CANADA

DEPARTMENT OF MINES

HON. ARTHUR MEIGHEN, MINISTER; R. G. MCCONNELL, DEPUTY MINISTER

MINES BRANCH

EUGENE HAANEL, PH.D., DIRECTOR

THE

Production of Copper, Gold, Lead, Nickel, Silver, Zinc, and Other Metals

IN

CANADA

During the Calendar Year

1916

Advance Chapter of the Annual Report on the Mineral Production of Canada, 1916

OTTAWA

GOVERNMENT PRINTING BUREAU

1917

29659c.

No. 471

LETTER OF TRANSMITTAL.

DR. EUGENE HAANEL,
Director, Mines Branch,
Department of Mines,
Ottawa.

Sir,—The accompanying report on "the production of Copper, Gold, Lead, Nickel, Silver, Zinc, and other metals in Canada during the Calendar Year 1916," which is submitted for publication as an advance chapter of the Annual Report on the Mineral Production of Canada, 1916, has been compiled, under direction, by Arthur Buisson, B.Sc., Assistant Mining Engineer in this Division.

I have the honour to be, Sir,
Your obedient servant,
(*Signed*) **John McLeish.**

Division of Mineral Resources and Statistics.
August 28, 1917.

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ADVANCE CHAPTER OF THE ANNUAL REPORT ON THE MINERAL PRODUCTION OF CANADA, DURING THE CALENDAR YEAR, 1916.

(Tons used throughout this report are short tons of 2,000 pounds, except where otherwise stated.)

ALUMINIUM.

No commercial ores of aluminium have as yet been found in Canada. Aluminium is, however, made in extensive works at Shawinigan Falls, Quebec, from bauxite ores imported from France, the United States, and also formerly from Germany, by the Northern Aluminium Company. A wire mill for the manufacture of aluminium wire and cables is also operated by the same firm.

There being but one firm engaged in the manufacture of aluminium we are precluded from publishing statistics of production.

Imports of alumina, probably including bauxite, and exports of aluminium are, however, published in the reports of the Department of Customs.

During the twelve months ending December 31, 1916, the imports of alumina were 53,819,000 pounds, or 26,910 tons valued at $1,114,061, as against 35,016,200 pounds or 17,508 tons valued at $892,634 in 1915.

The imports of aluminium in ingots, bars, tubes, etc., were in 1916, 1,355,503 pounds or 678 tons, valued at $526,646; besides manufactures of aluminium valued at $144,452, compared with 2,667,355 pounds, or 1,334 tons of aluminium in ingots, bars, tubes, etc., valued at $633,502, and manufactures of aluminium valued at $88,733, in 1915.

The exports of aluminium in ingots, bars, tubes, etc., in 1916, amounted to 18,425,300 pounds, or 9,213 tons, valued at $5,201,066, together with manufactures of aluminium valued at $26,780, as against 18,680,800 pounds, or 9,340 tons, valued at $3,333,726, and manufactures valued at $620,562, in 1915.

Annual Imports of 'Alumina' and Exports of Aluminium.

Calendar Year.	Imports of alumina.		Exports of aluminium.		
			Ingots, bars, etc.		Manufactures.
	Pounds.	Value.	Pounds.	Value.	Value.
1905	5,360,800	$ 138,765	2,535,386	$ 508,219	$ 1,588
1906	8,975,400	239,136	4,521,486	899,113	2,244
1907	12,705,300	268,502	5,478,203	1,109,353	1,499
1908	1,485,500	29,752	1,713,800	399,785	1,727
1909	11,794,100	234,544	6,134,500	918,195	3,453
1910	19,464,400	403,283	7,722,400	1,160,242	3,741
1911	18,607,200	372,009	4,990,100	747,587	1,555
1912	22,400,500	448,061	18,285,700	2,002,363	10,898
1913	30,704,200	614,713	13,015,000	1,762,214	8,203
1914	28,557,000	571,419	14,510,800	2,364,907	5,571
1915	35,016,200	892,634	18,680,800	3,333,726	620,562
1916	53,819,000	1,114,061	18,425,300	5,201,066	26,780

Annual Imports of Aluminium.

Year.	Ingots, blooms, bars.		Tubing.		Manufactures.	Leaf or foil (a).	Total value.
	Pounds.	Value.	Pounds.	Value.			
1910	3,180,250	$674,683	10,019	$4,203	$ 77,664	....	$756,550
1911	2,527,120	531,273	3,594	1,495	115,278	....	648,046
1912	2,396,375	410,022	11,624	3,654	120,029	....	533,705
1913	3,455,686	604,582	19,856	9,174	131,938	....	745,694
1914	3,796,353	745,855	15,775	6,898	103,143	$ 4,455	860,351
1915	2,661,117	630,504	6,238	2,998	83,281	5,452	722,235
1916	1,350,485	523,564	5,018	3,082	95,408	49,044	671,098

(a) Not given separately, previous to 1914.

Prices.—The price quotations on aluminium in New York remained steady around 60 cents for the greater part of the year.

The variety of uses of aluminium created by the exigencies of the war were the cause of the demand greatly exceeding the supply. There was a continued large demand for aluminium for the manufacture of "Ammonal," an explosive which is a mixture of nitrate of ammonia and powdered aluminium, also for the frame work of airships, aeroplanes, certain parts of machine guns, rifle bullet points, etc.

Average Monthly Prices of Ingot Aluminium[1].

(At New York in cents per pound).

	1912.	1913.	1914.	1915.	1916.
January	19·13	26·31	18·81	19·08	55·00
February	19·44	26·04	18·81	19·22	58·00
March	19·58	27·05	18·50	19·00	60·25
April	20·38	27·03	18·16	18·88	59·50
May	21·69	26·44	17·95	22·03	59·00
June	22·83	24·68	17·75	30·00	61·50
July	23·50	23·38	17·66	32·38	60·20
August	24·38	22·70	19·88	34·50	60·00
September	25·13	21·69	19·94	47·75	61·88
October	26·25	20·13	18·50	50·00	65·05
November	26·56	19·35	18·00	57·75	65·12
December	25·75	18·88	18·96	57·13	63·00
	22·01	23·64	18·63	33·98	60·71

[1] As quoted by the Engineering and Mining Journal, Jan. 6th, 1917.

ANTIMONY.

Shipments of both antimony ore and concentrates, and of refined antimony were made from Canadian properties during 1915 and 1916, this being the first recorded production of antimony since 1910. Refined antimony was produced at the smelter of the Consolidated Mining and Smelting Company at Trail, B.C., recovered from the residues of the lead refinery; and at the works, at Lake George, New Brunswick, of the New Brunswick Metals, Limited, the latter property having been formerly operated by the Canadian Antimony Company.

The production of refined antimony was reported as 107,185 pounds valued at $41,823, as against 59,440 pounds valued at $11,888 in 1915.

The shipments of antimony ore and concentrates were reported as 885 tons, containing approximately 750,400 pounds of antimony, and valued at $94,537, as against 1,341 tons, containing approximately 1,050,196 pounds of antimony and valued at $81,283 in 1915.

This production was derived principally from the mines of West Gore, Hants Co., Nova Scotia, and the property of the New Brunswick Metals, Ltd., at Lake George, New Brunswick. There were also shipments from the Alps-Alturas property, near Sandon, B.C., and from the Wheaton district, Yukon Territory.

Annual Shipments of Antimony Ore.

Year.	Tons.	Value.	Year.	Tons.	Value.
1886	665	$31,490	1907	2,016	$65,000
1887	584	10,860	1907 *Refined antimony	.....	5,108
1888	345	3,696	1908 (b)	148	5,443
1889	55	1,100	1909	35	1,575
1890	26½	625	1909 *Refined antimony	.....	4,285
1891	10	60	1910	364	13,906
1892 to 1897	.....	.....	1911-1914	.....	.....
1898	1,344	20,000	1915	1,341	81,283
1899 to 1904	.....	.....	1915 *Refined antimony	.....	11,888
1905 (a)	527	.....	1916	885	94,537
1906 (a)	782	.....	1916 *Refined antimony	.....	41,823

(a) As recorded by the Nova Scotia Department of Mines; no value given.
(b) Exports.
* Refined antimony; 63,850 pounds in 1907, 61,207 pounds in 1909, 59,440 pounds in 1915, and 107,185 pounds in 1916.

Exports of Antimony Ore.

Calendar Year.	Tons.	Value.	Calendar Year.	Tons.	Value.	Calendar Year.	Tons.	Value.
1880	40	$1,948	1890	38	$ 1,000	1905	525	$27,118
1881	34	3,308	1891	3½	60	1906	420	17,064
1882	323	11,673	1892–1897	.....	.....	1907	1,327	37,807
1883	165	4,200	1898	1,232	15,295	1908	148	5,443
1884	483	17,875	1899	6¾	190	1909	4	120
1885	758	36,250	1900	210	3,441	1910	239	14,095
1886	665	31,490	1901	10	1,643	1911	57	4,946
1887	229	9,720	1902	90	13,658	1912–1914	.....	.....
1888	352½	6,894	1903	33	4,332	1915	1,149	82,990
1889	30	695	1904	160	7,237	1916	794	48,158

Imports of Antimony.

Fiscal Year.	Pounds.	Value.	Fiscal Year.	Pounds.	Value.	Fiscal Year.	Pounds.	Value.
1880.....	42,247	$ 5,903	1889.....	119,034	$11,206	1898.....	156,451	$12,350
1881.....	.....	7,060	1890.....	117,066	17,439	1899.....	289,066	16,851
1882.....	183,597	15,044	1891.....	114,084	17,483	1900.....	186,997	20,001
1883.....	105,346	10,355	1892.....	180,308	17,680	1901.....	350,737	24,714
1884.....	445,600	15,564	1893.....	181,823	14,771	1902.....	504,822	39,276
1885.....	82,012	8,182	1894.....	139,571	12,249	1903.....	868,146	65,434
1886.....	89,787	6,951	1895.....	79,707	6,131	1904.....	418,943	27,112
1887.....	87,827	7,122	1896.....	163,209	9,557	1905.....	186,454	12,828
1888.....	120,125	12,242	1897.....	134,661	8,031	1906.....	403,918	56,297

Calendar Year.	Antimony or Regulus of.		Antimony salts.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1907.....	416,512	$ 69,447	117,592	$19,083	534,104	$ 88,530
1908.....	396,904	28,509	29,832	2,452	426,736	30,961
1909.....	551,354	37,362	40,176	4,369	591,530	41,731
1910.....	388,952	25,296	94,330	9,152	483,282	34,448
1911.....	561,046	36,405	18,420	2,418	579,466	38,823
1912.....	998,045	60,456	55,683	7,197	1,053,728	67,653
1913.....	667,050	49,408	23,649	2,421	690,699	51,829
1914.....	648,516	47,498	45,634	10,217	694,150	57,715
1915.....	1,962,194	344,918	67,956	10,320	2,030,150	355,238
1916.....	796,728	208,450	41,985	13,891	838,713	222,341

Prices.—The price of antimony, ordinary grades, in New York, ranged between a maximum of 46 cents in March, and a minimum of 9 cents in August, after which precipitated decline the prices gradually increased to about 15 cents in December.

The decline in prices was due to the new production especially in China which is the principal source of the world's supply of antimony.

Average Prices of Antimony.*

(In cents per pound.)

	1914.			1915.			1916.		
	Cookson's	U.S.[1]	Ordinaries.[2]	Cookson's	U.S.[1]	Ordinaries.[2]	Cookson's	U.S.[1]	Ordinaries.[2]
January.....	7·388	7·110	6·125	17·90	.....	15·85	.....	.....	42·45
February....	7·250	7·057	6·100	21·25	.....	18·21	.....	.....	44·31
March.....	7·315	7·073	6·053	28·75	.....	22·13	.....	.....	44·75
April.....	7·363	7·048	6·006	31·88	.....	24·88	.....	.....	42·06
May.....	7·365	7·020	6·845	42·70	.....	35·30	.....	.....	31·60
June.....	7·250	7·000	5·825	47·50	.....	37·69	.....	.....	20·05
July.....	7·210	6·940	5·638	50·44	.....	38·13	.....	.....	14·70
August.....	17·250	15·800	13·800	48·00	.....	33·00	.....	.....	11·53
September...	11·830	.....	9·940	44·56	.....	28·63	.....	.....	11·81
October.....	14·680	.....	12·060	45·50	.....	31·45	.....	.....	12·70
November...	17·750	.....	14·450	47·25	.....	38·88	.....	.....	13·84
December...	16·130	.....	13·310	55·00	.....	39·25	.....	.....	14·59
	10·732	.....	8·763	40·06	.....	30·28	.....	.....	25·37

[1]United States brands.
[2] Hungarian, Chinese, or other "Foreign" brands.
*As given by the "Engineering and Mining Journal."

Antimony is reported[1] smelted in the United States by the following firms:—

Magnolia Metal Co., 115 Bank St., New York City. Smelter at Matawan, N.J.

The Pennsylvania Smelting Co., Pittsburgh, Pa.

Great Western Smelting and Refining Co., Chicago, Ill.

Western Metals Co., 625 Security Building, Los Angeles, California.

Chapman Smelting Co., 409 Battery St., San Francisco, California.

International Smelting Co., Wm. Wraith, Mgr., Salt Lake City, Utah.

Antimony Smelting and Refining Co., Central Building, Seattle, Wash.

Besides these the American Star Antimony Co., is extracting antimony electrically at Gilham, Ark.; the Hoyt Metal Co., St. Louis, Mo., smelts more or less antimony ores in conjunction with lead ores to make antimony lead; and the John Finn Metal Works, San Francisco, Cal., has also treated some antimony ores.

[1] The Mining Congress Journal.

COBALT.

The silver-cobalt-nickel-arsenides of Coleman and adjacent townships, more familiarly known as the Cobalt district, in the Province of Ontario, are now the principal sources of the world's supply of cobalt.

The recovery of this metal in Canada has been in the form of cobalt-oxide and mixed oxides of cobalt and nickel, produced by the smelters treating the above ores, together with cobalt residues produced at the high grade mill of the Nipissing Mining Company. Formerly these residues have been chiefly exported, but they are now being shipped mainly to Canadian smelters.

In addition to the oxide of cobalt, there is now being recovered metallic cobalt, cobalt-oxide, cobalt sulphate, cobalt carbonate, cobalt hydroxide, unseparated oxides, and stellite (the cobalt alloy used for high speed tool metal).

The total production of cobalt contained in smelter products recovered and in cobalt residues exported during 1916, amounted to 840,536 pounds which if valued at $1.10 per pound, would be worth $924,590, as against 504,212 pounds valued at $536,268, in 1915.

This production included in 1916, 215,215 pounds of metallic cobalt, valued by the producers at $200,888; 670,760 pounds of cobalt-oxide, valued at $542,341; together with smaller quantities of cobalt sulphate, cobalt carbonate, cobalt hydroxide, unseparable oxides, stellite, and cobalt residues.

The 1915 production included 211,610 pounds of metallic cobalt, valued at $197,994, and 423,717 pounds of cobalt oxide, valued at $338,273 (including a small production of cobalt sulphate).

The total cobalt ores and residues treated in 1916 amounted to 8,127 tons with a cobalt content of 1,254,953 pounds.

Some of the cobalt residues from the Nipissing mill were shipped to smelter works in Great Britain.

No record is available as to the recovery of cobalt from silver ores exported but it is stated that cobalt speiss has been accumulated at United States smelters treating these ores.[1]

Production of Cobalt and Cobalt-Oxides.

Year.	Metallic cobalt.		Cobalt-oxide.		Mixed oxides of cobalt and nickel and other cobalt material.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1912	.....	.....	257,677	$128,843	1,285,280	$163,988
1913	.....	.....	660,079	525,028	3,216,000	90,266
1914	.....	.....	899,027	571,710	2,079,001	79,995
1915	211,610	$197,994	423,717	338,273	.....	.....
1916	215,215	200,888	670,760	542,341	.....	.....

[1] Mineral Resources of the United States 1913, p. 340.

Prior to the war the principal demand for cobalt was for colouring in the ceramic industry.

A small demand for cobalt metal now exists for use in making high speed tools, such as "stellite," an alloy of cobalt, chrome, and tungsten, or molybdenum.

A small amount is used for plating and for making salts, such as cobalt sulphate and cobalt carbonate, and also for making cobalt hydroxide.

The market for cobalt was very poor in 1915, but improved somewhat in 1916. The price of cobalt as quoted in New York in 1916, ranged from $1.25 to $1.50 per pound.

The results of researches on cobalt and cobalt alloys, undertaken for the Mines Branch, by Dr. H. T. Kalmus, at Queens' University, have been published in five parts.[1]

Under the provision of the "Metal Refining Bounty Act," passed by the Ontario Legislature in 1907, bounties amounting to $26,744.75 were paid to refineries on cobalt-oxide, and $10,280.28 on nickel-oxide in 1914, while in 1915, $19,029.22 were paid on cobalt metal and cobalt-oxide, and $6,521.69 on nickel metal and nickel-oxide.

The bounty is at the rate of six cents per pound on the metallic contents of the oxides. The "Act" which expires in April 1917, was quoted in the Annual Report on Mineral Production of Canada, during the Calendar Year 1914, and previous reports of this Division.

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[1] Mines Branch No. 259, "Preparation of Metallic Cobalt by Reduction of the Oxide." Report on, by H. T. Kalmus, B.Sc., Ph.D.
Mines Branch No. 334, "Electro-plating with Cobalt." Report on, by H. T. Kalmus, B.Sc., Ph.D., 1915,
Mines Branch No. 309, "The Physical Properties of the Metal Cobalt." Report on, by H. T. Kalmus, B.Sc., Ph.D.
Mines Branch No. 411, "Cobalt Alloys with Non-Corrosive Properties." Report on, by H. T. Kalmus, B.Sc., Ph.D.
Mines Branch No. 413. "Magnetic Properties of Cobalt and of Fe_2Co." Report on, by H. T. Kalmus, B.Sc., Ph.D.

COPPER.

The total production of copper in 1916, estimated on the basis of smelter recovery from ores treated, was 117,150,028 pounds, which at the average price of copper for the year in New York, 27·202 cents per pound, would be worth $31,867,150, as against 100,785,150 pounds, valued at $17,410,635 in 1915; that is an increase of 16·2 per cent in quantity and 83·0 per cent in value; and if compared with the 1914 production, the increase amounts to 50·4 per cent in quantity, and 209·3 per cent in value.

During 1912, 1913, and 1914, there had been a gradual falling off in quantity, and owing to the decrease in the price of the metal, a still greater falling off in value, but due to the great demand for copper for munitions, the production in 1915 and 1916 exceeded, both in quantity and value, that of any preceding year.

Statistics showing the annual copper production in Canada since 1886 are given in the following table, which shows the yearly increase or decrease as the case may be and also the yearly price per pound in New York:—

Annual Production of Copper.

Year.	Pounds.	Increase or Decrease.		Value.	Increase or Decrease.		Cents per pound.
		Pounds.	%		Value.	%	
1886	3,505,000	.....	.....	$ 385,550	.....	.....	11·00
1887	3,260,424	(d) 244,576	6·99	366,798	(d) $ 18,752	4·86	11·25
1888	5,562,864	2,302,440	70·60	927,107	560,309	152·70	16·66
1889	6,809,752	1,246,888	22·40	936,341	9,234	0·99	13·75
1890	6,013,671	(d) 796,081	11·69	947,153	10,812	1·15	15·75
1891	9,529,401	3,515,730	58·46	1,226,703	279,550	29·51	12·87
1892	7,087,275	2,442,126	25·63	818,580	(d) 408,123	33·27	11·55
1893	8,109,856	1,022,381	14·40	871,809	53,229	6·50	10·75
1894	7,708,789	(d) 401,067	4·94	736,960	(d) 134,849	15·46	9·56
1895	7,771,639	62,850	0·81	836,228	99,268	13·47	10·76
1896	9,393,012	1,621,373	20·86	1,021,960	185,732	22·21	10·88
1897	13,300,802	3,907,790	41·60	1,501,660	479,700	46·94	11·29
1898	17,747,136	4,446,334	33·43	2,134,980	633,320	42·17	12·03
1899	15,078,475	(d) 2,668,661	15·04	2,655,319	520,339	24·37	17·61
1900	18,937,138	3,858,663	25·59	3,065,922	410,603	15·46	16·19
1901	37,827,019	18,889,881	99·75	6,096,581	3,030,659	98·84	16·117
1902	38,804,259	977,240	2·58	4,511,383	(d) 1,585,198	26·00	11·626
1903	42,684,454	3,880,195	10·00	5,649,487	1,138,104	25·23	13·235
1904	41,383,722	(d) 1,300,732	3·05	5,306,635	(d) 342,852	6·07	12·823
1905	48,092,753	6,709,031	16·21	7,497,660	2,191,025	41·29	15·590
1906	55,609,888	7,517,135	15·63	10,720,474	3,222,814	42·98	19·278
1907	56,979,205	1,369,317	2·46	11,398,120	677,654	6·32	20·004
1908	63,702,873	6,723,668	11·80	8,413,876	2,984,244	26·18	13·208
1909*	52,493,863	.....	.....	6,814,754	.....	.....	12·982
1910	55,692,369	3,198,506	6·09	7,094,094	279,340	4·10	12·738
1911	55,648,011	(d) 44,358	0·79	6,886,998	(d) 207,096	2·92	12·376
1912	77,832,127	22,184,116	28·50	12,718,548	5,831,550	45·85	16·341
1913	76,976,925	(d) 855,202	1·10	11,753,606	(d) 964,942	7·59	15·269
1914	75,735,960	(d) 1,240,965	1·64	10,301,606	(d) 1,452,000	14·10	13·602
1915	100,785,150	25,049,190	24·85	17,410,635	7,109,029	40·83	17·275
1916	117,150,028	16,364,878	16·24	31,867,150	14,456,515	83·03	27·202

*The decrease is not as large as the figures would indicate because of the calculation of part of the 1909 production on a different basis from previous years.

The production of copper in Canada in 1916 included 32,611 pounds recovered in copper sulphate; 43,615,868 pounds contained in blister copper

exported for refining; 49,115,124 pounds contained in matte, chiefly nickel-copper matte exported for refining (including small amount of copper refined at Trail); and 24,386,425 pounds in ore, after allowing for smelter losses, exported for smelting and refining.

The total production in 1915 included 44,597 pounds recovered in copper sulphate; 42,050,347 pounds contained in blister copper exported for refining; 44,185,455 pounds contained in matte, chiefly nickel-copper matte, exported for refining, and 14,504,751 pounds in ore, after allowing for smelter losses, exported for smelting and refining.

The Province of British Columbia in 1916 contributed 54·3 per cent of the total, as against 56·2 per cent in 1915; Ontario contributed 38·4 per cent, as against 39·0 per cent in 1915; Quebec contributed 4·9 per cent, as against 4·1 per cent in 1915; and the Yukon Territory contributed 2·4 per cent, as against 0·5 per cent in 1915.

Production of Copper by Provinces, 1914, 1915, and 1916.

Provinces.	1914.		1915.		1916.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Quebec	4,201,497	$ 571,488	4,197,482	$ 725,115	5,703,347	$ 1,551,424
Ontario	28,948,211	3,937,536	39,361,464	6,799,693	44,997,035	12,240,094
British Columbia	41,219,202	5,606,636	56,692,988	9,793,714	63,642,550	17,312,046
Yukon	1,367,050	185,946	533,216	92,113	2,807,096	763,586
Total	75,735,960	10,301,606	100,785,150	17,410,635	117,150,028	31,867,150

Prices.—The price of copper in New York, which was quoted at 22½ cents at the beginning of 1916, rose quite steadily to a maximum of about 34 cents in the early part of May. Then the price gradually receded to 22¾ cents late in July, to again increase, reaching a maximum of 35 cents in November. The price started to drop again, closing the year with 28¾ cents. The Engineering and Mining Journal attributes the high prices in May and November to the large orders from the Allied Governments, and the decrease at the end of the year to the German peace proposal.

Monthly Average Prices of Electrolytic Copper in New York.

(In cents per pound.)

Months.	1912.	1913.	1914.	1915.	1916.
January	14·094	16·488	14·223	13·641	24·008
February	14·084	14·971	14·491	14·394	26·440
March	14·698	14·713	14·131	14·787	26·310
April	15·741	15·291	14·211	16·811	27·895
May	16·031	15·436	13·996	18·506	28·625
June	17·234	14·672	13·603	19·477	26·601
July	17·190	14·190	13·223	18·796	23·865
August	17·498	15·400	*	16·941	26·120
September	17·508	16·328	*	17·502	26·855
October	17·314	16·337	*	17·686	27·193
November	17·326	15·182	11·739	18·627	30·625
December	17·376	14·224	12·801	20·133	31·890
Yearly average	16·341	15·269	13·602	17·275	27·202

* No quotations.

Monthly Average Prices of Standard Copper in London.

(In £ Sterling per ton of 2,240 pounds.)

Months.	1912.	1913.	1914.	1915.	1916.
January	62·760	71·741	64·304	60·756	88·083
February	62·893	65·519	65·259	63·494	102·667
March	65·884	65·329	64·276	66·152	107·714
April	70·294	68·111	64·747	75·096	124·319
May	72·352	68·807	63·182	77·600	135·457
June	78·259	67·140	61·336	82·574	112·432
July	76·636	64·166	60·540	76·011	95·119
August	78·670	69·200	*	68·673	110·283
September	78·762	73·125	*	68·915	113·905
October	76·389	73·383	*	72·601	122·750
November	76·890	68·275	53·227	77·744	134·659
December	75·516	65·223	56·841	80·773	145·316
Yearly average	72·942	68·335	61·524	72·532	116·059

*No quotations.

Exports and Imports.—With the exception of a small output of copper sulphate at Trail, B.C., the copper production of Canada is exported for refining. The exports of copper in ore, matte, regulus, etc., during the calendar year 1916 were 124,942,400 pounds valued at $20,776,536, of which 89·4 per cent, in quantity, and 95·3 per cent in value were exported to the United States, and 10·6 per cent in quantity, and 4·7 per cent in value to Great Britain.

In 1915, 81·2 per cent in quantity, and 86·7 per cent in value were exported to the United States, and 18·8 per cent in quantity, and 13·3 per cent in value to Great Britain.

The exports of copper black or coarse and in pigs, etc., were to the United States, with the exception of a very small quantity to Newfoundland, and amounted to 2,430,400 pounds valued at $581,268. The exports of "old and scrap" copper amounted to 5,846,600 pounds valued at $1,284,895, most of which went to the United States.

The total exports of copper in 1916, were 133,219,400 pounds valued at $22,642,699, an increase of 23 per cent in quantity and 73 per cent in value over the exports of 1915.

Exports of Copper, 1915 and 1916.

Destination.	Fine in ore, matte, regulus, etc.		Black or coarse and in pigs, bars, sheets, etc.		'Old and Scrap'.	
1915.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
United States	66,155,803	$7,514,736	21,292,516	$3,788,715	3,956,600	$587,153
Great Britain	15,281,260	1,156,905	.....	.....	205,000	29,400
Other countries	.....	.....	.....	.....	.....	.....
	81,437,063	$8,671,641	21,292,516	$3,788,715	4,161,600	$616,553
1916.						
United States	111,695,500	$19,786,841	2,425,900	$580,525	5,803,300	$1,277,854
Great Britain	13,246,900	989,695	.....	.....	43,300	7,041
Other countries	.....	.....	(a) 4,500	743	.....	.....
	124,942,400	$20,776,536	2,430,400	$581,268	5,846,600	$1,284,895

(a) Newfoundland.

Exports of Copper in Ore, Matte, etc., from 1885 to 1916.

Calendar Year.	Pounds.	Value.	Calendar Year.	Pounds.	Value.
1885	.....	$ 262,600	1901	32,488,872	$ 3,404,908
1886	.....	249,259	1902	26,094,498	2,476,516
1887	.....	137,966	1903	38,364,676	3,873,827
1888	.....	257,260	1904	38,553,282	4,216,214
1889	.....	168,457	1905	40,740,861	5,443,873
1890	.....	398,497	1906	42,398,538	7,303,366
1891	.....	348,104	1907	54,688,450	8,749,609
1892	.....	277,632	1908	51,136,371	5,934,559
1893	4,792,201	269 160	1909	54,447,750	5,832,246
1894	1,625,389	91,917	1910	56,964,127	5,840,553
1895	3,742,352	236,965	1911	55,287,710	5,467,725
1896	5,462,052	281,070	1912	78,488,564	9,036,479
1897	14,022,610	850,336	1913*	85,147,560	9,927,814
1898	11,572,381	840,243	1914*	77,398,723	8,270,689
1899	11,371,766	1,199,908	1915*	106,891,179	13,076,909
1900	23,631,523	1,741,885	1916*	133,219,400	22,642,699

*Includes "Old and Scrap."

The total recorded imports of copper during the calendar year 1916 were valued at $7,566,080, and included: crude and manufactured copper, 25,594,029 pounds valued at $7,133,117; copper sulphate, 1,803,655 pounds valued at $198,542; and the manufactures of copper valued at $234,421. In 1915, the total imports were valued at $3,957,770, and included: crude and manufactured copper 20,245,407 pounds, valued at $3,593,818; copper sulphate, 1,854,850 pounds valued at $99,282; and the manufactures of copper valued at $264,670.

Unfortunately the above record does not represent the total copper imports during 1916 because of the fact that large quantities of copper, imported for the use of the Imperial Government, have been, for Customs Records' purposes, entered with many other products under one item.

According to United States trade records the exports from the United States to Canada of copper in pigs, ingots, bars, rods, wire, plates, etc., amounted during the calendar year 1916 to 45,947,740 pounds valued at $12,553,494, as against 24,128,098 pounds valued at $4,638,191 in 1915, and 24,221,498 pounds valued at $3,731,774 in 1914. The copper contents of brass or other alloy are not included. It will be noted that these figures are considerably higher than the Canadian record for both 1916 and 1915.

The following tables of imports show that the imports in 1916, were nearly double those of 1915, and exceeded those of 1913, the highest on record.

Imports of Copper, 1915 and 1916.

	1915.		1916.	
	Pounds.	Value.	Pounds.	Value.
Copper, old and scrap	68,500	$ 8,281	96,700	$ 20,777
Copper in pigs, ingots or in blocks	4,771,200	777,533	3,446,300	904,505
Copper in bars, and rods, in coils, or otherwise, in lengths, not less than 6 feet, unmanufactured	11,989,400	2,082,182	18,460,600	t 5,062,854
Copper, in strips, sheets or plates, not planished or coated, etc	2,668,400	534,926	2,650,700	t 792,400
Copper tubing in lengths not less than 6 feet and not polished, bent or otherwise manufactured	670,337	173,896	873,944	335,339
Copper rollers, for use in calico printing	.....	2,777	.....	727
Copper and manufactures of:—				
Nails, tacks, rivets and burrs or washers	.....	8,661	.....	3,593
Wire, plain, tinned or plated	77,383	16,965	55,843	16,523
Wire cloth, etc	.....	1,308	.....	2,926
All other manufactures of, n.o.p	.....	251.924	.....	227,175
Copper, precipitate of, crude	187	35	9,942	719
Copper sulphate (blue vitriol)	1,854,850	99,282	1,803,655	198,542
Total value	.....	3,957,770	.....	7,566,080

Imports of Copper, 1907 to 1916, inclusive.

Year.	Pigs, ingots or in blocks.		Old and scrap.		Manufactures of copper.			Crude precipitate.		Copper sulphate.		Total.
					Bars, rods, sheets, tube and wire.		Other manufactures.					
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Value.	Pounds.	Value.	Pounds.	Value.	Value.
1907	3,456,900	$699,388	196,300	$37,787	13,499,130	$3,138,283	$108,057	7,397	$1,340	2,299,674	$142,948	$4,127,803
1908	2,360,900	353,301	127,700	12,821	12,150,850	1,765,415	88,715	4,209	557	2,768,123	131,057	2,351,866
1909	4,200,100	554,273	132,600	14,447	16,208,978	2,340,464	126,769	1,990	257	1,634,751	66,459	3,102,669
1910	4,640,500	609,111	273,700	31,070	25,322,906	3,579,270	150,322	4,847	595	1,925,557	77,782	4,448,150
1911	5,650,400	705,598	265,300	28,748	29,244,210	3,898,416	215,289	2,608	299	2,191,899	88,419	4,936,769
1912	5,121,800	806,705	400,500	56,748	35,198,208	5,776,003	305,680	5,703	570	2,105,419	101,650	7,047,356
1913	5,314,200	845,095	596,700	87,790	35,101,061	6,002,937	370,313	4,743	515	2,037,714	107,960	7,414,610
1914	3,733,300	507,499	127,800	15,717	22,419,715	3,460,106	219,449	2,017	328	1,143,039	53,802	4,256,901
1915	4,771,200	777,533	68,500	8,281	15,405,520	2,807,969	264,670	187	35	1,854,850	99,282	3,957,770
1916	3,446,300	904,505	96,700	20,777	22,041,087	6,207,116	234,421	9,942	719	1,803,655	198,542	7,566,080

Imports of Copper, 1880 to 1916, inclusive.

Fiscal Year.	Pigs, Old, Scrap, etc.		Manufactures.	Fiscal Year.	Pigs, Old, Scrap, etc.		Manufactures.
	Pounds.	Value.	Value.		Pounds.	Value.	Value.
1880.....	31,900	$ 2,130	$123,061	1899.....	1,655,000	$246,740	$ 551,586
1881.....	9,800	1,157	159,163	1900.....	1,144,000	180,990	1,090,280
1882.....	20,200	1,984	220,235	1901.....	951,500	152,274	951,045
1883.....	124,500	20,273	247,141	1902.....	1,767,200	325,832	1,281,522
1884.....	40,200	3,180	134,534	1903.....	2,038,400	252,594	1,291,635
1885.....	28,600	2,016	181,469	1904.....	2,115,300	270,315	1,191,610
1886.....	82,000	6,969	219,420	1905.....	1,944,400	266,548	1,775,881
1887.....	40,100	2,507	325,365	1906.....	2,627,700	441,854	2,660,303
1888.....	32,300	2,322	303,459	Calendar Year.			
1889.....	32,300	3,288	402,216	1907.....	3,653,200	737,175	3,246,340
1890.....	112,200	11,521	472,668	1908.....	2,488,600	366,122	1,854,130
1891.....	107,800	10,452	563,522	1909.....	4,332,700	568,720	2,467,233
1892.....	343,600	14,894	422,870	1910.....	4,914,200	640,181	3,729,582
1893.....	168,300	16,331	458,715	1911.....	5,915,700	734,346	4,113,705
1894.....	101,200	7,397	175,404	1912.....	5,522,300	863,453	6,081,683
1895.....	72,062	6,770	251,615	1913.....	5,910,900	932,885	6,373,250
1896.....	86,905	9,226	285,220	1914.....	3,861,100	523,216	3,679,555
1897.....	49,000	5,449	264,587	1915.....	4,839,700	785,814	3,072,639
1898.....	1,050,000	80,000	786,529	1916.....	3,543,000	925,282	6,441,537

There are also imports of copper in the form of brass. The recorded imports of brass in 1916 included 2,974,676 pounds of metal in crude and manufactured form (see chapter on Zinc), valued at $923,523, and containing possibly 2,082,273 pounds of copper; and also manufactures of brass, quantity not recorded, valued at $3,752,851; while in 1915 the imports of brass included 3,810,946 pounds of metal in crude and manufactured form, valued at $714,410, and containing probably 2,667,663 pounds of copper; and also manufactures of brass, quantity not recorded, valued at $2,463,532.

Consumption.—In view of the large import of manufactured copper and brass for which no quantity is recorded, it is difficult to estimate closely the consumption of copper. The imports in 1916 amounted to at least 51,000,000 pounds on the basis of the United States record, and allowing 5,000,000 pounds for metal contained in other manufactures of copper and brass. Domestic production was practically all exported together with 6,000,000 pounds of copper "old and scrap," which, if deducted from the imports, gives an estimated consumption of 45,000,000 pounds, or 22,500 tons.

Quebec.

The mines in the Eastern Townships continued very active throughout the year, and the completion of the new concentrator at the Eustis mine in the mid-summer contributed to the increased production which amounted to 5,703,347 pounds, valued at $1,551,424, representing the estimated recovery from 130,492 tons of ore and concentrates with a metal content of 8,215,085 pounds of copper.

Quebec: Production of Copper.

Year.	Pounds.	Value.	Year.	Pounds.	Value.	Year.	Pounds.	Value.
1886.....	3,340,000	$367,400	1896...	2,407,200	$261,903	1906...	1,981,169	$ 381,930
1887.....	2,937,900	330,514	1897...	2,474,970	279,424	1907...	1,517,990	303,659
1888.....	5,562,864	927,107	1898...	2,100,235	252,658	1908...	1,282,024	169,330
1889.....	5,315,000	730,813	1899...	1,632,560	287,494	1909...	1,088,212	141,272
1890.....	4,710,606	741,920	1900...	2,220,000	359,418	1910...	877,347	111,757
1891.....	5,401,704	695,469	1901...	1,527,442	246,178	1911...	2,436,190	301,503
1892.....	4,883,480	564,042	1902...	1,640,000	190,666	1912...	3,282,210	536,346
1893.....	4,468,352	480,348	1903...	1,152,000	152,467	1913...	3,455,887	527,679
1894.....	2,176,430	208,067	1904...	760,000	97,455	1914...	4,201,497	571,488
1895.....	2,242,462	241,288	1905...	1,621,243	252,752	1915...	4,197,482	725,115
						1916...	5,703,347	1,551,424
						Total..	88,597,803	$12,988,886

Ontario.

The copper production from Ontario comes mainly from the nickel-copper ores of Sudbury district.

The chief companies are:—

The Canadian Copper Co., Ltd., shipping from the Creighton and adjoining properties.

The Mond Nickel Co., Ltd., operating at Coniston.

The Alexo Mining Co., operating near Porquis Junction, and shipping to the Coniston smelter.

The British American Nickel Corporation, which carried on active development and construction work but did not ship during 1916.

A few small shipments were also made from the following:—

The Bruce Mine, near Bruce Mines, Algoma.

The Cheney Mine, near Thessalon, Algoma.

The property of the Sable River Copper Co., now known as the Kenyon Copper Mines, Ltd., near Massey, Sudbury.

The Tip-Top Mine, near Port Arthur, in the Thunder Bay district.

The Hewitson, operated by the Mine Centre Copper Co., and now known as the Port Arthur Copper Co., Ltd., near Shoal Lake, Rainy River district.

The copper production from Ontario in 1916 amounted to 44,997,035 pounds valued at $12,240,094, equivalent to 38·4 per cent of the production for Canada. Details of the production of copper from the nickel-copper ores are given in the article on "Nickel."

The production of copper from the copper mines and Cobalt district amounts to less than one per cent of the total.

The Ontario Government offers a bounty on copper over 95 per cent pure metal, and on copper-sulphate produced from ore mined and refined in the Province. The text of the Act was quoted in the Annual Report on Mineral Production of Canada, 1914, p. 60.

Ontario: Production of Copper.

Year.	Pounds.	Value.	Year.	Pounds.	Value.	Year.	Pounds.	Value.
1886.....	165,000	$ 18,150	1897...	5,500,652	$ 621,023	1908.	15,005,171	$1,981,883
1887.....	322,524	36,284	1898...	8,375,223	1,007,539	1909.	15,746,699	2,044,237
1888.....	....	....	1899...	5,723,324	1,007,877	1910.	19,259,016	2,453,213
1889.....	1,466,752	201,678	1900...	6,740,058	1,091,215	1911.	17,932,263	2,219,297
1890.....	1,303,065	205,233	1901...	8,695,831	1,401,507	1912.	22,250,601	3,635,971
1891.....	4,127,697	531,234	1902...	7,408,202	861,278	1913.	25,885,929	3,952,522
1892.....	2,203,795	254,538	1903...	7,172,533	949,285	1914.	28,948,211	3,937,536
1893.....	3,641,504	391,461	1904...	4,913,594	630,070	1915.	39,361,464	6,799,693
1894.....	5,207,679	497,854	1905...	8,779,259	1,368,686	1916.	44,997,035	12,240,094
1895.....	4,576,337	492,414	1906...	10,638,231	2,050,838			
1896.....	3,167,256	344,598	1907...	14,104,337	2,821,432	Total	343,619,242	$56,048,640

British Columbia.

The total quantity of copper contained in matte, blister, and copper-sulphate produced in British Columbia in 1916, and including an estimate of smelter recovery for copper ores exported, was 63,642,550 pounds, after deducting the amount of copper produced from foreign ores.

The following table shows that the production in 1916 exceeded that of 1915 by over seven millions of pounds, an increase of 10·9 per cent. It was nearly double in quantity and over thrice in value that of 1908, when this department first collected returns of smelter production.

British Columbia: Production of Copper.

Year.	Pounds.	Value.	Year.	Pounds.	Value.
1908.....	37,041,115	$4,892,390	1913.....	45,791,579	$ 6,991,916
1909.....	35,658,952	4,629,245	1914.....	41,219,202	5,606,636
1910.....	35,270,006	4,492,693	1915.....	56,692,988	9,793,714
1911.....	35,279,558	4,366,198	1916.....	63,642,550	17,312,046
1912.....	50,526,656	8,256,561			
			Total.....	401,122,606	$66,339,399

Since 1909 the method of compilation of statistics of copper production by the Provincial Bureau of Mines of British Columbia, which is based upon ore shipments from mines, provides for a deduction of five pounds of copper per ton of ore shipped on account of smelter losses, a method which gives a result closely approximating that obtained by this Branch. Previous to 1909 no allowance for smelter losses was made.

British Columbia: Copper Content of Ores Shipped.†

Year.	Pounds.	Value.	Year.	Pounds.	Value.	Year.	Pounds.	Value.
1894.....	324,680	$ 31,039	1902....	29,636,057	$3,445,488	1910‡...	38,243,934	$4,871,512
1895.....	952,840	102,526	1903....	34,359,921	4,547,735	1911‡...	36,927,656	4,571,644
1896.....	3,818,556	415,459	1904....	35,710,128	4,579,110	1912‡...	51,546,537	8,408,513
1897.....	5,325,180	601,213	1905....	37,692,251	5,876,222	1913‡...	46,460,305	7,094,489
1898.....	7,271,678	874,783	1906....	42,990,488	8,287,706	1914‡...	45,009,699	6,121,319
1899.....	7,722,591	1,359,948	1907....	40,832,720	8,168,177	1915‡...	56,918,405	9,835,500
1900.....	9,977,080	1,615,289	1908....	47,274,614	6,244,031	1916‡...	65,379,364	17,784,494
1901.....	27,603,746	4,448,896	1909....	45,597,245	5,918,522			

† As published by the British Columbia Bureau of Mines.
‡Estimated recovery after making due allowance for smelter losses.

British Columbia: Production of Copper by Districts.†

(In pounds.)

	1910.	1911.	1912.	1913.	1914.	1915.	1916.
Cariboo—Omineca	.....	.....	.....	1,838	6,000	2,831,279	1,646,072
Cassiar—Skeena, etc.	.....	19,151	88,403	1,336	11,123,376	21,915,481	24,065,995
East Kootenay—							
Fort Steele	.....	.....	.....	.....	.....	.....	5,654
Windermere	.....	.....	.....	.....	.....	.....	3,400
West Kootenay—							
Nelson	231,936	.....	26,257	815,126	586,764	30,240	176,383
Trail creek	3,577,745	3,429,702	2,539,900	2,538,661	3,779,830	4,651,681	4,200,745
Yale—							
Boundary	31,354,985	22,327,359	33,372,199	28,621,973	16,428,959	17,402,662	17,626,623
Ashcroft and Kamloops	1,178	152,723	.....	29,505	14,525	295,164	636,594
Similkameen	.....	.....	.....	8,073	.....	21,701	182,633
Coast districts	3,078,090	10,998,721	15,429,778	14,443,793	13,070,245	9,770,197	16,835,265
Totals	38,243,934	36,927,656	51,456,537	46,460,305	45,009,699	56,918,405	65,379,364

† As published by British Columbia Bureau of Mines.

Copper mining is now by far the most important form of mining in the Province and in 1916 it formed about 57 per cent of the total value of the metalliferous mines.

In the Boundary the production was mainly from the mines of two of the large smelting companies: The Granby Consolidated Mining, Smelting & Power Co., Ltd., and the British Columbia Copper Co., Ltd.

These two companies operate their own smelters and convert their matte to blister copper. The low grade ores of this district are self-fluxing and very uniform in character, averaging a little over one per cent in copper, and from $1 to $2 in gold and silver.

The British Columbia Copper Company have been steadily developing their properties at Princess camp in the Similkameen, employing a large number of men. Some properties were producing during 1916 and we may look forward to the eventual establishment in that part of the country of another important copper producing centre.

Much development and some shipments are reported from the Ashcroft and Nicola divisions.

In the interior the main shippers were, at Rossland, the Centre Star and Le Roi groups, owned by the Consolidated Mining and Smelting Co., and the Le Roi II (Josie) mine. Besides these, shipments were made from the Nelson district by the Queen Victoria mine and a few other operators.

In the Kamloops division the Iron Mask mine is the only important shipper.

Much development work was done in the neighbourhood of New Hazelton in the Omineca mining division, and the Rocher Déboulé mine, after a couple of years of extensive development, has become an important producer.

There was noted in 1915 a large increase in the production of the Coast district which more than offset the falling off in the Boundary district. The increase was still more remarkable in 1916, and was due mostly to the Hidden Creek mines on Observatory Inlet, the Britannia mines on Howe Sound, and the Marble Bay mines on Texada Island.

Yukon.

The production from the Yukon Territory has been from the Whitehorse district. The mines in this district had been more or less idle for the past few years, but the high price of copper during 1916 was the cause of much activity. The production amounted to 2,807,096 pounds, valued at $763,586, as against 533,216 pounds, valued at $92,113 in 1915.

The principal shippers by order of importance were:—The Pueblo, operated by the Yukon Mining Co., the War Eagle, Grafter, Copper King, and Anaconda.

Yukon: Production of Copper.

Year.	Pounds.	Value.	Year.	Pounds.	Value.
1906 (and previous)	156,000	$ 23,400	1912	1,772,660	$ 289,670
1907	511,838	102,388	1913	1,843,530	281,489
1908	112,264	14,828	1914	1,367,050	185,946
1909	.....	.....	1915	533,216	92,113
1910	286,000	36,431	1916	2,807,096	763,586
1911	.....	.....			
			Total	9,389,654	$1,789,851

GOLD.

The production of gold in Canada in 1916 amounted to 930,492 fine ounces, valued at $19,234,976, and was made up as follows: (a) gold derived from alluvial workings, $4,964,831 or 25·8 per cent of the total; (b) gold obtained from the crushing of free milling quartz ores, i.e., stamp mill bullion, $10,480,661 or 54·5 per cent of the total; and (c) gold obtained from ores and concentrates sent to the copper and lead smelters, $3,789,484 or 19·7 per cent of the total production.

The production during 1915 was 918,056 fine ounces, valued at $18,977,901, and included: (a) gold derived from alluvial workings, $5,524,476 or 29 per cent of the total; (b) gold obtained from the crushing of free milling quartz ores, i.e., stamp mill bullion, $8,909,170 or 47 per cent; and (c) gold obtained from ores and concentrates sent to the copper and lead smelters, $4,544,245 or 24 per cent of the total production.

Annual Production of Gold in Canada, 1858–1916.

Year.	Fine ounces‡	Value.	Year.	Fine ounces‡	Value.	Year.	Fine ounces‡	Value.
1858.....	34,104	$ 705,000	1878....	74,420	$1,538,394	1898....	666,386	$13,775,420
1859.....	78,129	1,615,072	1879....	76,547	1,582,358	1899....	1,028,529	21,261,584
1860.....	107,806	2,228,543	1880....	63,121	1,304,824	1900....	1,350,057	27,908,153
1861.....	128,973	2,666,118	1881....	63,524	1,313,153	1901....	1,167,216	24,128,503
1862.....	135,391	2,798,774	1882....	60,288	1,246,268	1902....	1,032,161	21,336,667
1863.....	202,498	4,186,011	1883....	53,853	1,113,246	1903....	911,559	18,843,590
1864.....	199,605	4,126,199	1884....	51,202	1,058,439	1904....	796,374	16,462,517
1865.....	192,898	3,987,562	1885....	55,575	1,148,829	1905....	684,951	14,159,195
1866.....	152,555	3,153,597	1886....	70,782	1,463,196	1906....	556,415	11,502,120
1867.....	145,775	3,013,431	1887....	57,460	1,187,804	1907....	405,517	8,382,780
1868.....	134,169	2,773,527	1888....	53,145	1,098,610	1908....	476,112	9,842,105
1869.....	102,720	2,123,405	1889....	62,653	1,295,159	1909....	453,865	9,382,230
1870.....	83,415	1,724,348	1890....	55,620	1,149,776	1910....	493,707	10,205,835
1871.....	105,187	2,174,412	1891....	45,018	930,614	1911....	473,159	9,781,077
1872.....	90,283	1,866,321	1892....	43,905	907,601	1912....	611,885	12,648,794
1873.....	74,346	1,536,871	1893....	47,243	976,603	1913....	802,973	16,598,923
1874.....	97,856	2,022,862	1894....	54,600	1,128,688	1914....	773,178	15,983,007
1875.....	130,300	2,693,533	1895....	100,798	2,083,674	1915....	918,056	18,977,901
1876.....	97,729	2,020,233	1896....	133,262	2,754,774	1916....	930,492	19,234,976
1877.....	94,304	1,949,444	1897....	291,557	6,027,016	.....	.....	.....

‡Calculated from the value: one dollar = 0·048375 oz.

Gold was first discovered in various provinces about 1858, and the production gradually increased to over four million dollars in 1863, but fell again to $907,601 in 1892. The discovery of gold in the Yukon and other discoveries in 1896 gave the mining industry a new impetus, resulting in a rapid increase in the gold production, which, in 1900, reached the high mark of nearly twenty-eight million dollars. From this maximum it decreased again to a little over eight million dollars in 1907. With the discovery and development of the Porcupine mines in Ontario, gold production has rapidly increased again.

The Dominion Assay Office in Vancouver, operated in connexion with this Department, receives, assays, and purchases crude bullion, amalgam,

nuggets, and dust, the resultant bullion being resold. The total quantity of bullion thus received during the twelve months ending December 31, 1916, was 180,292·83 ounces, which, after melting was reduced to 175,393·10 ounces and valued at $2,828,239.65, after deducting office charges. The loss by melting was 2·718 per cent. The receipts were mostly from British Columbia and the Yukon, with also a few small deposits from Alaska and Alberta.

Receipts at Dominion Assay Office, Vancouver.

Year.	Weight before melting.	Weight after melting.	Net value.	Year.	Weight before melting.	Weight after melting.	Net value.
	ounces.	ounces.					
1908(*a*).....	90,175·48	89,117·76	$1,478,894.00	1913(*b*)....	111,479·94	109,920·49	$1,448,625.37
1909.....	48,478·58	47,576·27	789,267.94	1914.....	166,148·83	163,523·61	2,029,251.31
1910.....	46,064·31	45,228·92	746,101.92	1915.....	183,924·49	179,751·68	2,736,302.31
1911.....	39,784·70	39,069·31	647·416.38	1916.....	180,292·83	175,393·10	2,828,239.65
1912.....	59,068·82	57,951·98	974,077.14	.....	.....	.....	.....

(*a*) For 9 months only. (*b*) The removal of the assay charge in January 1913, accounts for the large increase.

Refined Metal.—There are two refineries producing fine gold in Canada; the Royal Mint at Ottawa, which receives shipments of gold from various provinces in the Dominion; and that of the Consolidated Mining and Smelting Co., of Canada, Ltd., at Trail, B.C., where gold is mainly recovered from the high grade silver-lead ores and the "dry" ores shipped to the smelter.

The production of gold by provinces is given in the following table in which it will be seen that Ontario, since the discovery of the Porcupine camp, has gradually increased its production, and to such an extent that in 1916 it produced 52·9 per cent of the total, as against 44·3 per cent in 1915, and 14·1 per cent in 1912, when Porcupine came into prominence.

Production of Gold by Provinces, 1914, 1915, and 1916.

	1914.		1915.		1916.	
	Fine ounces.‡	Value.	Fine ounces.‡	Value.	Fine ounces.‡	Value.
Nova Scotia.....	2,904	$ 60,031	6,636	$ 137,180	4,562	$ 94,305
Quebec.....	1,292	26,708	1,099	22,720	1,034	21,375
Ontario.....	268,264	5,545,509	406,577	8,404,693	492,481	10,180,485
Alberta.....	48	992	195	4,026	82	1,695
British Columbia (*a*)....	252,730	5,224,393	273,376	5,651,184	219,633	4,540,216
Yukon.....	247,940	5,125,374	230,173	4,758,098	212,700	4,396,900
Totals.....	773,178	15,983,007	918,056	18,977,901	930,492	19,234,979

‡Calculated from the value: one dollar = 0·048375 oz.

	1914.	1915.	1916.
(*a*)As follows: Gold from placer mining	$ 565,000	$ 770,000	$ 580,500
Gold from vein mining.....	4,659,393	4,881,184	3,959,716
	5,224,393	5,651,184	4,540,216

The exact value of fine gold is $\frac{20}{967}$ dollars per ounce equivalent to $20·671834. (United States Standard.) In most cases, statistics of gold production are stated as crude bullion with value thereof. The fine ounces given in the tables in this report are calculated from the values by multiplying these by $\frac{967}{20000}$ or 0·048375.

Exports and Imports.—The exports of gold in dust, nuggets, etc., during 1916 were valued at $18,382,903 as against $16,528,143 in 1915.

The imports during 1916 were: gold bullion, valued at $18,648,770; gold coins, $17,828,695; and manufactures of gold and silver, valued at $492,361; while in 1915 the imports were: gold bullion, valued at $1,028,405 gold coins, $19,910,229; and manufactures of gold and silver valued $464,294.

Nova Scotia.

The gold production of this Province, which is derived almost entirely from quartz ores, is reported by the Provincial Department of Mines in 1916 as 4,562 fine ounces, valued at $94,305, as compared with 6,636 fine ounces, valued at $137,180 in 1915, a decrease of 31 per cent. In 1915 there had been an increase of 128 per cent over the production of 1914.

The production of Nova Scotia which was 6,863 fine ounces in 1862, reached a maximum of 30,348 fine ounces in 1902; then decreased gradually, reaching in 1913 a minimum of 2,174 fine ounces. It is interesting to note that the production in 1915 is nearly identical to that of 1862, the first year returns were reported by the Provincial Mines Department.

Nova Scotia: Annual Production of Gold.

Year.	Tons treated.	Fine ounces.	Value.	Yield of gold per ton.	Year.	Tons treated.	Fine ounces.	Value.	Yield of gold per ton.
1862...	6,473	6,863	$141,871	$21.91	1890..	42,749	22,978	$474,990	$11.11
1863...	17,000	13,180	272,448	16.02	1891..	36,351	21,841	451,503	12.42
1864...	21,431	18,883	390,349	18.21	1892..	32,552	18,865	389,965	11.98
1865...	24,421	24,011	496,357	20.32	1893..	42,354	18,436	381,095	8.99
1866...	32,157	23,776	491,491	15.28	1894..	55,357	18,834	389,338	7.04
1867...	31,384	25,763	532,563	16.96	1895..	60,600	21,919	453,119	7.47
1868...	32,259	19,377	400,555	12.41	1896..	69,169	23,876	493,568	7.13
1869...	35,144	16,855	348,427	19.91	1897..	73,192	27,195	562,165	7.68
1870...	30,824	18,740	387,392	12.56	1898..	82,747	26,054	538,590	6.50
1871...	30,787	18,139	374,972	12.17	1899..	112,226	29,876	617,604	5.50
1872...	17,089	12,352	255,349	14.94	1900..	87,390	28,955	598,553	6.85
1873...	17,708	11,180	231,122	13.05	1901..	91,948	26,459	546,963	5.32
1874...	13,844	8,623	178,244	12.87	1902..	93,042	30,348	627,357	6.68
1875...	14,810	10,576	218,629	14.76	1903..	103,856	25,533	527,806	5.08
1876...	15,490	11,300	233,585	15.08	1904..	45,436	10,362	214,209	4.71
1877...	17,369	15,925	329,205	18.95	1905..	57,774	13,707	283,353	4.90
1878...	17,989	11,864	245,253	13.63	1906..	66,059	12,223	252,676	3.82
1879...	15,936	12,980	268,328	16.83	1907..	58,550	13,675	282,686	4.82
1880...	13,997	12,472	257,823	18.42	1908..	61,536	11,842	244,799	3.97
1881...	16,556	10,147	209,755	12.66	1909..	56,790	10,193	210,711	3.71
1882...	21,081	13,307	275,090	13.04	1910..	43,006	7,928	163,891	3.81
1883...	25,954	14,571	301,207	11.60	1911..	18,328	7,781	160,854	8.78
1884...	25,186	15,168	313,554	12.44	1912..	14,360	4,385	90,638	6.51
1885...	28,890	20,945	432,971	14.98	1913..	7,324	2,174	44,935	6.13
1886...	29,010	22,038	455,564	15.70	1914..	13,156	2,904	60,031	4.56
1887...	32,280	20,009	413,631	12.81	1915..	25,204	6,636	137,180	5.44
1888...	36,178	21,137	436,939	12.08	1916..	17,497	4,562	94,305	5.38
1889...	39,160	24,673	510,029	13.02					
					Total	2,180,820	904,395	$18,695,587	8.57

Nova Scotia: Production of Gold from 1862 to 1916.

District.	Tons crushed.	Total yield of gold.			Average yield of gold per ton.			Valued at $19 per ounce.
		ounces.	dwt.	grs.	ounces.	dwt.	grs.	
Brookfield(c)	93,627	38,748	13	2	.....	8	7	$ 736,224
Caribou & Moose River (a)	223,515	62,415	3	11	.....	5	14	1,185,888
Fifteen Mile stream (f)	36,878	17,363	0	5	.....	9	10	329,897
Lake Catcha	31,984	28,334	5	11	.....	17	17	538,351
Malaga Barrens (g)	23,028	20,422	8	6	.....	17	18	388,026
Montagu	30,191	43,575	12	8	1	8	21	827,937
Oldham	59,951	68,538	7	8	1	2	21	1,302,229
Rawdon (e)	12,189	9,606	5	10	.....	15	18	182,519
Renfrew	61,795	48,699	7	19	.....	15	18	925,289
Sherbrooke	340,823	157,333	21	3	.....	9	6	2,989,347
Stormont	529,687	123,422	18	4	.....	4	16	2,345,035
Salmon River (h)	118,819	41,852	5	20	.....	7	1	795,194
Tangier	70,098	29,561	5	5	.....	8	10	561,664
Uniacke (b)	63,351	43,983	1	17	.....	13	21	835,679
Waverley	155,556	69,986	8	16	.....	9	0	1,329,742
Whiteburn (d)	6,907	9,800	0	2	1	8	9	186,200
Wine Harbour	77,396	34,992	15	11	.....	9	1	664,863
Other districts	146,477	75,877	10	2	.....	10	9	1,441,672
West Gore	4,879	6,813	18	14	1	7	2	129,465
	2,087,151	931,327	8	6	.....	8	22	$17,695,221

(a) from 1869, (b) from 1868, (c) from 1883, (d) from 1887, (e) from 1882, (f) from 1887, (g) from 1883, (h) from 1905.

Quebec.

The gold production in Quebec during 1916 was 1,034 fine ounces, valued at $21,375, as against 1,099 fine ounces, valued at $22,720, in 1915.

This production is derived from the pyritic mines of the Eastern Townships, which are worked chiefly for the sulphur and copper contents of the ore. No alluvial production has been reported for a number of years.

Quebec: Annual Production of Gold.

Year.	Fine ounces.‡	Value.	Year.	Fine ounces.‡	Value.	Year.	Fine ounces.‡	Value.
1877	583	$ 12,057	1891	87	$ 1,800	1905	191	$ 3,940
1878	868	17,937	1892	628	12,987	1906	165	3,412
1879	1,160	23,972	1893	759	15,696	1907	.....	.....
1880	1,605	33,174	1894	1,412	29,196	1908	.....	.....
1881	2,741	56,661	1895	62	1,281	1909	193	3,990
1882	827	17,093	1896	145	3,000	1910	124	2,565
1883	860	17,787	1897	44	900	1911	613	12,672
1884	422	8,720	1898	295	6,089	1912	642	13,270
1885	103	2,120	1899	238	4,916	1913	701	14,491
1886	193	3,981	1900	.....	.....	1914	1,292	26,708
1887	78	1,604	1901	145	3,000	1915	1,099	22,720
1888	181	3,740	1902	391	8,073	1916	1,034	21,375
1889	58	1,207	1903	180	3,712			
1890	65	1,350	1904	140	2,900	Total	20,324	$400,096

Ontario.

The gold production in Ontario, which in 1913 had exceeded the total of all the other years since 1886, more than doubled that figure in 1916, amounting to 492,481 fine ounces, valued at $10,180,485, as against 406,577 fine ounces, valued at $8,404,693 in 1915, an increase of 21·1 per cent.

Ontario: Annual Production of Gold.

Year.	Fine ounces.‡	Value.	Year.	Fine ounces.‡	Value.	Year.	Fine ounces.‡	Value.
1887.....	327	$ 6,760	1897....	9,157	$189,294	1907....	3,212	$ 66,399
1888.....	.....	.....	1898....	12,863	265,889	1908....	3,212	66,389
1889.....	.....	.....	1899....	20,394	421,591	1909....	1,569	32,425
1890.....	.....	.....	1900....	14,391	297,495	1910....	3,089	63,849
1891.....	97	2,000	1901....	11,844	244,837	1911....	2,062	42,625
1892.....	344	7,118	1902....	11,118	229,828	1912....	86,523	1,788,596
1893.....	708	14,637	1903....	9,096	188,036	1913....	219,801	4,543,690
1894.....	1,917	39,624	1904....	1,935	40,000	1914....	268,264	5,545,509
1895.....	3,015	62,320	1905....	4,402	91,000	1915....	406,577	8,404,693
1896.....	5,563	115,000	1906....	3,202	66,193	1916....	492,481	10,180,485
						Total.....	1,597,163	33,016,282

‡Calculated from the value: one dollar = 0·048375 ounce.

The Porcupine district has since its development in 1912 been the main producer. Other producing districts were: Kirkland Lake and Munro township, in Timiskaming district; and Long Lake, near Naughton, Sudbury district.

Other districts besides Timiskaming and Sudbury, though not as yet arrived at the producing stage, have shown much activity during 1915 and 1916, and may soon become important centres.

The principal of these districts is the Kowkash district, Thunder Bay, which is reported on by Mr. P. E. Hopkins of the Ontario Bureau of Mines.[1]

Other gold discoveries were subsequently made in the surrounding district, the most important being at Tashota, 22 miles west of Kowkash, where gold and telluride were discovered.

In the Kenora district much interest has been caused by the report of rich gold findings on the Rognon property, near Wabigoon lake.

In the Boston Creek district, Timiskaming, the promising development work on several properties attracted many prospectors to the area and resulted in new discoveries in this district. The Provincial Bureau of Mines had a report made on this district, and published in 1916.[2]

Much prospecting and development have been done in the adjoining district of Goodfish lake.

The most spectacular find probably ever made was that of August, 1915, in Munro township, Timiskaming, on the Dobie-Leyson property, now called the Croesus Mine. Specimens from this property have been reported to run from 2,000 to 3,000 ounces in gold.

Since 1914, Ontario has become by far the largest producer of gold in Canada, and this remarkable increase was brought about by the successful development of the Porcupine district and by the extension of milling facilities in that camp.

[1] Bulletin No. 27 of the Ontario Bureau of Mines, on Kowkash gold area.
[2] Bulletin No. 29 of the Ontario Bureau of Mines, on Boston Creek and Goodfish Lake gold areas.

The principal producers in Ontario during 1916 were:—

Table of Operators.

Operator.	Mine.	District.
Canadian Exploration Co	Long Lake	Algoma.
Dome Mines Co., Ltd	Dome	Timiskaming:— Porcupine.
Dome Lake Mines, Ltd	Dome Lake	"
Consol. Gold Mines, Ltd	Hollinger	"
McIntyre Porcupine Mines, Ltd	McIntyre	"
Mines Leasing and Developing Co	Rea	"
Porcupine Crown Mines, Ltd	Porcupine Crown	"
Vipond Mines Co., Ltd	Porcupine Vipond	"
Wm. C. Offer et al	Porphyry Hill	"
Schumacher Gold Mines, Ltd	Schumacher	"
Tough Oakes Gold Mines, Ltd	Tough Oakes	Kirkland Lake.
Croesus Gold Mines, Ltd	Croesus	Munro.

The following notes are taken from the respective company's reports:—

The Dome Mines Co., Ltd.

"Record of Production for twelve months ending March 31, 1917:—

Tons of ore milled	459,530
Average value per ton	$5·083
Bullion recovered by amalgamation	$1,337,911
" " " cyanidation	$833,874
Per cent of value recovered by amalgamation	57·308
" " " " cyanidation	35·672
Total value recovered	$2,171,785
Average yield per ton	4·726
Per cent of value recovered	92·980

The completion of the plant extension has resulted in a modern installation with a milling capacity of 45,000 tons and a mining capacity of more than double that amount.

The conditions under which we are operating have been very bad, and gradually get worse month by month.

During our fiscal year, 1915-1916, the cost of producing an ounce of fine gold was $10.30. During our fiscal year, 1916-1917, the cost was $11.82; during the last five months of the above year the cost had risen to $12.64; during the months of March and April the cost had risen to $14.18.

The Dome is a long-lived mine with liberal ore bodies, which will be profitably mined for many years to come, and the labor shortage will eventually rectify itself.

Needless to add that the Dome Mine is essentially a low grade proposition.

Hollinger Consolidated Gold Mines, Ltd.

Year ending December 31, 1916:—

	Total.
Tons of ore milled	601,854
Average value per ton	$8·84
Total values sent to mill	$5,322,716.05
Average tons per day	1,649
Per cent of possible running time	91·1
Average tons per 24 hours of running time	1,810
Stamp duty tons per 24 hours of running time	16·7
Unrecovered values:—	
Concentrates stored for treatment (9,500 tons)	$ 7,367.00
Lost in filter tails	241,958.00
Total	$ 249,325.00
Values recovered	$5,073,401.05
Value per ton in tailings	$0.40
Lime consumed per ton of ore in pounds	2·113
Zinc " " " "	·405
Lead acetate " " " "	·0042
Tons of solution precipitated per ton of ore	2·224
Zinc added per ton of solution, pounds	·182
Average value of pregnant solution	$ 3.782

HOLLINGER GOLD MINES, LTD., AND ACME GOLD MINES, LTD.

Year.	Ore milled in tons.	Value recovered.	Dividends paid.
1911	1,000	$ 46,082.52	.....
1912	45,195	933,682.00	$ 270,000
1913	140,131	2,488,022.58	1,170,000
1914	211,846	2,719,354.47	1,170,000
1915	441,236	4,205,901.69	1,720,000
Total	840,128	$10,393,043.26	$4,330,000

HOLLINGER CONSOLIDATED GOLD MINES, LTD.

1916	601,854	5,073,401.05	3,126,000
Grand total	**1,441,982**	**$15,466,444.31**	**$7,456,000**

The dilution of ore with waste has the effect of lowering the value per ton of the mixture, although it increases the number of tons. Our experience, after five years of operations, has been that there is a dilution of approximately 10 per cent, and hence the present estimate of 3,938,540 tons at $8.68 per ton will, when milled, probably yield approximately 4,300,000 tons, averaging about $7.75 per ton.

During the year additions to the mill were completed and the tonnage treated per four weeks gradually increased from 43,000 tons to 50,000 tons.

McIntyre Porcupine Mines.

Year ending June 30, 1917, (15 months):—

Tons of ore milled	179,021
Average value	$9.82
Extraction per ton	$9.36
Tailing loss per ton	0·46
Gross value	$1,757,530.14
Bullion produced and by-products obtained	$1,676,982.39
Total loss in tails	$80,547.75
Per cent of extraction	95·4
Cost per ton of ore milled	$4.78
Profit " " "	$4.58
Per cent of possible running time	90·27

Operating results have been highly satisfactory, considering the handicaps under which, owing to its standard of value, the mining of gold is carried on while all other metals, due to conditions incidental to the great war, have materially advanced in value. Mine and milling costs have been low, notwithstanding the exceedingly high cost of supplies and labour and the natural disadvantages attendant upon gold mining under present conditions. The costs shown in the accompanying report include the total costs of operations, none of our development work being capitalized or deferred to future operations.

During the period 179,021 tons of the Company's ore were treated, yielding $1,676,982.39. In addition 16,286 tons were treated for subsidiary Companies, which yielded $187,931.89, or a total of 195,307 tons and $1,864,914.28 in bullion. Average value of all ore treated was $10.00 with a recovery of $9.55 per ton.

Previous to January 1st., 1917, production for McIntyre-Jupiter and McIntyre-Extension Mines are treated separately and since that date when amalgamation was effected their production is included in McIntyre-Porcupine figures.

While the amount of development work performed has not been up to our expectations, the results obtained are very satisfactory. After mining and treating ore of a value of $1,954,793.28, the ore reserves have been increased over 100%.

Porcupine Crown Mines, Limited.

Year ending December 31, 1916:—

	Total.
Tons of ore milled	51,273
Average value of heads	$11.78
" " "	.33
" " extraction	97·14%
Cost per ton of ore milled	$5.47
Gross value of production	$574,604.98
Mint charges	$2,952.48
Mine operation expense	$280,569.60
" " net profit	$291,082.90
Dividend paid in 1916	$240,000.00

The war tax amounts to about 3¼% on the running profits, and totalled in 1916, $11,169.49, and will amount to $9,627.58 in 1917. The ore reserves are estimated at 97,000 tons of a value of $1,050,000, as against 150,000 tons last year of a value of $1,250,000, but with an increased net profit of over $100,000.

Schumacher Gold Mines, Limited.

Year ending March 31, 1917, (nine months only):—

Tons of ore milled	35,271
Average value per ton	$5.243
Total value sent to mill	$184,919.82
Values recovered	$169,186.78
Average tons per day	128·25
" " " 24 hours running time	147·73
Per cent of time run	87·1

The total ore reserves amount to 99,425 tons with an estimated value of $674,240.

The new mill addition contracted for will increase our output to 180 tons a day and this added capacity should be available by July or August, 1917. If conditions warrant, the mill equipment by the end of the year can be so augmented as to provide a daily output of 300 tons.

Manitoba.

There was no production in Manitoba during 1916, but development work was carried on extensively in the Big Rice Lake district, east of Lake Winnipeg, and in the Pas district, Northern Manitoba.

About 85 miles northeast of Pas is Herb or Wekusko lake, where several companies are operating, the principal one, which made its first shipment early in 1917, being the Northern Manitoba Mining and Development Company.

A few miles southwest from Herb lake are the Flin Flon lake, where much development has been carried on by the Great Sulphides Gold Mines, Ltd.; and Schist lake near which operations are being carried on by the Mandy Mining Co., Ltd., a subsidiary company of the Tonopah Mining Company, and which has the distinction of being the first to ship from this new district early in 1917.

Mr. E. L. Bruce, of the Geological Survey, has been conducting an exploration of the Pas district for the past two years and reported last year as follows:—

Gold-bearing quartz veins have now been discovered in so many parts of the belt of basic rocks extending from Amisk lake (in Saskatchewan) to Wekusko lake (in Manitoba), that there seem to be good possibilities of finding gold in paying quantities. Careful examination requires time and work. This is especially true in the eastern part where the thick deposits of Lake Agassiz clays mantle the rock surfaces. All parts of the area are easily accessible by canoe travel, but thorough prospecting will demand examination of the country inland from the main routes, and attention concentrated on a few promising claims rather than dissipated over a large number.

A report on Rice Lake, Pas, and Star Lake districts, prepared by Dr. R. C. Wallace and Mr. J. S. Delury, acting for the Manitoba Public Utilities Commission, Winnipeg, was published early in 1917.

Saskatchewan.

In the autumn of 1913 considerable interest was created in the reported gold discoveries at Beaver lake (Amisk lake). A number of prospectors went in with the opening of navigation. A good deal of prospecting was done during 1914, and some further work in 1915, but as yet no production has been reported. Amisk lake is at the western end of the area being examined by Mr. Bruce and referred to under "Manitoba."

Alberta.

In past years there has been a small production of gold from the gravels of the Saskatchewan river. A recovery was reported for 1916 amounting to 82 ounces, valued at $1,695, as against 195 ounces, valued at $4,026, in 1915.

The operations are carried on by individuals, and the returns are necessarily incomplete.

Alberta: Annual Production of Gold.

Year.	Fine ounces.‡	Value.	Year.	Fine ounces.‡	Value.	Year.	Fine ounces.‡	Value.
1887.....	102	$ 2,100	1897....	2,419	$ 50,000	1907....	33	$ 675
1888.....	58	1,200	1898....	1,209	25,000	1908....	50	1,037
1889.....	967	20,000	1899....	726	15,000	1909....	25	525
1890.....	193	4,000	1900....	242	5,000	1910....	89	1,850
1891.....	266	5,500	1901....	726	15,000	1911....	10	207
1892.....	508	10,506	1902....	484	10,000	1912....	73	1,509
1893.....	466	9,640	1903....	48	1,000	1913....	.....	.....
1894.....	726	15,000	1904....	24	500	1914....	48	992
1895.....	2,419	50,000	1905....	121	2,500	1915....	195	4,026
1896.....	2,661	55,000	1906....	39	800	1916....	82	1,695
						Total.....	15,009	$310,262

‡Calculated from the value: one dollar = 0·048375 oz.

British Columbia.

The gold production of British Columbia in 1916 amounted to 219,633 fine ounces, valued at $4,540,216, and comprising: (a) placer gold $580,500 or 12·8 per cent of the total; (b) bullion from milling ores $290,088 or 6·4 per cent of the total; and (c) smelter recoveries $3,669,628 or 80·8 per cent.

In 1915 the production was 273,376 fine ounces, valued at $5,651,184 and comprising: (a) placer gold $770,000, or 13·6 per cent of the total; (b) bullion from milling ores $405,334, or 7·2 per cent of the total; and (c) smelter recoveries $4,475,850, or 79·3 per cent.

The total production in 1916 showed a decrease of nearly 20 per cent, and is accounted for by the following reasons: the shortage of water, the scarcity of men, and the very high cost of supplies. Under normal conditions these detrimental causes will be obviated and a much larger production will result therefrom.

British Columbia: Annual Production of Gold.

Year.	Fine ounces.‡	Value.	Year.	Fine ounces.‡	Value.	Year.	Fine ounces.‡	Value.
1858.....	34,104	$ 705,000	1878....	61,688	$1,275,204	1898...	142,215	$2,939,852
1859.....	78,129	1,615,072	1879....	62,407	1,290,058	1899...	203,295	4,202,473
1860.....	107,806	2,228,543	1880....	49,044	1,013,827	1900...	228,916	4,732,105
1861.....	128,973	2,666,118	1881....	50,636	1,046,737	1901...	257,292	5,318,703
1862.....	128,528	2,656,903	1882....	46,154	954,085	1902 ..	288,383	5,961,409
1863.....	189,318	3,913,563	1883....	38,422	794,252	1903...	284,108	5,873,036
1864.....	180,722	3,735,850	1884....	35,612	736,165	1904...	275,975	5,704,908
1865.....	168,887	3,491,205	1885....	34,527	713,738	1905...	285,529	5,902,402
1866.....	128,779	2,662,106	1886....	43,714	903,651	1906...	269,886	5,579,039
1867.....	120,012	2,480,868	1887....	33,558	693,709	1907...	236,216	4,883,020
1868.....	114,792	2,372,972	1888....	29,834	616,731	1908...	286,858	5,929,880
1869.....	85,865	1,774,978	1889....	28,489	588,923	1909...	250,320	5,174,579
1870.....	64,675	1,336,956	1890....	23,918	494,436	1910...	261,386	5,403,318
1871.....	87,048	1,799,440	1891....	20,792	429,811	1911...	238,496	4,930,145
1872.....	77,931	1,610,972	1892....	19,327	399,525	1912...	251,815	5,205,485
1873.....	63,166	1,305,749	1893....	18,360	379,535	1913...	297,459	6,149,027
1874.....	89,233	1,844,618	1894....	25,664	530,530	1914...	252,730	5,224,393
1875.....	119,724	2,474,904	1895....	61,289	1,266,954	1915...	273,376	5,651,184
1876.....	86,429	1,786,648	1896....	86,504	1,788,206	1916...	219,633	4,540,216
1877.....	77,796	1,608,182	1897....	131,805	2,724,657	Total..	7,836,549	$162,016,555

‡Calculated from the value: one dollar = 0·048375 oz.

The statistics of lode gold represented, as closely as can be ascertained, the actual gold recovery based on smelter recoveries and bullion shipments.

The record of production of placer gold is given as ascertained by the Provincial Mineralogist, who, in his Annual Report states that:—

Great difficulty is found in obtaining reliable figures, since the work is, in many cases, carried out by individuals or unorganized groups of men who keep no books, frequently paying wages, or for supplies, in gold-dust, which, being readily transported, is scattered, and the tax imposed thereon by law is thus evaded.

The production of gold from lode mining as reported by the Provincial Bureau of Mines being based upon metal contents of ore shipments is naturally somewhat higher than the record of smelter recoveries.

British Columbia: Production of Gold by Districts, 1916.*

Districts.	Gold placer.		Gold lode.	
	Ounces.	Value.	Ounces.	Value.
Cariboo:—				
Cariboo	7,900	$ 158,000	.....	.....
Quesnel	1,000	20,000	.....	.....
Omineca	850	17,000	1,303	$ 26,933
Cassiar:—				
Atlin	16,925	338,500	736	15,213
All others	1,100	22,000	3,806	78,670
East Kootenay:—				
Fort Steele	200	4,000	.....	.....
West Kootenay:—				
Ainsworth	.....	.....	45	930
Nelson	50	1,000	4,107	84,891
Slocan	.....	.....	64	1,323
Trail creek	.....	.....	129,790	2,682,759
Others	50	1,000	22	455
Lillooet:—				
Lillooet	250	5,000	2,625	54,259
Yale:—				
Grand Forks, Greenwood and Osoyoos	50	1,000	75,628	1,563,231
Similkameen, Nicola, and Vernon	450	9,000	32	661
Yale, Ashcroft and Kamloops	150	3,000	570	11,782
Coast	50	1,000	3,204	66,227
Total	29,025	$ 580,500	221,932	$ 4,587,334

*From Annual Report of the Minister of Mines for British Columbia.

Yukon.

The gold production of the Yukon in 1916 amounted to 212,700 ounces valued at $4,396,900, and includes 690 ounces valued at $14,264, derived from lode mining. It showed a decrease of nearly 8 per cent on the production for 1915.

The placer production of the Yukon in 1916 is estimated at 212,010 fine ounces of gold, valued at $4,382,636, and 47,703 fine ounces of silver, valued at $31,322, making a total valuation of $4,413,958.

The placer production of the Yukon in 1915 was estimated at 229,803 fine ounces of gold, valued at $4,750,450, and 51,706 fine ounces of silver, valued at $25,689, making the total valuation of the Yukon placer output $4,776,139.

Annual Production of Gold in Yukon.

Year.	Fine ounces.‡	Value.	Year.	Fine ounces.‡	Value.	Year.	Fine ounces.‡	Value.
1885\			1896..	14,513	$ 300,000	1907..	152,381	$ 3,150,000
1886/ ..	4,837	$ 100,000	1897..	120,937	2,500,000	1908..	174,150	3,600,000
1887 ...	3,386	70,000	1898..	483,750	10,000.000	1909..	191,565	3,960,000
1888 ...	1,935	40,000	1899..	774,000	16,000,000	1910*.	221,091	4,570,362
1889 ...	8,466	175,000	1900..	1,077,553	22,275,000	1911*.	224,197	4,634,574
1890 ...	8,466	175,000	1901..	870,750	18,000,000	1912*.	268,447	5,549,296
1891 ...	1,935	40,000	1902..	701,437	14,500,000	1913*.	282,838	5,846,780
1892 ...	4,233	87,500	1903..	592,594	12,250,000	1914*.	247,940	5,125,374
1893 ...	8,514	176,000	1904..	507,938	10,500,000	1915*.	230,173	4,758,098
1894 ...	6,047	125,000	1905..	381,001	7,876,000	1916*.	212,700	4,396,900
1895 ...	12,094	250,000	1906..	270,900	5,600,000			
						Total.	8,060,768	$166,630,884

‡Calculated from the value: one dollar = 0·048375 oz.
*Including a small production from lode mines.

The statistics of production of gold in the Yukon district during the years between 1898 and 1906, as given in the table showing the annual production, are based primarily on the receipts of gold at the United States mints and receiving offices credited to the Canadian Yukon. Although a royalty was exacted on the gold output, it seems certain that considerable amounts of gold were produced which escaped royalty payment especially during the years of high production.

Since 1906 the statistics of gold production of the Yukon have been based on the royalty of 2½ per cent which is collected by the Interior Department. For the purpose of collecting the royalty, a fixed value of $15 per ounce is placed on the crude gold. The actual value of the deposits for a number of years, has been about $16.50 per ounce. At the Dominion Government Assay Office at Vancouver, B.C., there were deposited during the twelve months ending December 31, 1916, 95,005·82 ounces from the Yukon, valued, after all the charges had been deducted, at $1,525,723.55, showing an average of $16.06 per ounce, as against 87,040·87 ounces, valued at $1,418,496.63, or an average of $16.28 per ounce in 1915.

Receipts from the Yukon, at the Dominion Government Assay Office, Vancouver, B.C.

Year.	Weight before melting.	Net value.	Average value.	Year.	Weight before melting.	Net value.	Average value.
	Ounces.				Ounces.		
1908 (*a*).....	60,132·00	$1,000,296	$16.63	1913 (*b*)...	15,235·29	$ 247,189	$16.22
1909.....	5,003·12	83,871	16.75	1914.....	56,564·83	915,914	16.21
1910.....	3,594·87	62,094	17.27	1915.....	87,040·87	1,418,497	16.28
1911.....	2,073·61	34,994	16.88	1916.....	95,005·82	1,525,724	16.06
1912.....	2,211·88	36,481	16.41				

(*a*) For nine months only.
(*b*) The removal in 1913 of the assay charge accounts for the great increase.

The production of crude placer gold in the Yukon during the past six years, as ascertained by the Interior Department, and upon which a royalty of 2½ per cent has been collected, is shown in the accompanying table:—

Production of Crude Gold in the Yukon District.

(Gross weight of dust, nuggets, and bullion in ounces.)

Month.	1911.	1912.	1913.	1914.	1915.	1916.
January.....	.....	5·25	19·30	136·50	520·69	3,116·18
February.....	435·66	525·29	56·90	325·50	·40	566·62
March.....	13·30	0·50	.....	6·75	232·13	1,574·82
April.....	.....	.....	1,293·69	1,572·65	277·84	859·56
May.....	16,719·16	26,158·66	5,557·35	11,668·10	17,553·29	13,099·13
June.....	38,499·39	54,243·03	67,594·39	67,604·85	57,884·87	38,292·47
July.....	42,783·38	58,283·29	57,873·50	45,067·31	49,478·87	35,598·34
August.....	47,677·49	56,975·55	63,315·92	49,458·17	41,015·41	47,980·26
September.....	48,383·63	53,225·29	58,641·62	62,744·69	47,055·83	45,883·90
October.....	58,690·82	66,518·01	66,798·37	63,365·22	59,984·89	62,927·73
November.....	11,097·51	11,648·08	26,565·50	4,308·00	7,248·17	13,168·23
December.....	13,130·63	7,432·72	5,183·50	3,433·43	6,001·77	1,944·64
	277,430·97	335,015·67	352,900·04	309,691·17	287,254·16	265,013·88

Since 1898 a royalty to the extent of $4,476,209.67 has been collected on the gold production of this district. The yearly amounts collected, as well as the annual production of gold as ascertained by the Interior Department, are shown in the accompanying table. The difference between these figures and those shown in the table of annual production of the district which are based on mint receipts of Yukon gold, has already been mentioned, and is probably due to three factors: (1) the fixing of the value of the gold for royalty purposes at $15 per ounce, a figure probably slightly below the actual value of the gold, (2) the probability that in the earlier years of royalty collection, considerable quantities of gold-dust left the camps unrecorded and escaped royalty payments, and (3) the fact that in the last few years there has been a small but growing production from the lode mines.

Gold Production in the Yukon, the Royalty Collected.‡

Fiscal Year.	Total gold production.	Total exemption.	Royalty collected on.	Royalty paid.
Ending June, 1898	$ 3,072,773	$ 339,845	$ 2,732,928	$273,292.82
" " 1899	7,582,283	1,699,657	5,882,626	588,262.37
" " 1900	9,809,465	2,501,744	7,307,720	730,771.99
" " 1901	9,162,083	1,927,666	7,234,416	592,660.98
" " 1902	9,566,340	1,199,114	8,367,226	331,436.79
" " 1903	12,113,015	.....	12,113,015	302,893.48
" " 1904	10,790,663	.....	10,790,663	272,217.96
" " 1905	8,222,054	.....	8,222,054	206,760.87
" " 1906	6,540,007	.....	6,540,007	163,963.25
" March 1907	3,304,791	.....	3,304,791	82,622.42
" " 1908	2,820,162	.....	2,820,162	70,504.65
" " 1909	3,260,283	.....	3,260,282	81,507.07
" " 1910	3,594,251	.....	3,594,251	89,844.10
" " 1911	4,126,728	.....	4,126,728	103,168.19
" " 1912	4,024,237	.....	4,024,237	100,606.29
" " 1913	5,018,412	.....	5,018,412	125,460.52
" " 1914	5,301,508	.....	5,301,508	132,537.69
" " 1915	4,649,634	.....	4,649,634	116,241.04
" " 1916	4,458,278	.....	4,458,278	111,457.19
Total	$117,416,966	.....	$109,748,939	$4,476,209.67

‡From the Report of the Yukon and Mining Lands Branch of the Department of the Interior, Fiscal Year ending March 31, 1916, p. 53.

LEAD.

The production of lead in Canada in 1916 amounted to 41,497,615 pounds valued at $3,532,692, as compared with 46,316,450 pounds valued at $2,593,721 in 1915, a decrease of 10·4 per cent in quantity, but an increase of 40·0 per cent in value.

The statistics of lead production since 1909 as given in the accompanying table represent the quantity of refined lead produced in Canada from domestic ores, together with a small quantity of lead contained in lead ores or bullion exported. The production has been mainly from British Columbia with occasional small amounts from other provinces and the Yukon Territory.

Annual Production of Lead.

Year.	Pounds.	Cents per pound.	Value.	Year.	Pounds.	Cents per pound.	Value.
1887.....	204,800	5·400	$ 9,216	1902.....	22,956,381	4·069	$ 934,095
1888.....	674,500	4·420	29,812	1903.....	18,139,283	4·237	768,562
1889.....	165,100	3·930	6,488	1904.....	37,531,244	4·309	1,617,221
1890.....	105,000	4·480	4,704	1905.....	56,864,915	4·707	2,676,632
1891.....	88,665	4·350	3.857	1906.....	54,608,217	5·657	3,089,187
1892.....	808,420	4·090	33,064	1907.....	47,738,703	5·325	2,542,086
1893.....	2,135,023	3·730	79,636	1908.....	43,195,733	4·200	1,814,221
1894.....	5,703,222	3·290	187,636	1909.....	45,857,424	*3·690	1,692,139
1895.....	16,461,794	3·230	531,716	1910.....	32,987,508	*3·687	1,216,249
1896.....	24,199,977	2·980	721,159	1911.....	23,784,969	†3·480	827,717
1897.....	39,018,219	3·580	1,396,853	1912.....	35,763,476	†4·467	1,597,554
1898.....	31,915,319	3·780	1,206,399	1913.....	37,662,703	†4·659	1,754,705
1899.....	21,862,436	4·470	977,250	1914.....	36,337,765	†4·479	1,627,568
1900.....	63,169,821	4·370	2,760,521	1915.....	46,316,450	†5·600	2,593,721
1901.....	51,900,958	4·334	2,249,387	1916.....	41,497,615	†8·513	3,532,692

*In 1909 and 1910, average prices at Toronto as quoted by *Hardware and Metal*, in previous years average prices at New York, as quoted by *Engineering and Mining Journal*.

†Average price at Montreal. Quotations furnished by Messrs. Thos. Robertson & Co., Montreal, Que.

For a number of years there has been a very wide divergence between the record of lead recovery and the statements of lead contained in ores shipped from the mines. While the difference is due in part to smelter losses, there was also, during 1912 and 1913 especially, a considerable accumulation of lead ores at the Trail smelter. In 1915, however, the recovery of lead in smelters was but little less than that contained in ores shipped from mines, apparently indicating a reduction in stocks of ores at the smelter, but in 1916 the metal contents of lead ores shipped from mines exceeded by far the recovery in smelter.

Ores Shipped and Metal Contents.

Year.	Lead ores shipped in tons.	Lead contents in pounds.	Silver contents in ounces.
1912	59,814	45,896,537	2,366,294
1913	85,978	53,807,570	2,564,155
1914	70,207	50,527,130	2,501,820
1915	88,647	48,708,005	2,954,175
1916	84,516	54,124,628	2,582,952

Previous to 1904 lead ores mined in Canada were either exported as ore or smelted in Canadian furnaces and exported in the form of base bullion to be refined abroad. A lead refinery employing the Betts electrolytic process has been in operation at Trail, B.C., since 1904, treating the base bullion produced by the lead blast furnaces.

The North American Smelting Company erected a plant at Kingston, Ontario, which started operations during the latter part of 1912, treating scrap and lead dross, as well as ores from the United States, British Columbia, and Ontario. This plant closed down November 1, 1913, but operations were resumed during the latter part of 1916 by the Kingston Smelting Co., Ltd., under lease.

The Estate of James Robertson, operating the Kingdon Lead Mine at Galetta, put in a 20-ton open-hearth lead furnace which was operated in October and November, 1916.

Refined Lead Produced.

Year.	Pounds of refined lead produced.	Year.	Pounds of refined lead produced.	Year.	Pounds of refined lead produced.
1904	7,519,440	1909	41,883,614	1913	39,663,766
1905	15,804,509	1910	32,987,508	1914	36,443,706
1906	20,471,314	1911	23,525,050	1915	43,518,618
1907	26,607,461	1912	37,008,490	1916	43,100,236
1908	36,549,274				

*The refined lead reported includes also that from foreign ores.

Prices.—The average price for soft lead in 1916 on the London market was £30 19s 6d, as compared with £22 17s 10d in 1915, and £18 13s 9d in 1914.

The price of lead at Montreal, the main Canadian market, has been higher than the New York and London values for the past four years. The average price of lead at Montreal in 1916 was 8·513 cents per pound, as against 6·858 cents in New York, 6·777 cents in St. Louis, and 6·715 cents in London. In 1915 the Montreal price was 5·600 cents per pound, as against 4·673 cents in New York, 4·567 cents in St. Louis, and 4·979 cents in London.

The Toronto price in winter is about the same as that at Montreal, but the latter falls during the period of summer freight rates, about 10 cents per 100 pounds below the former.

Yearly Average Prices of Lead in Montreal, London, New York, and St. Louis.

(Values in cents per pound.)

	1910.	1911.	1912.	1913.	1914.	1915.	1916.
Montreal	3·246	3·480	4·467	4·659	4·479	5·600	8·513
London	2·775	2·992	3·921	4·072	4·146	4·979	6·715
New York	4·446	4·420	4·471	4·370	3·862	4·673	6·858
St. Louis	4·312	4·286	4·360	4·238	3·737	4·567	6·777

Monthly Average Prices of Pig-Lead at Montreal.*

(Values in cents per pound.)

Month.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.
January	4·94	3·67	3·35	3·48	3·31	3·93	4·32	4·78	4·27	7·29
February	4·88	3·60	3·38	3·40	3·32	3·97	4·18	4·73	4·58	7·73
March	4·92	3·54	3·42	3·34	3·34	4·03	4·05	4·57	5·04	9·25
April	4·92	3·44	3·35	3·21	3·26	4·10	4·42	4·41	5·21	9·60
May	4·84	3·21	3·26	3·13	3·20	4·08	4·66	4·54	5·26	9·10
June	4·93	3·11	3·23	3·15	3·27	4·34	4·98	4·55	6·53	8·48
July	4·98	3·17	3·12	3·13	3·33	4·57	4·93	4·49	6·35	7·79
August	4·69	3·31	3·08	3·11	3·45	4·84	5·02	4·48	5·62	7·76
September	4·85	3·24	3·14	3·11	3·63	5·47	5·02	4·42	5·63	8·41
October	4·56	3·29	3·26	3·23	3·77	5·07	4·99	4·07	5·71	8·61
November	4·25	3·42	3·28	3·31	3·93	4·53	4·82	4·29	6·39	8·72
December	3·65	3·37	3·34	3·35	3·95	4·55	4·52	4·41	6·61	9·42
Average	4·701	3·364	3·268	3·246	3·480	4·467	4·659	4·479	5·600	8·513

*Producers' prices for car-load quantities ex-cars Montreal as furnished by Messrs. Thos. Robertson Co., Ltd., of Montreal.

Monthly Average Prices of Lead in New York.†

(Values in cents per pound.)

Month.	1905.	1906.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.
January	4·552	5·600	6·000	3·691	4·175	4·700	4·483	4·435	4·321	4·111	3·729	5·921
February	4·450	5·465	6·000	3·725	4·018	4·613	4·440	4·026	4·325	4·048	3·827	6·246
March	4·470	5·350	6·000	3·838	3·986	4·459	4·394	4·073	4·327	3·970	4·053	7·136
April	4·500	5·404	6·000	3·993	4·168	4·376	4·412	4·200	4·381	3·810	4·221	7·630
May	4·500	5·685	6·000	4·253	4·287	4·315	4·373	4·194	4·342	3·900	4·274	7·463
June	4·500	5·750	5·760	4·466	4·350	4·343	4·435	4·392	4·325	3·900	5·932	6·936
July	4·524	5·750	5·288	4·447	4·321	4·404	4·499	4·720	4·353	3·891	5·659	6·352
August	4·665	5·750	5·250	4·580	4·363	4·400	4·500	4·569	4·624	3·875	4·656	6·244
September	4·850	5·750	4·813	4·515	4·342	4·400	4·485	5·048	4·698	3·828	4·610	6·810
October	4·850	5·750	4·750	4·351	4·341	4·400	4·265	5·071	4·402	3·528	4·600	7·000
November	5·200	5·750	4·376	4·330	4·370	4·442	4·298	4·615	4·293	3·683	5·155	7·042
December	5·422	5·900	3·658	4·213	4·560	4·500	4·450	4·303	4·047	3·800	5·355	7·513
Average	4·707	5·657	5·325	4·200	4·273	4·446	4·420	4·471	4·370	3·862	4·673	6·858

†From the *Engineering and Mining Journal.*

Monthly Average Prices of Lead in London.‡

(In £ Sterling per ton of 2,240 pounds.)

Month.	1907.	1908.	1909.	1910.	1911.
January	19 16 0	14 10 6	13 3 6	13 3 11	13 0 8
February	19 11 8	14 5 6	13 5 5	13 7 3	13 1 11
March	19 14 6	14 1 4	13 8 8½	13 2 9	13 2 11
April	19 16 7	13 13 10	13 7 0	12 13 9	12 18 5
May	19 17 7	13 2 7	13 5 3	12 11 8	12 19 2
June	20 6 0	12 15 7	13 2 4	12 13 9	13 5 5
July	20 8 2	12 19 6	12 13 3	12 11 8	13 10 11
August	19 0 3	13 9 10½	12 10 6	12 10 10	14 1 4
September	19 17 6	13 3 6	12 15 3	12 12 6	14 15 1
October	18 13 0	13 7 3	13 4 4	13 2 0	15 6 1
November	17 4 11	13 12 2	13 1 4½	13 4 6	15 15 5
December	14 9 4	13 3 6	13 2 11½	13 3 9	15 13 4
Yearly average	19 1 10	13 10 5	13 1 8	12 19 0	13 19 3

Month.	1912.	1913.	1914.	1915.	1916.
January	15 11 3	17 1 11	18 19 10	18 12 0	30 17 5
February	15 13 9	16 8 5	19 2 8	19 3 7	31 18 9
March	15 19 8	15 19 8	19 2 3	21 17 8	34 7 8
April	16 6 6	17 8 10	17 19 8	21 2 1	34 8 0
May	16 10 2	18 14 3	18 4 8	20 9 2	32 19 5
June	17 11 8	19 10 8	18 13 11	25 4 1	30 14 0
July	18 8 9	19 7 10	18 8 6	24 12 3	27 8 11
August	19 5 8	19 15 8	20 9 9	21 18 11	29 2 7
September	21 9 0	19 14 10	18 16 3	23 3 0	29 17 4
October	20 8 0	19 9 5	17 9 8	23 19 9	30 0 0
November	18 4 7	18 13 9	17 19 9	26 2 9	30 0 0
December	18 1 6	17 8 8	18 18 6	28 8 8	30 0 0
Yearly average	17 15 11	18 6 2	18 13 9	22 17 10	30 19 6

‡As published by the Metal Information Bureau, London.

Exports.—The exports of lead in 1916 amounted to 9,160,500 pounds, valued at $565,890, and consisted of pig-lead 112,100 pounds, valued at $7,710, and lead in ores, concentrates, bullion, etc., 9,048,400 pounds, valued at $558,180. A few thousand tons of base bullion were exported from Trail, B.C., for refining in the United States, which fact explains the large increase in exports for 1916.

The exports in 1915 amounted to 3,912,029 pounds, valued at $119,340, and consisted of pig-lead 2,066,929 pounds, valued at $79,067, and lead in ore, concentrates, etc., 1,845,100 pounds, valued at $40,273.

Exports of Lead, 1910 to 1916.

	Lead in ore, concentrates, etc.		Pig-lead.	
	Pounds.	Value.	Pounds.	Value.
1910—To United States	46,800	$ 1,308	59,605	$ 2,295
" " Other countries	.....	.....	7,652,648	245,879
1911— " United States	65,100	1,826	71,961	2,806
1912— " " "	299,240	8,193	.....	.....
1913— " " "	329,960	9,136	.....	.....
1914— " " "	246,100	2,681	510,573	19,507
1915— " " "	1,845,100	40,273	47,540	1,494
" " Newfoundland	.....	.....	1,600	40
" " Other countries	.....	.....	2,017,789	77,533
1916— " United States	9,048,400	558,180	7,500	300
" " Other countries	.....	.....	104,600	7,410
Total for 1916	9,048,400	$558,180	112,100	$7,710

Exports of Lead, 1873 to 1916.

Year.	Pounds.	Value.	Year.	Pounds.	Value.	Year.	Pounds.	Value.
1873	.....	$1,993	1888	.....	$ 18	1903	18,624,303	$ 426,466
1874	.....	127	1889	.....	18	1904	25,868,823	559,461
1875	.....	7,510	1890	.....	.....	1905	41,657,403	1,046,541
1876	.....	66	1891	.....	5,000	1906	21,436,022	736,007
1877	.....	720	1892	.....	2,509	1907	25,591,883	1,029,898
1878	.....	.....	1893	.....	3,099	1908	18,454,594	622,454
1879	.....	230	1894	5,792,700	144,509	1909	17,528,028	493,642
1880	.....	.....	1895	23,075,892	435,071	1910	7,759,053	249,482
1881	.....	.....	1896	26,480,320	462,095	1911	137,061	4,632
1882	.....	32	1897	43,802,697	925,144	1912	299,240	8,193
1883	.....	5	1898	37,375,678	885,485	1913	329,960	9,136
1884	.....	36	1899	15,799,518	466,950	1914	756,673	22,188
1885	.....	.....	1900	57,642,029	1,917,690	1915	3,912,029	119,340
1886	.....	.....	1901	45,590,995	1,804,687	1916	9,160,500	565,890
1887	.....	724	1902	17,761,484	457,170			

Imports.—The imports of lead in 1916 were 13,580 tons, valued at $2,077,896, and included certain manufactures of lead, valued at $155,278, for which no equivalent quantity is given.

In 1915 the imports were 24,369 tons, valued at $2,482,916, and included manufactures of lead valued at $102,439.

Imports of Lead, 1914, 1915, and 1916.

	1914.		1915.		1916.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
Old scrap, pig and block	7,722	$590,557	21,308	$2,010,006	9,933	$1,258,284
Bars and sheets	481	41,244	456	56,331	492	85,686
Pipe	283	26,282	73	8,708	109	21,450
Shots and bullets	90	10,542	543	51,890	39	6,390
Manufactures of lead (*a*)	.....	99,285	.....	102,439	.....	155,278
Tea lead	844	108,097	480	67,652	1,073	198,541
Litharge	543	52,525	790	89,232	1,384	211,359
Total	9,963	928,532	23,650	2,386,258	13,030	1,936,988
Metallic lead contained in imported lead pigments	961	114,006	719	96,658	550	140,908
	10,924	1,042,538	24,369	2,482,916	13,580	2,077,896

(*a*) Includes nitrate and acetate of lead in 1915, 250,921 pounds valued at $23,269 and in 1916, 224,648 pounds valued at $30,445.

Imports of Lead in Pigs, Bars, Sheets, Etc.

Fiscal Year.	Old scrap, and pig.		Average price.	Bars, blocks, sheets.		Average price.	Total.	
	Cwt.	Value.		Cwt.	Value		Cwt.	Value.
1880							30,298	$124,117
1881	16,236	$ 56,919	$3.51	18,222	$70,744	$3.88	34,458	127,663
1882	36,655	120,870	3.30	10,540	35,728	3.39	47,195	156,598
1883	48,680	148,759	3.06	8,591	28,785	3.35	57,371	177,544
1884	39,409	103,413	2.62	9,704	28,458	2.93	49,113	131,871
1885	36,106	87,038	2.41	9,362	24,396	2.61	45,468	111,434
1886	39,945	110,947	2.78	9,793	28,948	2.96	49,738	139,895
1887	61,160	173,477	2.84	14,153	41,746	2.95	75,313	215,223
1888	68,678	196,845	2.87	14,957	45,900	3.06	83,635	242,745
1889	74,223	213,132	2.87	14,173	43,482	3.07	88,396	256,614
1890	101,197	283,096	2.80	19,083	59,484	3.12	120,280	342,580
1891	86,382	243,033	2.81	15,646	48,220	3.08	102,028	291,253
1892	97,375	254,384	2.61	11,299	32,368	2.86	108,674	286,752
1893	94,485	215,521	2.28	12,403	32,286	2.60	106,888	247,807
1894	70,223	149,440	2.13	8,486	20,451	2.41	78,709	169,891
1895	67,261	139,290	2.07	6,739	16,315	2.42	74,000	155,605
1896	72,433	173,162	2.39	8,575	23,169	2.70	81,008	196,331
1897	65,279	158,381	2.43	10,516	29,175	2.77	75,795	187,556
	Old, scrap, pig, and block.*			Bars, and sheets.†			Total.	
1898	88,420	$ 260,779	$2.95	22,214	$39,041	$1.76	110,634	$299,820
1899	114,659	283,432	2.47	44,796	39,833	0.89	159,455	323,265
1900	62,361	207,819	3.33	15,493	53,506	3.45	77,854	251,325
1901	(a) 85,321	97,011	1.14	16,295	78,316	4.81	101,616	175,327
1902	(a) 122,279	104,672	0.86	18,596	49,261	2.65	140,875	153,933
1903	(a) 98,530	67,821	0.69	11,535	35,398	3.07	110,065	103,219
1904	(a) 94,602	121,165	1.28	14,102	39,644	2.81	108,704	160,809
1905	(a) 57,074	133,775	2.34	17,792	51,972	2.92	74,866	185,747
1906	82,729	271,105	3.28	16,106	57,185	3.55	98,835	328,290
Calendar Year.								
1907	79,673	363,655	4.56	19,177	86,338	4.50	98,850	449,993
1908	49,825	155,513	3.12	14,402	49,527	3.44	64,227	205,040
1909	112,980	184,572	1.63	13,412	44,071	3.29	126,392	228,645
1910	120,591	346,516	2.87	17,697	45,674	2.58	138,288	392,190
1911	199,774	495,923	2.48	30,837	55,458	1.80	230,611	551,381
1912	281,787	940,583	3.34	19,212	93,702	4.88	300,999	1,034,285
1913	111,995	464,117	4.14	14,944	62,527	4.18	126,939	526,644
1914	154,441	590,557	3.82	9,615	41,244	4.29	164,056	631,801
1915	426,162	2,010,006	4.72	9,125	56,331	6.17	435,287	2,066,337
1916	198,658	1,258,284	6.33	9,850	85,686	8.70	208,508	1,343,970

*Duty 15 per cent.
†Duty 25 per cent.
(a) Includes Canadian lead ore sent to the United States for refining, imported at price of refining only.

Imports of Lead Manufactures.

Calendar Year.	Pipe Lead.		Shot and Bullets.		Tea Lead.		Other manufactures of lead.
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Value.
1910	403,012	$15,365	6,903	$ 311	2,371,136	$117,399	$107,688
1911	512,737	19,426	8,912	1,053	2,688,211	134,160	108,012
1912	688,383	32,423	477,047	23,163	3,212,861	167,716	144,571
1913	466,753	21,679	429,656	19,582	3,475,171	217,009	155,178
1914	565,762	26,282	180,639	10,542	1,687,029	108,097	99,285
1915	145,953	8,708	1,085,196	51,890	959,189	67,652	102,439
1916	217,905	21,450	78,474	6,390	2,145,854	198,541	124,833

Imports of Litharge.

Fiscal Year.	Cwt.	Value.	Fiscal Year.	Cwt.	Value.	Fiscal Year.	Cwt.	Value.
1880.....	3,041	$14,334	1893....	7,685	24,401	1906....	10,165	$ 39,836
1881.....	6,126	22,129	1894....	38,547	28,685	Calendar		
1882.....	4,900	16,651	1895....	11,955	32,953	Year:—		
1883.....	1,532	6,173	1896....	10,710	32,817	1907....	17,546	85,557
1884.....	5,235	18,132	1897....	12,028	34,538	1908....	15,524	57,929
1885.....	4,990	16,156	1898....	10,446	32,904	1909....	17,049	58,100
1886.....	4,928	16,003	1899....	9,530	32,518	1910....	15,541	56,049
1887.....	6,397	21,865	1900....	9,139	29,176	1911....	17,979	65,743
1888.....	7,010	23,808	1901....	11,132	51,944	1912....	25,925	113,941
1889.....	8,089	31,082	1902....	13,002	47,021	1913....	10,009	50,734
1890.....	9,453	31,401	1903....	13,921	47,761	1914....	10,863	52,525
1891.....	7,979	27,613	1904....	9,894	32,633	1915....	15,798	89,232
1892.....	10,384	34,343	1905....	17,865	57,736	1916....	27,672	211,359

Imports of Dry White and Red Lead and Orange Mineral, and White Lead Ground in Oil.

Fiscal Year.	Pounds.	Value.	Cents per pound.	Fiscal Year.	Pounds.	Value.	Cents per pound.
1885.....	5,540,753	$198,913	3·69	1896.....	11,711,496	$367,569	3·14
1886.....	6,703,077	213,258	3·18	1897.....	10,310,463	347,539	3·37
1887.....	6,998,820	233,725	3·34	1898.....	12,682,808	448,659	3·54
1888.....	6,361,334	216,654	3·41	1899.....	14,507,945	514,842	3·55
1889.....	7,066,465	267,236	3·78	1900.....	14,679,920	634,492	4·32
1890.....	10,859,672	381,959	3·52	1901.....	10,241,601	461,368	4·50
1891.....	8,560,615	337,407	3·94	1902.....	15,584,164	603,582	3·87
1892.....	10,288,766	351,686	3·42	1903.....	19,208,786	758,371	3·95
1893.....	10,865,183	364,680	3·36	1904.....	16,925,585	662,098	3·91
1894.....	10,958,170	353,053	3·22	1905.....	17,376,588	638,381	3·67
1895.....	8,780,052	282,353	3·22	1906.....	10,412,891	417,444	4·01

Calendar Year.	Dry White Lead.		Dry White Lead, Ground in Oil.		Dry Red Lead and Orange Mineral.		Total Imports.		Cents per pound.
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	
1907.....	7,560,185	$403,941	512,473	$29,063	443,905	$ 30,203	8,516,563	$463,207	5·44
1908.....	2,913,799	119,860	415,606	18,429	638,518	25,367	3,967,923	163,656	4·12
1909.....	2,690,575	95,894	730,001	32,678	516,032	25,341	3,936,608	153,913	3·91
1910.....	2,076,629	75,463	811,510	37,475	881,788	31,803	3,769,927	144,741	3·84
1911.....	1,467,193	58,335	1,033,732	46,986	1,571,508	64,180	4,072,433	169,501	4·16
1912.....	2,499,725	138,627	714,362	37,916	2,539,767	113,579	5,753,854	290,122	5·04
1913.....	1,162,082	61,424	1,057,683	59,444	2,389,460	103,739	4,609,225	224,607	4·87
1914.....	363,136	20,279	546,961	31,654	1,451,264	62,073	2,361,361	114,006	4·83
1915.....	448,920	23,393	169,095	9,590	1,091,120	63,675	1,709,135	96,658	5·66
1916.....	200,256	15,746	59,601	5,203	1,423,351	119,959	1,683,208	140,908	8·37

Consumption.—The production of lead, as already stated, was in 1916, 20,749 tons, while the exports were 4,580 tons, leaving a balance of 16,169 tons; by adding this amount to the 13,580 tons of imports and the manufactures, we get a total consumption for Canada of over 30,000 tons of lead, as against 46,000 tons in 1915, and 29,000 in 1914.

This estimate of consumption for 1916 is probably incomplete because of the fact that very large quantities of materials chiefly for munitions,

and no doubt including lead, have been imported for the use of the Imperial Government. These imports for record purposes have been entered under one general item and not separately classified. Information received from other sources shows that the total consumption in 1916 amounted to at least 55,000 tons.

Estimated Consumption of Lead.

Year.	Tons.	Year.	Tons.	Year.	Tons.
1908	22,000	1911	28,000	1914	29,000
1909	25,000	1912	39,000	1915	46,000
1910	24,000	1913	30,000	1916	55,000

Quebec.

The production of lead in Quebec during 1916 amounted to 698,760 pounds, valued at $59,485, as against 40,401 pounds, valued at $2,262 in 1915. This production was wholly from the zinc-lead deposits of Notre-Dame des Anges.

Ontario.

The Ontario production of lead in 1916 was 685,932 pounds, valued at $58,393, as against 88,985 pounds, valued at $4,983 in 1915. The two principal producers were: the property of the James Robertson Estate at Galetta, and the Hollandia Mine at Bannockburn.

British Columbia.

The production of refined lead together with lead in ores exported amounted in 1916 to 39,157,701 pounds, valued at $3,333,496, as against 45,377,064 pounds, valued at $2,541,116 in 1915, a decrease of 13·7 per cent in quantity, but an increase of 31·1 per cent in value.

Almost all of the lead ore mined in British Columbia is smelted and refined at Trail, B.C. In 1915 and 1916, however, the Surprise mine shipped its total output, amounting to a considerable tonnage, to the United States.

According to the Provincial Department of Mines, 48,727,516 pounds of lead were contained in the lead ores shipped to the smelters for which returns had been received during 1916.

The record given in the following table for the years 1909 to 1916, inclusive, represents the recovery of lead at smelter or refinery as distinguished from the figures given for the same year in the table next succeeding, which indicate the quantities of lead contained in ore sent to the smelters.

It will be noticed also that the Fort Steele district produced about 49·6 per cent of the total, the Slocan 29·6 per cent, and Ainsworth about 16.1 per cent.

British Columbia: Production of Lead.

Year	Pounds.	Value.	Cents per pound.	Year.	Pounds.	Value.	Cents per pound.
1887	204,800	$ 9,216	4·40	1902	22,536,381	$ 917,005	4·069
1888	674,500	29,813	4·42	1903	18,089,283	766,443	4·237
1889	165,100	6,488	3·93	1904	36,646,244	1,579,086	4·309
1890				1905	56,580,703	2,663,254	4·707
1891				1906	52,408,217	2,964,733	5·657
1892	808,420	33,064	4·09	1907	47,738,703	2,542,086	5·325
1893	2,131,092	79,490	3·73	1908	43,195,733	1,814,221	4·200
1894	5,703,222	187,636	3·29	1909	45,857,424	1,692,139	*3·690
1895	16,461,794	531,716	3·23	1910	32,987,508	1,216,249	*3·687
1896	24,199,977	721,159	2·98	1911	23,784,969	827,717	‡3·480
1897	38,841,135	1,390,513	3·58	1912	35,763,476	1,597,554	‡4·467
1898	31,693,559	1,198,017	3·78	1913	37,626,899	1,753,037	‡4·659
1899	21,862,436	977,250	4·47	1914	36,289,845	1,625,422	‡4·479
1900	62,158,621	2,760,031	4·37	1915	45,377,064	2,541,116	‡5·600
1901	51,582,906	2,235,603	4·334	1916	39,157,701	3,333,496	‡8·513

*Average prices at Toronto for years 1909 and 1910. For previous years average prices at New York.
‡Average price at Montreal. Quotations furnished by Messrs. Thos. Robertson & Co., Montreal, Que.

British Columbia: Production of Lead by Districts.*

(Lead contained in Ore shipped from Mines, in pounds.)

District.	1910.	1911.	1912.	1913.	1914.	1915.	1916.
Cassiar—							
Atlin							7,260
Skeena, etc	1,695	238,578	41,512	6,579		30,462	1,077
East Kootenay—							
Fort Steele	23,874,562	17,158,069	18,238,238	18,525,083	24,863,105	26,582,050	24,156,143
Other districts	66,010		2,249,237	2,495,355		216,327	571,244
West Kootenay—							
Ainsworth	2,558,353	289,009	4,863,894	9,027,861	8,069,525	3,436,184	7,841,869
Nelson	1,245,844	1,928,836	2,293,000	1,936,418	2,004,436	967,775	1,240,784
Slocan	6,406,358	6,705,571	16,944,811	22,648,766	15,233,910	14,925,345	14,415,645
Other districts	470,241	522,615	240,762	521,771	128,912	89,041	206,741
Yale—							
Yale-Kamloops							47,380
Grand Forks, etc	35,683	29,719		45,982	1,678	7,127	14,922
Cariboo—							
Omineca				156,862	323,482	249,279	224,451
	34,658,746	26,872,397	44,871,454	55,364,677	50,625,048	46,503,590	48,727,516

*From the Report of the Minister of Mines, B.C.

Yukon.

During the last few years, several properties have been developed and have shipped occasionally, but they have been handicapped by the high cost of development and supplies, and by the heavy transportation charges.

The most important operations being conducted during 1916 were in what is known as the "Mayo" area, north of the Stewart river. About 1,500 tons of very rich silver-lead ore were shipped from the Silver King property on Galena creek to the Selby smelter at San Francisco. This area is one of the most important placer gold producing districts of Yukon Territory but valuable lode deposits have also been discovered.

Bounties.—In 1901, and again in 1903, the Dominion Government, to encourage the lead industry, authorized the payment of a bounty on the production of lead. The Act of 1903 provided for the payment, under certain restrictions, of 75 cents per hundred pounds on lead contained in ore mined and smelted in Canada, provided that when the standard price of pig-lead in London, England, exceeded £12 10s per ton of 2,240 pounds, such bounty should be reduced proportionately by the amount of such excess. Thus, when the price of lead in London rose to £16, or over, per long ton, the bounty ceased. As the price of lead exceeded £16 sterling on the London market for a considerable period during 1906 and 1907 the bounty paid during those years was comparatively small.

The Act of 1903 provided that payment of bounty should cease on June 30, 1908, and as only a portion of the funds provided had been used, a new Act was passed in the latter year providing for further bounty payments at the rate of 75 cents per hundred pounds, or approximately £3 10s per ton of 2,240 pounds, subject to the restriction that when the price of lead in London exceeds £14 10s the bounty shall be reduced by such excess.

The Act of 1908 expired in 1913, and a new Act was passed extending the bounty for a further period of five years, with the same provisions. The text of this Act and of the regulations under which the Act is administered may be consulted in the "Annual Report on Mineral Production for 1914," and previous years.

There was no bounty paid on lead during the fiscal year ending March 31, 1917.

Statement of Bounties Paid on Lead during the Fiscal Years 1899 to 1917.

Year ending.	Bounty paid.	Year ending.	Bounty paid.	Year ending.	Bounty paid.
June 30, 1899.....	$ 76,665	June 30, 1906.....	$ 90,196	March 31, 1913.....	$ 68,065
" 30, 1900.....	43,335	March 31, 1907.....	1,995	" 31, 1914.....	8,179
" 30, 1901.....	30,000	" 31, 1908.....	51,001	" 31, 1915.....	3,217
" 30, 1902.....	.....	" 31, 1909.....	307,433	" 31, 1916.....	59
" 30, 1903.....	4,380	" 31, 1910.....	340,542	" 31, 1917.....	.....
" 30, 1904.....	195,627	" 31, 1911.....	248,534	.....	.....
" 30, 1905.....	330,645	" 31, 1912.....	179,288	Total	1,979,164

MERCURY.

There has been no production of mercury since 1897. The small production reported in 1895 and 1897 was derived from the deposits at the western end of Kamloops lake, B.C. These deposits consist of quartz veins containing pockets of cinnabar in a zone of decomposed Tertiary volcanic rocks.

Elsewhere in Canada mercury has been reported as also occurring in ores of the Cobalt district, and in the neighbourhood of Field, B.C., and Sechart on the west coast of Vancouver island.

The imports of mercury during 1916 were 79,204 pounds, valued at $74,461, as against 184,432 pounds, valued at $159,184 in 1915.

Production of Mercury.

Calendar Year.	Flasks.*	Price per flask.	Value.
1895	71	$33.00	$2,343
1896	58	33.44	1,940
1897	9	36.00	324

*Seventy-six and one half (76½) pounds each.

Imports of Mercury.

Fiscal Year.	Pounds.	Value.	Fiscal Year.	Pounds.	Value.	Fiscal Year.	Pounds.	Value
1882	2,443	$ 965	1894	36,914	$14,483	1906	150,364	$ 69,505
1883	7,410	2,991	1895	63,732	25,703	Calendar Year.		
1884	5,848	2,441	1896	77,869	32,353	1907	189,841	82,873
1885	14,490	4,781	1897	76,058	33,534	1908	87,620	44,030
1886	13,316	7,142	1898	59,759	36,425	1909	285,958	147,625
1887	18,409	10,618	1899	103,017	51,695	1910	107,888	63,450
1888	27,951	14,943	1900	85,342	51,987	1911	118,336	67,416
1889	22,931	11,844	1901	140,610	94,564	1912	137,474	72,171
1890	15,912	7,677	1902	97,283	56,615	1913	219,442	109,493
1891	29,775	20,223	1903	164,968	91,625	1914	204,229	97,449
1892	30,936	15,038	1904	151,107	80,658	1915	184,432	159,184
1893	50,711	22,998	1905	103,330	48,412	1916*	79,204	74,461

*Duty free.

Average Monthly Price of Mercury:

(Per flask of 75 pounds).

Month.	1915.			1916.		
	New York.	San Francisco.	London.	New York.	San Francisco.	London.
January	$ 51.60	$ 50.80	£11.35	$231.50	$200.50	£16.75
February	59.38	58.00	12.28	283.50	300.63	17.88
March	73.13	62.16	12.50	213.75	223.75	19.00
April	71.50	64.31	12.44	140.78	147.50	17.75
May	77.20	67.50	11.80	95.10	97.50	16.50
June	95.63	88.13	15.13	73.00	73.81	16.50
July	95.50	92.50	17.94	79.80	79.90	17.30
August	92.50	89.25	18.15	74.75	75.00	17.50
September	89.50	88.00	16.50	75.50	75.06	17.50
October	94.70	90.80	15.90	79.40	75.80	19.50
November	108.13	102.00	16.38	79.25	75.50	18.25
December	135.00	121.25	16.63	80.00	78.00	18.63
Year	$ 87.01	$ 81.23	£14.75	$125.49	$125.25	£17.75

MOLYBDENUM.

There are numerous mineralogical occurrences of molybdenite in Canada, many of which during the past ten or fifteen years have attracted more or less attention because of the possibility of their development indicating deposits of commercial importance. As a result of this work, small shipments of ore were made in 1902 and 1903. The high prices offered in 1914 and 1915 resulted in an active renewal of this development, but it was not until 1916 that really important contributions have been made to the market demands for this metal. While a large proportion of the 1916 production has been derived from one property at Quyon in the Province of Quebec, nevertheless important contributions have been made from a number of other deposits which, in the aggregate, give promise of increasing contributions to the supply.

The ore produced was chiefly low grade material carrying less than 2 per cent MoS_2, but included small quantities of ore running from 2 to 15 per cent MoS_2, and some higher grade hand picked material.

The owners of the Quyon mine were authorized to export a portion of their ore for concentration in their own plant at Denver, Col.; with this exception, all of the ore production was concentrated in Canadian mills erected for the purpose, and marketed either as concentrates, ferro-molybdenum, for the manufacture of which two electric furnace plants have been established, or as molybdic acid or ammonia molybdate.

The total production in 1916, representing the MoS_2 contents of concentrates produced was 156,461 pounds which at $1.00 per pound, the approximate equivalent at Ottawa of the British official price, would have a total value of $156,461. The actual marketing value would probably exceed this figure since, as already stated, the output was sold in various forms, and some of the concentrates sold in the United States possibly brought a higher price.

The production in 1915 was equivalent to 29,210 pounds of concentrate valued at $28,450, as compared with a production in 1914 equivalent to 3,814 pounds of concentrate, valued at $2,063.

Early in 1915 the export of molybdenite to foreign destinations was prohibited except under license. Since September of 1915, the Imperial Government has requisitioned all supplies of molybdenite arriving in the United Kingdom at the price of five pounds, five shillings (105s.) per unit, cost, insurance and freight or ex. warehouse, on the basis of 90 per cent MoS_2, less one per cent brokerage charges. Subsequently the basis was reduced to a minimum of 85 per cent MoS_2. The firm of H. H. Watson & Co., Liverpool, was appointed by His Majesty's Government to act as brokers for the purchase of these ores. At a later date the Imperial Munitions Board of Ottawa was authorized to purchase molybdenite in Canada.

Prices in the United States during 1916 for molybdenite concentrates 85 to 90 per cent MoS_2 ranged from $1.40 to $1.85 per pound.

Mining.

During 1916 shipments were made from the following properties:—

QUEBEC

Pontiac County.—Moss mine near Quyon in Onslow tp., lots 9 and 10, range VII. This has so far proved the most important molybdenite mine developed. Ore shipments were made during 1916 to Denver, Col., to thecon centrating plant at Renfrew operated by the International Molybdenum Company, and to the Mines Branch concentration plant, Department of Mines, Ottawa. A concentrating plant was built at the mine and placed in operation, and a second mill was installed at Hull, Que., on the property of the Canada Cement Co., the cement plant ball mills being used for grinding the molybdenite ore. The property was operated by the Canadian Wood Molybdenite Company, and has recently been sold to the Dominion Molybdenite Co., Ltd.[1]

Abitibi District.—A small shipment of hand picked ore was made from the property of the Height of Land Mining Company in Preissac tp., south of Amos on the Canadian Government Railways.

ONTARIO

Renfrew County.—Several properties in this county made shipments during 1916 including: the Jamieson mine in the township of Lyndeck, lots 5 and 6, con. VIII, operated by the International Molybdenum Company; the Spain or Legree mine in Griffith tp., lots 30 and 31, con. IV, operated by W. J. Spain, a concentrating mill was erected at this property which was, however, operated but a short time during 1916; Brougham tp., lots 7, 8, and 9, con. XII, operated by the Renfrew Molybdenum Mines, Ltd., a vacuum oil flotation mill was placed in operation just at the close of the year and was producing at the rate of about a ton per week; the Moran and O'Brien properties, Brougham tp., lots 16 and 17, con. XII, operated by M. J. O'Brien of Renfrew; the Ross mine, Brougham tp., lots 1 and 2, con. III, operated by the Aldfield Mineral Syndicate, and sold to Molybdenum Ltd., of Montreal.

Haliburton County.—Mr. George Padwell operated a property near Tory Hill.

Victoria County.—Shipments were made from properties in Somerville tp., and in Laxton tp., operated by Mr. T. Horscroft.

Lennox and Addington Counties.—Shipments were made from the Chisholm mine in Sheffield tp.

[1] Report on the Molybdenite deposits of the Moss mine, Quyon, Que., by Charles Camsell. Summary Report, Geol. Survey, 1916, p. 207.

BRITISH COLUMBIA

West Kootenay District.—The Molly mine at Salmo, B.C., was operated by the International Molybdenum Co., of Orillia, Ont., and the ore shipped to Renfrew, Ont., for concentration.

Skeena District.—A property has been developed at Alice Arm at the head of Observatory inlet, Portland canal, by the Molybdenum Mining and Reduction Co., Ltd. Shipments were made to Renfrew, Ont.

Lillooet District.—From the Index claim on Texas creek about 9 tons of ore were shipped to Renfrew.[1]

Concentration of Molybdenite.

The concentration of molybdenite ores was undertaken to a greater or less extent in five mills, two of which were operated as Custom plants, and three treated only the ores produced by the operators.

Mines Branch Plant, Ottawa.—The Department of Mines had, through its Ore Testing and Metallurgical Division, already undertaken an investigation of the concentration of molybdenite ores as a result of which a successful water flotation concentration process was developed. Through an arrangement with the Imperial Munitions Board, the plant was increased in size and placed upon a commercial basis, and has been in practically continuous operation throughout 1916. During the year a total of 2,397·4 tons of ore were treated in this plant containing an average of 1·84 per cent MoS_2. There was recovered 43·58 tons of concentrates containing an average of 79·95 per cent MoS_2.

Ores have been purchased on the basis of the following schedule:—

Schedule of Prices governing purchase of Molybdenite Ores and Concentrates Delivered f.o.b. Dominion Government Testing Plant, *Ottawa.*

Payments will be made upon the following terms:—

(1) On assay returns from samples dried at 212°F.
(2) Moisture will be deducted.
(3) The treatment charge to be $5.65 per ton of 2,000 lbs. of crude oil.
(4) The value of molybdenite (MoS_2) to be $1.00 per pound delivered in Ottawa unless otherwise stated.
(5) Payments will be made for molybdenite only. No allowance will be made for Molybdite or Wulfenite.
(6) Payments will be calculated as follows, per ton of 2,000 lbs. dry ore or concentrates, delivered railway siding, Mines Branch Testing Laboratories, Ottawa:—

[1] Report on the Index molybdenite mine, Lillooet, B.C., by Dr. C. W. Drysdale. Summary Report of the Geol. Survey, 1916, p. 54.

Schedule A. Treatment charge $5.65 per ton.

For Molybdenite ores containing:—

(a)	Between	0·5	%	and	1·0%	inc.	for	70%	of	the	total	molybdenite content.
(b)	,,	1·1	%	,,	1·5%	,,	,,	78%	,,	,,	,,	,,
(c)	,,	1·51%		,,	2·0%	,,	,,	84%	,,	,,	,,	,,
(d)	,,	2·1	%	,,	2·5%	,,	,,	87%	,,	,,	,,	,,
(e)	,,	2·51%		,,	3·0%	,,	,,	90%	,,	,,	,,	,,
(f)	,,	3·0	%	,,	.....	,,	,,	92%	,,	,,	,,	,,

Net returns to the miner will be the value of the ore calculated as indicated above less $5.65 per net ton concentration charges.

Schedule B. No treatment charge.

For Molybdenite Middling Product containing:—

(a)	Between	3·1%	and	10%	inc.	molybdenite	content	83c	per	pound.	
(b)	,,	10·1%	,,	15%	,,	,,	,,	85c	,,	,,	
(c)	,,	15·1%	,,	20%	,,	,,	,,	87c	,,	,,	
(d)	,,	20·1%	,,	25%	,,	,,	,,	88·5c	,,	,,	
(e)	,,	25·1%	,,	30%	,,	,,	,,	90c	,,	,,	
(f)	,,	30·1%	,,	35%	,,	,,	,,	91·6c	,,	,,	
(g)	,,	35·1%	,,	40%	,,	,,	,,	92·6c	,,	,,	
(h)	,,	40·1%	,,	45%	,,	,,	,,	93·6c	,,	,,	
(i)	,,	45·1%	,,	50%	,,	,,	,,	94·6c	,,	,,	
(j)	,,	50·1%	,,	55%	,,	,,	,,	95·6c	,,	,,	
(k)	,,	55·1%	,,	60%	,,	,,	,,	96·6c	,,	,,	
(l)	,,	60·1%	,,	65%	,,	,,	,,	97·6c	,,	,,	
(m)	,,	65·1%	,,	70%	,,	,,	,,	98·6c	,,	,,	

Schedule C. No treatment charges.

For Molybdenite Concentrates:—

Containing	not	less	than	70%	molybdenite	content	$1.00	per	pound.
,,	,,	,,	,,	75%	,,	,,	$1.02	,,	,,
,,	,,	,,	,,	80%	,,	,,	$1.05	,,	,,
,,	,,	,,	,,	85%	,,	,,	$1.09	,,	,,

Prices on *Schedule C* to include cost of delivery to Mines Branch, in suitable packages for either local or export shipment.

The International Molybdenum Company's Mill, Renfrew:—

The International Molybdenum Company built a flotation concentration mill at Renfrew which was placed in operation during the latter part of the year. Custom ores from Quebec, Ontario, and British Columbia were treated as well as ores mined by the Company. The concentrates produced were shipped to the Company's Refinery at Orillia, Ontario. Custom ores were purchased on the basis of the following prices:—

Schedule of prices per unit (20 lbs.) of molybdenite in ore delivered at concentrator, Renfrew.

Ores carrying between	2%	and	3%	MoS_2	—	$13.00	per unit.		
,, ,, ,,	3%	,,	5%	,,	—	14.50	,,		
,, ,, ,,	5%	,,	10%	,,	—	16.00	,,		
,, ,, ,,	10%	,,	15%	,,	—	17.00	,,		
,, ,, ,,	15%	,,	20%	,,	—	18.00	,,		

80% concentrates $1.00 per lb. of MoS_2.

Penalties imposed for copper and bismuth.

No settlement made for any molybdic oxide in ores.

Settlement 10 days after sampling.

Samples of ores to be submitted before any shipment made.

Ferro-Molybdenum, Etc.

The production of ferro-molybdenum in electric furnaces was begun in October of 1916 at Orillia by the International Molybdenum Company. This firm has also undertaken the production of molybdic acid and ammonia molybdate. Ferro-molybdenum is also being made in electric furnaces at Belleville, Ont., by the Tivani Electric Steel Co.

Estimated World's Production of Molybdenum Ores, 1915*.

Country.	Ore Mineral.	Quantity (short tons).	Estimated per cent of molybdenum.	Weight of molybdenum, (short tons).
Canada	Molybdenite	14·3	50	7·2
New South Wales	"	35·5	54	19·2
Norway	"	87·0	45	39·1
Peru	"	3·0	49	1·5
Queensland	"	109·0	54	58·8
Spain	Wulfenite	29·0	20	5·8
United States	Molybdenite & wulfenite	3,498·0	2·6	91·0
				222·6

*Estimated by Frank L. Hess of the United States Geological Survey, Mineral Resources, United States 1915, p. 810.

NICKEL.

The industry based on the mining and metallurgical treatment of the nickel-copper ores of the Subdury district, Ontario, ranks among the most important of Canada. Not only is there a considerable production of copper, but the nickel, which is the important product, supplies a very large proportion of the world's consumption of the metal.

The past few years development has very largely increased the known ore reserves of the district. These nickel-copper deposits have been the subject of special reports by the Mines Branch and Geological Survey at Ottawa, by the Ontario Bureau of Mines, Toronto, and just recently by the Royal Ontario Nickel Commission.[1]

The production of nickel in 1916 amounted to 82,958,564 pounds, valued at $29,035,497, as compared with 68,308,657 pounds, valued at $20,492,597 in 1915, an increase of 21·4 per cent over that of 1915, and of 82·2 per cent over the production of 1914.

There were mined in 1916, 1,566,333 tons of ore, and smelted 1,521,689 tons, from which were produced 80,011 tons of Bessemer matte, carrying approximately 41,298 tons of nickel, and 22,430 tons of copper. The net value of the matte, as reported by operators was $12,116,333, which is based on an average value of 7·2 cents per pound for the copper, and 10·8 cents per pound for the nickel. The average metal recovery in matte from the ores treated was 1·474 per cent copper and 2·714 per cent nickel, as against 1·541 per cent copper, and 2·675 per cent nickel in 1915.

The nickel-copper ore is reduced in smelters and converters to a Bessemer matte, containing from 77 to 82 per cent of the combined metals; in 1916 it averaged 51·6 per cent nickel and 28·0 per cent copper, as against 50·3 per cent nickel and 29·0 per cent copper in 1915; 49·0 and 31·1 respectively in 1914; and 52·7 and 27·4 respectively in 1913.

For the production of monel metal, a special matte is produced with contents of about 22 per cent copper, and 58 per cent nickel, which is included in the total given above. Monel metal is produced directly from this matte without the intermediate refining of either the nickel or the copper.

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[1]Report on Nickel and Copper Deposits of Sudbury, Ont., by A. E. Barlow, Geological Survey, Canada. No. 873, 1901.
The Sudbury Nickel Region, by A. P. Coleman, Ph.D., Bu reau of Mines, Vol. XIV, Part III, 1904.
The Nickel Industry, with special reference to the Sudbury Region, Ontario. Report by A. P. Coleman, Ph.D., Mines Branch, Ottawa, No. 170, 1913.
Report of The Royal Ontario Nickel Commission with Appendix, Toronto, 1917.

Production of Nickel.

	1913.	1914.	1915.	1916.
Ore mined.....Short tons.	784,697	1,000,364	1,364,048	1,566,333
Ore smelted..... "	823,403	947,053	1,272,283	1,521,689
Bessemer matte produced..... "	47,150	46,396	67,703	80,011
Copper content of matte..... "	12,938	14,448	19,608	22,430
Nickel " " ..... "	24,838	22,759	34,039	41,298
Spot value of matte.....	$7,076,945	$7,189,031	$10,352,344	$12,116,333
Wages paid miners and smelters.....	$3,291,956	$3,096,911	$3,555,912	$4,841,662
Men employed.....	3,486	3,379	4,033	4,656

Annual Production of Nickel.

Calendar Year.	Pounds of nickel in matte shipped.	Cents per pound.	Value.	Calendar Year.	Pounds of nickel in matte shipped.	Cents per pound.	Value.
1889 (a).....	830,477	60	$ 498,286	1903.....	12,505,510	40	$5,002,204
1890.....	1,435,742	65	933,232	1904.....	10,547,883	40	4,219,153
1891.....	4,035,347	60	2,421,208	1905.....	18,876,315	40	7,550,526
1892.....	2,413,717	58	1,399,956	1906.....	21,490,955	42	8,948,834
1893.....	3,982,982	52	2,071,151	1907.....	21,189,793	45	9,535,407
1894.....	4,907,430	38½	1,870,958	1908.....	19,143,111	43	8,231,538
1895.....	3,888,525	35	1,360,984	1909.....	26,282,991	36	9,461,877
1896.....	3,397,113	35	1,188,990	1910.....	37,271,033	30	11,181,310
1897.....	3,997,647	35	1,399,176	1911.....	34,098,744	30	10,229,623
1898.....	5,517,690	33	1,820,838	1912.....	44,841,542	30	13,452,463
1899.....	5,744,000	36	2,067,840	1913.....	49,676,772	30	14,903,032
1900.....	7,080,227	47	3,327,707	1914.....	45,517,937	30	13,655,381
1901.....	9,189,047	50	4,594,523	1915.....	68,308,657	30	20,492,597
1902.....	10,693,410	47	5,025,903	1916.....	82,958,564	35	29,035,497

(a) Calculated from shipments made by rail.

Refined metallic nickel is now being recovered in Canadian refineries but only in small quantities and as a by-product in the smelting and refining of the silver-cobalt-nickel ores, nickel-oxide having been recovered in these smelters for several years. The recovery of nickel-sulphate was also reported for the first time in 1915. A considerable amount of nickel is probably contained in ores exported for smelting, for which no payment is received by the mines shipping and the amount finally recovered is impossible to ascertain.

The production of metallic nickel during 1916 was reported as 79,360 pounds, valued by the operators at $31,538, as against 55,325 pounds, valued at $22,130 in 1915; that of nickel-oxide and nickel-sulphate was reported as 555,868 pounds valued at $101,358, as against 282,025 pounds valued at $31,262 in 1915.

The total estimated nickel content of recoveries from silver-cobalt-nickel ores was in 1916, 361,702 pounds, as against 231,634 pounds in 1915.[1]

The companies engaged in mining and smelting nickel ores are:—

The Canadian Copper Company, subsidiary to the International Nickel Company, with smelter at Copper Cliff, Ontario, and refinery at Bayonne, New Jersey. This company is erecting a new refining

[1] See chapter on "Cobalt."

plant at Port Colborne, Ontario, which will probably be in operation late in 1917.

The Mond Nickel Company of London, England, with smelter at Coniston, Ontario, and refinery at Clydach, Swansea, Wales.

The British American Nickel Corporation, Ltd., which started erecting a smelter and refinery at the Murray mine, late in 1916, although not shipping during the year, development was actively carried on.

The Alexo Mining Company, Ltd., which operated its mine at Porquis Junction on the Porcupine Branch of the Timiskaming and Northern Ontario Railway, shipping nickel-copper ore to the Mond smelter at Coniston.

Nickel was recovered as a by-product in the smelters at Deloro, Thorold, and Welland, from the silver-cobalt-nickel ores of the Cobalt district.

Prices.—The price of refined nickel in New York according to quotations published by the Engineering and Mining Journal remained throughout the year at from 45 to 50 cents per pound for ordinary forms with 5 cents more per pound asked for electrolytic nickel.

The price during 1915 remained fairly constant between 40 and 45 cents during the first seven months, and ranging between 45 and 50 cents for the last five months for ordinary forms. Electrolytic nickel was five cents higher per pound.

The price of nickel in Europe in 1916, as given by the "London Mining Journal," was quoted throughout the year at £225, or 48·9 cents per pound while as in 1915 it was quoted between £186 and £206 (40·4 to 44·7 cents per pound) from January 1st, until the end of May, when it rose to £210, and gradually increased until it reached in the last week in July a quotation of £225 per long ton (48·8 cents per pound) and remained at that price until the close of the year.

Exports and Imports.—The exports in 1916 amounted to 80,441,700 pounds, of which 11,136,900 pounds or 13·8 per cent went to Great Britain, and 69,304,800 pounds, or 86·2 per cent to the United States. In 1915, 20·7 per cent of the total went to Great Britain, and 79·3 per cent to the United States; and in 1914, 22·1 per cent went to Great Britain, and 77·4 per cent to the United States.

The exports to the United States, which had fallen off nearly 20 per cent in 1914 showed an increase in 1915 of over 46 per cent, and in 1916 of over 31 per cent.

Exports of Nickel, 1912-1916.

Destination.	1912.	1913.	1914.	1915.	1916.
To Great Britain.....Pounds.	5,072,867	5,164,512	10,291,979	13,747,991	11,136,900
To United States..... „	39,148,993	44,224,119	36,015,642	52,662,451	69,304,800
To other countries..... „	.....	70,386	220,706	.....	.....
Total.....	44,221,860	49,459,017	46,528,327	66,410,442	80,441,700

Exports of Nickel since 1890.

Calendar Year.	Value.	Calendar Year.	Pounds.	Value.	Cents per pound.
1890	$ 89,568	1903	12,699,227	$1,116,099	8·78
1891	667,280	1904	11,233,869	1,091,349	9·71
1892	293,149	1905	17,318,059	1,569,693	9·06
1893	629,692	1906	20,653,845	2,042,965	9·89
1894	559,356	1907	19,376,335	2,280,374	11·76
1895	521,783	1908	19,419,893	1,866,624	9·61
1896	658,213	1909	25,616,398	2,676,483	10·45
1897	723,130	1910	36,014,782	4,030,040	11·19
1898	1,019,363	1911	32,619,971	3,676,396	11·27
1899	939,915	1912	44,221,860	4,661,758	10·54
1900	1,031,030	1913	49,459,017	5,195,560	10·50
1901	751,080	1914	46,528,327	5,149,427	11·07
1902	1,007,211	1915	66,410,442	7,394,446	11·13
		1916	80,441,700	8,662,179	10·77

The imports of nickel are classed with those of nickel-silver and German-silver and manufactures of these metals. There is also a considerable import of nickel-plated ware. The imports in 1916 consisted of nickel in ingots, bars, sheets, etc., to the amount of 892,439 pounds, valued at $325,326, and manufactures of nickel, valued at $89,084.

Imports of Nickel, Nickel-Silver, and German Silver, 1915 and 1916.

	1915.		1916.	
	Pounds.	Value.	Pounds.	Value.
Nickel, nickel-silver, and German silver in ingots or blocks	74,381	$ 27,361	179,367	$ 66,515
Nickel, nickel-silver, and German silver in bars and rods, and also in strips, sheets or plates	635,963	169,807	713,072	258,811
Manufactures of German, Nevada, and nickel-silver, not plated	.....	77,538	.....	89,084

In view of the large export of nickel from Canada to the United States, and its refinement in that country, a record of the imports into, and exports of nickel from the United States, may be of special interest and is shown below as compiled from the "Foreign Commerce of the United States."

The values of the United States exports ranged from 37 to 46 cents per pound, with an average of 38·5 cents in 1916, as against 34 to 43 cents per pound with an average of 38 cents per pound in 1915, and 32 to 39 cents per pound with an average of 34 cents per pound in 1914.

United States: Imports and Exports of Nickel.*

	1915.			1916.		
	Quantity.	Value.	Cents per pound.	Quantity.	Value.	Cents per pound.
Imports into United States—						
(Ore and matte.....Gross tons	45,798	$7,615,999	13·52	59,741	$9,889,122	13·62
Nickel content.....Pounds.	56,352,582			72,611,492		
Exports from United States—						
(To France.....Pounds.	3,018,354	1,124,382	37·25	2,823,132	1,101,813	39·02
„ Italy (a)..... „	.....	.....	.....	2,715,521	1,110,035	40·88
„ Netherlands..... „	129,557	55,954	43·29	516,331	224,872	43·55
„ Russia in Europe(a) „	.....	.....	.....	7,767,875	3,010,599	38·76
„ United Kingdom... „	14,801,565	5,317,532	35·92	16,674,487	6,191,029	37·13
„ Other countries..... „	8,469,074	3,540,646	41·80	2,906,665	1,314,145	46·21
Totals.....	26,418,550	10,038,514	38·00	33,494,011	12,952,493	38·67

*From the "Foreign Commerce of the United States," Dec., 1916.
(a) Not separately stated prior to Jan. 1, 1916.

Imports of Nickel Ore and Matte into the United States during the following fiscal years ending June 30th.*

From		1912.	1913.	1914.	1915.	1916.†
Belgium	Tons.	1,078	1,371	1,243	242	.....
	Pounds.	1,587,598	2,498,262	2,037,008	317,971	.....
France	Tons.	.....	.....	.....	.....	297
	Pounds.	.....	.....	.....	.....	514,828
Norway	Tons.	.....	.....	3	366	.....
	Pounds.	.....	.....	5,040	530,704	.....
Canada	Tons.	26,373	35,597	35,174	29,592	52,742
	Pounds.	32,414,454	(a)45,010,108	(b)41,507,255	(c)36,607,235	(d)64,622,286
Oceania—French	Tons.	.....	.....	.....	.....	2,618
	Pounds.	.....	.....	.....	.....	2,391,922
—Australia	Tons.	.....	.....	.....	601	1,329
	Pounds.	.....	.....	.....	539,109	1,268,084
Peru	Tons.	.....	.....	.....	.....	1
	Pounds.	.....	.....	.....	.....	118
Totals	Tons.	27,451	36,968	36,420	30,801	56,987
	Pounds.	34,002,052	47,508,370	43,549,303	37,995,019	68,797,238

(a) Value, $5,825,642. (b) Value, $5,621,480. (c) Value, $4,788,145. (d) $8,596,921.
*From the "Foreign Commerce of the United States," Dec., 1916.
†From Reports on the commerce and navigation of the United States, Department of Commerce, Washington, D.C.

Exports of Nickel, Nickel-Oxide, and Matte from the United States during the following fiscal years, ending June.*

(in pounds.)

To	1911.	1912.	1913.	1914.	1915.	1916.
Austria-Hungary	.....	.....	134,400	672,043	67,200	.....
Belgium	.....	551,740	1,719,285	1,230,274	210,612	.....
Denmark	.....	.....	.....	.....	43,830	2,174
France	3,765,510	5,579,335	4,197,110	4,419,663	3,210,980	1,871,595
Germany	1,902,393	2,527,273	2,346,325	11,084,366	1,036,242	.....
Italy	604,938	1,321,733	1,075,303	1,276,905	2,365,177	1,880,661
Netherlands	8,205,836	7,584,653	9,164,012	2,376,216	22,033	139,300
Norway	.....	.....	.....	.....	31,158	34,460
Russia in Europe	.....	.....	7,250	186,626	4,082,280	5,371,089
Spain	.....	.....	.....	.....	700	112,450
Sweden	.....	.....	.....	.....	367,696	313,958
U. Kingdom:—						
England	1,342,714	3,019,833	2,334,845	2,171,511	8,535,418	7,973,478
Scotland	3,114,166	5,970,045	6,878,264	5,433,081	7,817,384	6,113,198
N. America:—						
Canada	8,926	3,373	16,379	42,529	52,949	11,646
Cuba	.....	.....	.....	.....	.....	10
Mexico	40	.....	.....	.....	1,779	.....
W. Indies (Brit.)	.....	.....	.....	.....	300	.....
West Indies (Dutch)	.....	.....	.....	.....	.....	10
S. America:—						
Brazil	.....	.....	1,796	.....	.....	473
Chili	.....	.....	.....	.....	.....	100
Colombia	.....	.....	32	.....	.....	.....
Asia:—						
British India	.....	.....	.....	.....	.....	411
Japan	1,957	4,005	5,447	2,028	308,444	597,257
Russia in Asia	.....	.....	.....	.....	1,423,030	1,226,990
Oceania:—						
Brit. Australia and Tasmania	1,330	.....	829	.....	22,400	679
Philippine Islands	.....	.....	.....	.....	.....	56
	18,947,810	26,561,990	27,881,277	28,895,242	29,599,612	25,649,995

*From Reports on the commerce and navigation of the United States, Department of Commerce, Washington, D.C.

Bounty on Refined Nickel and Nickel-oxide.—Under the terms of "The Metal Refining Act, 1907." of the Province of Ontario (7 Edward VII, Chap XIV) a bounty is authorized to be paid on nickel, cobalt, copper, and arsenic under certain conditions and restrictions during a period of five years following the passing of the Act (April, 1907). In March, 1912, the Act was amended to cover a further period of five years.

The sections affecting nickel are as follows:—

The Treasurer of the Province may under the authority of such regulations as may from time to time be made in that behalf by the Lieutenant Governor in Council pay in each year to the refiners of the metals or metal compounds hereinafter specified when refined in the Province from ores raised and mined in the Province, a bounty on each pound of such metal or compound so refined, as follows:—

Class 1. On refined metallic nickel or on refined oxide of nickel, 6 cents per pound on the free metallic nickel or on the nickel contained in the nickel-oxide, but nickel on which a bounty has already been paid in one form of product shall not be entitled to any further bounty in any other form, and the amount to be paid as bounty on the nickel products therein mentioned is not to exceed in all $60,000 in any one year.

PLATINUM AND PALLADIUM.

In past years, the chief source of the platinum production of Canada was the placer gravels of British Columbia, principally in the Similkameen district.

During 1916, the reported recovery was only 15 crude ounces, valued at $600, as against 23 crude ounces, valued at $1,063 in 1915. It is possible that the production of platinum is considerably greater than actually reported. A perusal of the imports from Canada to the United States, as given by the United States Department of Commerce, and the exports from Canada into the United States, as given by the Canadian Department of Customs, shows that much larger quantities are leaving Canada. There is a possibility, of course, that the Canadian export record may include old and scrap platinum.

The exports from Canada into the United States were, in 1916, 532 ounces, valued at $41,945, against 236 ounces, valued at $11,052 in 1915.

Annual Production of Platinum.

Year.	Value.	Year.	Value.	Year.	Crude ounces.	Value.
1887	$ 5,600	1895	$ 3,800	1903	.....	$33,345
1888	6,000	1896	750	1904	.....	10,872
1889	3,500	1897	1,600	1905	.....	500
1890	4,500	1898	1,500	1906	.....	*
1891	10,000	1899	825	1907–1912	.....	**
1892	3,500	1900	.....	1913	18	489
1893	1,800	1901	457	1914	.....	.....
1894	950	1902	46,502	1915	23	1,063
				1916	15	600

*See under Palladium.
**See explanation in text.

Annual Production of Palladium.

	Ounces.	Value.
1902 Palladium	4,411	$86,014
1903 "	3,177	61,952
1904 "	952	18,564
1905 Metals of the platinum group	1,562	28,116
1906 " " "	314	5,652
1907-1916	(a)	.....

(a) See explanation in text.

The nickel-copper ores of the Sudbury district also carry small quantities of the metals of the platinum group, and from 1902 to 1912, considerable quantities of these metals were recovered from the residues resulting from the treatment of the mattes from Sudbury. In view, however, of the fact that other material has been treated in the works of the International

Nickel Company in addition to the nickel-copper mattes from Copper Cliff, Ontario, it is impossible to state what proportion of the above recoveries was from Canadian sources, although it is, of course, safe to assume that part of these metals has been derived from the Sudbury district mattes. The Company reported there has been no production in 1913, 1914, 1915, or 1916 from Canadian ores.

The recovery of gold, silver, platinum, and palladium at the works of the International Nickel Company in New Jersey for the six years ending December 31, 1912, was as follows:—

Recovery at the International Nickel Co.'s Works—New Jersey.

Year.	Gold.	Silver.	Platinum.	Palladium.
1907.....Ounces.	993·572	63,400·70	226·800	607·300
1908..... "	5,238·181	139,329·29	172·316	328·287
1909..... "	2,113·669	63,138·66	546·627	1,270·598
1910..... "	2,649·799	60,256·83	258·325	522·804
1911..... "	2,203·052	70,954·38	665·552	753·363
1912..... "	2,476·558	62,169·66	496·850	680·130
	15,674·831	459,249·52	2,366·470	4,216·482

During 1915, the average monthly price of refined platinum in New York, fell from $41.10 per ounce in January to $38.00 in June and July, but increased rapidly during the last five months of the year to an average of $85.50 in December. The price remained firm throughout 1916, reaching a maximum of $101.25 for November, and an average for 1916 of $83.40.

Average Monthly Prices of Platinum, 1915 and 1916.*

(In dollars per ounce troy).

Month.	1915.			1916.		
	New York refined platinum	St. Petersburg 83%.	Ekaterinburg crude metal platinum.	New York refined platinum	St. Petersburg 83%.	Ekaterinburg crude metal platinum.
January.....	41·10	.....	.....	90·05	61·25	61·10
February.....	40 00	30·38	30·08	90·00	61·14	62·63
March.....	39·50	30·38	30·08	90·75	.....	.....
April.....	38·63	30·38	30·08	83·10	63·70	63·70
May.....	38 50	30·57	30·08	80·50	66·64	65·92
June.....	38·00	32·39	31·02	78·13	63·70	63·92
July.....	38·00	32·39	31·02	63·60	63·21	63·92
August.....	39·25	32·30	30·73	62·56	67·41	66·45
September.....	50·00	.....	.....	84·25	67·41	66·45
October.....	54·50	37·98	38·70	89·75	77·42	71·44
November.....	62·63	47·46	46·64	101·25	.....	.....
December.....	85·50	56·40	56·25	86·87	.....	.....
Year.....	47·13	.....	.....	83·40	.....	.....

*From the "Engineering and Mining Journal."

Average Yearly Prices of Platinum.*

(In dollars per ounce troy).

	1911.	1912.	1913.	1914.	1915.	1916.
New York refined platinum.....	43.12	45.55	44.88	45.14	47.13	83.40
St. Petersburg, Russia, 83%.....	35.21	37.08	36.54	.....	.....	.....
Ekaterinburg crude metal platinum.	35.09	37.05	36.25	.....	.....	.....

*From quotation in "Engineering and Mining Journal," p. 47, January 8, 1916.

Imports of Platinum.*

Fiscal Year.	Value.	Fiscal Year.	Value.	Fiscal Year.	Value.	Fiscal Year.	Value.
1883.....	$ 113	1889.....	$ 3,167	1895.....	$ 3,937	1901.....	$20,263
1884.....	576	1890.....	5.215	1896.....	6,185	1902.....	19,357
1885.....	792	1891.....	4,055	1897.....	9,031	1903.....	21,251
1886.....	1,154	1892.....	1,952	1898.....	9,781	1904.....	28,112
1887.....	1,422	1893.....	14,082	1899.....	9,671	1905.....	61,719
1888.....	13,475	1894.....	7,151	1900.....	57,910	1906.....	54,494

Calendar Year.	Crucibles.	Wire and bars, strips, sheets, or plates.	Retorts, pans, condensers, etc.	Total Imports.
	Value.	Value.	Value.	Value.
1907.....	$2,974	$ 89,719	$ 3,415	$ 96,108
1908.....	1,709	37,223	5,321	44,253
1909.....	3,617	61,441	9,432	74,590
1910.....	2,133	100,185	10,744	113,062
1911.....	4,549	170,944	.....	175,493
1912.....	7,874	224,216	73	232,163
1913.....	4,557	141,117	.....	145,674
1914.....	9,795	69,736	142	79,673
1915.....	5,147	65,040	13,900	84,087
1916.....	5,430	68,633	14,480	88,543

*Platinum wire and platinum in bars, strips, sheets or plates; platinum retorts, pans, condensers, tubing and pipe, imported by manufacturers of sulphuric acid for use in their works; crucibles. Duty free.

(a)Estimate of World's Production of Crude Platinum.

Country.	1911.	1912.	1913.	1914.	1915.	1916.
Borneo and Sumatra.....	.....	200	200	*	*	*
Canada.....	30	30	50	30	100	60
Colombia.....	12,000	12,000	15,000	17,500	18,000	25,000
New South Wales.....	470	778	1,275	1,248	303	222
Russia.....	300,000	300,000	250,000	241,200	124,000	63,900
United States.....	628	721	483	570	742	750
	313,128	313,729	267,008	260,548	143,145	89,932

*No basis for estimate.
(a) From the Mineral Resources of the United States, July, 1917.

SILVER.

The total production of silver in 1916, amounted to 25,459,741 fine ounces, valued at $16,717,121, and included: (a) refined silver, or silver contained in silver or gold bullion, 20,465,384 ounces, or 80·3 per cent; (b) silver contained in blister copper and copper matte, 779,916 ounces, or 3·1 per cent; and (c) silver estimated as recoverable from ores exported 4,214,441 ounces, or 16·6 per cent.

In 1915, the total production was 26,625,960 fine ounces, valued at $13,228,842, and included: (a) refined silver, 81 per cent; (b) silver in blister copper and copper matte produced 2·6 per cent; and (c) silver estimated as recoverable from ores exported 16·4 per cent.

For the last few years, the production has shown a falling off both in quantity and value, while in 1916, the production decreased 4·4 per cent, and the value increased 26·3 per cent.

From 1887 to 1893, the production ranged in value between $300,000 and $400,000, and was derived chiefly from Ontario and Quebec. The next three years saw a rapid increase in production, due to the development of the silver-lead deposits of British Columbia, and in 1896 a production of over $2,000,000 is recorded. From that year until 1905, the production varied between $2,000,000 and $3,500,000 rising rapidly during the next six years to $17,580,455 in 1910, as a result of the discovery of the rich ores of the Cobalt district. Since then, there has been a falling off in quantity, but owing to the higher price of the metal, the total value was higher in 1912, 1913, and 1916.

Annual Production of Silver, 1887 to 1916.

Year.	Ounces.	Value.	Cents per ounce.	Year.	Ounces.	Value.	Cents per ounce.
1887	355,083	$ 347,271	98·00	1902	4,291,317	$2,238,351	52·16
1888	437,232	410,998	94·00	1903	3,198,581	1,709,642	53·45
1889	383,318	358,785	93·60	1904	3,577,526	2,047,095	57·22
1890	400,687	419,118	104·60	1905	6,000,023	3,621,133	60·35
1891	414,523	409,549	98·00	1906	8,473,379	5,659,455	66·79
1892	310,651	272,130	86·00	1907	12,779,799	8,348,659	65·33
1893	.....	330,128	77·00	1908	22,106,233	11,686,239	52·86
1894	847,697	534,049	63·00	1909	27,529,473	14,178,504	51·50
1895	1,578,275	1,030,299	65·28	1910	32,869,264	17,580,455	53·49
1896	3,205,343	2,149,503	67·06	1911	32,559,044	17,355,272	53·30
1897	5,558,456	3,323,395	59·79	1912	31,955,560	19,440,165	60 83
1898	4,452,333	2,593,929	58·26	1913	31,845,803	19,040,924	59·79
1899	3,411,644	2,032,658	59·58	1914	28,449,821	15,593,630	54·81
1900	4,468,225	2,740,362	61·33	1915	26,625,960	13,228,842	49·68
1901	5,539,192	3,265,354	58·95	1916	25,459,741	16,717,121	65·66

Ontario produced in 1905, 40·9 per cent of the output of Canada, in 1911 its percentage was 93·8; in 1914 it had fallen to 88·4 per cent, and in

1915 it decreased again to 85·4 per cent, while in 1916 it amounted to 84·9 per cent of the total.

Quebec and the Yukon, have produced but a small proportion of the total, being in 1915, 0·3 per cent for Quebec, and 0·9 per cent for the Yukon; while in 1916, Quebec produced 0·4 per cent and the Yukon, 1·4 per cent.

The production of British Columbia, which has varied between two and five million ounces for the last twenty years, was in 1914, 11·1 per cent of the total production of Canada; in 1915 it increased to 13·4 per cent, and in 1916 it was 13·3 per cent of the total.

Production of Silver by Provinces, 1887-1916.

Year.	Ontario.		Quebec.		British Columbia.		Yukon Territory.	
	Ounces.	Value.	Ounces.	Value.	Ounces.	Value.	Ounces.	Value.
1887	190,495	$ 186,304	146,898	$143,666	17,690	$ 17,301	.....	.....
1888	208,064	195,580	149,388	140,425	79,780	74,993	.....	.....
1889	181,609	169,986	148,517	139,012	53,192	49,787	.....	.....
1890	158,715	166,016	171,545	179,436	70,427	73,666	.....	.....
1891	225,633	222,926	185,584	183,357	3,306	3,266	.....	.....
1892	41,581	36,425	191,910	168,113	77,160	67,592	.....	.....
1893	.....	8,689	.....	126,439	.....	195,000	.....	.....
1894	.....	.....	101,318	63,830	746,379	470,219	.....	.....
1895	.....	.....	81,753	53,369	1,496,522	976,930	.....	.....
1896	.....	.....	70,000	46,942	3,135,343	2,102,561	.....	.....
1897	5,000	2,990	80,475	48,116	5,472,971	3,272,289	.....	.....
1898	85,000	49,521	74,932	43,655	4,292,401	2,500,753	.....	.....
1899	202,000	120,352	40,231	23,970	2,939,413	1,751,302	230,000	$137,034
1900	161,650	99,140	58,400	35,817	3,958,175	2,427,548	290,000	177,857
1901	151,400	89,250	41,459	24,440	5,151,333	3,036,711	195,000	114,953
1902	145,000	75,632	42,500	22,168	3,917,917	2,043,586	185,900	96,985
1903	17,777	9,502	28,600	15,287	2,966,204	1.601,471	156,000	83,362
1904	206,875	118,376	15,000	8,583	3,222,481	1,843,935	133,170	76,201
1905	2,451,356	1,479,442	19,620	11,841	3,439,417	2,075,757	89,630	54,093
1906	5,401,766	3,607,894	17,686	11,813	2,990,262	1,997,226	63,665	42,522
1907	9,982,363	6,521,178	16,000	10,452	2,745,448	1,793,519	35,988	23,510
1908	19,398,545	10,254,847	13,299	7,030	2,631,389	1,391,058	63,000	33,304
1909	24,822,099	12,784,126	13.233	6,815	2,649,141	1,364.387	45,000	23,176
1910	30,366,366	16,241,755	7,593	4,061	2,407,887	1,287,883	87,418	46,756
1911	30,540,754	16,279,443	18,435	9,827	1,887,147	1,005,924	112,708	60,078
1912	29,214,025	17,772,352	9,465	5,758	2,651,002	1,612,737	81,068	49,318
1913	28,411,261	16,987,377	34,573	20,672	3,312,343	1,980,483	87,626	52,392
1914	25,139,214	13,779,055	57,737	31,646	3,159,897	1,731,971	92,973	50,959
1915	22,748,609	11,302,419	63,450	31,524	3,565,852	1,771,658	248,049	123,241
1916	21,608,158	14,188,133	98,610	64,748	3,392,872	2,227,794	360,101	236,446

Prices.—The average price of silver in New York for the year 1916 was 65·661 cents per ounce, as against 49·684 cents in 1915.

The price, which was 56½ cents during the first week of January, gradually increased, reaching a maximum of 77¼ cents early in May; it then receded gradually to 61⅞ cents towards the middle of July, to again increase to 76⅝ cents in the last week of the year.

In London, the average price for the year was 31·315 pence per standard ounce (925 parts fine), as against 23·675 pence in 1915. The minimum prices were 26⅞ pence early in January, and 29½ pence in the middle of July; while the maximum prices were 37½ pence early in May, and 36 13/16 pence at the end of December.

The high silver prices in 1916 were due to the augmented demand from the Mints of the Entente Powers, a diminished supply, and also increased consumption in India, and the United States.

Yearly Average Prices of Silver in New York and London.

Year.	New York. Cents per fine ounce.	London. Pence per Standard ounce. (a)	Year.	New York. Cents per fine ounce.	London. Pence per Standard ounce. (a)
1908	52·864	24·402	1913	59·791	27·576
1909	51·503	23·726	1914	54·811	25·313
1910	53·486	24·670	1915	49·684	23·675
1911	53·304	24·592	1916	65·661	31·315
1912	60 835	28·042			

(a) 925 parts fine.

Average Monthly Prices of Silver.

Months.	New York.—Cents per fine ounce.						London—Pence per Standard ounce (*a*).
	1911.	1912.	1913.	1914.	1915.	1916.	1916.
January	53·795	56·260	62·938	57·572	48·855	56·775	26·960
February	52·222	59·043	61·642	57·506	48·477	56·755	26·975
March	52·745	58·375	57·870	58·067	50·241	57·935	27·597
April	53·325	59·207	59·490	58·519	50·250	64·415	30·662
May	53·308	60·880	60·361	58·175	49·915	74·269	35·477
June	53·043	61·290	58·990	56·471	49·034	65·024	31·060
July	52·630	60·654	58·721	54·678	47·519	62·940	30·000
August	52·171	61·606	59·293	54·344	47·163	66·083	31·498
September	52·440	63·078	60·640	53·290	48·680	68·515	32·584
October	53·340	63·471	60·793	50·654	49·385	67·855	32·361
November	55·719	62·792	58·995	49·082	51·714	71·604	34·192
December	54·905	63·365	57·760	49·375	54·971	75·765	36·410
Average for the year	53·304	60·835	59·791	54·811	49·684	65·661	31·315

(*a*) 925 parts fine. From "Engineering and Mining Journal," Jan. 6, 1917.

Important quantities of silver are being produced in Canada, both as fine metal and as silver bullion, ranging in fineness from 850 to 998·2. Fine silver is produced at Trail, B.C., by the Consolidated Mining and Smelting Company of Canada, Limited, being derived chiefly from the silver-lead ores of the Province, and finds a market in Canada, the United States, and China.

In Ontario, ores from the Cobalt district are treated by the Coniagas Reduction Co., Thorold, Ontario; the Deloro Smelting and Refining Co., Deloro, Ontario; the Metals Chemical Co., Welland, Ontario; and the Standard Smelting and Refining Co., Chippewa, Ontario.

Silver bullion varying from 850 to 998·2 is produced at these works, other products being white arsenic, metallic nickel and cobalt, sulphate of nickel and cobalt, nickel and cobalt-oxides, and mixed oxides. The silver bullion as a rule finds a market in the United States and in England.

Bullion shipped by these Ontario smelters in 1907 contained 4,449,722 fine ounces of silver; in 1908, 11,168,689 ounces; in 1911, 17,753,167 ounces;

in 1913, 11,356,707 ounces; in 1915, 9,885,989 fine ounces, and in 1916, 9,665,516 fine ounces.

The bullion shipped from the mines and mills in the Cobalt district in 1916, is reported as 8,551,070 fine ounces, as against 9,204,893 fine ounces in 1915, and 10,335,527 in 1914.

United States smelters report the receipt in 1916 of 7,072 tons of ore from Cobalt district, containing 3,238,795 fine ounces of silver, as against 7,310 tons, containing 3,580,843 fine ounces in 1915.

Exports and Imports.—The exports of silver as metallic or contained in ores, concentrates, etc., during 1916 were 25,279,359 fine ounces valued at $15,637,885, as against 27,672,481 fine ounces, valued at $13,812,038 in 1915.

The imports of silver bullion into Canada in 1916 were valued at $875,157, as against imports to the value of $337,254 in 1915.

Exports of Silver in Ore, etc.

Calendar Year.	Value.	Calendar Year.	Value.	Calendar Year.	Value.
1886	$ 25,957	1896	$2,271,959	1906	$ 5,686,444
1887	206,284	1897	3,576,391	1907	9,941,849
1888	219,008	1898	2,902,277	1908	12,403,482
1889	212,163	1899	1,623,905	1909	15,719,909
1890	204,142	1900	2,341,872	1910	15,649,537
1891	225,312	1901	2,026,727	1911	15,807,366
1892	56,688	1902	1,820,058	1912	19,494,416
1893	213,695	1903	1,989,474	1913	21,441,220
1894	359,731	1904	1,904,394	1914	15,584,813
1895	994,354	1905	2,777,218	1915	13,812,038
				1916	15,637,885

Imports of Silver Bullion.

Calendar Year.	Value.	Calendar Year.	Value.
1910	$ 975,045	1913	$840,245
1911	847,645	1914	629,279
1912	1,100,344	1915	337,254
		1916	875,157

Quebec.

The small quantity of silver credited to Quebec province for a number of years represents a small silver content of the pyritic ores mined at Eustis and Weedon, in the Eastern Townships, and the lead-zinc ores of Notre-Dame des Anges, Portneuf county. The production in 1916 was 98,610 fine ounces, valued at $64,748, as against 63,450 fine ounces, valued at $31,524 in 1915.

Ontario.

The production of silver in Ontario increased from 17,777 fine ounces in 1903 to 2,451,356 fine ounces in 1905, and reached a maximum of 30,-540,754 fine ounces in 1911. The maximum value, $17,772,352, was reached in 1912.

In 1916 the production was 21,608,158 fine ounces, valued at $14,188,133, as against 22,748,609 fine ounces, valued at $11,302,419 in 1915, a decrease of 5·0 per cent in quantity, but an increase of 15·5 per cent in value. The production included in addition to the production of the Cobalt and adjacent silver camps, 86,974 ounces contained in gold bullion, as against 74,784 ounces in 1915.

The silver ores of the Cobalt district, which in the early days of the camp were all exported for treatment, are being reduced to an increasing extent each year within the camp by a combination of amalgamation cyanide process, with recovery of silver bullion. During 1916, 8,551,070 ounces, or 39·5 per cent of the output was thus recovered as bullion in the district, while 9,665,516 ounces, or 44·7 per cent of the total was recovered by the silver smelters of the Province, so that over 18 millions or 84·2 per cent of the Ontario production was recovered in the form of bullion within the Province, leaving a balance of 15·8 per cent treated in the United States. In 1915 about 41 per cent was recovered as bullion in the district and 43 per cent by the silver smelters, giving a total of 84 per cent as recovered in the form of bullion within the Province, while in 1914, the recovery in the district was 41 per cent, and that by the silver smelters 36 per cent, or a total of 77 per cent as recovered within the Province.

The following notes are taken from the respective company's reports:—

Canadian Mining Corporation, Ltd.

Record of production for 12 months ending December 31, 1916:—

Tons of ore broken	65,645
" " hoisted	101,271
" " treated	114,392
Silver content in ounces	4,837,667·78
" " per ton	42·29
" recovered	3,884,427·54
Percentage of recovery	80·29
Tons of slimes, treated by cyanidation	51,171·75
Silver content of slimes, in ounces	705,887·81
" recovered from slimes, in ounces	573,013·26
Percentage of recovery, in ounces	81·18
Total silver recovered, in ounces	4,457,440·80
" percentage of extraction	92·14
" average silver production per ton of ore, in ounces	38·97

The proportion of silver produced from high grade and other shipping ore, as compared with the total silver produced, was 32·85% in 1916, as against 35·90% in 1915.

The total production from the Company's mines since the commencement of operations up to December 31, 1916, was 23,129,040 ounces.

The total cost per ton of ore treated was $13.43 in 1916, as against $10.15 in 1915, and $9.16 for the nine months in 1914; and the cost per ounce of silver was 34·46 cents as against 29·57 cents in 1915, and 30·91 cents in 1914.

The ore reserves estimated at December 31, 1916, are reported as 67,752 tons, containing 3,235,000 ounces of silver.

Nipissing Mines Company.

Year ending December 31, 1916:—(Nipissing production only).

Total tonnage of ore produced (high grade 1,269 tons)	78,120
" tonnage of ore treated (high grade 1,064 tons)	78,021
" silver produced, in ounces	4,044,668·49
" gross value of production	$3,027,668.83
" net value of production	$2,955,062.16
" tonnage of ore produced since 1904, inclusive	30,413·74
" gross ounces of silver produced	45,029,006·52
" " value	$26,180,028.71
" Net "	$24,846,967.90

"The high grade mill ran at full capacity throughout the year, and treated 1,064 tons of Nipissing ore and metallics, assaying 1,800 ounces per ton and 598 tons of custom ore and metallics, with an average assay of 3,113 ounces per ton.

"The precipitate from the low grade mill, containing over two million ounces was also refined at the high grade plant.

"Shipments of bullion amounted to 192 tons, averaging 998 fine, and contained 5,578,-162 fine ounces.

"The treatment cost was higher on account of the largely increased cost of mercury and cyanide, due to the war. The same cause, however, produced an active demand for cobalt, so that we were enabled to sell our entire stock of cobalt residue and to contract for the whole of our 1917 output.

"Shipments of residue in 1916 amounted to 2,506 tons, compared with 326 tons in 1915.

"The low grade mill treated 76,851 tons of Nipissing ore, averaging 29·61 ounces per ton, and 106 tons of by-products, assaying 1,732·38 ounces with a recovery of 2,133,681 ounces in the cyanide plant, or an extraction of 86·76 per cent.

"The above recovery does not include the silver saved by flotation of the cyanide tailing.

"Forty stamps ran 286·71 days or 78·33% of possible running time, crushing 268·04 tons per day, and 6·70 tons per stamp per day.

"The ore coming from the lower levels of the mine is more difficult to treat and consumes more cyanide. This, together with rapid rise in prices of all chemicals and supplies, and the advance in wages, brought the mill costs up to $4.60 per ton, compared with $3.91 in 1915; of this increase $0.34 is due to cyanide and $0.15 to wages.

"The high cost of aluminum dust necessitated the adoption of some other method of precipitation, and after exhaustive experiments precipitation by sodium sulphide was substituted. A solution of caustic soda is added to the precipitate, which is then desulphurized by circulating it through a small tube mill filled with aluminium ingots. The precipitate is then melted down to fine silver. The new practice is very satisfactory, and is cheaper even should the prices of all supplies drop to the pre-war basis.

"Experiments with the flotation of the tailing from the cyanide plant have been carried on throughout the year; the results are not yet satisfactory. The extraction is low, notwithstanding many variations in the method of applying the flotation treatment. By supplementing the treatment with concentration, either before or after flotation, much better results can probably be obtained and experiments are now being conducted along this line."

Coniagas Mines, Ltd.

Year ending October 31, 1916:—

Tons of ore treated	56,973
" " high grade concentrates shipped	492
Average silver content, in ounces	2,276·6
Tons of low grade slime	152·4
Average silver content, in ounces	329·8
Tons of mine ore shipped	193·2
Average silver content, in ounces	2,710·3
Tons of precipitate shipped	3·5
Average silver content, in ounces	20,494·6
Per cent of possible running time	99·83

"Mill heads averaged 25·76 ounces per ton as compared with 23 ounces for 1915. The sand tailings from the mill averaged 3·33 ounces per ton, and the slime tailings 4·90 ounces per ton, or an average for general tailings of 3·99 ounces.

"A recovery of 131·3 tons of slime concentrates containing 26,986 ounces of silver was made in the canvas plant which was erected to re-treat the slime tailings. Forty-four tons containing 8,968 ounces were shipped to the Coniagas Reduction Company, and 87·3 tons containing 18,018 ounces were treated in the cyanide mill.

"Cyanidation of canvas table concentrates and of the primary slime from the mine was begun February 26, 1916, and was continued during the remainder of the year. During this period 87·3 tons, dry weight, of canvas table concentrates, averaging 206·40 ounces per ton, and 889·3 tons, dry weight, of mine slime averaging 81·62 ounces per ton were treated, or a total of 976·6 tons, dry weight, containing 81,916 ounces of silver, of which 71,731·24 ounces of silver were recovered.

"The ore has been mined and concentrated during the past year at the net cost of 15·24 cents per ounce as compared with 13·618 cents per ounce for the previous year. This cost includes all overhead expenses, royalties, and all other expenses, exclusive of shipping, smelting, refining, and marketing charges which amounted to 4·27 cents per ounce of silver as compared with 3·252 cents for the previous year. It also includes the cost of development of the Agaunico property amounting to about 1 cent per ounce, but excludes an undetermined War Tax."

Buffalo Mines, Ltd.

Year ending April 30, 1917:—

Tonnage of ore treated by combination concentration and oil flotation methods	14,452
Tonnage of sand tailings treated by flotation process	35,507
Recovery from combination concentration and oil flotation, in ounces	324,636
Tonnage of slime from concentrator cyanided	3,038
Recovery from slimes, in ounces	37,089
" " shipments of concentrates, residues, etc., in ounces	205,194
" " bullion shipments, in ounces	36,715
Total production of silver for year	394,587

"The ore reserves amount to 40,900 tons with a total content of 1,071,125 ounces.

"The sand tailings approximate 275,000 with an estimated content of 1,400,000 ounces, and there also 3,000 tons of residues at the high grade plant.

"The reconstruction of plant is still under way and refining plant is not yet completed for the final treatment of flotation concentrates. This has been considerably delayed, due to our inability to get the equipment required and delay in making the installation, but it is probable the refining plant will again be in operation, treating both high grade and low grade ore by the new process in the latter part of June.

"This should materially decrease the cost of treatment both for high grade ore and flotation concentrates, and is a possible solution of the residue pile with its additional values in cobalt and nickel. The completion of the present process should for the present end the matter of reconstruction and allow us to get down to systematic work again."

Kerr Lake Mining Company.

Year ending August 31, 1916:—

Tonnage or ore treated (10,354 tons from dump)	36,129
Average grade ore treated in ounces	27·55
High grade ore shipped, in tons	493
Production from shipping ore, in ounces	1,438,600·80
" " milling ore, in ounces	995,192·27
Total gross production, in ounces	2,433,793·07

The cost of mining was $3.68 per ton, and 8·89 cents per ounce. The ore reserves are estimated at 3,827,000 ounces.

British Columbia.

The silver production of British Columbia based on smelter recoveries in 1916 was 3,392,872 fine ounces, valued at $2,227,794, as against 3,565,-852 fine ounces, valued at $1,771,658 in 1915, a decrease of 4·8 per cent in quantity, but an increase of 25·7 per cent in value.

The chief sources of the silver production in this Province are the silver-lead ores of the East and West Kootenays, supplemented by the silver contained in the gold-copper ores of Rossland, the Boundary, and Coast districts.

The leading silver producers, in order of importance were:—

Silver-Lead Mines.—Sullivan, Standard, Utica, Rambler, Cariboo, Galena Farm, Surprise, Ruth-Hope, Slocan Star, Silver Standard, and Blue Bell.

Copper-Gold Mines.—Hidden Creek, Granby, Centre Star, Le Roi, Britannia, Le Roi No. 2, Mother Lode, Rocher Deboule, and Marble Bay.

Gold-Silver Mines.—Union, Horn-Silver, Nickel Plate, and Jewel.

Production of Silver in British Columbia by Districts, 1912-1916.

(Silver contents of ores shipped, in fine ounces.)

——	1912.	1913.	1914.	1915.	1916.
Cariboo—					
Omineca division	.....	46,298	135,265	79,155	112,635
Cassiar:—					
Atlin	.....	.....	.....	.....	3,054
Skeena, etc.	5,868	4,714	131,509	175,179	256,802
Kootenay, East—					
Fort Steel division	376,918	362,311	492,080	481,258	509,693
Other divisions	7,405	4,756	.....	1,188	29,178
Kootenay, West—					
Ainsworth division	301,755	477,015	329,586	289,565	321,202
Slocan division	1,657,105	1,841,226	1,775,975	1,812,550	1,480,571
Nelson division	164,182	129,011	150,268	9,405	32,547
Trail Creek division	87,530	109,585	136,185	159,584	132,080
Revelstoke, Trout Lake, and Lardeau	43,536	23,397	11,295	16,740	22,419
Yale—					
Boundary	389,341	394,048	347,981	273,795	280,578
Similkameen Nicola	.....	335	15	347	830
Yale, Ashcroft and Kamloops	.....	126	57	1,702	4,215
Lillooet	.....	295	390	5	.....
Coast and other districts	98,468	103,034	91,574	66,033	116,119
Total	3,132,108	3,465,856	3,602,180	3,366,506	3,301,923

*From the Minister of Mines Reports, British Columbia.

Yukon.

The silver production of the Yukon in 1916 amounted to 360,101 fine ounces, valued at $236,466, as against 248,049 ounces valued at $132,241 in 1915, and 92,973 ounces, valued at $50,959 in 1914.

The comparatively large increase in the production for the past two years is due to the shipments of high grade silver-lead ores from the Silver-King property in the Mayo area, north of the Stewart river.

Thus lode mining, including recovery from the gold, copper and silver-lead ores, produced in 1916, 13 per cent of the total output, leaving 87 per cent as the production from the alluvial workings.

On an average about one ounce of silver is contained in each five ounces of crude bullion from the alluvial workings.

TIN.

Tin ores have not yet been found in sufficient quantities in Canada to be of economic importance.

The occurrence of tin ore has been reported from several localities, the most important, perhaps, being the discovery of cassiterite, near New Ross, Lunenburg county, Nova Scotia. Reports upon it may be found in the Summary Report of the Geological Survey Branch of the Department of Mines, for 1907, 1908, 1910, 1911, and 1912.

Tin has also been found in black sands in the Atlin district of British Columbia.

The imports of 1916 were valued at $2,999,675, and included: tin in blocks, pigs, and bars, 3,457,500 pounds, valued at $1,372,200; tin foil, bichloride of tin and strip waste, $1,544,420; and tin ware and crystals, valued at $1,311,482. There is also a large annual import of tin plate, the quantity in 1916 being 115,084,900 pounds, valued at $5,221,163.

Annual Imports of Tin.

Calendar Year.	Tin in blocks, pigs and bars.		Tin foil.		(a) Tinware, etc.	Tin crystals.	Bichloride of tin.		Strip waste.	
	Pounds.	Value.	Pounds.	Value.	Value.	Value.	Pounds.	Value.	Pounds.	Value.
1910	3,231,100	$1,058,778	866,751	$114,602	$389,040	$3,903	31,219	$3,846	.....	.....
1911	4,047,500	1,623,670	1,531,877	176,602	461,029	4,370	25,797	3,876	.....	.....
1912	4,894,700	2,134,221	1,316,882	183,707	540,599	6,308	36,045	5,595	.....	.....
1913	5,085,700	2,252,324	1,074,131	188,779	667,158	8,077	19,114	2,422	.....	.....
1914	3,382,700	1,191,466	1,244,628	173,088	650,987	7,759	200	29	.....	.....
1915	2,912,600	1,009,597	1,002,413	151,599	463,610	9,852	.....	.....	5,335	$138
1916	3,457,500	1,372,200	1,507,318	314,970	1,301,008	10,474	81	48	37,021	975

(a) Tinware, plain, japanned or lithographed, and all manufactures of tin n.e.s.

TUNGSTEN.

No production of tungsten is reported during 1916.

Scheelite was discovered in Halifax county, Nova Scotia, in 1908. Mr. Faribault, of the Geological Survey, visited this deposit again in 1909, and a preliminary report thereon will be found in the Summary Report of the Geological Survey for 1909, pages 228 to 234. During 1910 and 1912 these deposits were developed by the Scheelite Mines, Limited, who constructed a mill and made a shipment of 14 tons of tungsten concentrates —the first shipment from Nova Scotia—carrying 72 per cent tungstic acid.

The occurrence of wolframite has also been noted in association with molybdenite, by Dr. Walker, in New Brunswick, near the confluence of Burnt Hill brook and southwest Miramichi river. The property was tested by Mr. Freeze, of Doaktown, New Brunswick, and Mr. Matthew Lodge, of Moncton, who formed the Acadia Tungsten Mines Company. This Company has done a little development and had under construction a 30-ton concentrator, during 1916.

The tungsten ore deposits of Nova Scotia and New Brunswick were reported on by Mr. Charles Camsell and Dr. D. D. Cairnes, in the Summary Report of the Geological Survey Branch for 1916.

During September 1916, Dr. D. D. Cairnes investigated the possibility of important deposits of scheelite on Dublin gulch, Mayo district, Yukon territory, and reports rather favourably on these deposits, stating that the ore is found as alluvial with the gold placer and in lodes associated with small, barren, ramifying quartz veinlets which occur very plentifully intersecting pegmatitic zones within the granite. The scheelite, where found, occurs in the form of crystals along the edges of and between the veinlets.

He states that between $1\frac{1}{2}$ and 2 tons of scheelite concentrates should be freighted to Mayo during the winter and be available early in the summer of 1917. He looked to a recovery for the season of 1917 of from 10 to 20 tons of concentrates in addition to the gold.[1]

Prices.—The most spectacular advance in the price of metal known in recent years was in tungsten, both metal and ore.

During the first quarter of 1915, the New York market was very poor, ranging from $6.00 to $9.00 per unit. Following enormous orders for war requirements, in April and May, 1915, the price reached $10.00 per unit and continued rising by leaps and bounds. Large quantities of tungsten ore were booked in December at $44.00 per unit and also at $50.00 per unit. Ammunition buyers have paid as much as $62.50 per unit or even more.

[1] Summary Report of the Geol. Survey for 1916, pp. 12-19.

Early in 1916 the demand for tungsten ore advanced the price rapidly to $60.00 per unit by the end of January, and $70.00 in the latter part of February. Spot tungsten in March realized $85.00 per unit, in New York, and even a higher figure was paid in the West for immediate delivery. And towards the middle of April sales at round $100.00 per unit were reported, but at the close of the month the quotations for tungsten ore experienced a heavy break caused mostly by the great increase in production which soon satisfied consumers as to their requirements. By the middle of May prices had dropped, and ranged from $40.00 to $45.00 per unit. By the middle of August, the price had gone to $20.00.

Orders from the allied countries found sellers willing to accept $15.00 early in September. The market strengthened, and $18.00 and $20.00 were paid for prompt delivery towards the close of 1916.[1]

"The average price obtained in the United States the first six months of 1916 was $2,700 per ton; the average price in 1915 was $970; in 1914 it was $400; in 1913, $438; and in 1912, $377 per ton. Early in 1917 the price ranged from $1,800 to $2,000 per ton."[2]

The official prices in London for tungsten powder were 6s 3d ($1.52) per pound for the whole year, with the exception of the period from May 26th. until September 22nd., when it was fixed at 5s 10d ($1.42) per pound. The price for ferro-tungsten varied between 6s 1d ($1.48) and 5s 6d ($1.34) per pound.

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[1] From quotations by the Engineering and Mining Journal.
[2] From the Denver Mining and Financial Record.

ZINC.

With the exception of a small production in experimental work, there was no recovery of zinc spelter, or refined zinc in Canada previous to 1916. Hitherto the production of zinc has been recorded in terms of the tonnage of ore shipped and metal contents thereof. The establishment of an electrolytic refinery at Trail has placed the metallurgy of this metal in Canada on a similar basis to that of lead and copper, and it will be in order to record the production accordingly.

In 1915 the shipments of zinc ores to the United States smelters for reduction were 14,895 tons valued at $554,938, and containing 12,231,439 pounds of zinc. Assuming a probable recovery of 80% of the metal, the production of zinc may be recorded as 9,785,151 pounds which, at the average price of zinc for the year, 13·230 cents per pound in New York, would be worth $1,294,575.

In 1916 the total zinc ore shipments from mines, including the zinc-lead ores from the Sullivan mine, and ores exported were about 82,077 tons, containing 48,498,078 pounds of zinc (partially estimated in the absence of complete returns). A portion of the ores shipped to Trail were not treated during the year and the percentage of zinc recovered at the Trail refinery in the early stages of operation was probably not as large as will be secured when the primary difficulties have been eliminated. Adding to the actual recovery of refined zinc at Trail the zinc contents of ores sent to the United States smelters after allowing for smelter losses, we have a zinc production of 23,364,760 pounds which, at the average price of zinc for the year, 12·804 cents, would be worth $2,991,623. Of the total production thus recorded 1,663,200 pounds is credited to the Notre-Dame des Anges ores in Quebec, and 21,701,560 pounds to British Columbia.

The greater part of this production is from British Columbia, and the ore shipped contains also a varying silver content, for which payment is made by the smelters, and without which, on account of the import duty to the United States and the long rail haul, it would not, in many cases, pay to ship. The Slocan mining division produced about $\frac{1}{3}$ of the total output, the Fort Steele division, about $\frac{1}{2}$, and the balance came mostly from the Ainsworth and Nelson divisions.

In Quebec, the property at Notre-Dame des Anges, Portneuf, which is being operated by the Weedon Mining Company, shipped several hundred tons of ore, and a small production was made by Mr. P. Tetreault.

The output from Quebec was about 5 per cent of the total production from Canada.

Annual Shipments of Zinc Ores.

Year.	Zinc ore shipped.		Metallic zinc in ore shipped.
	Tons.	Spot value.	Pounds.
1898	1,162	$ 11,000	788,000
1899	865	18,165	814,000
1900	261	4,810	212,000
1901			
1902	158	1,659	142,200
1903	1,000	10,500	900,000
1904	597	3,700	477,568
1905	9,413	139,200	*
1906	1,154	23,800	*
1907	1,573	49,100	*
1908	452	3,215	*
1909(a)	18,371	242,699	16,468,204
1910	5,063	120,003	4,361,712
1911	2,590	101,072	2,346,849
1912	6,415	215,149	5,354,700
1913	7,389	186,827	7,069,800
1914	10,893	262,563	9,101,460
1915	14,895	554,938	12,231,439
1916	82,077	1,086,249	48,498,078

*Figures not available.
(a) Includes 7,424 tons shipped late in 1908.

The zinc industry has been the subject of a special report in 1905 by a Commission appointed to investigate the zinc resources of British Columbia, and the conditions affecting their exploitation.

In 1916 a brief report was made by Dr. A. W. G. Wilson on the production of spelter in Canada, and conditions in connexion with the home treatment of British Columbia zinc ore.[1]

During 1913 the new United States customs tariff came into effect considerably reducing the duties payable on Canadian ores, the new items affecting Canadian shipments being:—

Zinc ores containing 25 per cent or more zinc: 10% on zinc contained therein. Lead bearing ore: $\frac{3}{4}$ cent per pound on lead contained therein.

Although not paid for by the United States smelters, the lead in ore is considered as dutiable and as there is often a small lead content in the zinc ore or cencentrates shipped, the lead duty applies. The result of the decreased duties has been a considerable increase in zinc shipments.

There is also a duty of 15 per cent on metallic zinc exported to the United States, and at present an import of $7\frac{1}{2}$ per cent on zinc and other materials imported into Canada from the United States.

Prices.—The price of spelter in New York, which was 16 cents early in January rose sharply to $18\frac{1}{4}$ cents towards the end of the month, to decrease gradually to a minimum of $8\frac{1}{4}$ cents towards the end of August. Early in September a large business was done and the price gradually strengthened to 13 cents in November, but in December the market was weak, and the year finished with spelter quoted at $9\frac{1}{2}$ cents.

[1] Mines Branch No. 12. Report of the Commission on the Investigation of the Zinc Resources of British Columbia, 1905. (Out of print.)
Mines Branch No. 428. Report on the Production of Spelter in Canada, 1916, by Dr. A. W. G. Wilson.

Average Price of Spelter in Cents per Pound at New York.

Month.	1910.	1911.	1912.	1913.	1914.	1915.	1916.
January	6·101	5·452	6·442	6·931	5·262	6·386	16·915
February	5·569	5·518	6·495	6·239	5·377	8·436	18·420
March	5·637	5·563	6·626	6·078	5·250	8·541	16·846
April	5·439	5·399	6·633	5·641	5·113	10·012	16·695
May	5·191	5·348	6·679	5·406	5·074	14·781	14·276
June	5·128	5·520	6·877	5·124	5·000	21·208	11·752
July	5·152	5·695	7·116	5·278	4·920	19·026	8·925
August	5·279	5·953	7·028	5·658	5·568	12·781	8·730
September	5·514	5·869	7·454	5·694	5·380	13·440	8·950
October	5·628	6·102	7·426	5·340	4·909	12·800	9·829
November	5·976	6·380	7·371	5·229	5·112	15·962	11·562
December	5·624	6·301	7·162	5·154	5·592	15·391	10·669
Year	5·520	5·758	6·943	5·648	5·213	13·230	12·804

*From the Engineering and Mining Journal, N.Y., Jan. 6, 1917.

Average Prices of Spelter, Ordinary Brands, in London.*

(In pounds per ton.)

Month.	1910.			1911.			1912.			1913.			1914.			1915.			1916.		
January	23	4	3	23	16	7	26	9	11	25	19	1	21	6	6	30	16	1	83	12	5
February	23	3	1	23	3	10	26	6	5	25	4	3	21	7	6	39	16	4	93	10	11
March	23	3	7	22	19	2	25	19	11	24	11	4	21	7	7	44	2	7	90	1	9
April	22	9	11	23	13	8	25	8	11	25	2	4	21	10	2	49	17	9	94	1	8
May	22	1	1	24	6	1	25	11	2	24	10	4	21	5	9	67	19	0	89	11	4
June	22	3	2	24	9	7	25	11	11	21	19	10	21	6	0	100	12	3	63	16	4
July	22	5	6	24	13	10	25	13	1	20	11	2	21	6	7	97	5	0	48	7	6
August	22	14	0	26	11	2	26	1	2	20	14	0	29	0	9	67	15	9	47	19	7
September	23	2	7	27	12	7	26	17	0	21	3	10	25	14	0	67	17	9	48	15	8
October	23	16	6	27	4	10	27	5	10	20	13	9	23	13	6	66	10	11	52	4	4
November	24	1	9	26	13	2	26	14	3	20	14	4	24	14	10	85	6	4	55	0	5
December	23	17	7	26	13	7	26	0	4	21	6	8	27	6	10	82	4	1	54	5	9
Year	23	0	0	25	3	2	26	3	3	22	14	3	23	6	8	66	13	8	68	8	11

*From the annual publication of the "Metal Information Bureau," London, E.C.

Imports.—The recorded imports of zinc, which have hitherto been taken as an index of consumption, show a fairly steady increase, and amounted in 1916 to 29,999,838 pounds, valued at $3,642,476, with also manufactures of zinc valued at $48,101.

The imports of brass, which alloy contains about 30 per cent zinc, were valued in 1916, at $3,752,851.

The imports of zinc during 1915 were 28,170,757 pounds, valued at $2,753,647, with also manufactures of zinc valued at $21,711.

The imports of brass were valued at $2,463,532.

The detailed imports for the last three years are given in the following table, with also the estimated zinc contents of zinc products and brass.

Summary of Imports of Zinc and Zinc Products in 1914, 1915, and 1916.

Zinc and Zinc Products.	1914.			1915.			1916.		
	Product in pounds.	Value of products.	Zinc content in pounds.	Product in pounds.	Value of product.	Zinc content in pounds.	Product in pounds.	Value of product.	Zinc content in pounds.
Zinc, in blocks, pigs and sheets	3,160,900	$ 189,785	3,160,900	1,653,700	$ 226,104	1,653,700	1,624,600	$ 267,750	1,624,600
" as spelter	10,845,400	551,031	10,845,400	14,265,700	1,784,471	14,265,700	13,214,800	1,873,605	13,214,800
" seamless tubing				100	27	100			
" white	9,445,397	389,796	(80%) 7,556,318	11,368,569	656,132	(80%) 9,094,855	14,171,673	1,314,629	11,327,338
" dust	362,109	34,295	(90%) 325,898	503,143	70,823	(90%) 452,829	691,704	162,186	622,534
" sulphate and chloride of	352,715	9,390	(44%) 155,195	379,545	16,090	(44%) 167,000	297,061	24,306	130,707
Total	24,166,521	$1,174,297	22,043,711 (11,021·8 tons)	28,170,757	$2,753,647	25,634,184 (12,817·1 tons)	29,999,838	$3,642,476	26,919,979 (13,460 tons)
" as manufacture		$36,355			$21,711			$ 48,101	
Brass in blocks, pigs and ingots	1,010,600	$ 126,357	(30%) 303,180	1,677,800	$226,499	(30%) 503,340	736,000	$ 163,540	220,800
" old and scrap	1,407,900	150,346	" 422,370	311,900	41,971	" 93,570	848,800	183,611	254,640
" tubing	1,590,573	314,675	" 477,172	1,381,482	349,988	" 414,445	993,119	411,539	297,936
" plain wire	370,407	59,984	" 111,122	439,766	95,952	" 131,930	396,757	164,833	119,027
" bars and rods (free)	1,747,700	285,656	" 524,310						
Total	6,127,180	$ 937,018	1,838,154 (919·1 tons)	3,810,948	$ 714,410	1,143,285 (571·6 tons)	2,974,676	$ 923,523	892,403 (446·2 tons)
Brass, bars and rods		$ 94,827			$ 215,782			$ 362,318	
" strips, sheets or plates		110,733			234,590			242,101	
" wire cloth n.o.p.		120,614			147,464			266,202	
" cups for manufacture of shells		124,622			435,161			1,059,678	
" caps for electric-batteries		5,684			5,367			6,985	
" hand-pumps		11,956			10,930			22,795	
" nails, tacks, etc.		6,736			7,562			13,796	
" other manufactues, n.o.p.		1,445,898			1,406,676			1,778,976	
Total		$1,921,070			$2,463,532			$3,752,851	

Imports of Zinc.

Fiscal Year.	In blocks, pigs and sheets.		As spelter.		As manufactures of zinc.	Seamless tubing.	
	Cwt.	Value.	Cwt.	Value.	Value.	Pounds.	Value.
1880	13,805	$ 67,881	1,073	$ 5,301	$ 8,327	.....	.....
1881	20,920	94,015	2,904	12,276	20,178	.....	.....
1882	15,021	76,631	1,654	7,779	15,526	.....	.....
1883	22,765	94,799	1,274	5,196	22,599	.....	.....
1884	18,945	77,373	2,239	10,417	11,952	.....	.....
1885	20,954	70,598	3,325	10,875	9,459	.....	.....
1886	23,146	85,599	5,432	18,238	7,345	.....	.....
1887	26,142	98,557	6,908	25,007	6,561	.....	.....
1888	16,407	65,827	7,772	29,762	7,402	.....	.....
1889	19,782	83,935	8,750	37,403	7,233	.....	.....
1890	18,236	92,530	14,570	71,122	6,472	.....	.....
1891	17,984	105,023	6,249	31,459	7,178	.....	.....
1892	21,881	127,302	13,909	62,550	7,563	.....	.....
1893	26,446	124,360	10,721	49,822	7,464	.....	.....
1894	20,774	90,680	8,423	35,615	6,193	.....	.....
1895	15,061	63,373	9,249	30,245	5,581	.....	.....
1896	20,223	80,784	10,897	40,548	6,290	.....	.....
1897	11,946	57,754	8,342	32,826	5,145	.....	.....
1898	35,148	112,785	2,794	13,561	10,503	.....	.....
1899	18,785	107,477	5,450	29,687	14,661	.....	.....
1900	28,748	156,167	5,836	29,416	11,475	.....	.....
1901	20,527	103,457	14,621	58,283	6,882	.....	.....
1902	34,871	141,560	18,356	80,757	6,683	.....	.....
1903	26,646	142,827	23,159	110,817	9,754	.....	.....
1904	25,553	138,057	33,952	164,751	12,682	.....	.....
1905	25,141	141,514	37,941	206,244	11,912	.....	.....
1906	24,462	158,438	50,137	290,686	12,917	.....	.....
Calendar Year.							
1907	30,130	198,570	58,430	348,810	21,812	670	$53
1908	24,273	130,689	54,780	254,225	14,577	.....	.....
1909	35,283	199,016	120,615	592,148	16,073	.....	.....
1910	31,660	191,051	109,084	561,170	21,829	.....	.....
1911	33,678	206,859	116,996	654,097	30,862	.....	.....
1912	100,095	617,836	117,845	686,585	46,336	.....	.....
1913	47,226	291,368	126,051	661,207	54,898	.....	.....
1914	31,609	189,785	108,454	551,031	36,355	.....	.....
1915	16,537	226,104	142,657	1,784,471	21,711	100	27
1916	16,246	267,750	132,148	1,873,605	48,101	.....	.....

Imports of Zinc White, Zinc Dust, and Zinc Sulphate and Chloride.

Calendar Year.	Zinc white.		Zinc dust.		Zinc, sulphate and chloride of.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1910	8,496,399	$ 312,779	97,461	$ 4,859	237,466	$ 6,470
1911	8,537,498	314,194	86,242	5,718	414,500	15,930
1912	10,505,944	425,714	308,239	18,944	941,780	29,104
1913	12,682,126	525,643	412,294	26,403	634,634	17,424
1914	9,445,397	389,796	362,109	34,295	352,715	9,390
1915	11,368,569	656,132	503,143	70,823	379,545	16,090
1916	14,171,673	1,314,629	691,704	162,186	297,061	24,306

Consumption.—The table of imports shows that in 1916, 13,460 tons of zinc were imported as zinc or zinc products, with also 446 tons of zinc in brass, and approximately 1,000 tons as zinc contents of manufactures of zinc and brass, or a total of 14,906 tons, which added to the zinc refined in Canada, would give a total consumption of about 18,000 tons, as against 14,000 in 1915.

It is probable, however, in the case of zinc, as has been already shown for steel, copper and lead, that there have been other imports besides those recorded under the usual classification, and that the actual consumption in 1916 was greater than the above estimate.

There are now in Canada three companies constructing, or operating electrolytic plants, viz: The Electro Zinc Company, formerly at Welland, Ontario, and now at Shawinigan Falls, Que, which uses the Watt's process; the French Complex Ore Reduction Company at Nelson, B.C., using the French process; and the Consolidated Mining and Smelting Co. of Canada, Ltd., at Trail, B.C., which company has erected a large plant and is increasing its capacity so as to treat, it is reported, about 70 tons per day.

In 1916, the operations with the exception of the Trail plant were still in the experimental stages of development.

The plant of the Electro Zinc Co. was designed to recover refined zinc ores from Notre-Dame des Anges, Quebec.

The French Complex Ore Reduction Co. established a plant at Nelson, after the Provincial Government had guaranteed its bonds to the amount of $40,000, and was reported to be in a position to start operations early in 1917.

The Trail plant of the Consolidated Mining and Smelting Co. started regular commercial operations early in 1916, and in July it was reported to be producing 20 tons per day. Later in the year, the company undertook to increase its capacity to 45 tons, and then to 70 tons.

Early in 1917 it was reported to be producing about 45 tons per day.

Bounties.—An Act to provide for the payment of bounties on zinc produced from zinc ores mined in Canada was passed by the House of Commons of Canada, May 3, 1916, and reads as follows:—

"An Act to provide for the payment of Bounties on Zinc produced from Zinc Ores mined in Canada. His Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

"1. This Act may be cited as The Zinc Bounties Act, 1916.

"2. Whenever it appears to the satisfaction of the Minister of Trade and Commerce who is charged with the administration of this Act, that the standard price of zinc or spelter in cakes, stocks or pigs, in London, England, is less than £36 19s 3d sterling, per ton of two thousand two hundred and forty pounds, the Governor in Council may authorize the payment out of the Consolidated Revenue Fund of a bounty on zinc or spelter, containing not more than two per cent of impurities, produced in Canada, at the time the price is as hereinbefore stated, from zinc ores mined in Canada. Such bounty shall be equal to the difference between such standard price per ton, and £36 19s 3d per ton, but shall in no case exceed two cents per

pound, and in no event shall any bounty be paid when the price received for such zinc and spelter by the producer is eight cents or more per pound.

"3. No bounty shall be payable under this Act on zinc or spelter produced during the continuation of the war, and in no event shall bounty be payable on zinc or spelter produced after the thirty-first day of July, one thousand nine hundred and seventeen.

"4. The total amount payable under the provisions of this Act shall not exceed the sum of $400,000.

"5. The Governor in Council may make regulations for carrying out the provisions of this Act."

Production of Zinc in British Columbia by Districts, 1912-1916.*

(Contents of ore shipped in pounds).

——	1912.	1913.	1914.	1915.	1916.
Kootenay, East—					
Fort Steele division	.....	.....	.....	180,000	14,840,000
Other divisions	142,643	.....	.....	311,719	210,000
Kootenay, West—					
Ainsworth division	.....	150,680	280,000	678,940	625,971
Nelson division	.....	.....	332,003	3,127,209	3,470,036
Slocan division	5,215,637	6,608,088	7,254,464	8,684,572	17,854,357
Cariboo—					
Omineca	.....	.....	.....	.....	168,616
	5,358,280	6,758,768	7,866,467	12,982,440	37,168,980

*From the Minister of Mines Reports, British Columbia.

World's Production of Spelter, in Short Tons.*

Country.	1908.	1909.	1910.	1911.	1912.	1913.
Australia	1,198	.....	560	1,904	2,531	4,105
Austria and Italy	14,063	13,931	14,666	18,602	21,609	23,928
Belgium	181,851	184,194	190,233	215,050	220,678	217,928
France and Spain	61,512	61,859	65,191	79,791	79,543	78,289
Germany	239,062	242,594	251,046	276,008	298,794	312,075
Great Britain	60,029	65,422	69,531	73,803	63,086	65,197
Holland	19,017	21,548	23,121	25,059	26,380	26,811
Poland	9,740	8,758	9,514	10,952	9,659	8,389
United States	210,424	255,760	269,184	286,526	338,806	346,676
Norway	.....	.....	.....	7,363	8,959	10,237
Total	796,896	854,066	893,046	986,058	1,070,045	1,093,635

*Mineral Resources of the United States.

World's Consumption of Spelter, in Short Tons.*

Country.	1908.	1909.	1910.	1911.	1912.	1913.
Austria-Hungary	35,935	36,155	37,258	47,950	51,588	44,533
Belgium	74,956	71,209	84,326	81,240	85,098	84,216
France	85,869	73,744	62,059	90,389	90,389	89,286
Germany	198,634	207,343	203,374	241,734	248,899	255,734
Great Britain	152,669	171,408	195,989	193,674	204,146	214,508
Holland	4,189	4,409	4,409	4,409	4,409	4,409
Italy	9,259	9,039	8,929	11,133	11,795	12,015
Russia	19,621	20,282	27,447	31,856	30,754	36,707
Spain	5,512	4,960	4,630	5,291	5,181	6,503
United States	214,167	270,730	245,884	280,059	340,372	295,370
Other countries	11,023	9,921	13,669	19,621	21,715	23,038
Total	811,834	879,200	887,974	1,007,356	1,094,346	1,066,319

*Mineral Resources of the United States.

Electrolytic Zinc Plants in Canada.

Company.	Location of plant.	Remarks.
Consolidated Mining and Smelting Co. of Canada, Ltd	Trail, B.C.	Capacity of plant, 45 tons of refined zinc per day being increased to 70 tons per day.
Electro Zinc Company, Ltd	Shawinigan Falls, Que.	Experimental in 1916. Small plant for recovery of zinc from zinc oxide.
FrenchComplex Ore Reduction Company	Nelson, B.C.	Experimental. Small demonstration plant at Nelson, B.C.

Electrolytic Zinc Plants in the United States.*

Company.	Location of plant.	Daily spelter capacity.	Remarks.
American Smelting and Refining Co.	Omaha, Nebr.	Experimental.	Operated in 1915.
" " "	Garfield, Utah	10 tons.	Planned.
Anaconda Copper Mg. Co.	Anaconda, Mont.	25 tons.	Under construction; 10 tons operated in 1915.
" " "	Great Falls, Mont	100 tons.	Under construction.
Bully Hill Copper Co.	Bully Hill, Cal.	Experimental.	Operated in 1915.
		10 tons.	Under construction.
Daly-Judge Mining Co.	Park City, Utah.	15 tons.	" "
Electrolytic Zinc Co.	Baltimore, Md.	10 tons.	" " 2½ tons now in operation.
Mammoth Copper Mg. Co.	Kennett, Cal.	Experimental.	Operated in 1915.
Northwestern Metals Co.	Helena, Mont.	Ore capacity 100 tons.	Malm process: not operated in 1915.
Reed Zinc Co.	Palo Alto, Cal.	Experimental.	Operated in 1914-15.
River Smelting and Refining Co.	Keokuk, Iowa.	"	Operated in 1915.
Western Metals Co.	Georgetown, Colo.	Ore capacity 100 tons.	Malm process; under construction.

*As published by the United States Geological Survey, April 4, 1916.

Active Zinc Smelters in the United States, and Capacity in 1916, by Companies and States.*

Company.	Location.	Acid Plants.	Retorts at close of 1915.	Retorts June 30 1916.	Additional retorts contemplated or under construction.
Fort Smith Spelter Co.	Fort Smith, Ark.			2,560	
Arkansas Zinc Co.	Van Buren, "			2,400	
United States Zinc Co.	Pueblo, Colo.		2,208	1,944	
American Zinc Co. of Illinois	Hillsboro, Ill.	A	4,000	4,864	
Collinsville Zinc Sm. Co.	Collinsville, "		1,792	2,304	
Granby Mg. & Sm. Co.	E. St. Louis, "	A	3,220	3,220	2,400
Hegeler Zinc Co.	Danville, "	A	3,600	5,400	
Illinois Zinc Co.	Peru, "	A	4,640	4,640	800
Matthiesson & Hegeler Zinc Co.	La Salle, "	A	6,168	6,168	
Missouri Zinc Co.	Beckemeyer, "		352	352	
Mineral Pt. Zinc Co.	Depue, "	A	9,068	9,068	
National Zinc Co.	Springfield, "	A	3,200	4,480	
Robt. Lanyon Z. & Acid Co.	Hillsboro, "	A	1,840	3,200	
Sandoval Zinc Co.	Sandoval, "		672	672	
American Spelter Co.	Pittsburg, Kan.		896	992	
American Zinc, Lead & Smelting Co.	Caney, "		6,080	6,080	
" " "	Dearing, "		4,480	4,480	
Chanute Spelter Co.	Chanute, "		1,280	1,280	
Cherokee Smelting Co.	Bruce, "		896	896	
Edgar Zinc Co.	Cherryvale, "		4,800	4,800	
Granby Mg. & Sm. Co.	Neodesha, "		3,760	3,760	
Iola Zinc Co.	Concreto, "		660	1,320	
Joplin Ore & Spelter Corporation	Pittsburg, "		1,444	1,792	
Lanyon Smelting Co.	" "		448	448	
Owen Zinc Co.	Caney, "		1,280	1,280	640
Pittsburg Zinc Co.	Pittsburg, "		910	910	
Prime Western Spelter Company.	Gas, "	A	4,868	4,868	
U.S. Smelting Co.	Altoona, "		3,960	4,600	
" "	Iola, "		3,440	3,440	
" "	La Harpe, "		1,924	1,924	
Weir Smelting Co.	Weir, "				448
Edgar Zinc Co.	St. Louis, Miss.		2,000	2,000	
Miss. Zinc Sm. Co.	Rich Hill, "			448	
Nevada Smelting Co.	Nevada, "		672	672	
Bartlesville Zinc Co.	Bartlesville, Okla.		5,184	6,336	
" " "	Blackwell, "			1,600	4,800
" " "	Collinsville, "		10,752	13,440	
" " " (Lanyon-Starr Plant)	Bartlesville, "		3,456	3,456	
Eagle-Picher Lead Co.	Henryetta, "				4,000
Henryetta Spelter Co.	" "			3,000	
J. B. Kirk Gas & Sm. Co.	Checotah, "			2,560	2,560
Kusa Spelter Co.	Kusa, "		3,720	3,720	
La Harpe Spelter Co.	" "			4,000	
National Zinc Co.	Bartlesville, "		4,970	4,970	
Oklahoma Spelter Co.	Kusa, "			1,600	
Quinton Spelter Co.	Quinton, "				1,340
Tulsa Fuel & Mfg. Co.	Collinsville, "		6,232	6,232	
U.S. Zinc Co.	Sand Springs, "		5,680	8,000	
American Steel & Wire Company	Donora, Penn.	A	3,648	9,120	
American Zinc & Chemical Co.	Langeloth, "	A	3,648	6,384	912
N.J. Zinc Co. (of Pennsylvania)	Palmerton, "		6,720	6,960	
Clarksburg Zinc Co.	Clarksburg, W.Va		3,648	3,648	
Grasselli Chemical Co.	" "	A	5,760	5,760	
" " "	Meadowbrook, "	A	8,592	8,592	
United Zinc Smelting Corporation	Moundsville, "	A			6,912
Total, for all States			156,568	196,640	24,812
	Plants with special retorts:— Michael Hayman & Co., Buffalo, N.Y.		12	12	
	Trenton Sm. & Refining Co., Trenton, N.J.		96	60	
	Wm. Cramp & Sons Ship & Engine Bldg. Co., Philadelphia, Pa.		32	32	

*United States Geological Survey, Press Bulletin No. 285, August, 1916.