39.50
41.50
43.50
45.50
47.50
Dollars & Cents. ( Costs.)

Figure 24.

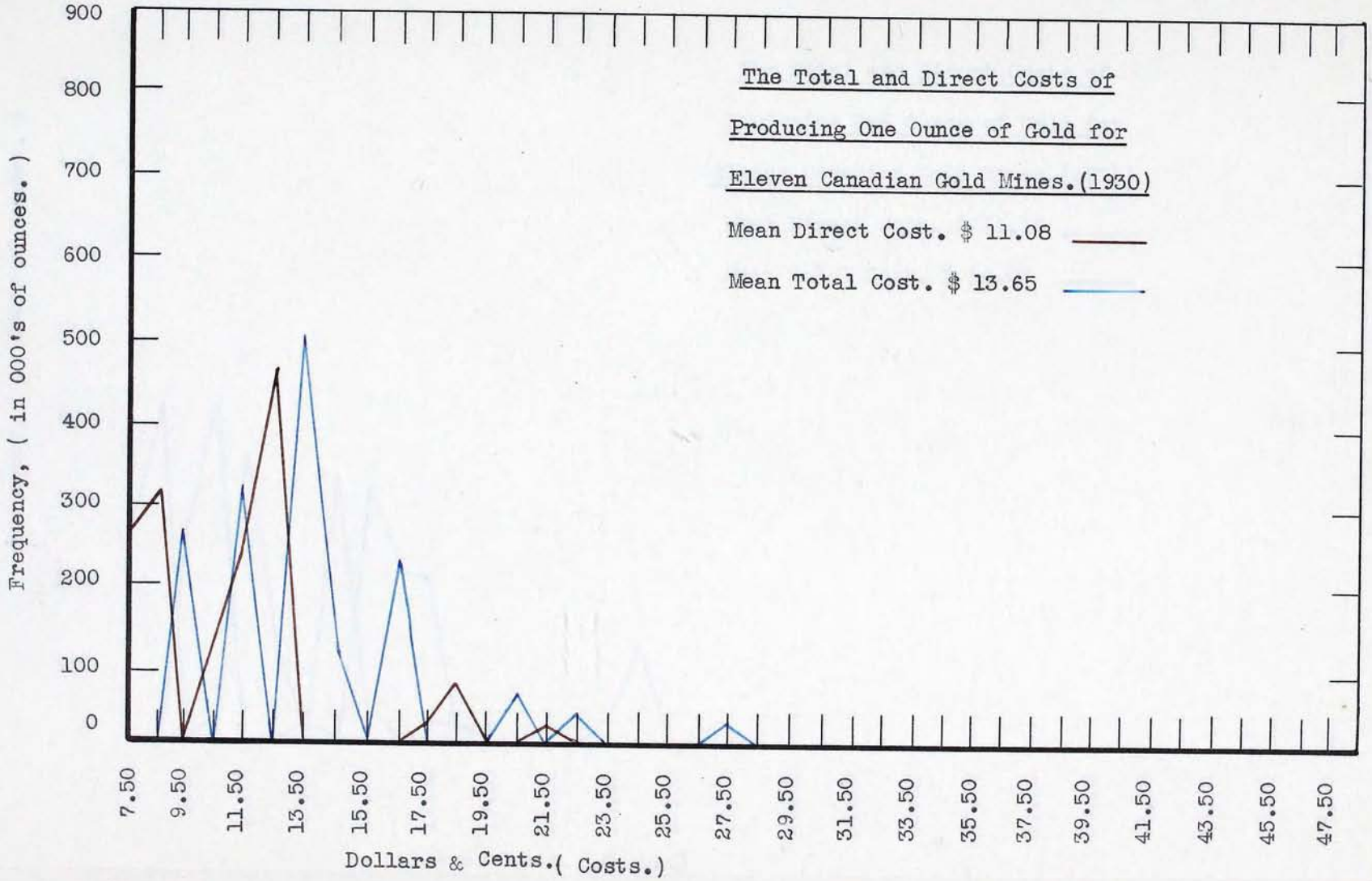
The Total and Direct Costs of
Producing One Ounce of Gold for
Eleven Canadian Gold Mines.(1930)
Mean Direct Cost. $ 11.08
Mean Total Cost. $ 13.65
Frequency, ( in 000's of ounces. )
900
800
700
600
500
400
300
200
100
0
7.50
9.50
11.50
13.50
15.50
17.50
19.50
21.50
23.50
25.50
27.50
29.50
31.50
33.50
35.50
37.50
39.50
41.50
43.50
45.50
47.50
Dollars & Cents.( Costs.)

Figure 25.

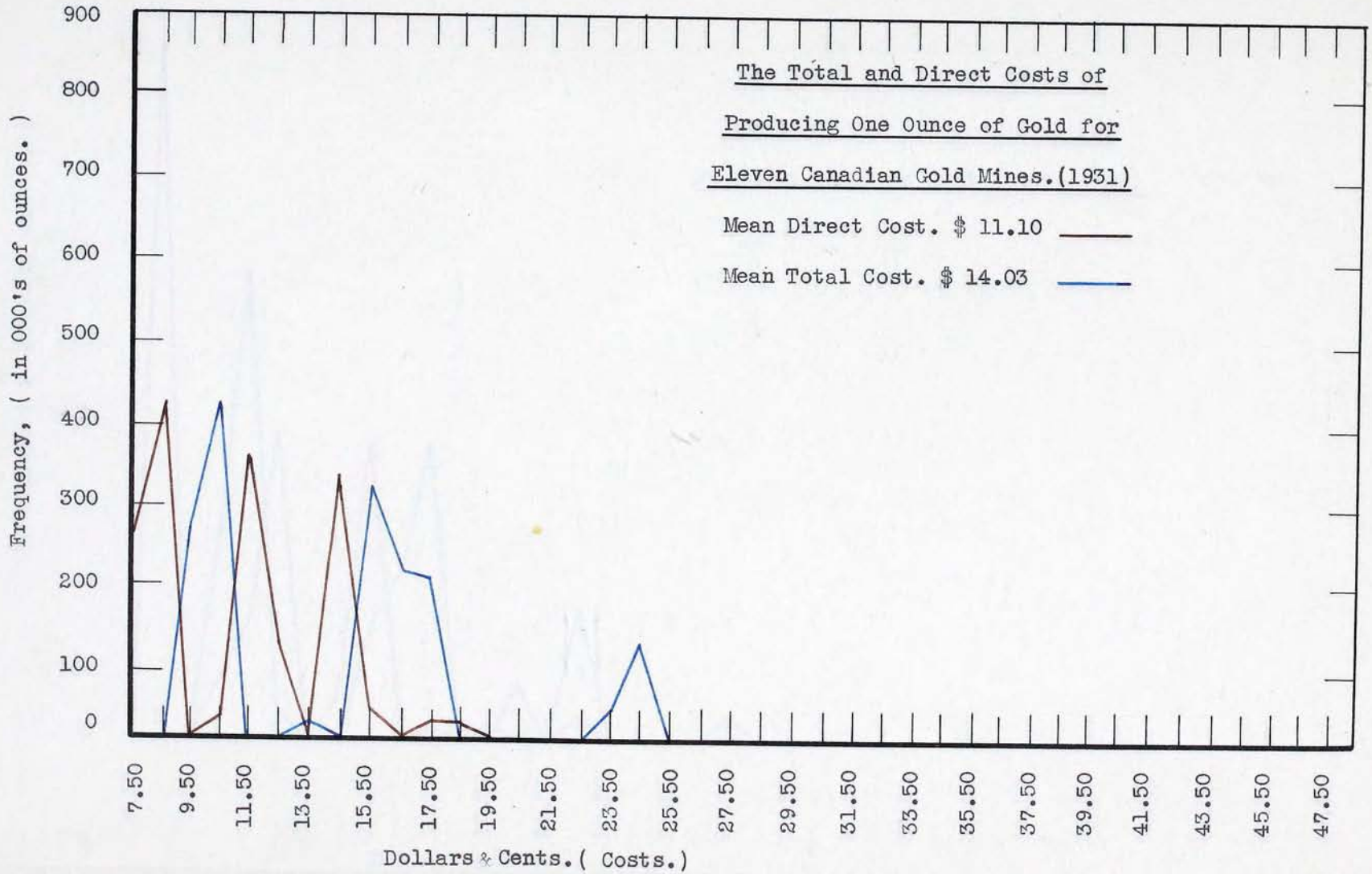
The Total and Direct Costs of
Producing One Ounce of Gold for
Eleven Canadian Gold Mines.(1931)
Mean Direct Cost. $ 11.10
Mean Total Cost. $ 14.03
Frequency, ( in 000's of ounces. )
900
800
700
600
500
400
300
200
100
0
7.50
9.50
11.50
13.50
15.50
17.50
19.50
21.50
23.50
25.50
27.50
29.50
31.50
33.50
35.50
37.50
39.50
41.50
43.50
45.50
47.50
Dollars & Cents.( Costs.)

Figure 26.

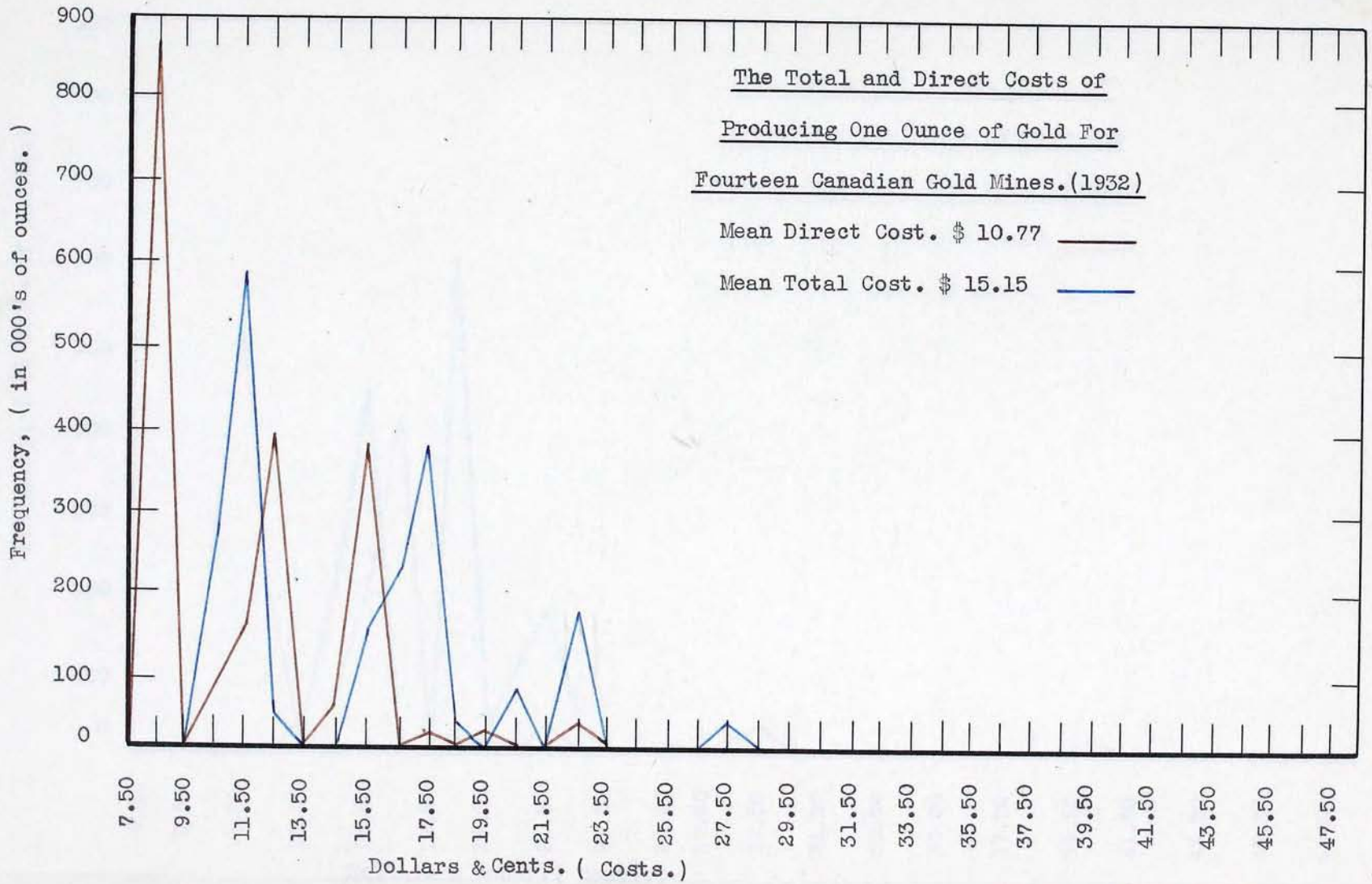
The Total and Direct Costs of
Producing One Ounce of Gold For
Fourteen Canadian Gold Mines.(1932)
Mean Direct Cost. $ 10.77
Mean Total Cost. $ 15.15
Frequency, ( in 000's of ounces. )
900
800
700
600
500
400
300
200
100
0
7.50
9.50
11.50
13.50
15.50
17.50
19.50
21.50
23.50
25.50
27.50
29.50
31.50
33.50
35.50
37.50
39.50
41.50
43.50
45.50
47.50
Dollars & Cents. ( Costs.)

Figure 27.

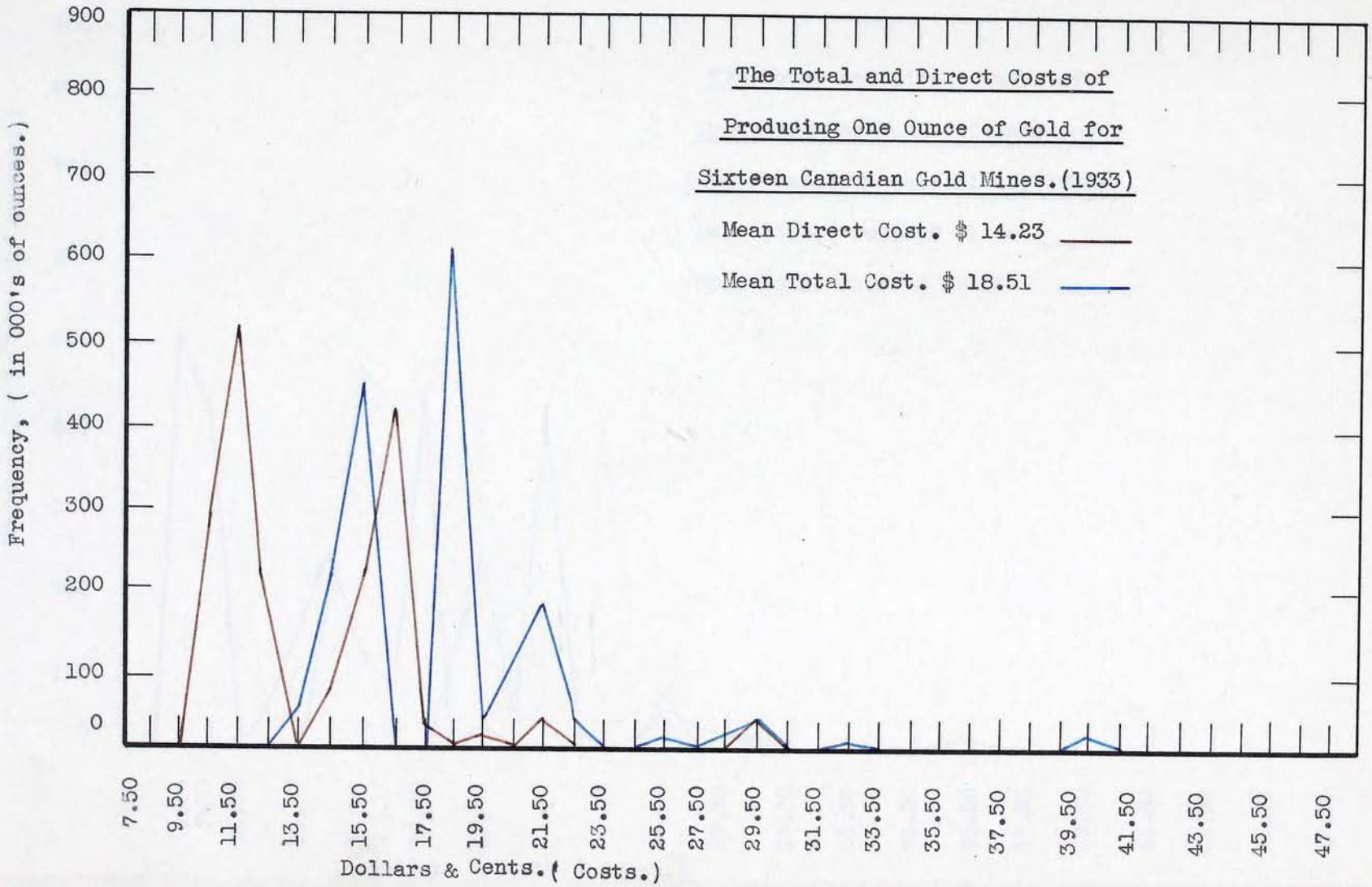
The Total and Direct Costs of
Producing One Ounce of Gold for
Sixteen Canadian Gold Mines.(1933)
Mean Direct Cost. $ 14.23
Mean Total Cost. $ 18.51
Frequency, ( in 000's of ounces.)
900
800
700
600
500
400
300
200
100
0
7.50
9.50
11.50
13.50
15.50
17.50
19.50
21.50
23.50
25.50
27.50
29.50
31.50
33.50
35.50
37.50
39.50
41.50
43.50
45.50
47.50
Dollars & Cents.( Costs.)

Figure 28.

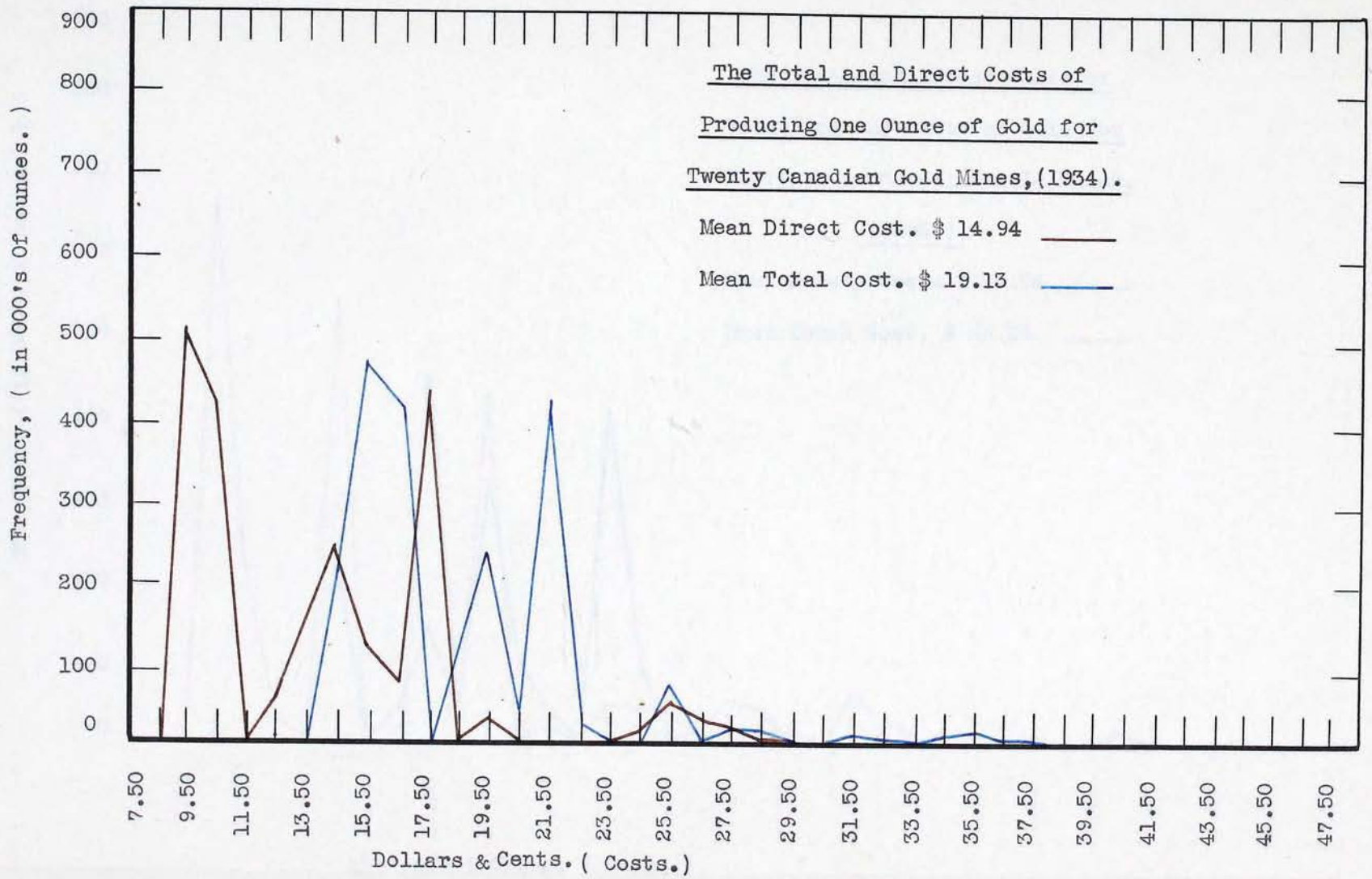
The Total and Direct Costs of
Producing One Ounce of Gold for
Twenty Canadian Gold Mines, (1934).
Mean Direct Cost. $ 14.94
Mean Total Cost. $ 19.13
Frequency, ( in 000's Of ounces. )
900
800
700
600
500
400
300
200
100
0
7.50
9.50
11.50
13.50
15.50
17.50
19.50
21.50
23.50
25.50
27.50
29.50
31.50
33.50
35.50
37.50
39.50
41.50
43.50
45.50
47.50
Dollars & Cents. ( Costs.)

Figure 29.

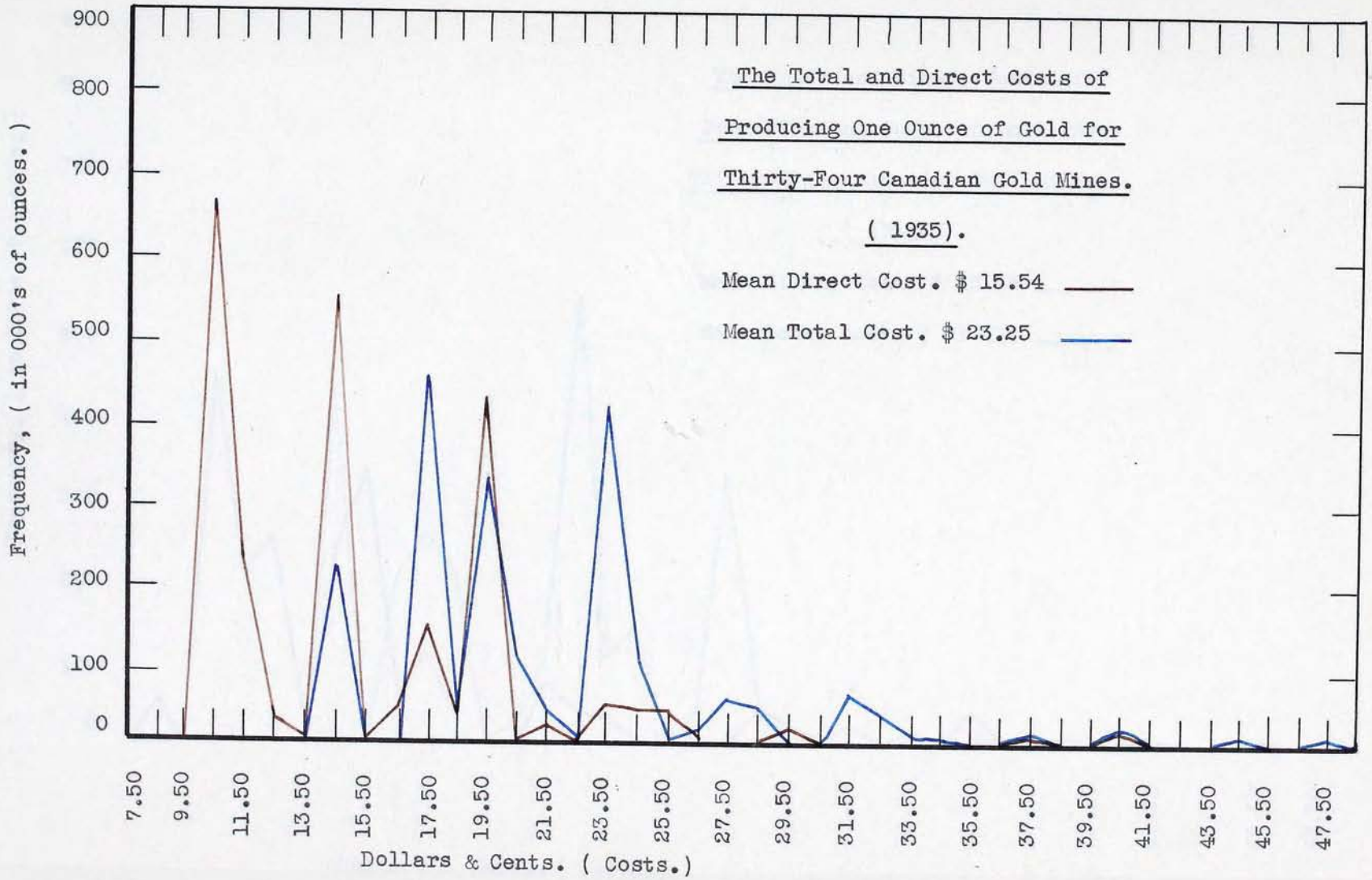
The Total and Direct Costs of
Producing One Ounce of Gold for
Thirty-Four Canadian Gold Mines.
( 1935).
Mean Direct Cost. $ 15.54
Mean Total Cost. $ 23.25
Frequency, ( in 000's of ounces. )
900
800
700
600
500
400
300
200
100
0
7.50
9.50
11.50
13.50
15.50
17.50
19.50
21.50
23.50
25.50
27.50
29.50
31.50
33.50
35.50
37.50
39.50
41.50
43.50
45.50
47.50
Dollars & Cents. ( Costs.)

Figure 30.

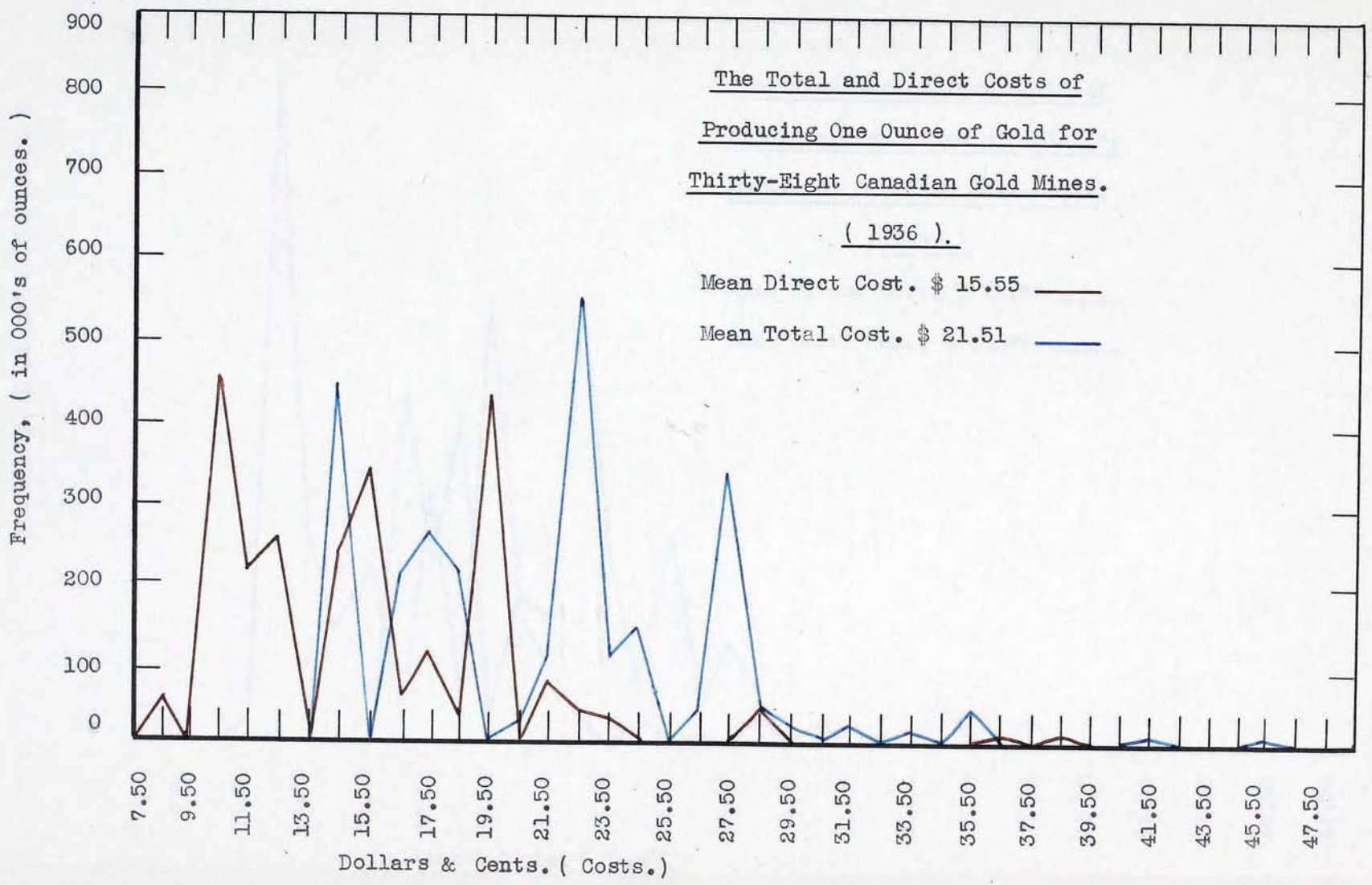
The Total and Direct Costs of
Producing One Ounce of Gold for
Thirty-Eight Canadian Gold Mines.
( 1936 ).
Mean Direct Cost. $ 15.55
Mean Total Cost. $ 21.51
Frequency, ( in 000's of ounces. )
900
800
700
600
500
400
300
200
100
0
7.50
9.50
11.50
13.50
15.50
17.50
19.50
21.50
23.50
25.50
27.50
29.50
31.50
33.50
35.50
37.50
39.50
41.50
43.50
45.50
47.50
Dollars & Cents. ( Costs.)

Figure 31.

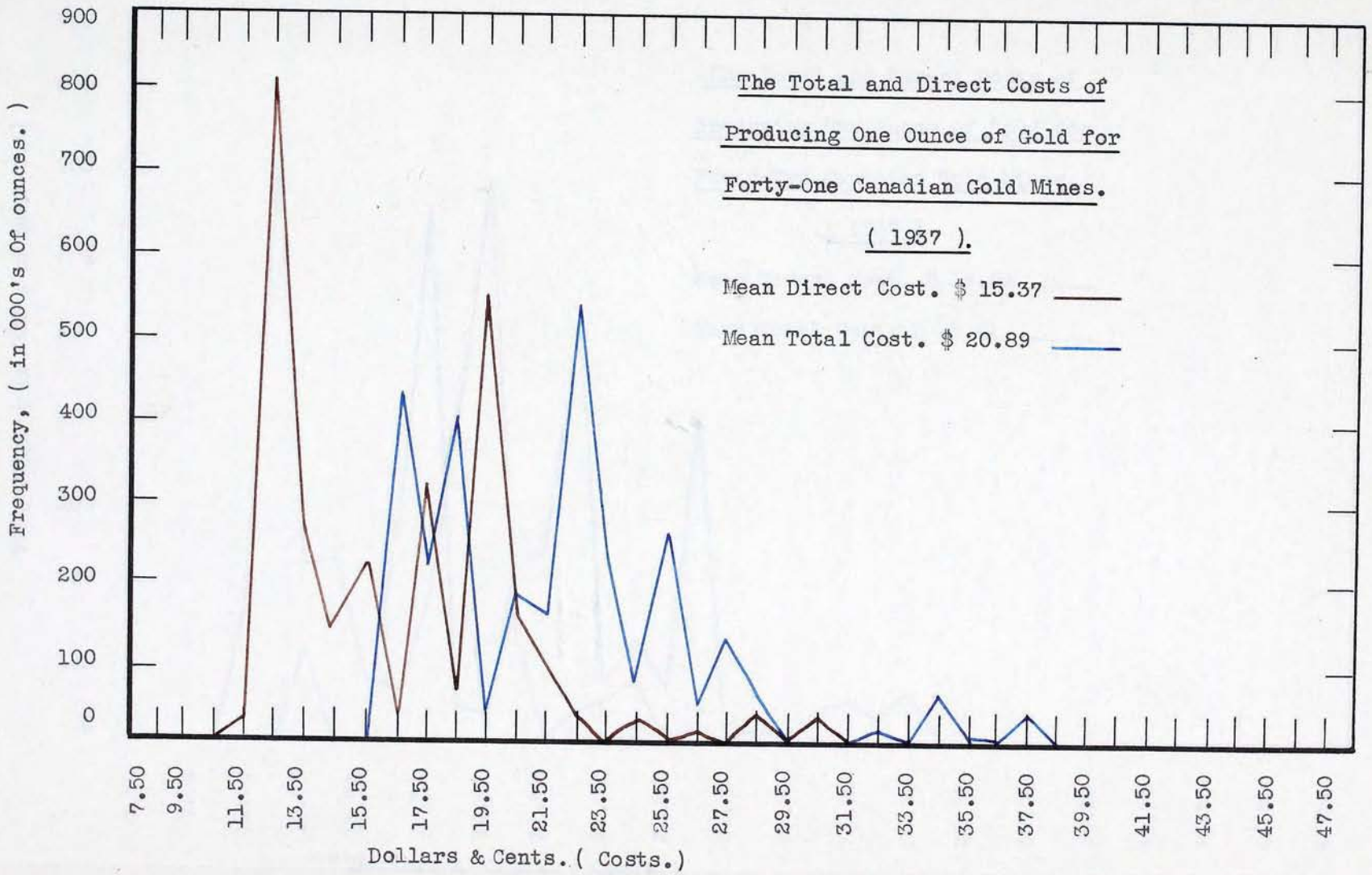
The Total and Direct Costs of
Producing One Ounce of Gold for
Forty-One Canadian Gold Mines.
( 1937 ).
Mean Direct Cost. $ 15.37
Mean Total Cost. $ 20.89
Frequency, ( in 000's Of ounces. )
900
800
700
600
500
400
300
200
100
0
7.50
9.50
11.50
13.50
15.50
17.50
19.50
21.50
23.50
25.50
27.50
29.50
31.50
33.50
35.50
37.50
39.50
41.50
43.50
45.50
47.50
Dollars & Cents. ( Costs.)

Figure 32.

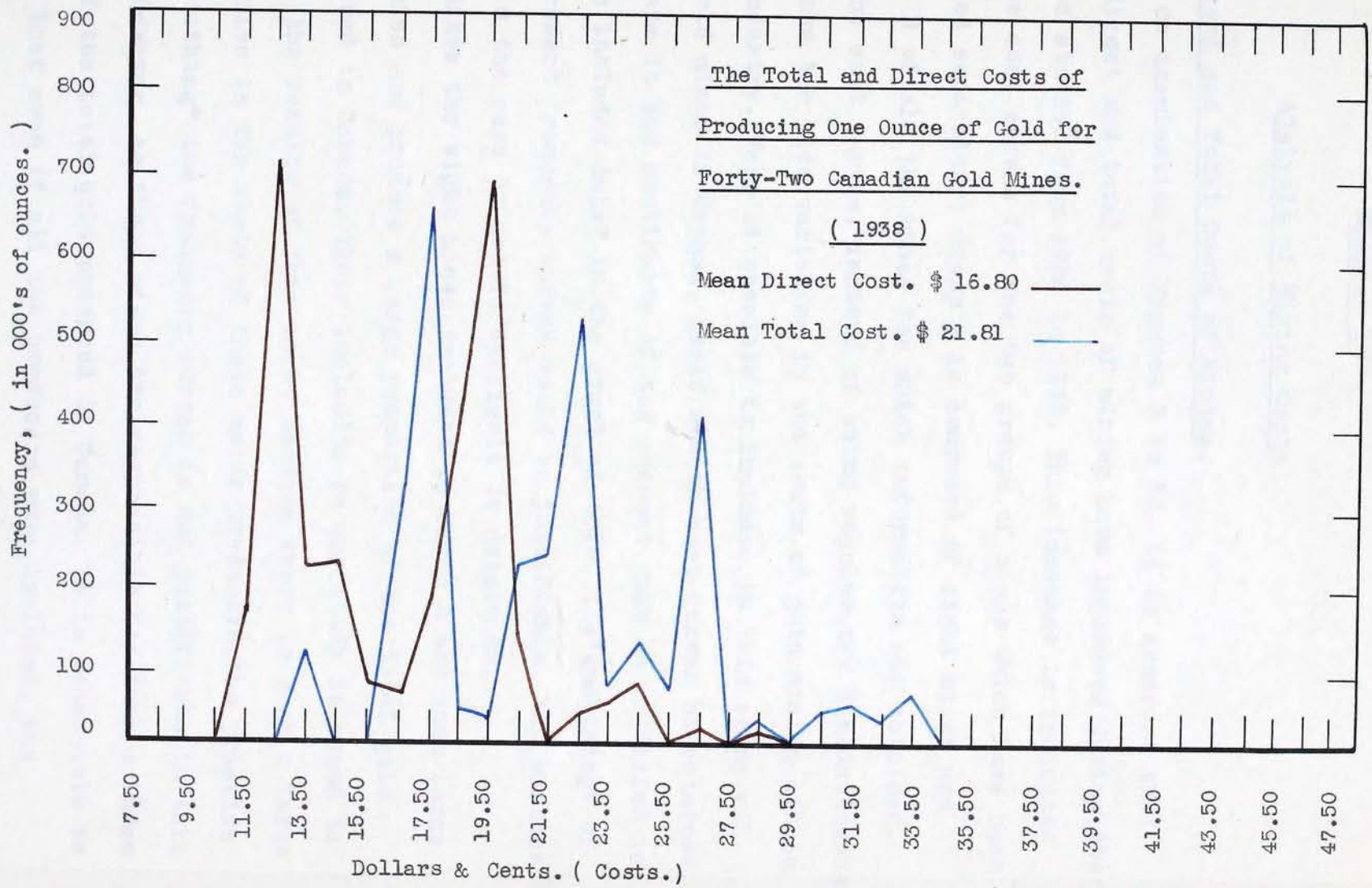
The Total and Direct Costs of
Producing One Ounce of Gold for
Forty-Two Canadian Gold Mines.
( 1938 )
Mean Direct Cost. $ 16.80
Mean Total Cost. $ 21.81
Frequency, ( in 000's of ounces. )
900
800
700
600
500
400
300
200
100
0
7.50
9.50
11.50
13.50
15.50
17.50
19.50
21.50
23.50
25.50
27.50
29.50
31.50
33.50
35.50
37.50
39.50
41.50
43.50
45.50
47.50
Dollars & Cents. ( Costs.)

Figure 33.

## Chapter IV

## Analysis of Mining Costs

### Direct and Total Costs of Mining.

On examination of Figures 8 to 33, it is apparent that the direct and total costs of mining have increased during the period studied from 1928 to 1938. This increase is indicated in the cost curves for the two groups of mines which have been treated separately; Group A is composed of eight mines and Group B of all the mines for which information was obtained.

The cost curves, instead of being regular, are discontinuous and show the wide variation in the costs of gold mining within the industry. Were it possible to include in this study all the gold mines in Canada, would smooth cost curves be obtained, i.e. would the gaps in the continuity of the present ones be filled in by the included data? In the event of this, the "smoothing" of the present frequency curves would be justifiable, but whether this is the case or not is difficult to determine.

Since the eight mines included in Group A are such large companies and produce a large proportion of the total gold recovered in Canada, their inclusion in any study is bound to weight the results of that work. Because there is such a large dispersion in the costs of these major producers, the practice of "smoothing" the frequency curves is not justifiable in this case. However, as these mines are responsible for such a large part of the total gold produced in Canada, it is reasonable to assume that even if all the producers were included, the

Table No. XIII

The Mean Total & Direct Costs of Producing One Ounce of Gold

| Year | Mean Direct Cost | Standard Deviation | Mean Total Cost | Standard Deviation |
|---|---|---|---|---|
| **Group A -- Eight Mines** | | | | |
| 1928 | $ 11.55 | $ 2.41 | $13.45 | $ 2.47 |
| 1929 | 11.12 | 2.88 | 13.45 | 2.58 |
| 1930 | 10.75 | 2.49 | 13.16 | 2.63 |
| 1931 | 10.90 | 2.48 | 14.27 | 4.36 |
| 1932 | 11.32 | 2.99 | 14.72 | 3.59 |
| 1933 | 13.75 | 2.88 | 17.67 | 2.67 |
| 1934 | 12.96 | 3.40 | 17.75 | 2.85 |
| 1935 | 14.16 | 3.87 | 18.35 | 3.76 |
| 1936 | 14.32 | 3.57 | 19.62 | 4.56 |
| 1937 | 15.37 | 3.06 | 20.92 | 4.11 |
| 1938 | 15.78 | 3.09 | 20.22 | 3.32 |
| **Group B -- All Mines** | | | | |
| 1928 | 11.55 | 2.49 | 13.45 | 2.47 |
| 1929 | 11.19 | 2.95 | 13.50 | 2.87 |
| 1930 | 11.08 | 3.09 | 13.65 | 3.47 |
| 1931 | 11.10 | 2.72 | 14.03 | 3.74 |
| 1932 | 10.77 | 3.34 | 15.15 | 4.04 |
| 1933 | 14.23 | 3.78 | 18.51 | 4.44 |
| 1934 | 14.94 | 4.47 | 19.13 | 4.50 |
| 1935 | 15.54 | 4.84 | 23.25 | 4.83 |
| 1936 | 15.55 | 4.62 | 21.51 | 5.25 |
| 1937 | 15.37 | 3.87 | 20.89 | 4.62 |
| 1938 | 16.80 | 3.85 | 21.81 | 4.70 |

Table No. XIV

Costs of Milling One Ton of Ore

| Year | Mean Direct Cost | Standard Deviation | Mean Total Cost | Standard Deviation |
|---|---|---|---|---|
| | Group A -- Eight Mines | | | |
| 1928 | $ 4.75 | $ .95 | $ 5.59 | $ 1.32 |
| 1929 | 5.19 | 1.31 | 5.92 | 1.63 |
| 1930 | 5.06 | 1.03 | 6.21 | 1.54 |
| 1931 | 4.84 | .86 | 6.15 | 1.01 |
| 1932 | 4.73 | .69 | 6.41 | 1.05 |
| 1933 | 4.73 | .92 | 6.43 | 1.26 |
| 1934 | 4.74 | .94 | 6.70 | 1.58 |
| 1935 | 4.93 | .83 | 7.36 | 1.69 |
| 1936 | 5.05 | .82 | 6.87 | 1.41 |
| 1937 | 5.43 | .77 | 7.17 | 1.28 |
| 1938 | 5.27 | .82 | 7.04 | 1.11 |
| | Group B -- All Mines | | | |
| 1928 | 4.75 | .95 | 5.59 | 1.32 |
| 1929 | 4.70 | 1.30 | 5.94 | 1.65 |
| 1930 | 5.07 | .69 | 6.48 | 1.54 |
| 1931 | 5.13 | .98 | 6.21 | 1.06 |
| 1932 | 5.05 | .92 | 6.70 | 1.67 |
| 1933 | 4.86 | .91 | 6.83 | 1.82 |
| 1934 | 4.95 | 1.43 | 7.09 | 2.26 |
| 1935 | 4.50 | 1.54 | 8.07 | 2.70 |
| 1936 | 5.58 | 1.53 | 7.78 | 2.34 |
| 1937 | 5.83 | 1.47 | 7.00 | 2.69 |
| 1938 | 5.50 | 1.55 | 7.47 | 2.21 |

YEARLY AVERAGE DIRECT AND TOTAL COSTS OF PRODUCING ONE OUNCE OF GOLD FOR EIGHT CANADIAN MINES. (1928-1938).

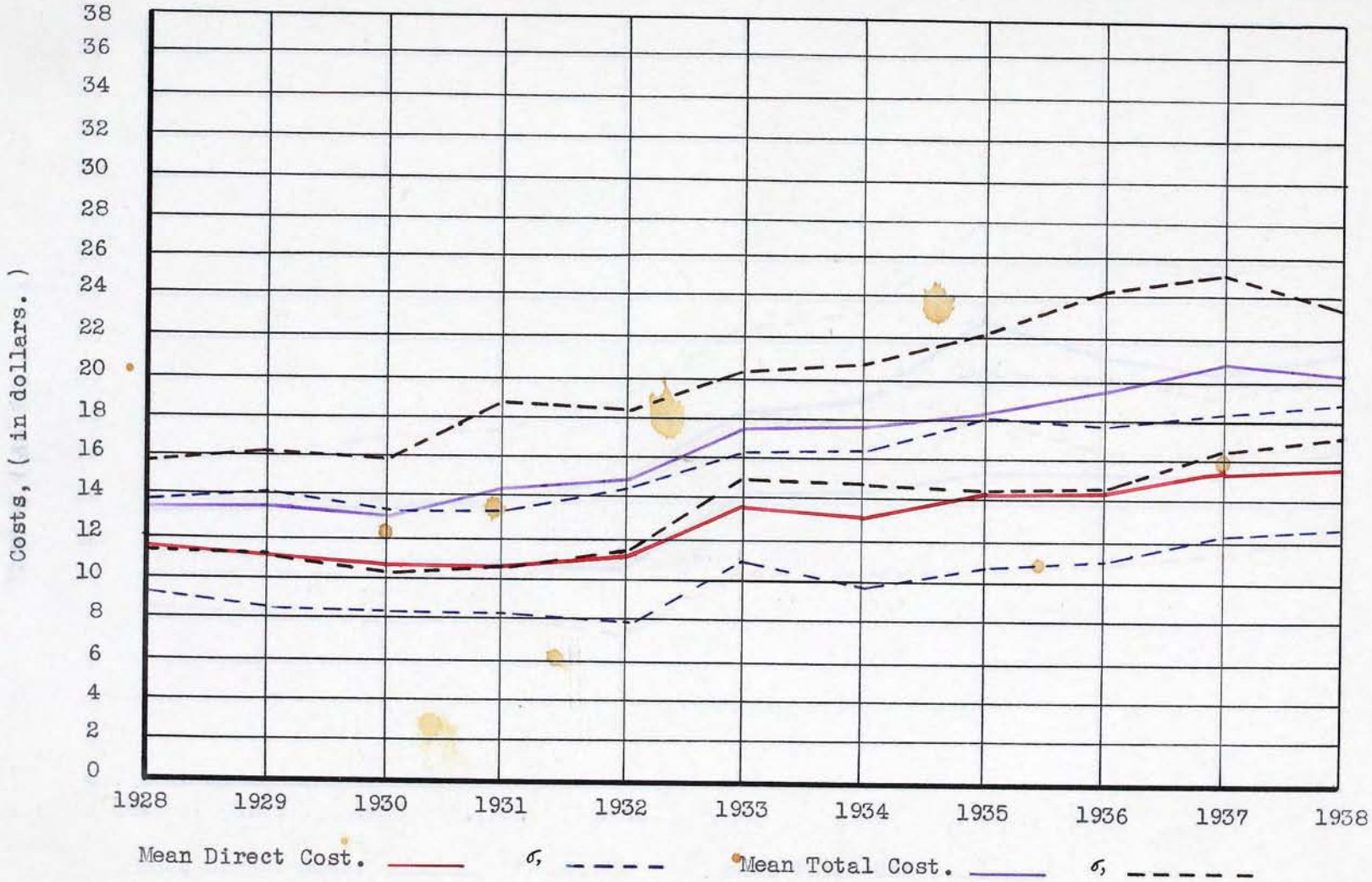


Figure 34.

YEARLY AVERAGE DIRECT AND TOTAL COSTS OF PRODUCING ONE OUNCE OF GOLD FOR SELECTED CANADIAN MINES (1928-1938).

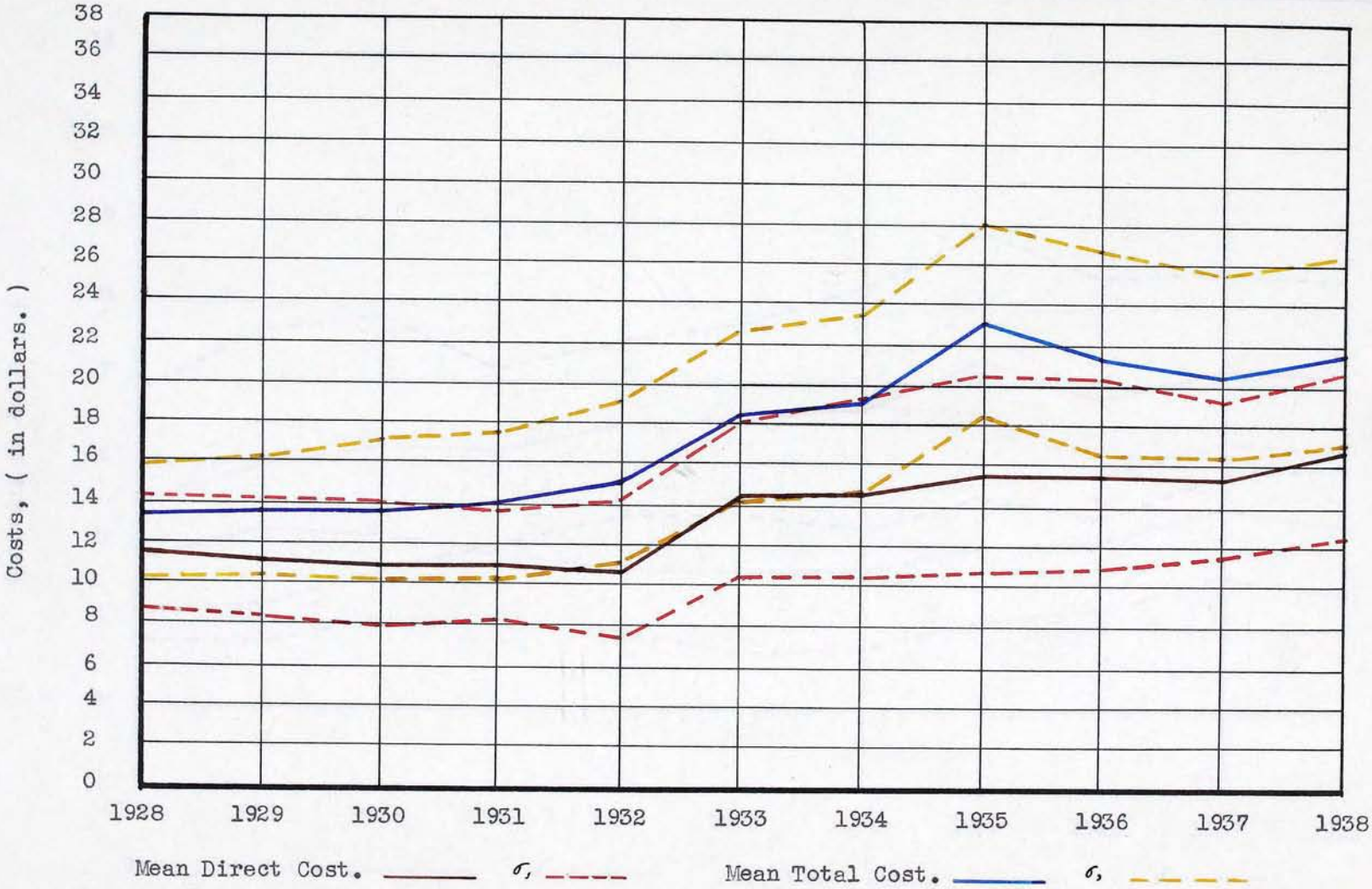


Figure 35.

YEARLY AVERAGE DIRECT AND TOTAL COSTS OF MINING ONE TON OF GOLD ORE FOR EIGHT CANADIAN GOLD MINES.(1928-1938).

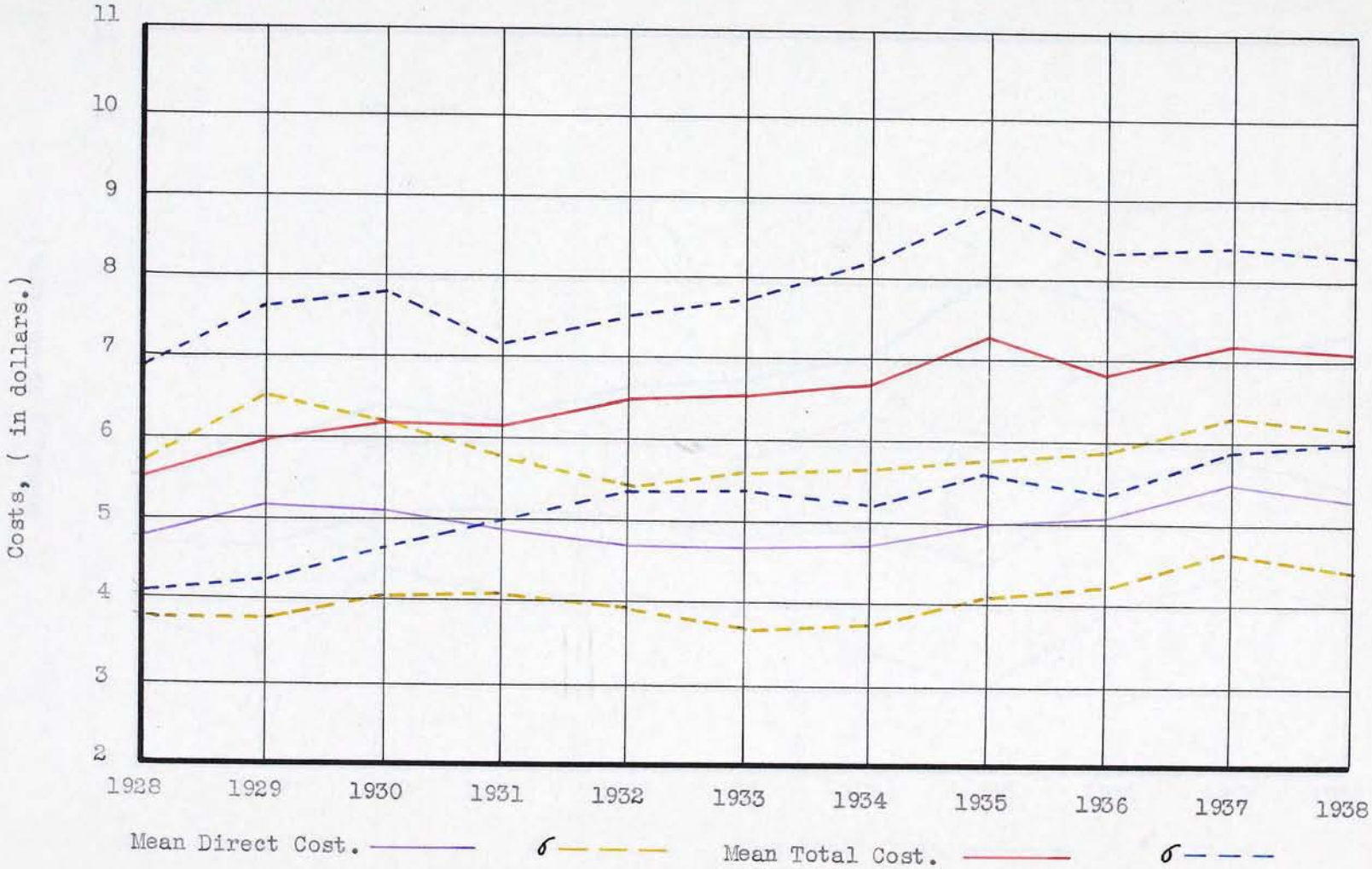


Figure 36.

YEARLY AVERAGE DIRECT AND TOTAL COSTS OF MINING ONE TON OF GOLD ORE FOR SELECTED CANADIAN GOLD MINES.(1928-1938).

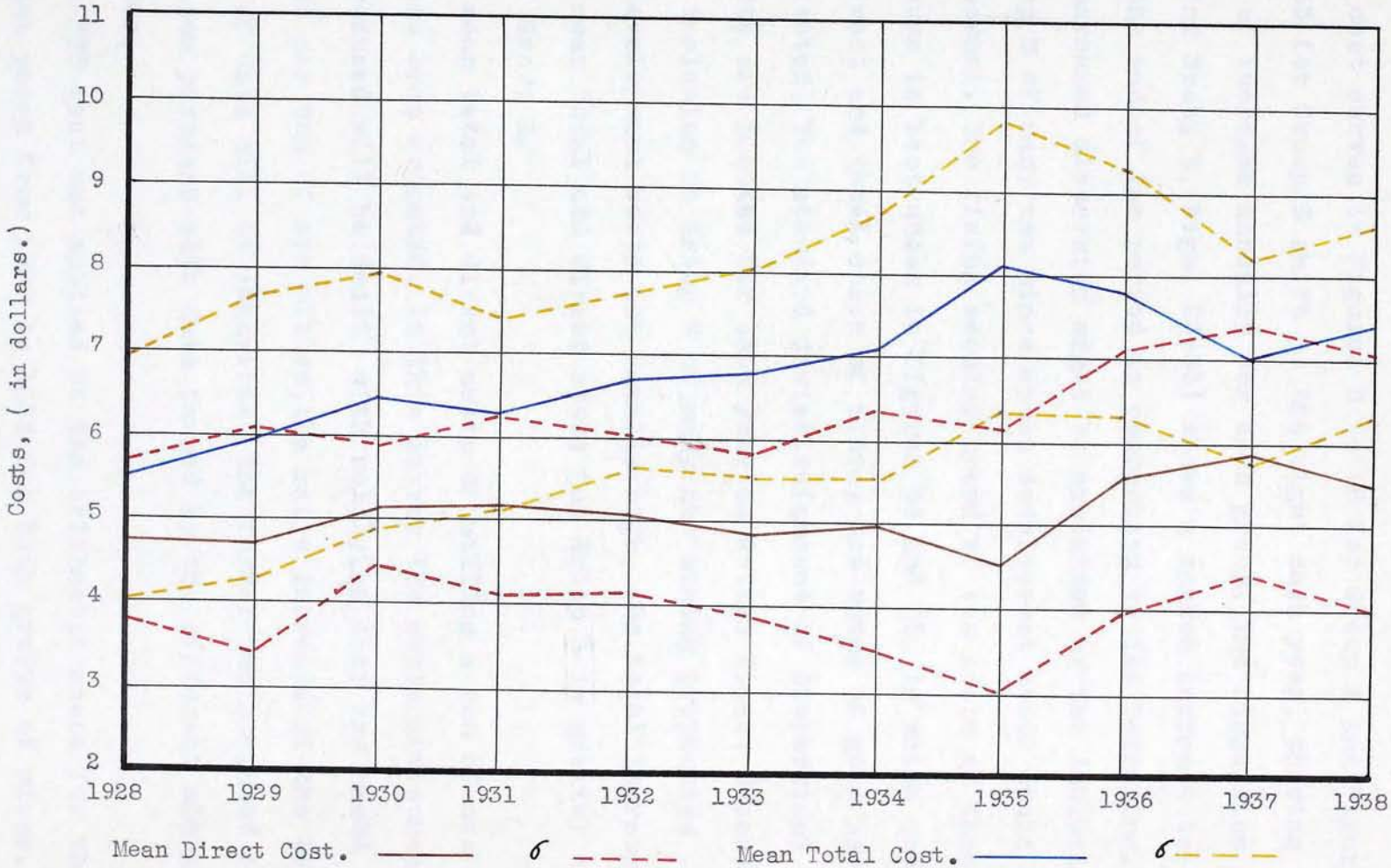


Figure 37.

statistical measures derived therefrom would not vary appreciably from those derived in this study.

The cost curves in Figures 8 to 18 for Group A and Figures 23 to 33 for Group B shift to the right each year, showing the amount of increase annually for each group. The dispersion of costs for Group B,(Figs. 23-33) shows a marked increase towards the end of the period in comparison to the beginning. This increased dispersion might be explained by the inclusion in Group B of many new mines whose development costs would be above normal. The rising secular trend of the costs of these two groups is best shown in figures 34 and 35, in which the mean direct and total costs of mining one ounce of gold have been plotted. The standard deviation(amount of dispersion) of the costs are plotted for each year as dotted lines. Because of the inclusion in Group B of many new mining properties whose development costs are usually high, the total increase in the mean total and direct costs for Group B is greater than that of Group A.

The mean total and direct costs of milling a ton of ore have also been computed. In this survey the costs per ounce of gold produced will be dealt with solely. As they are based on the cost per ton of ore milled, the ratio increase of the two groups of data will be identical. The former was computed for comparison purposed with data issued by the different mining companies.

The "T" test was applied to the arithmetic means for the different years from 1928 to 1938 for both groups of mines. This test indicated whether the samples treated have been

drawn from the same or from different universes.

$$T = \frac{\overline{X_1} - \overline{X_2}}{S} \sqrt{\frac{N_1 \quad N_2}{N_1 + N_2}}$$ where

$\overline{X_1}$ is the mean of the first sample and $N_1$ is the number of cases in the first sample; $\overline{X_2}$ is the mean of the second sample and $N_2$ is the number of cases in the second sample. S is the average standard deviation of the two distributions.[1]

In all cases it was found that the differences in the means calculated for the m ines of Group A and those calculated for Group B were not statistically significant. That is, the discrepancy in the values of the two means could be attributed to errors in sampling. The mean total and direct costs of producing one ounce of gold for the eight mines of Group A were not judged significantly less than for the country as a whole being compared to Group B. The two samples apparently came from the same homogeneous parent population.

Proceeding on the assumption that the data has been taken from the same parent population, we may now set limits within which the true mean costs of the mining industry as a whole will fall. Taking 1928 as an example, the mean direct cost of producing one ounce of gold for the mines of Group A is $11.35

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1. See Mills, Statistical Methods, N.Y. 1938, Henry Holt & Co. page 606.

and the mean total cost is $13.45. Within what limits would the mean direct and total costs fall if all of the gold mines in Canada were included in the summary? Given the formula

$$\sigma_M = \sqrt{\frac{S}{N - 1}} \qquad \text{where}$$

M is the standard deviation of the mean(which we are calculating). S is the standard deviation of the sample we are using; N is the number of cases included in the sample, the standard deviation of the mean direct cost of producing one ounce of gold in 1928 is

$$\sigma_M = \frac{2.41}{\sqrt{8 - 1}} = \$ .91 \qquad \text{(See Table 13 for S \& N).}$$

For the total cost of producing one ounce of gold the standard deviation is

$$\sigma_M = \frac{2.47}{\sqrt{8 - 1}} = \$ .94$$

Therefore, for 1928 we may assume that the chances are 68 out of 100 that the true mean direct cost of producing one ounce of gold for all the mines in Canada lies between $12.46 and $10.64. Also for the same probability, the true mean total cost for that year lies between $14.39 and $12.51. By using the above formula limits may be set for every year within which the true mean mining costs of all the mines in Canada lie.

From 1928 to 1932, the mean direct and total costs of the two studies remained fairly constant. The fact that up to 1932 the sample B is composed mainly of the mines of Sample A

would explain the similar trend of costs for these two separate studies. As the eight mines constituting Group A are by far the most important producers of gold in Canada, they will weight Group B in which they are included,in proportion to their total production of gold. Their costs etc will be reflected in the final results of that study.

From 1932 to 1938 the secular trend of the mean and total costs of both series is upwards, being fairly regular in each case. The sudden rise in the total costs of Group B in 1935, (See Fig. 35), is the result of the inclusion in the sample of that year of some 14 new mining properties whose high development costs came under this division. Figure 6 indicates the items included under total and direct costs and those of development and exploration, depletion and depreciation which are always high for a new mine, fall within this category. The fact that there is no rise in the direct costs apprears to substantiate this hypothesis.

There has been an increase in the direct and total costs of mining gold in Canada from 1928 to 1938. This increase has been shown to have taken place in the study of eight gold mines, (Group A)which have operated continuously during that period. These costs are also shown to have increased for Group B which includes samples of from 8 to 42 gold mines, depending on the year studied. The increase in costs has been greater for Group B than for Group A. The question is now raised as to why this increase took place.

In analysing the increase in the costs of production the data used were those pertaining to Group A, as the mines

## Legend for Mining Costs.

### Chart (a).

(1) Mine development. ——

(2) Mining costs. ——

(3) Total direct mining costs.. ——

(4) General expense. ——

(5) Milling costs. ——

(6) Total direct operating costs. — — —

(7) Overhead. — — — —

(8) Total direct operating costs plus overhead. ——

### Chart (b).

(1) Development costs. ——

(2) Depreciation. ——

(3) Taxes. — — — —

(4) Extra expenditure including depletion. ——

(5) Total cost per ton of ore milled. ——

(6) Total direct cost per ounce of gold produced. — — —

(7) Total cost per ounce of gold produced. ——

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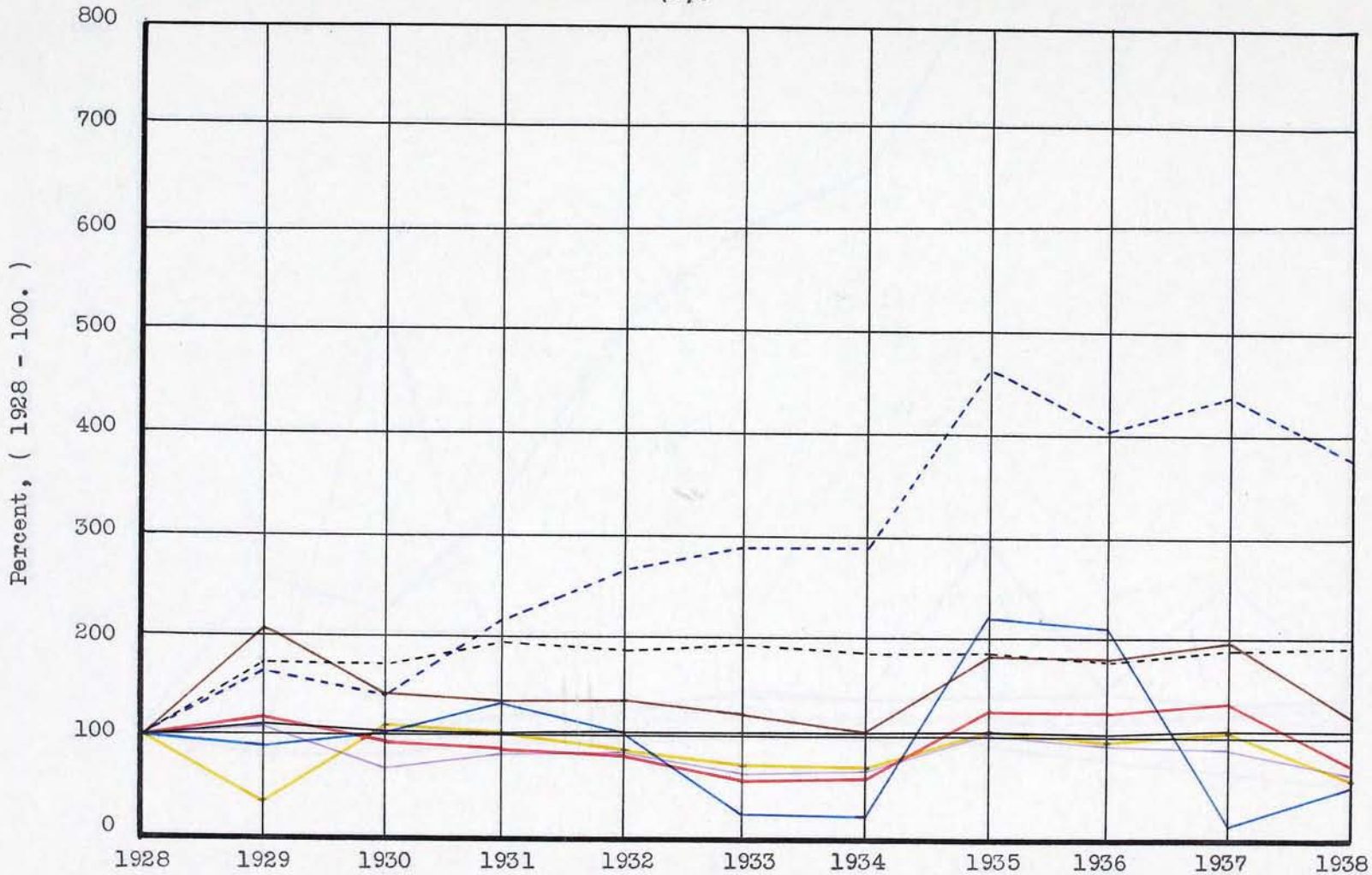
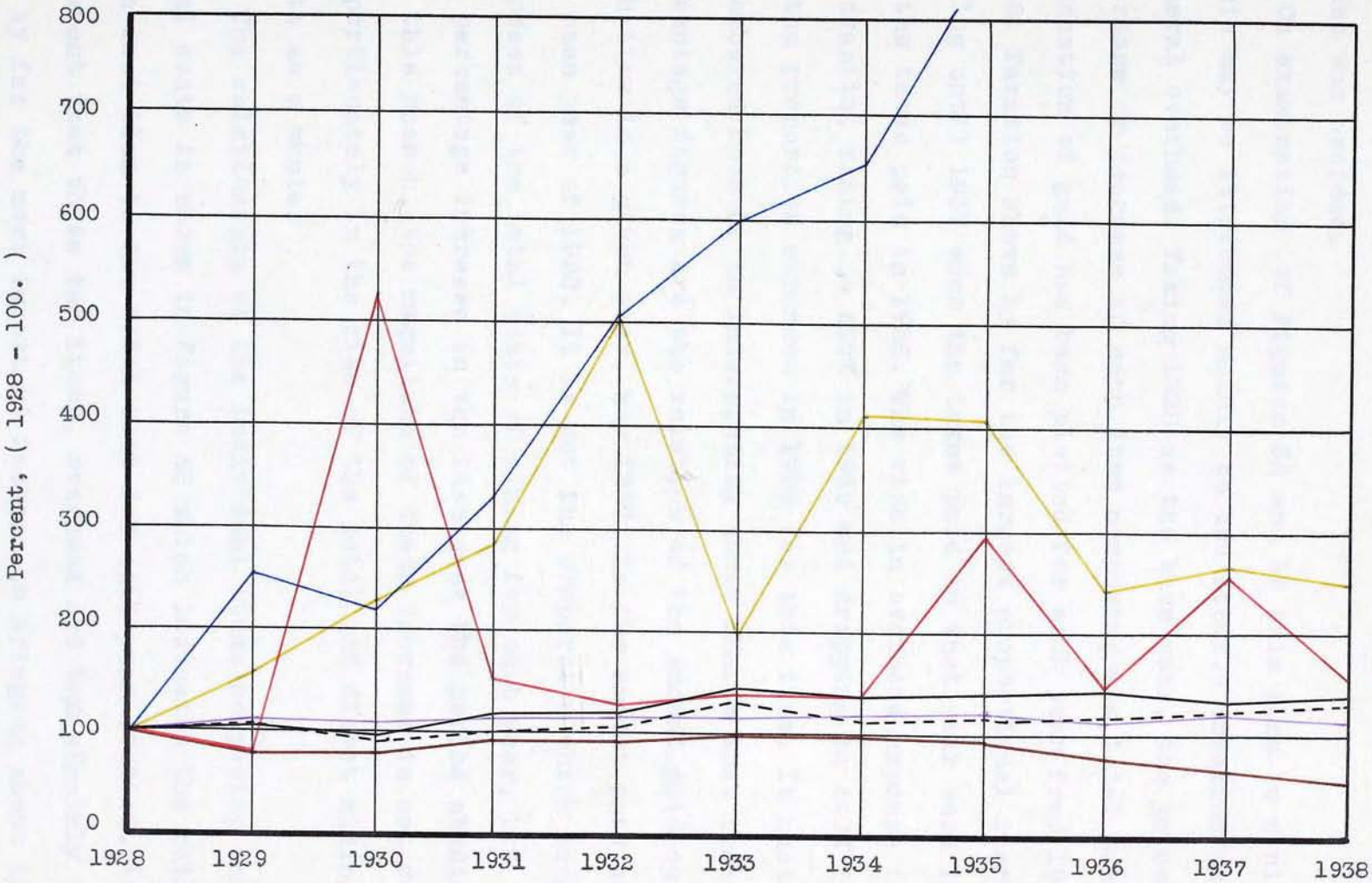
(a).




YEARLY PERCENTAGE INCREASE OR DECREASE IN THE MINING COSTS OF EIGHT CANADIAN GOLD MINES. ( 1928 - 1938).

Figure 38.

(b).

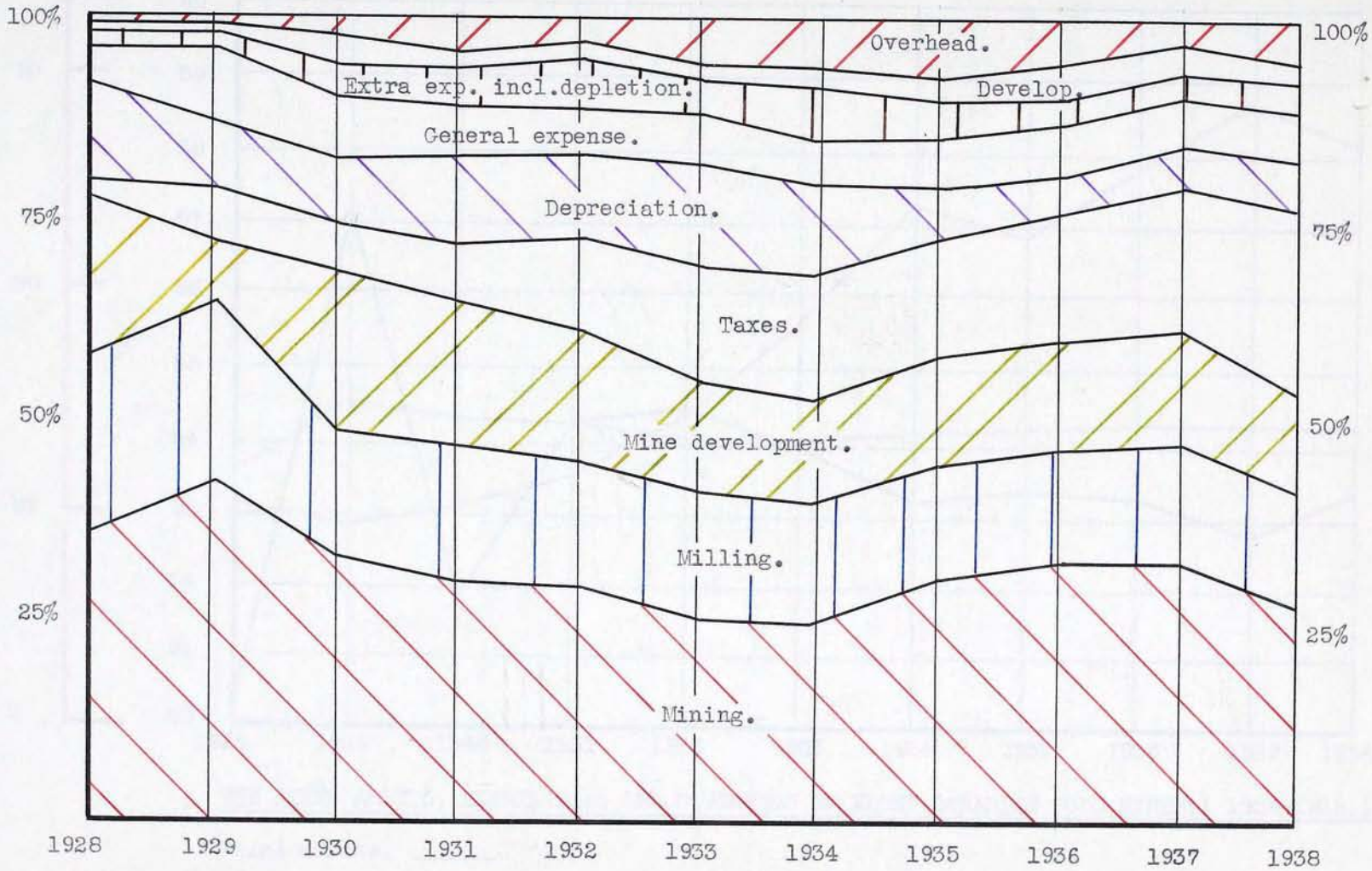



YEARLY PERCENTAGE INCREASE OR DECREASE IN THE MINING COSTS OF EIGHT CANADIAN GOLD MINES. ( 1928 - 1938.)

includedin the yearly sample were the same in each case. Thus any discrepancy due to the inclusion or exclusion of different mines was avoided.

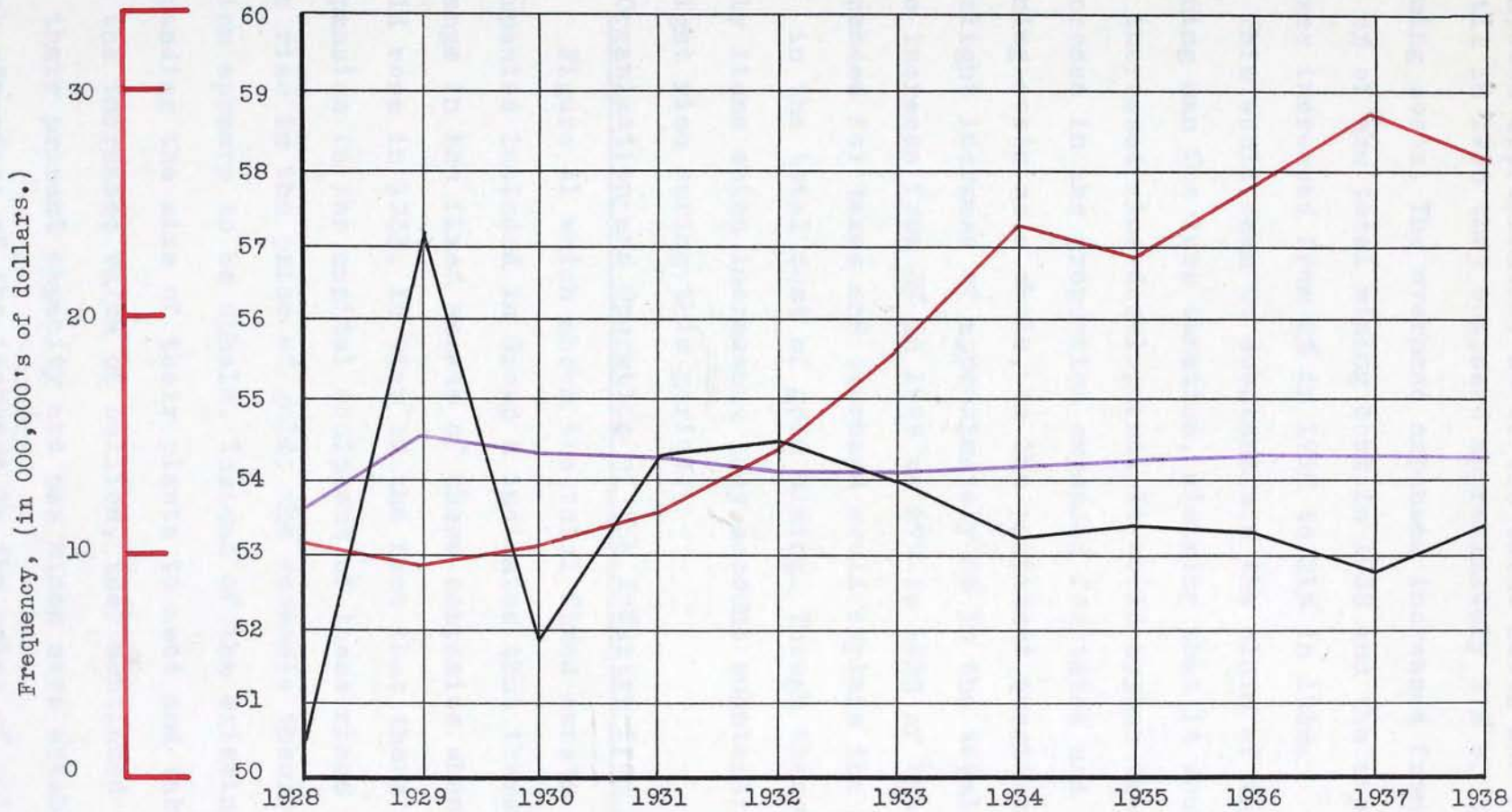
On examination of Figures 38 and 39 this rise in mining costs may be attributed mainly to two items,- taxation and general overhead. Taking 1928 as the base year, the percentage increase or decrease of each item composing the total cost of production of gold has been plotted for each year from 1928 to 1938. Taxation shows by far the largest proportional increase, rising until 1937 when the taxes paid in that year were 1,003% of the taxes paid in 1928. The rise in overhead expense is not so drastic, rising to 460% in 1935 and dropping to 440% in 1937, of the proportion expended in 1928 for this item. It must be remembered however in interpreting these charts that these percentage figures are the relation of the amount paid out for each item in a given year, say 1937, to the amount paid out in the base year of 1928. It is not the proportion which each item composes of the total costs of mining for each year, but it is the percentage increase in the item over the period studied. For this reason, the magnitude of their increase is not reflected proportionately in the rise of the total and direct mining costs as a whole.

The relationship of the individual items composing the total costs is shown in Figure 40 which indicates the ratio of each cost item to the total cost for each year studied. It is apparent that these two items, overhead and taxes(mainly taxes), are by far the most important factors in bringing about the increase in mining costs in the industry. In 1928 together they




YEARLY PROPORTIONATE COSTS OF PRODUCING ONE OUNCE OF GOLD FOR EIGHT CANADIAN GOLD MINES.( From 1928 to 1938.)

Figure 40.




THE FIXED ASSETS, LIABILITIES AND DIVIDENDS OF EIGHT CANADIAN GOLD MINES.( 1928-1938.)

Fixed assets. ———

Fixed liabilities. ———

Dividends paid. ———

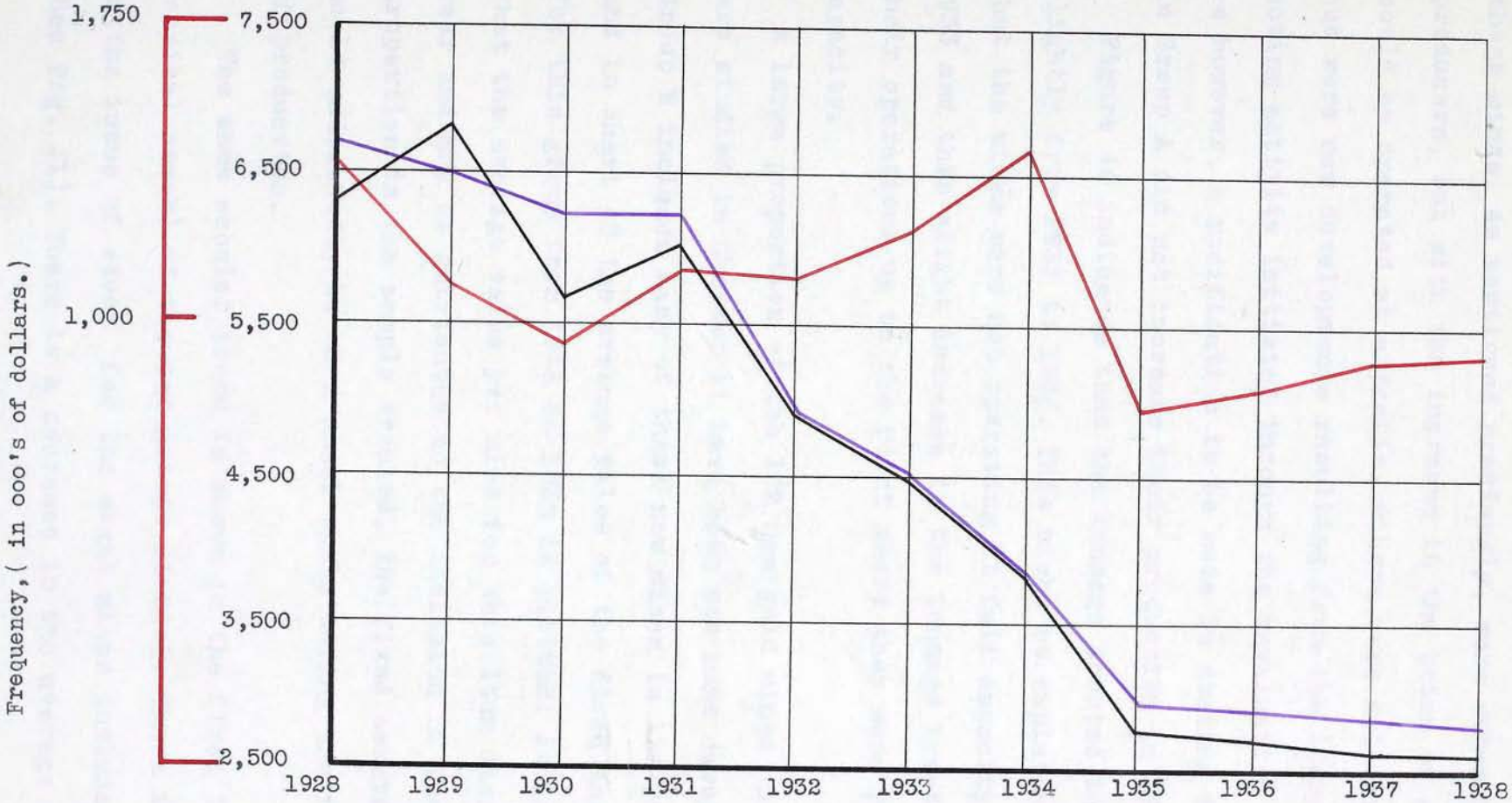
Figure 41.

composed approximately 3% of the total costs and rose steadily until in 1938 they composed approximately 27% of the total mining costs. The overhead expenses increased from 1% in 1928 to 6% of the total mining cost in 1938 and the expenditure for taxes increased from 2% in 1928 to 21% in 1938.

This would seem to substantiate the claim of the average mining man for less taxation, claiming that it would result in increased mine development. It would appear that this increase in the proportion expended for taxes and overhead of mining costs as a whole, is the pertinent question, not that of a slight increase of approximately 8% in the total mining costs. The increase from 3% in 1928 to 27% in 1938 of the percentage expended for taxes and overhead would explain the rise of the 8% in the total cost of gold mining. Though these are not the only items which increased, they account substantially for the slight rise during this period.

Organization and Operation of the Industry from 1928 to 1938

Figure 41 which shows the total fixed assets of the eight companies included in Group A indicates that there was no change in the fixed assets of these companies when the price of gold rose in 1933. In view of the fact that there was no expansion in the capital equipment of these mines along with the rise in the price of gold, the economic theory of marginalism appears to be upheld. Instead of the existing producers expanding the size of their plants to meet and take advantage of the increased value of bullion, they continued to operate at their present capacity and new mines were established which took advantage of the increase in the price of gold. Some of




THE FIXED ASSETS, LIABILITIES AND DIVIDENDS OF SELECT CANADIAN GOLD MINES. (1928-1938)

Fixed assets. _____ ( Average value per mine.)

Fixed liabilities. _____

Dividends paid. _____

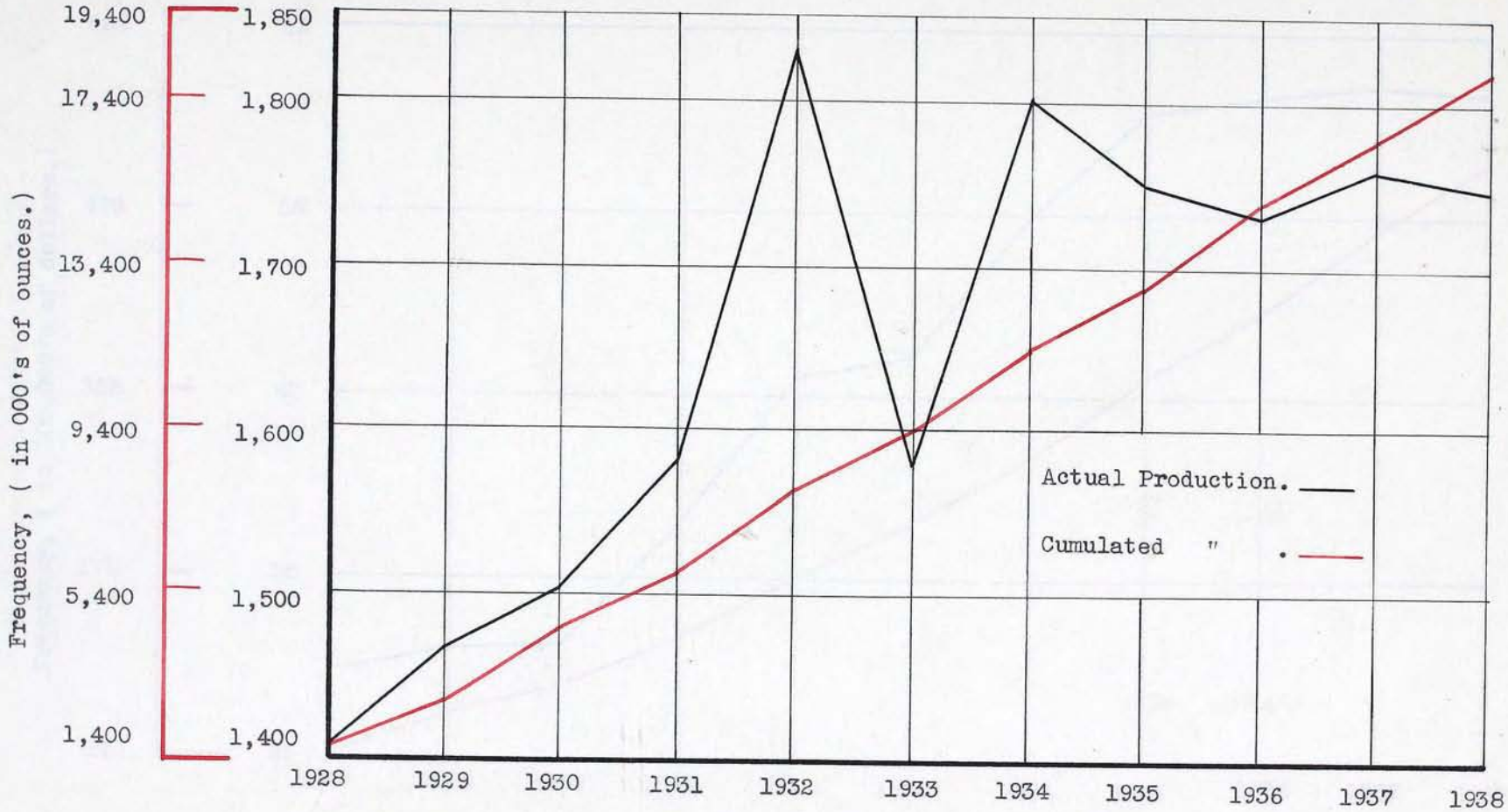
Figure 42.

these mines, as mentioned previously, were sub-marginal producers, but with the increase in the price of gold they could be operated at a profit. Others were not marginal mines but were new developments resulting from the increased prospecting activity initiated through the revaluation of gold. There is however, a modification to be made in stating that the mines in Group A did not increase their production in 1933.

Figure 44 indicates that the tonnage treated increased slightly from 1933 to 1938. This might be explained by the fact that the mines were not operating at full capacity previous to 1933 and this slight increase in the tonnage treated brought their operations up to the point where they were running at full capacity.

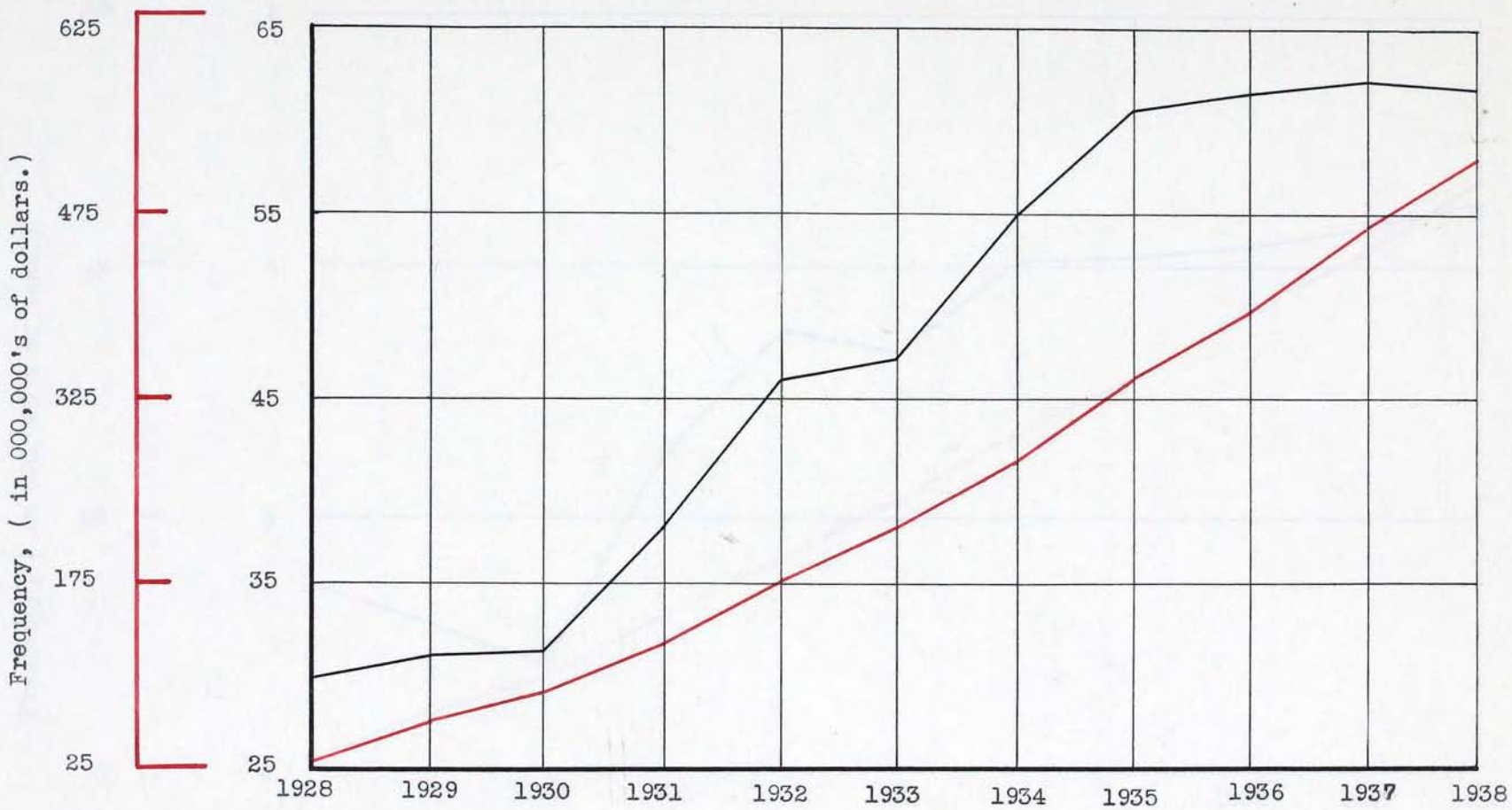
A large proportion of the 162 new gold mines in Canada which were studied in Chapter 11 have been new mine developments. Group B includes many of these new mines in its yearly sample and in chart 42 the average value of the fixed assets per mine for this group from 1928 to 1938 is plotted. It is apparent that the average value per mine for this item decreases each year and may be attributed to the inclusion of the new mining properties in the sample treated, the fixed assets of which would undoubtedly be on a small scale during the first years of production.

The same secular trend is shown in the fixed liabilities (capital stock) of the two groups studied. There is no increase in the issue of stock for the eight mines included in Group A. (See Fig. 41). There is a decrease in the average value of the




THE GOLD PRODUCTION OF EIGHT CANADIAN GOLD MINES. ( 1928 - 1938. ).

Figure 43.




THE VALUE OF THE BULLION PRODUCED BY EIGHT CANADIAN GOLD MINES. ( 1928-1938.).

Actual value of bullion. ——

Cumulated value " . ——

Figure 44.

THE TONNAGE TREATED BY EIGHT CANADIAN GOLD MINES. ( 1928 - 1938. ).

Actual tonnage treated. ____

Tonnage cumulated. ____

Figure 45.

stock per mine for group B (See Fig. 42). The reasons for this decrease are identical to those set forth in the previous paragraph explaining the decrease in the average value of fixed assets per mine for Group B.

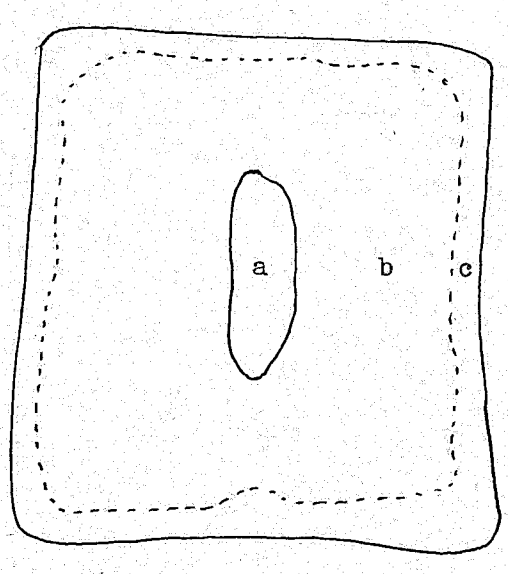
The dividends paid by the mines in group A show an increase for this period(See Fig. 41). However when all the mines are included as in group B, the average dividend paid per mine decreases(See Fig. 42). Again this phenomenon may be explained by the inclusion in the sample for group B of the new properties. It is unlikely that these new mines would pay any dividends for a few years as any profits would probably be used to further development work or set up depletion reserves.

Detailed Analysis of Group A Mines

In Figure 43 the actual and cumulated gold productions of the eight mines included in group A are shown. From 1931 to 1932 the actual production of gold in ounces increased sharply and was probably the direct result of an increase in the tonnage treated during that year(See Fig. 45). Also the value of the bullion for that year increased proportionately(See Fig. 44). From 1932 to 33 the gold production decreased and this may be attributed to two factors. In the first place the tonnage treated during this year decreased slightly from the previous year and as a natural result we would expect a decrease in the amount of gold produced. On the other hand, the decrease in the number of ounces was far greater in proportion to the decrease in the tonnage milled and this decrease in gold produced might be expalined by the mining of ore of a lower grade(i.e. less gold content). From Figures 43,44 and 45

Figure 46.

The mining of lower grade ore.




(a). The paying vein of the mine.

(b). Ore removed in the mining process and which under the old price of gold was discarded as waste. With the new price of gold it is refined and the gold content is removed.

(c). Waste which is removed in the mining process.

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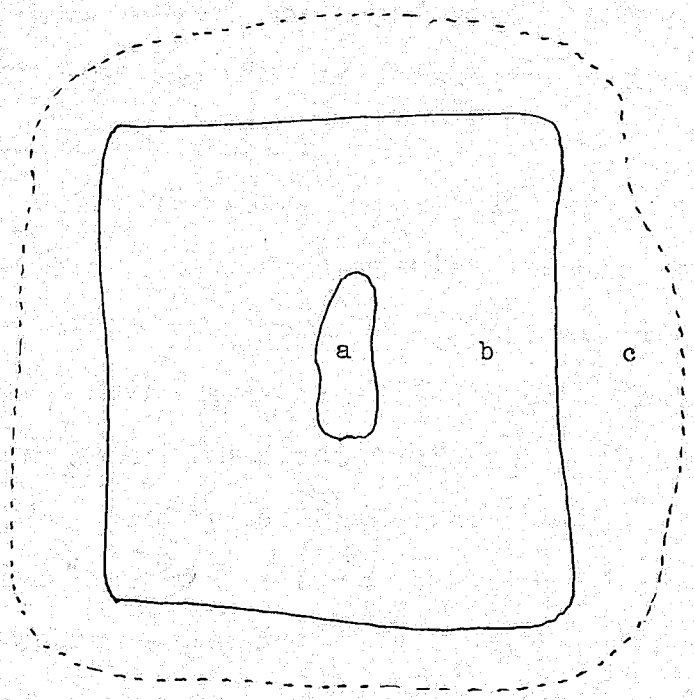
Figure 47.

The mining of lower grade ore.




(a). The paying vein of the mine.

(b). Ore removed in the mining process , all of which was treated for the gold content at the old price.

(c). Under the new price of gold this additional ore is mined for the gold content is now of sufficient value to pay the expenses necessary for recovering it.

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it is apparent that the gold production, the tonnage milled and the value of the bullion produced all increased, and from 1933 on it appears that the eight mines in group A continued to mine low grade ore with satisfactory results.

The Mining of Low Grade Ore

The practise of mining lower grade ore when possible is carried out by most mining companies and is done in order to prolong the life of the gold mine. The rise in the price of gold in 1933 enabled many mines to develop and mine large bodies of ore which otherwise could not be handled at a profit because of their low gold content.

In general there are two methods in which the marginal ores are utilized depending upon the type of deposit in each case. If a mine is operating successfully on a deposit which is of the type shown in Fig. 46, the majority of the rock which is removed in the tunnelling process is discarded as waste. It has not sufficient gold content to cover the expenses necessary for its recovery, but still it is necessary to blast and remove this rock in order to extract the ore of the paying vein. No larger tunnel or shaft is constructed than is necessary to ennable the miners to work and removed the high grade mineralized rock. With the rise in the price of gold this ore which had previously been discarded, has a gold content which is now of sufficient value to cover the expenses of the milling etc necessary to recover it. As a result, most of the rock which is removed in the tunnelling process is put through the mill and the gold removed. In most cases it is profitable to mill the waste rock which had been discarded previously

as it is no longer a submarginal ore. This ore and that which is removed from the mine itself may be treated very economically as the facilities necessary for its handling are already installed for mining the higher grade ore. Possibly this increase in the tonnage handled will realize greater efficiency from the equipment through full capacity operations which the treatment of the additional ore might entail.

The other type of gold deposit is illustrated in Figure 47. The present paying vein is in the centre of the tunnel and all of the rock which is removed in the tunnelling process is of sufficient gold content to warrant its refining. However, the rock which composes the ceiling, floor and walls is not of sufficient gold content to warrant its treatment and so the tunnel is maintained at its present size. These are the assay marginal ores of a gold deposit. In the first illustration they did not extend to the walls and floors of the tunnel but were mined during the tunnelling and the ores with no gold content were discarded as waste. With a rise in the price of gold, this ore, which previously lay outside the assay margin, has a gold content which is now of sufficient value to cover the expenses incurred in the mining and refining necessary to obtain it. The walls of the tunnel are made wider and the floors and ceiling are extended to a point where the ore becomes marginal. That is, the value of the gold content just covers the expense incurred in recovering it. As in the previous illustration this operation may be carried out very economically for the facilities necessary for the work are already installed.

It would appear from the previous conclusions that operations

of this type have been carried on by the eight mines of group A since 1933. Their tonnage has shown a steady increase since that year but their actual gold production in ounces has, on the whole, remained fairly constant. The life of a mine is prolonged by this operation and it would appear that these mines are reserving their higher grade ore to be mined in the future.

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# CHAPTER V

## Financial Organization of the Industry

## Chapter V

### Financial Organization of the Industry

In the previous chapter it was shown that with the increase in the price of gold in 1933, the mines operating at that time(Group A) instead of continuing the mining of rich ore, began to treat ore of a lower grade. As a result a smaller production of gold was obtained but the new value of this decreased production was still appreciable. For the eight mines included in Group A the value of their total bullion production rose from forty-seven and a half million dollars in 1933 to sixty-seven and three quarter million dollars in 1938(See Fig.44 The number of ounces of gold produced in 1933 was approximately one and six-tenths million ounces and in 1938 it had only risen to about one and three-quarter millions. It would appear then that although mining lower grade ore, the increase in the value of the bullion produced would warrant an expectation for these mines of increased profits which is the case as is shown in tables 15 and 16. Figure 41 indicates that with this increase in the value of the bullion produced there was an increase in the amount of dividends paid out during these years. In 1933 the total amount paid by these companies amounted to eighteen million dollars and rose to approximately twenty-seven million dollars in 1938(See Fig. 41). The amount paid by each mine for the period 1928 to 1938 is indicated in Tables 15 and 16. It is rather interesting to note that there has been a constant ratio between the number of mines which have shown a loss, after dividends have been paid and those which have shown a profit.

Table XV.

( Data listed by mine.)

| Mine number. | Year. | Amount of profit or loss for the year, dividends not paid. | Amount of dividends paid each year. | 1 = Profit 2 = Loss. | Amount of profit or loss after the payment of the dividends. |
|---|---|---|---|---|---|
| 3 | 28 | 158081 | | 1 | 158081 |
| | 29 | 95474 | | 1 | 95474 |
| | 30 | 92685 | 65990 | 1 | 26695 |
| | 31 | 199994 | 131980 | 1 | 68014 |
| | 32 | 258039 | 164975 | 1 | 93064 |
| | 33 | 201923 | 164975 | 1 | 36948 |
| | 34 | 1059415 | 824875 | 1 | 234540 |
| | 35 | 723443 | 659900 | 1 | 63543 |
| | 36 | 875116 | 659900 | 1 | 215216 |
| | 37 | 945695 | 824875 | 1 | 120820 |
| | 38 | 1021417 | 824875 | 1 | 196542 |
| 4 | 28 | 3287563 | 2860286 | 1 | 427277 |
| | 29 | 2545018 | 2866286 | 2 | 321268 |
| | 30 | 3053386 | 2872286 | 1 | 181100 |
| | 31 | 3552948 | 3118143 | 1 | 434805 |
| | 32 | 3484933 | 2884286 | 1 | 600647 |
| | 33 | 3229010 | 2884286 | 1 | 344724 |
| | 34 | 2769141 | 2643929 | 1 | 145212 |
| | 35 | 2336888 | 1922858 | 1 | 414030 |
| | 36 | 2432360 | 2163215 | 1 | 269145 |
| | 37 | 2203391 | 2403572 | 2 | 200181 |
| | 38 | 1604895 | 2163215 | 2 | 558320 |
| 6 | 28 | 487818 | 825000 | 2 | 337182 |
| | 29 | 444935 | | 1 | 444935 |
| | 30 | 514489 | | 1 | 514489 |
| | 31 | 1182437 | 825000 | 1 | 357437 |
| | 32 | 1640703 | 962500 | 1 | 678203 |
| | 33 | 1939272 | 1653888 | 1 | 285384 |
| | 34 | 3831132 | 3040602 | 1 | 790530 |
| | 35 | 3846046 | 3308160 | 1 | 537886 |
| | 36 | 3943309 | 3320561 | 1 | 622748 |
| | 37 | 3945592 | 3854492 | 1 | 91100 |
| | 38 | 611302 | 385000 | 1 | 226302 |
| 10 | 28 | 1470837 | 953334 | 1 | 517503 |
| | 29 | 1778251 | 953334 | 1 | 824917 |
| | 30 | 85710 | 953334 | 2 | 867624 |
| | 31 | 990825 | 953334 | 1 | 37491 |
| | 32 | 958337 | 1239334 | 2 | 480997 |
| | 33 | 2919657 | 1716001 | 1 | 1203656 |
| | 34 | 3759025 | 3336669 | 1 | 422356 |
| | 35 | 3719720 | 3813336 | 2 | 93616 |
| | 36 | 4124062 | 3873336 | 1 | 250726 |
| | 37 | 3143468 | 4380003 | 2 | 1236535 |
| | 38 | 4055153 | 3893336 | 1 | 161817 |
| 11 | 28 | 4615309 | 5412000 | 2 | 796691 |
| | 29 | 3638606 | 3198000 | 1 | 440606 |
| | 30 | 3963728 | 3444000 | 1 | 519728 |
| | 31 | 3508204 | 3444000 | 1 | 64204 |
| | 32 | 3962885 | 3690000 | 1 | 272885 |
| | 33 | 5737176 | 4182000 | 1 | 1555176 |
| | 34 | 6505363 | 6888000 | 2 | 382637 |
| | 35 | 5049502 | 4428000 | 1 | 621502 |
| | 36 | 5798744 | 5412000 | 1 | 386744 |
| | 37 | 5283310 | 5412000 | 2 | 128690 |
| | 38 | 5652932 | 5412000 | 1 | 240932 |
| 13 | 28 | 9229 | | 1 | 9229 |
| | 29 | 8618 | | 1 | 8618 |
| | 30 | 9010 | | 1 | 6010 |
| | 31 | 203051 | | 1 | 203051 |
| | 32 | 137214 | | 1 | 137214 |
| | 33 | 141720 | | 1 | 141720 |
| | 34 | 163513 | 157174 | 1 | 6339 |
| | 35 | 166730 | 157174 | 1 | 9556 |
| | 36 | 161003 | 316975 | 2 | 155972 |
| | 37 | 518280 | 479402 | 1 | 38878 |
| | 38 | 711278 | 532670 | 1 | 178608 |
| 14 | 28 | 80881 | | 1 | 80881 |
| | 29 | 2540160 | 2000000 | 1 | 540160 |
| | 30 | 2728985 | 2200000 | 1 | 528985 |
| | 31 | 3905601 | 3000000 | 1 | 905601 |
| | 32 | 6591011 | 4800000 | 1 | 1797011 |
| | 33 | 13215193 | 6000000 | 1 | 7215193 |
| | 34 | 10145705 | 6000000 | 1 | 4145705 |
| | 35 | 7237891 | 7000000 | 1 | 237891 |
| | 36 | 9759600 | 8000000 | 1 | 1759600 |
| | 37 | 6384792 | 10000000 | 2 | 3615208 |
| | 38 | 9732417 | 12000000 | 2 | 2267583 |
| 16 | 28 | 1160647 | 798000 | 1 | 362647 |
| | 29 | 1043981 | 798000 | 1 | 245981 |
| | 30 | 1146603 | 798000 | 1 | 348603 |
| | 31 | 1293484 | 798000 | 1 | 495484 |
| | 32 | 1778209 | 997500 | 1 | 780709 |
| | 33 | 2641794 | 1496250 | 1 | 1145544 |
| | 34 | 4039415 | 1596000 | 1 | 2443415 |
| | 35 | 3128403 | 1596000 | 1 | 1532403 |
| | 36 | 4180645 | 1596000 | 1 | 3214645 |
| | 37 | 5012333 | 1596000 | 1 | 3425333 |
| | 38 | 5148837 | 1596000 | 1 | 3586837 |

Table XVI.

( Data listed by year.)

| Year | Mine Number. | Amount of profit or loss for the year, dividends not paid. | Amount of dividends paid each year. | 1 = Profit 2 = Loss | Amount of profit or loss after the payment of the dividends. |
|---|---|---|---|---|---|
| 28 | 03 | 158081 | | 1 | 158081 |
| | 4 | 3287563 | 2860286 | 1 | 427277 |
| | 6 | 487818 | 825000 | 2 | 337182 |
| | 10 | 1470837 | 953334 | 1 | 517503 |
| | 11 | 4615309 | 5412000 | 2 | 796691 |
| | 13 | 9229 | | 1 | 9229 |
| | 14 | 80881 | | 1 | 80881 |
| | 18 | 1160647 | 798000 | 1 | 362647 |
| 29 | 03 | 95474 | | 1 | 95474 |
| | 4 | 2545018 | 2866286 | 2 | 321268 |
| | 6 | 444935 | | 1 | 444935 |
| | 10 | 1778251 | 953334 | 1 | 824917 |
| | 11 | 3638606 | 3198000 | 1 | 440606 |
| | 13 | 8618 | | 1 | 8618 |
| | 14 | 2540160 | 2000000 | 1 | 540160 |
| | 18 | 1043981 | 798000 | 1 | 245981 |
| 30 | 03 | 92685 | 65990 | 1 | 26695 |
| | 4 | 3053386 | 2872286 | 1 | 181100 |
| | 6 | 514489 | | 1 | 514489 |
| | 10 | 85710 | 953334 | 2 | 867624 |
| | 11 | 3963728 | 3444000 | 1 | 519728 |
| | 13 | 9010 | | 1 | 6010 |
| | 14 | 2728985 | 2200000 | 1 | 528985 |
| | 18 | 1146603 | 798000 | 1 | 348603 |
| 31 | 03 | 199994 | 131980 | 1 | 68014 |
| | 4 | 3552948 | 3118143 | 1 | 434805 |
| | 6 | 1182437 | 825000 | 1 | 357437 |
| | 10 | 990825 | 953334 | 1 | 37491 |
| | 11 | 3508204 | 3444000 | 1 | 64204 |
| | 13 | 203051 | | 1 | 203051 |
| | 14 | 3905601 | 3000000 | 1 | 905601 |
| | 18 | 1293484 | 798000 | 1 | 495484 |
| 32 | 03 | 258039 | 164975 | 1 | 93064 |
| | 4 | 3484933 | 2884286 | 1 | 600647 |
| | 6 | 1640703 | 962500 | 1 | 678203 |
| | 10 | 958337 | 1239334 | 2 | 480997 |
| | 11 | 3962885 | 3690000 | 1 | 272885 |
| | 13 | 137214 | | 1 | 137214 |
| | 14 | 6591011 | 4800000 | 1 | 1797011 |
| | 18 | 1778209 | 997500 | 1 | 780709 |
| 33 | 03 | 201923 | 164975 | 1 | 36948 |
| | 4 | 3229010 | 2884286 | 1 | 344724 |
| | 6 | 1939272 | 1653888 | 1 | 285384 |
| | 10 | 2919657 | 1716001 | 1 | 1203656 |
| | 11 | 5737176 | 4182000 | 1 | 1555176 |
| | 13 | 141720 | | 1 | 141720 |
| | 14 | 13215193 | 6000000 | 1 | 7215193 |
| | 18 | 2641794 | 1496250 | 1 | 1145544 |
| 34 | 03 | 1059415 | 824875 | 1 | 234540 |
| | 4 | 2789141 | 2643929 | 1 | 145212 |
| | 6 | 3831132 | 3040602 | 1 | 790530 |
| | 10 | 3759025 | 3336669 | 1 | 422356 |
| | 11 | 6505363 | 6888000 | 2 | 382637 |
| | 13 | 163513 | 157174 | 1 | 6339 |
| | 14 | 10145705 | 6000000 | 1 | 4145705 |
| | 18 | 4039415 | 1596000 | 1 | 2443415 |
| 35 | 03 | 723443 | 659900 | 1 | 63543 |
| | 4 | 2336888 | 1922858 | 1 | 414030 |
| | 6 | 3846046 | 3308160 | 1 | 537886 |
| | 10 | 3719720 | 3813336 | 2 | 93616 |
| | 11 | 5049502 | 4428000 | 1 | 621502 |
| | 13 | 166730 | 157174 | 1 | 9556 |
| | 14 | 7237891 | 7000000 | 1 | 237891 |
| | 18 | 3128403 | 1596000 | 1 | 1532403 |
| 36 | 03 | 875116 | 659900 | 1 | 215216 |
| | 4 | 2432360 | 2163215 | 1 | 269145 |
| | 6 | 3943309 | 3320561 | 1 | 622748 |
| | 10 | 4124062 | 3873336 | 1 | 250726 |
| | 11 | 5798744 | 5412000 | 1 | 386744 |
| | 13 | 161003 | 316975 | 2 | 155972 |
| | 14 | 9759600 | 8000000 | 1 | 1759600 |
| | 18 | 4180645 | 1596000 | 1 | 3214645 |
| 37 | 03 | 945695 | 824875 | 1 | 120820 |
| | 4 | 2803391 | 2403572 | 2 | 200181 |
| | 6 | 3945592 | 3854492 | 1 | 91100 |
| | 10 | 3143468 | 4380003 | 2 | 1236535 |
| | 11 | 5283310 | 5412000 | 2 | 128690 |
| | 13 | 518280 | 479402 | 1 | 38878 |
| | 14 | 6384792 | 10000000 | 2 | 3615208 |
| | 18 | 5012333 | 1596000 | 1 | 3425333 |
| 38 | 03 | 1021417 | 824875 | 1 | 196542 |
| | 4 | 1604895 | 2163215 | 2 | 558320 |
| | 6 | 611302 | 385000 | 1 | 226302 |
| | 10 | 4055153 | 3893336 | 1 | 161817 |
| | 11 | 5652932 | 5412000 | 1 | 240932 |
| | 13 | 711278 | 532670 | 1 | 178608 |
| | 14 | 9732417 | 12000000 | 2 | 2267583 |
| | 18 | 5148837 | 1596000 | 1 | 3588837 |

Figures 48 to 58 inclusive
relate to the data of
the Group B Mines.
(8 - 42 mines)

( Dividends paid.)

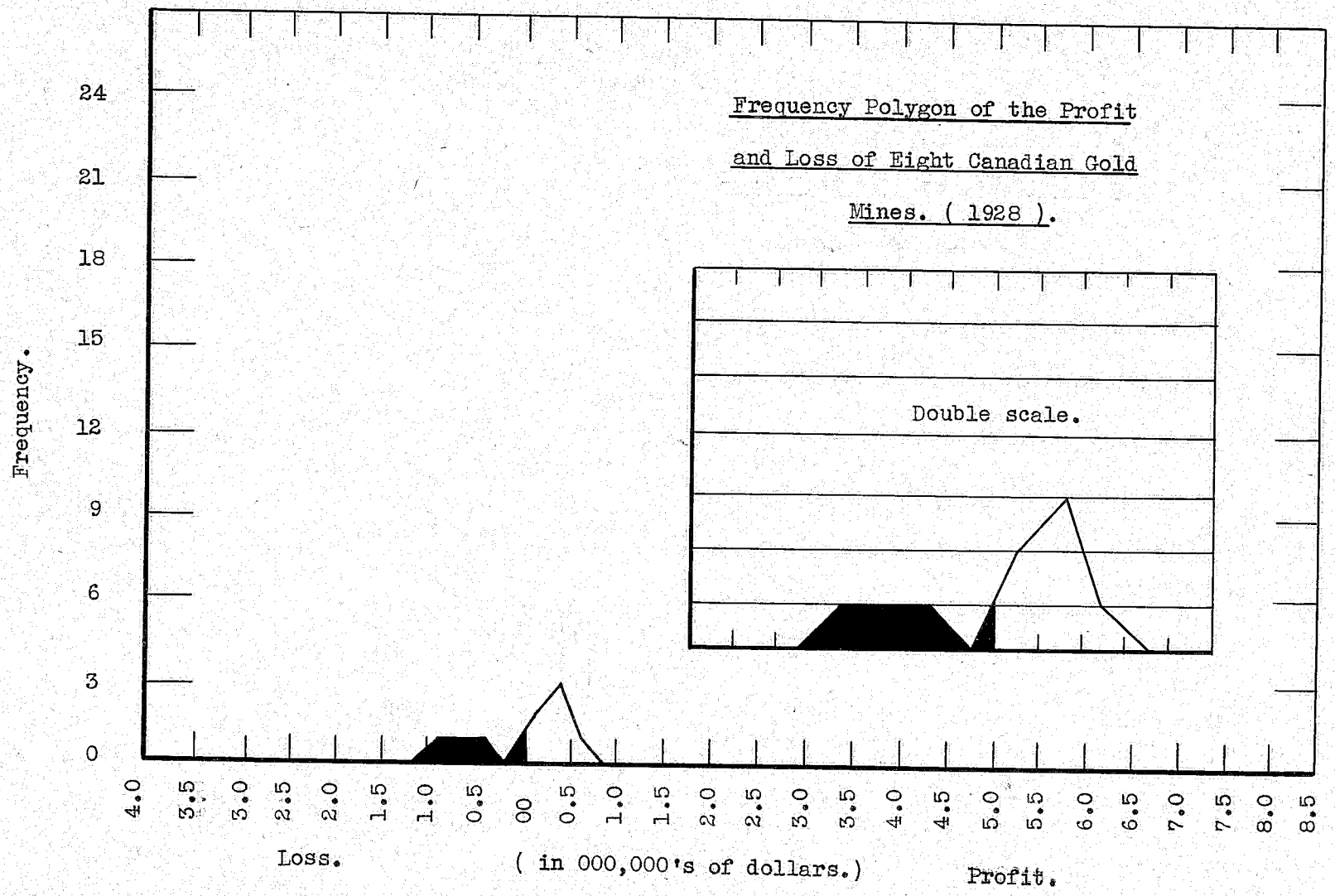


Figure 48.

( Dividends paid.)

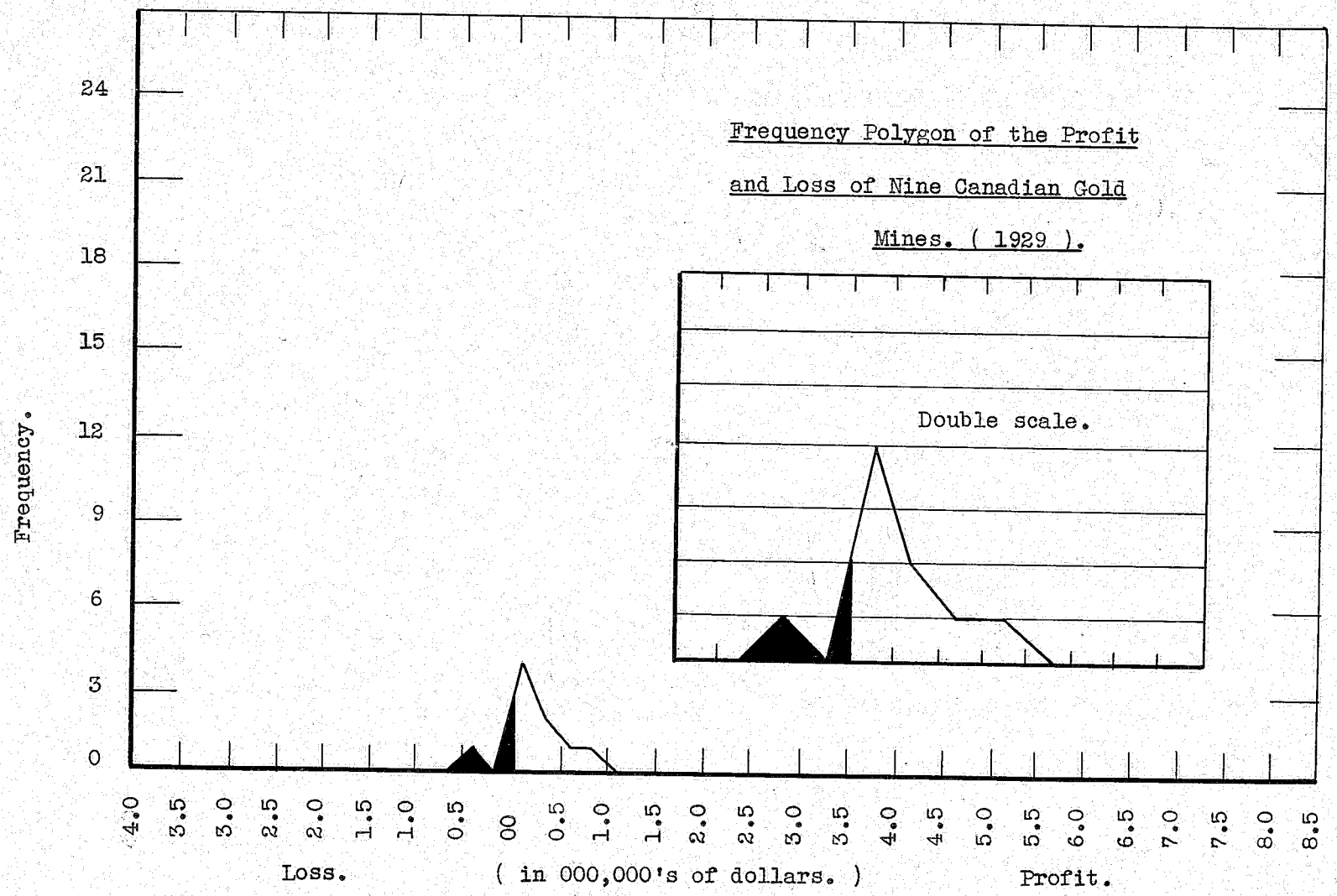


Figure 49.

( Dividends paid.)

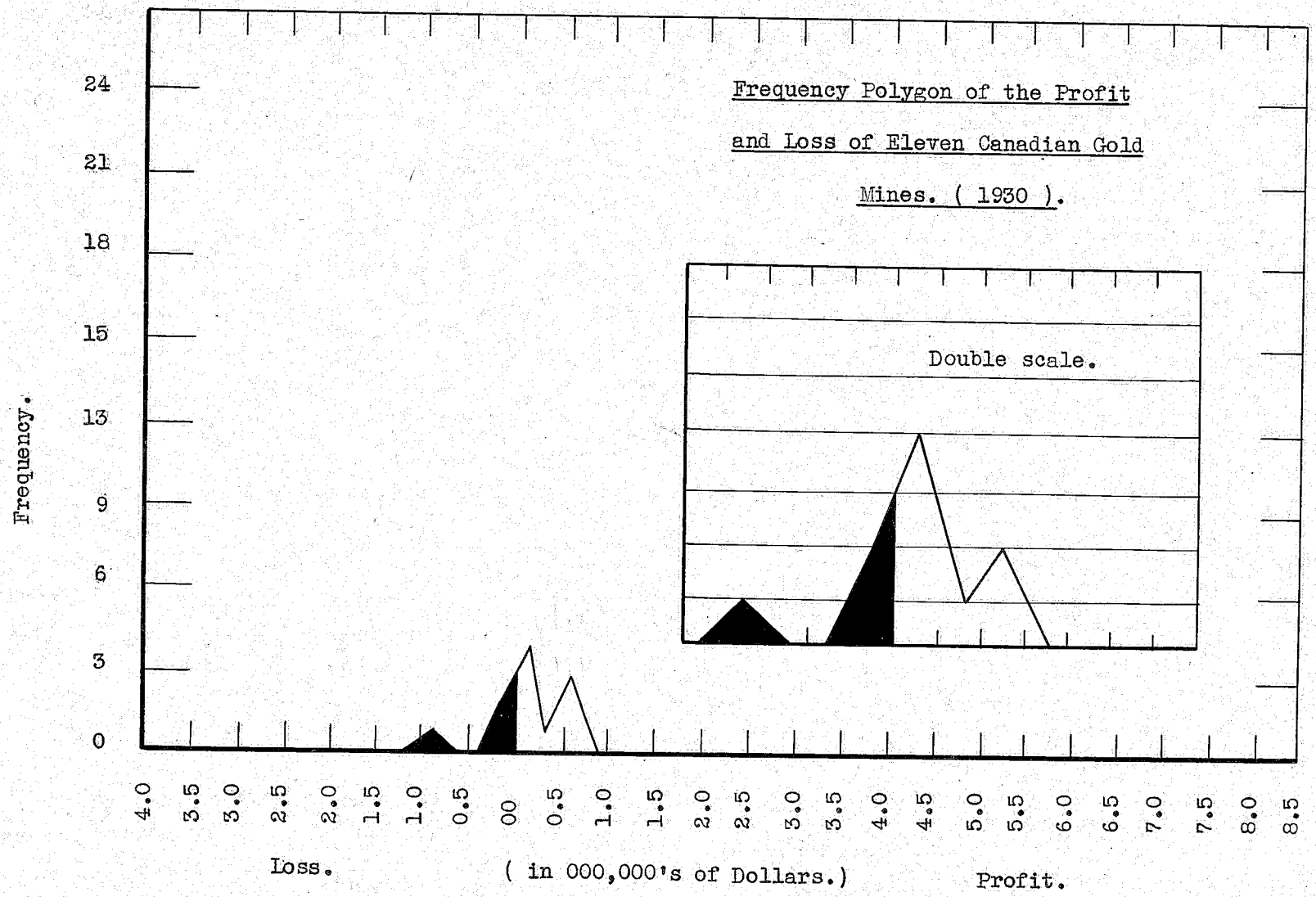


Figure 50.

( Dividends Paid.)

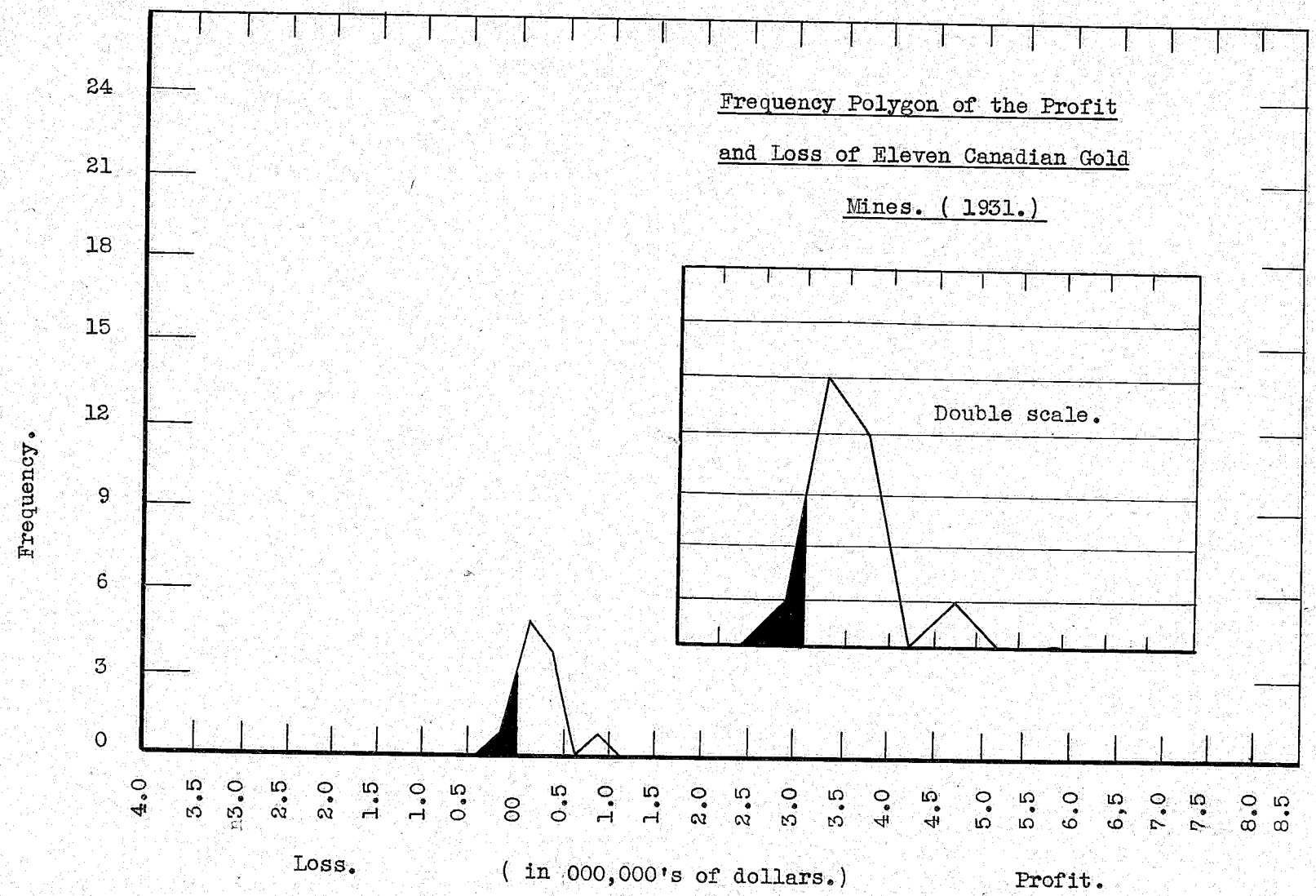


Figure 51.

( Dividends Paid.)

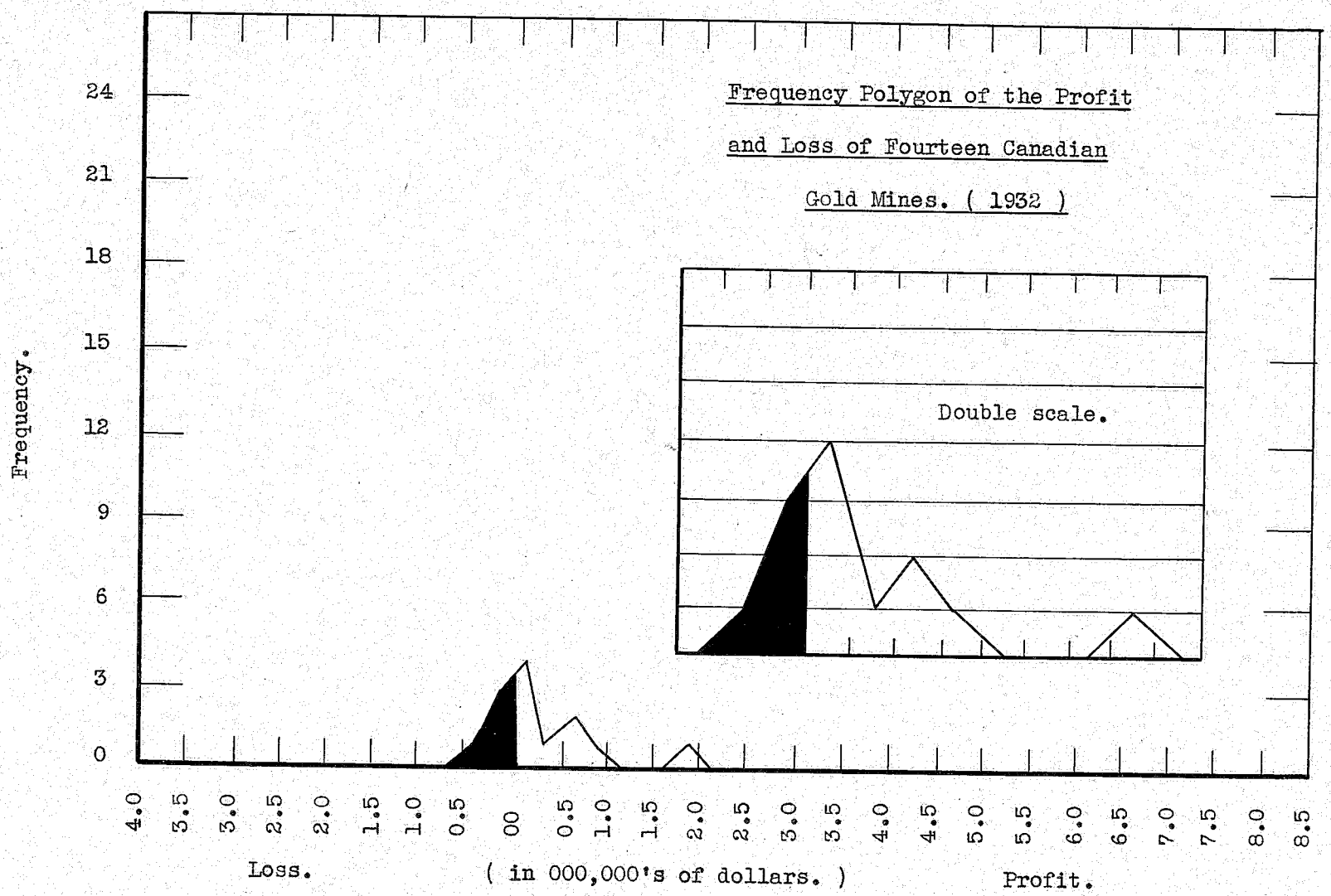


Figure 52.

( Dividends paid.)

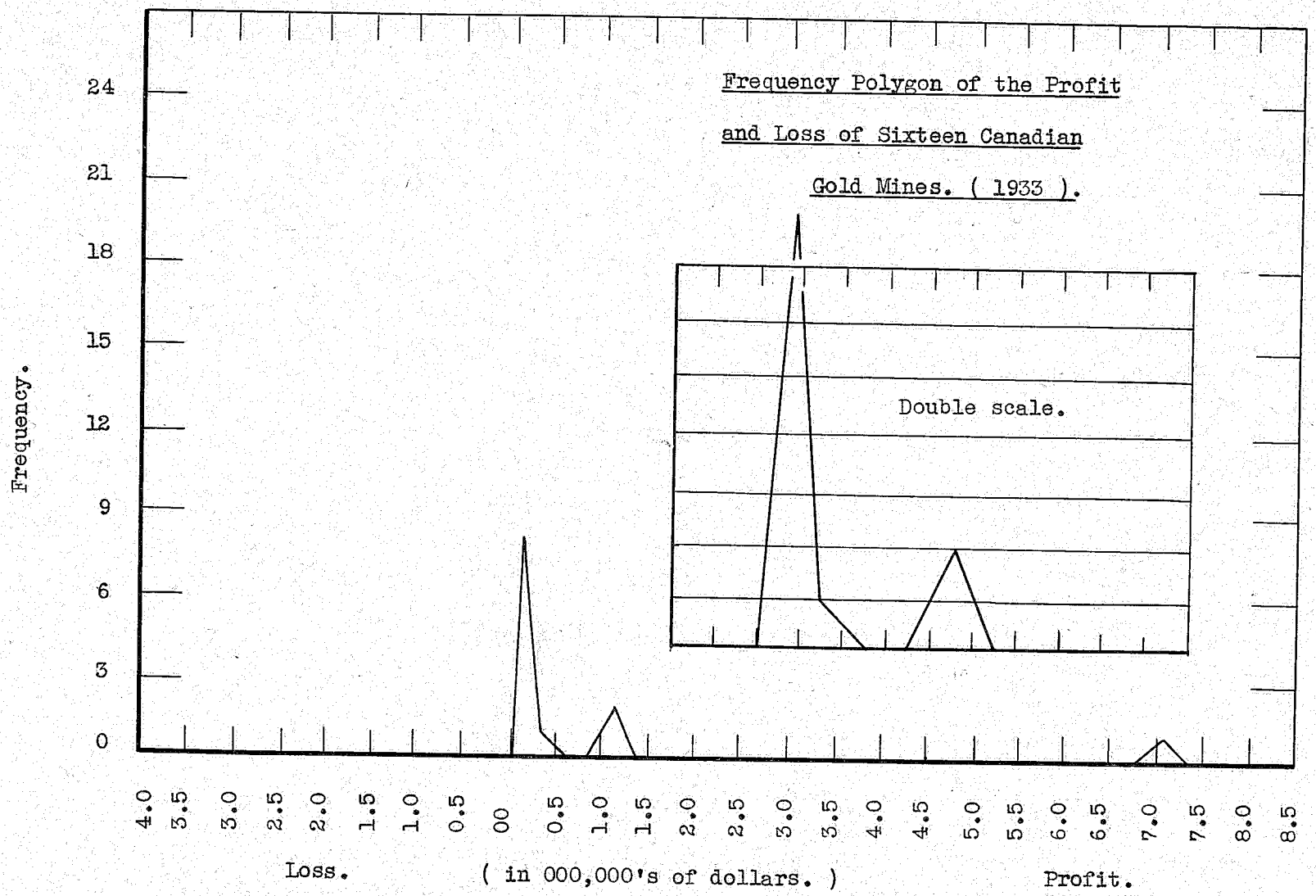


Figure 53.

( Dividends paid.)

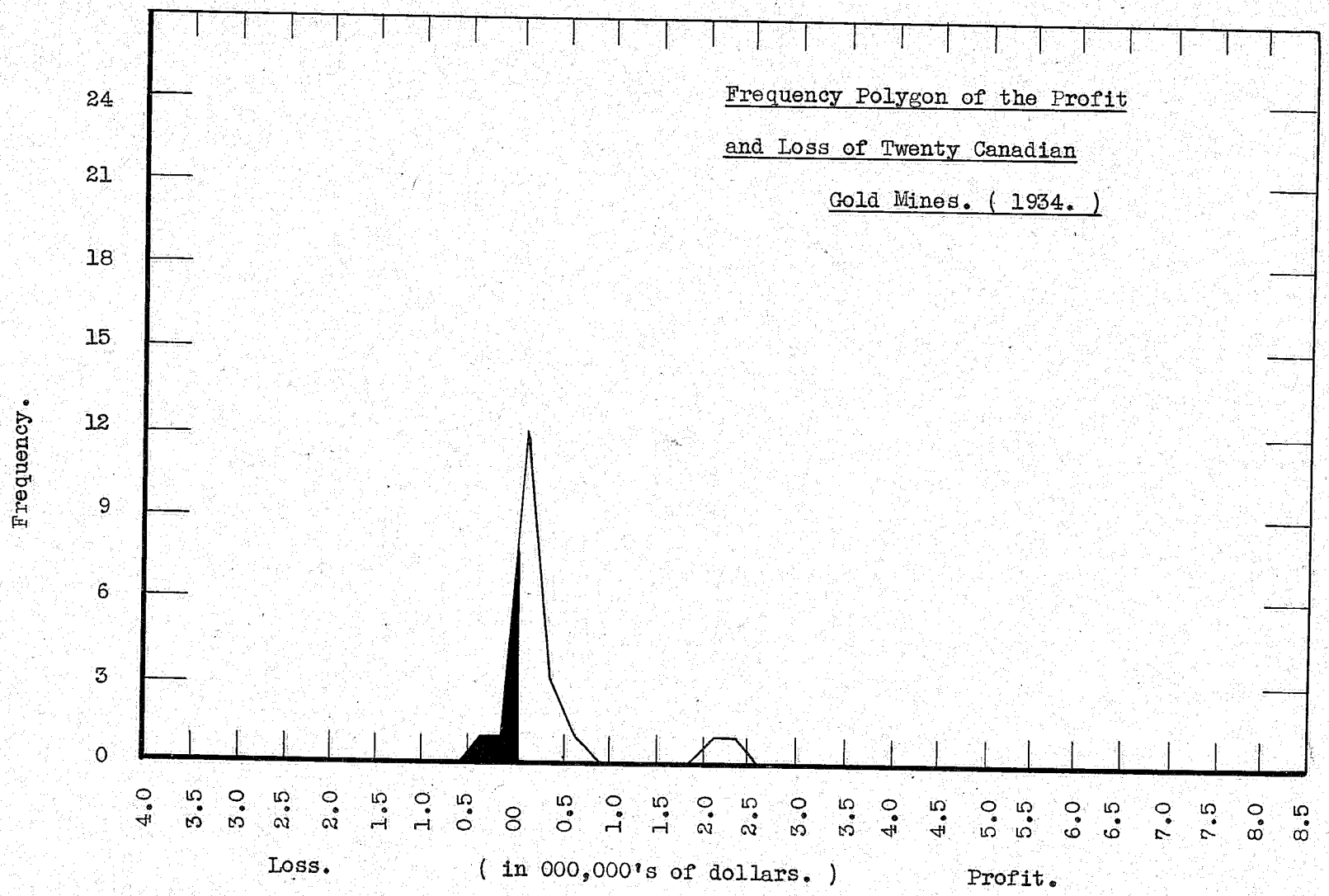


Figure 54.

( Dividends paid.)

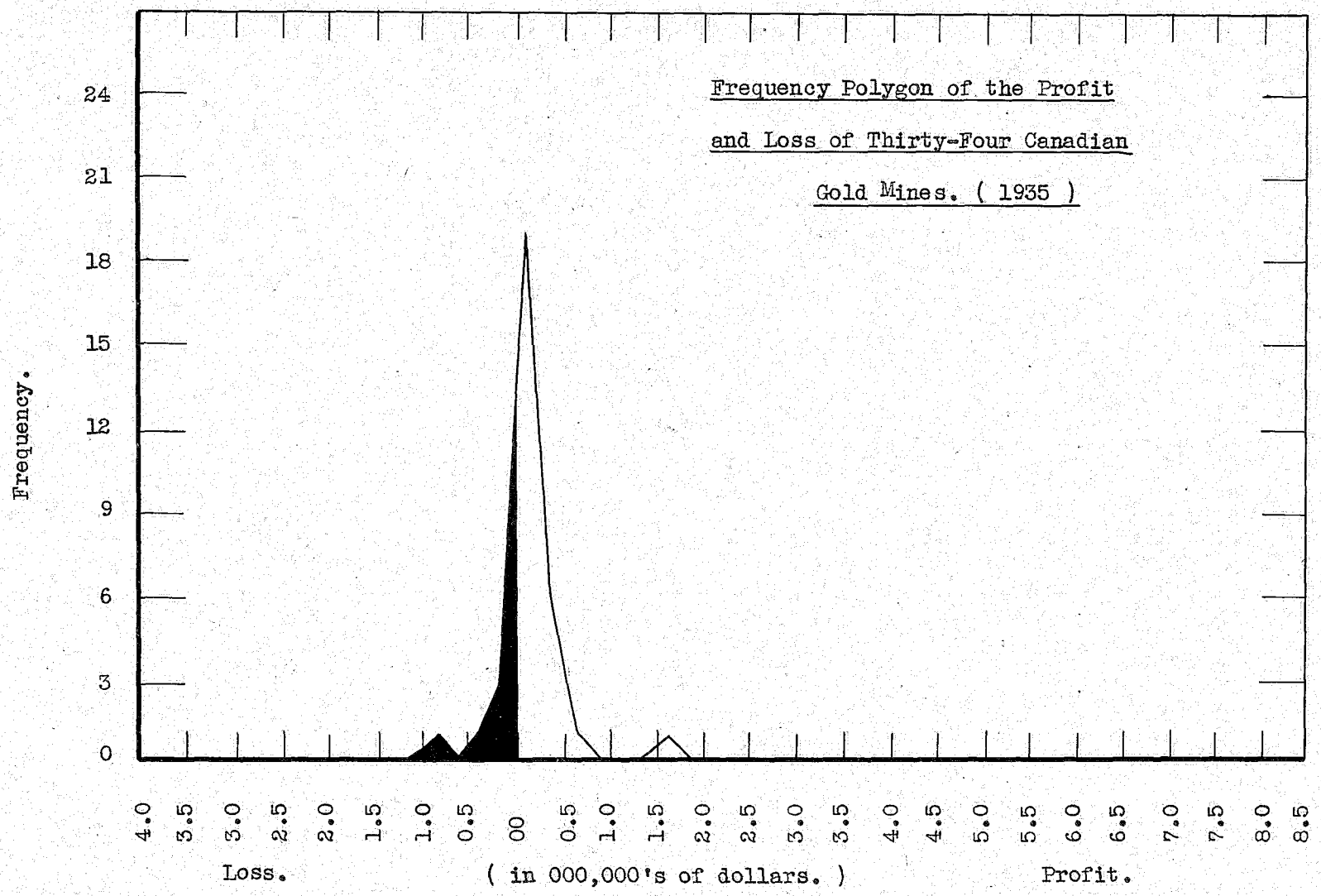


Figure 55.

( Dividends paid.)

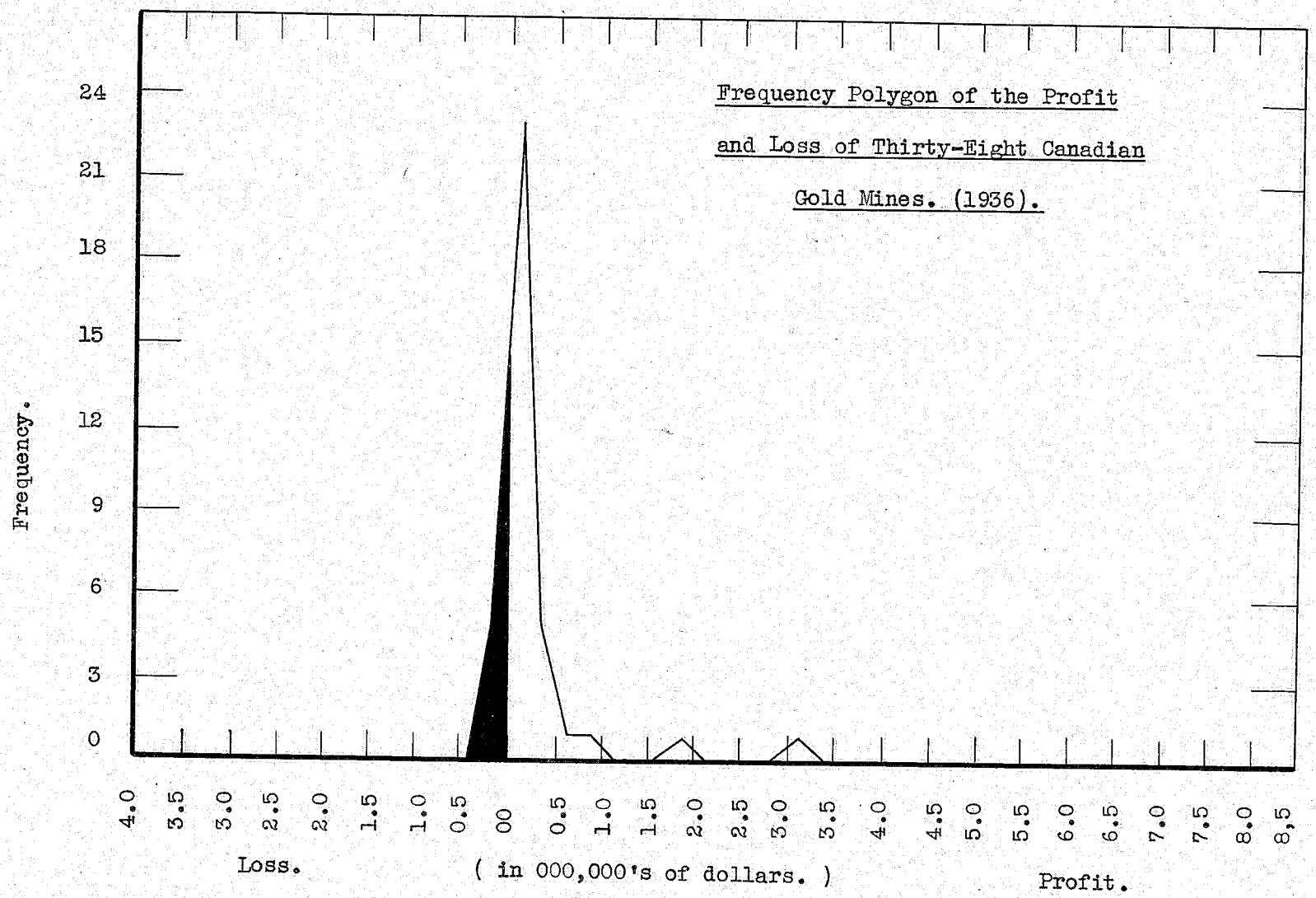


Figure 56.

( Dividends paid.)

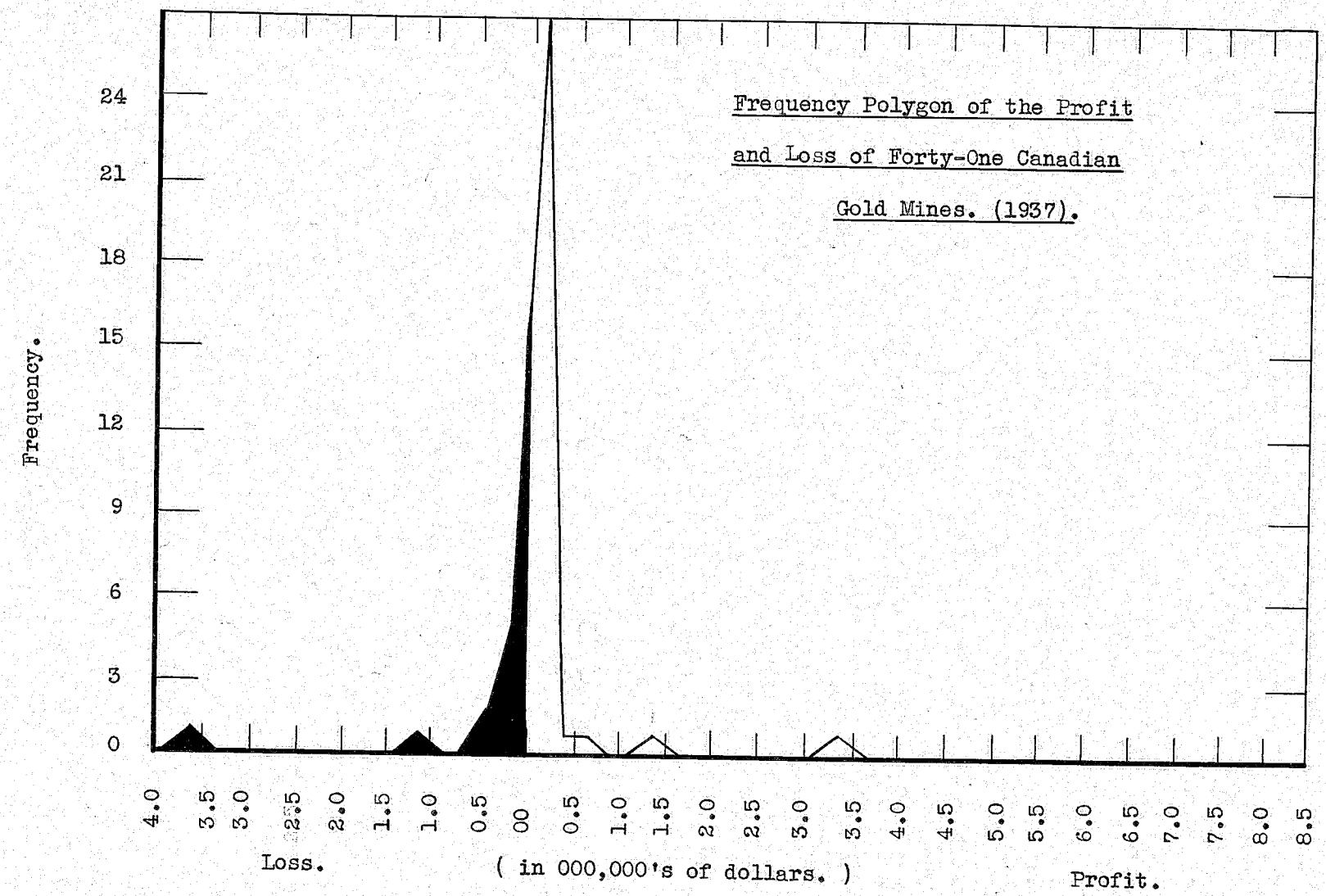


Figure 57.

( Dividends paid.)

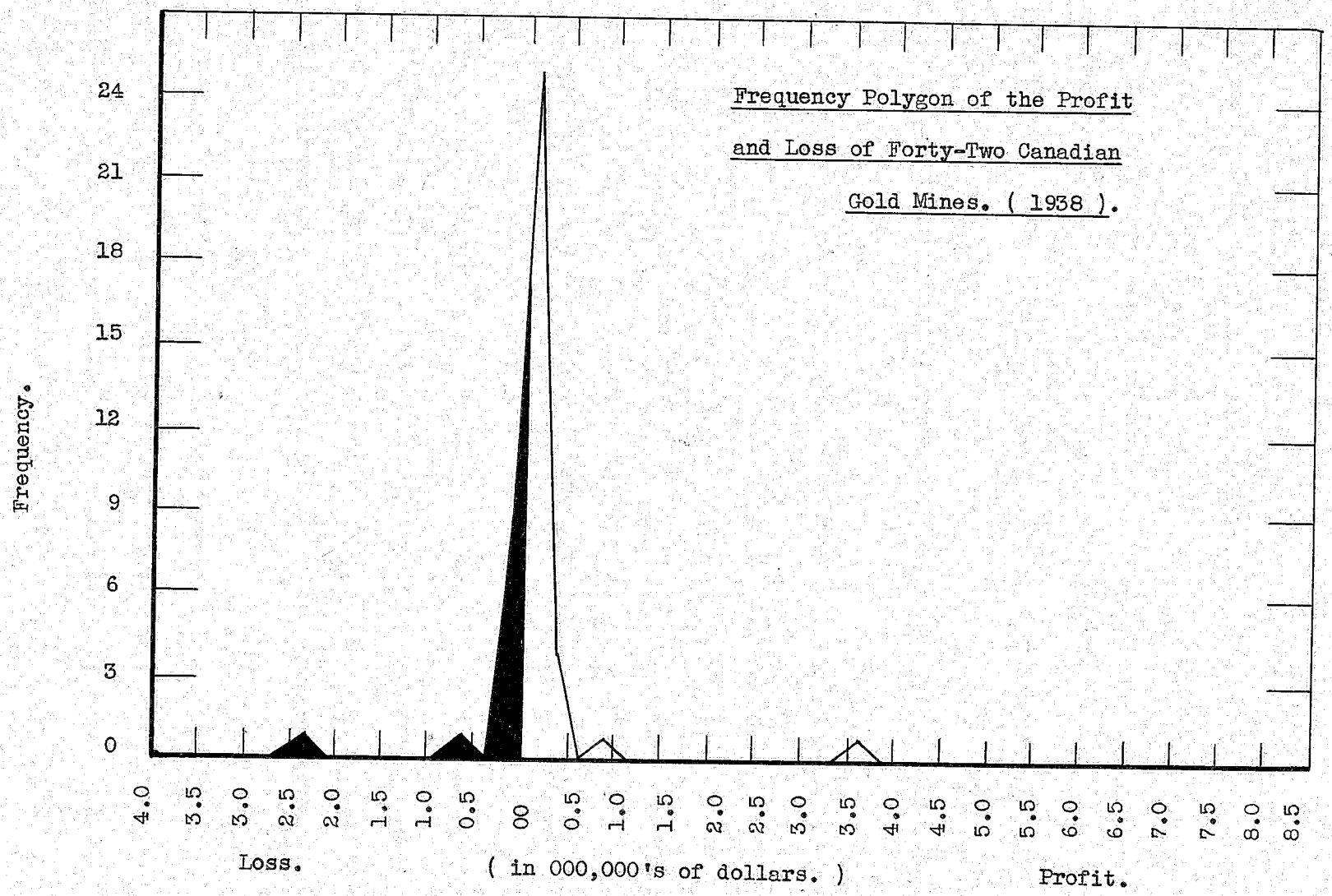


Figure 58.

This ratio is illustrated in Figures 48 to 58 and proves the fact that the shareholders of the corporations received the benefits arising from the increase in the price of gold. There have been no large accumulations of undistributed profits, the companies paying out their profits in the form of dividends after their costs have been met. As the sample treated increases in size from 8 mines in 1928 to 42 mines in 1938 the ratio of profits to losses is maintained showing this procedure to be the practice of not only the large mining companies, but also the smaller new developments which are included in the samples of later years.

Many of the large gold mining companies in Canada are owned or controlled by holding companies or investment houses, but just how important a factor investment is in these companies is not known. The Ventures Limited have the controlling interests of Coniarium, Beattie and Canadian Malartic Gold Mines and probably many others. From 1928 to 1937 the Coniaurium Mine lost money on every ton of ore that it mined and last year for the first time it made a profit on the ore treated. On the other hand, the Beattie and Canadian Malartic gold mines have made handsome profits over the same period. One would expect them to pay large dividends but it is generally conceded that these two mines are not paying the dividends which the richness of the properties warrant. Possibly this may be explained by the tranference by Ventures Limited of the earnings of the two profitable mines, to the unprofitable one in order to keep it functioning. This is a good example because of the complex financial structures of this type. It is possible that the real

effect of the rise of gold in 1933 on certain mining companies has been concealed.

The statistical measure(the coefficent of correlation) employed to determine the degree of relationship between two items was applied to the following factors,-

1. Average recovery per ton(in dollars)--- to --- the amount of profit or loss for the year.
2. The total fixed assets -- to -- the amount of profit or loss for the year.
3. The total cost of producing one ounce of gold -- to -- the amount of profit or loss for the year.
4. The total cost of milling one ton of ore-- to --- the total fixed assets.

A coefficient of correlation as high as .968 was found to exist between the average recovery per ton(in dollars) and the amount of profit or loss for the year. This indicates almost a perfect relationship and is to be expected as the success of a mining venture depends upon this factor almost entirely. On the other hand there was no correlation found between the factors of the other three items which could be taken as statistically significant. One would expect the cost of producing one ounce of gold to have some effect on the profit or loss for the year but, as was shown in Chapter lV the cost of producing gold has remained almost constant during the period studied and apparently has not has any effect on the profits realized. Possibly the lack of relationship between certain of these items might be explained by the complexity of the financial structure of certain of the companies but this

is a problem for a student of corporation finance and is too large to be dealt with in this work.

Taxes on Gold Mines.

There remains the task of explaining the large increase in the amount expended in 1938 for taxes as compared with the amount spent for this item in 1928. As the data pertaining to cost were only available up to 1938, the War Tax Laws imposed in September 1939 will not be discussed.

In Ontario where the Group A mines of the study were located, owners of claims are required to do certain development work to retain title to their property. This however is negligible; the main burden of taxation falling on the profits arising from mining operations. In 1928 the mining companies were taxed under the corporation income tax of that province on their net profits, the rate being 3% on all profits in excess of $10,000 up to $1,000,000; 5% on profits from $1,000,000 to $5,000,000 and 6% on the excess above $5,000,000.[1] There has been no change in this schedule since 1928.

Mining companies also pay income taxes to the Dominion Government under the Income War Tax Act of 1917[2] and are subject to the same tax rates as those applicable to corporations and joint stock companies. By amendment to the Dominion Income Tax Act in 1936, the allowance for depletion to gold and silver mining companies was lowered from 50% to 33 1/3% of the net profits arising solely from their mining operations. A mine no longer has the right to apply half of its first two years'

1. Canada Year Book, 1928. Page 243.

2. Income War Tax Act, 1917, 8 George V, c 28, s 1.

Table No. 17

Lake Shore Mine

| Year | Capitalization(Fixed Assets). | Amount of Profit. |
|---|---|---|
| 1928 | $ 852,823 | $ 1,680,881 |
| 1929 | 817,227 | 7,540,160 |
| 1930 | 1,814,254 | 3,128,985 |
| 1931 | 1,860,965 | 4,505,601 |
| 1932 | 2,098,857 | 7,797,011 |
| 1933 | 1,597,411 | 7,215,173 |
| 1934 | 1,030,340 | 10,145,705 |
| 1935 | 545,106 | 8,237,891 |
| 1936 | 796,906 | 9,759,600 |
| 1937 | 764,052 | 8,384,792 |
| 1938 | 698,635 | 7,732,417 |

Table No 18

Lake Shore Mine

| Year | Amount of Profit or Loss (Dividend not paid) | Amount Paid for Taxes as a percentage of Cost | Dividend Paid |
|---|---|---|---|
| 1928 | $ 1,680,881 | --- not given | $ 2,000,000 |
| 1929 | 2,540,160 | 7.43% | 2,200,000 |
| 1930 | 3,128,985 | 7.71 | 3,000,000 |
| 1931 | 4,505,601 | 10.77 | 4,800,000 |
| 1932 | 7,797,o111 | 17.37 | 6,000,000 |
| 1933 | 7,215,193 | 14.72 | 6,000,000 |
| 1934 | 10,145,705 | 18.54 | 7,000,000 |
| 1935 | 8,237,891 | 31.17 | 8,000,000 |
| 1936 | 9,759,600 | 24.75 | 10,000,000 |
| 1937 | 8,384,792 | 21,84 | 12,000,000 |
| 1938 | 7,732,417 | 20.01 | 10,000,000 |

Table No. 19

Lake Shore Mine

| Year | Taxes as % of Total Cost | Amount of Profit or Loss |
|---|---|---|
| 1928 | % increase since 1929=100 | % increase since 1929=100 |
| 1929 | 100 | 100 |
| 1930 | 103 | 123 |
| 1931 | 144 | 177 |
| 1932 | 233 | 306 |
| 1933 | 198 | 284 |
| 1934 | 249 | 399 |
| 1935 | 419 | 324 |
| 1936 | 333 | 384 |
| 1937 | 293 | 330 |
| 1938 | 269 | 304 |

DIVIDENDS, PROFIT, AND TAXES AS A PERCENTAGE OF THE TOTAL MINING COST FOR THE LAKE SHORE MINE, ( 1928 to 1938.)

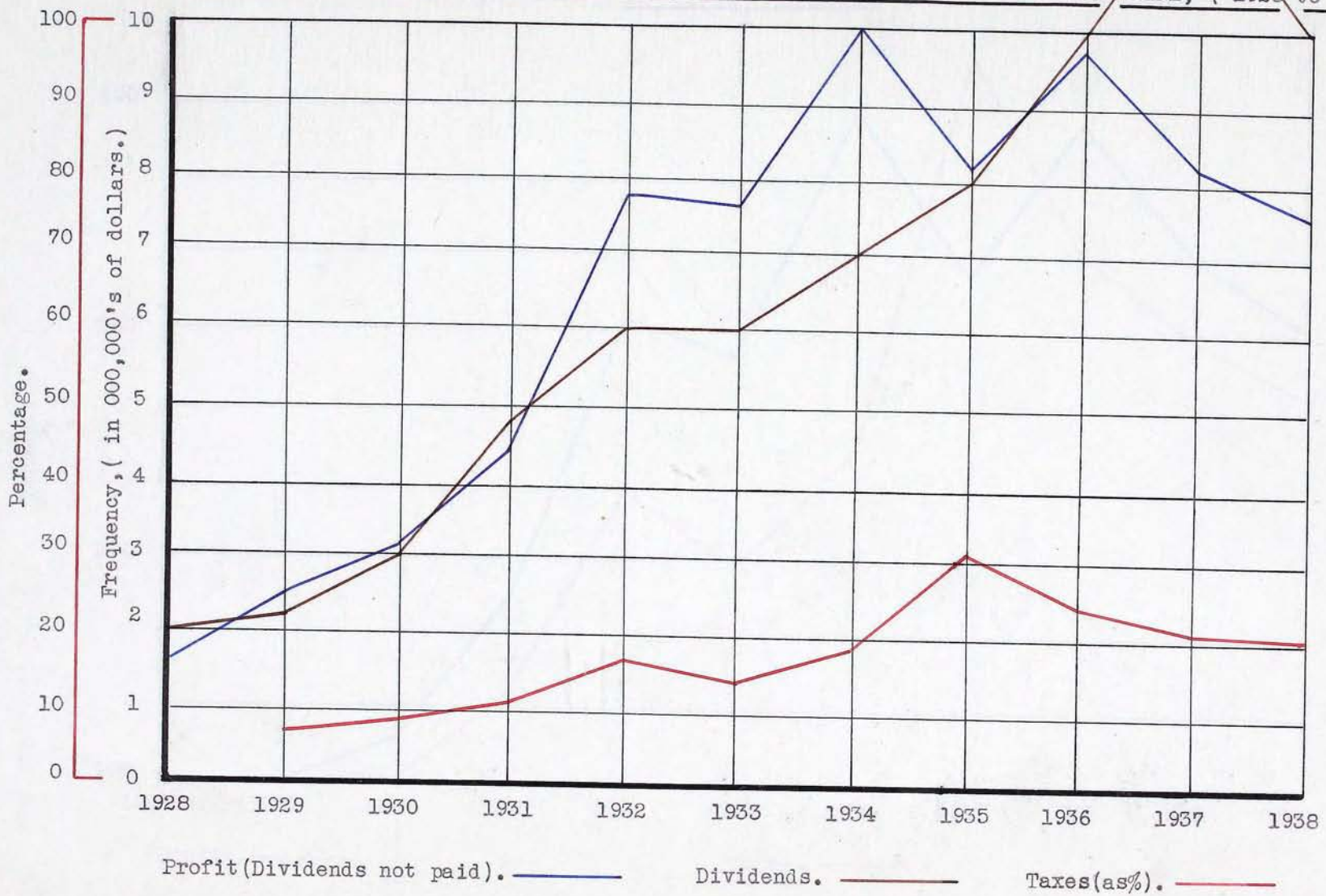


Figure 59.

PERCENTAGE INCREASE (1929= 100) IN PROFITS, & TAXES (as percentage of total mining costs) OF LAKE SHORE MINE.
(From 1929 to 1938.)

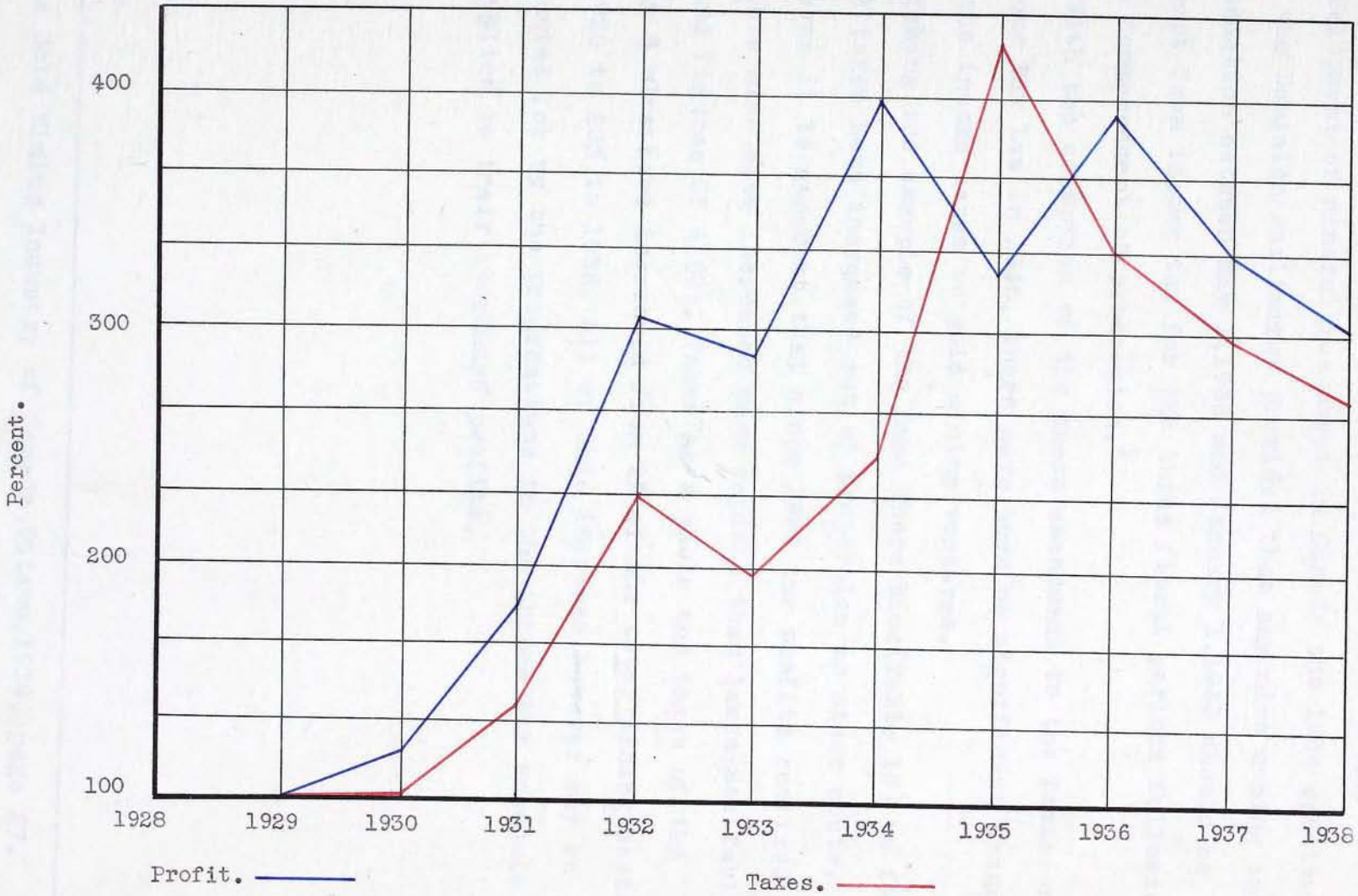


Figure 60.

earnings to capital depletion.

With a view to stimulating further exploration and development of mineral resources in Canada the 1936 session of the Dominion Parliament provided that any mine coming into production between May 1,1936 and January 1,1940 should be exempt from income tax for the three fiscal periods following the commencement of production.[1]

With the exception of the above amendment to the Dominion Income Tax Law in 1936, there have been no significant changes in the income taxes on gold mining ventures.

Taking the example of the Lake Shore Mine(Table 18) we find that taxes have increased out of proportion to other costs. However it is apparent that since 1929 the profits realized by this mine have increased more rapidly than taxes(See Table 19 and figures 59 & 60). Taken as a whole the taxes of the Group A mines have increased from 2% of the total mining costs in 1928 to 20% in 1938. All of this increase however may be accounted for by the progressions in the income tax schedule as applied to their increased profits.

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1. The Gold Mining Industry of Canada,Ottawa,1939, page 27.

# CHAPTER VI

## Conclusion

## Chapter VI

### Conclusion.

In conclusion it may be said that gold mining in Canada is on a very sound financial basis. The new development which has been a direct result of the 1933 rise in the price of gold appears to be very promising.

The cost of mining gold appears to have risen slightly but we may not assume that this conclusion would necessarily apply to the gold mining industry as a whole. The rise in the cost of mining, excluding taxes, has been negligible; the increase in the costs being the direct result of the application of the income tax laws to the increased profits of the gold mining.

When the government of United States raised the price per ounce of gold from $20.67 to $35.00 it subsidized the industry and widened the margin of economic rent. The Canadian government has taken part of the unearned increment from the mining companies by means of taxation, but it has by no means taken all of it.

Due to the fact that the amount paid in taxes becomes large when high profits are realized, the producing mines do not realize the enormous profits which the new price of gold makes possible. In many cases they appear to be following the policy of moderate returns in order to avoid high tax rates. While it was not the purpose of this paper to make an exhaustive study of the taxes levied on mining companies, it appears on the

surface that the government is defeating its own ends in maintaining a tax structure which serves to restrict its income and that of the mining companies.

The government has embarked upon a policy of stimulating new mining ventures by exempting them from taxation during the first years of their operations. At present extensive surveys are being carried on in search of new gold fields and it is to be hoped that rich gold deposits will be discovered.

This study has revealed a surprising constancy of costs in the face of a resort to lower grade ores made possible by the arbitrary increase in the price of gold. Incidentally it pointed to the fallacy of the popularly held belief that taxes are absorbing the profits of the industry. In actuality there appears to have been a recourse to lower grade ores on which the increases in taxes did not apply. There has been an increase in taxes only when profits arising from the subsidy granted by the government were partially returned to it by the ordinary application of the progressive income taxes.

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