CANADA

DEPARTMENT OF MINES

HON. MARTIN BURRELL, 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

1918

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LETTER OF TRANSMITTAL.

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

SIR,—The accompanying report "The Production of Copper, Gold, Lead, Nickel, Silver, Zinc, and other metals in Canada, during the calendar year 1918," has been compiled by Arthur Buisson, B.Sc., Mining Engineer in this Division.

Contrary to the usual practice, this report will not be included in the "Annual Report on Mineral Production of Canada during the Calendar Year 1918." A brief synopsis of the statistical data will, however, form part of the Annual Report.

I have the honour to be, Sir,

Your obedient servant,

(Signed) **John McLeish.**

Division of Mineral Resources and Statistics,
OTTAWA, September 19, 1919.

CONTENTS.

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. Bauxite is used in the manufacture of artificial abrasives as well as a source of aluminium.

During the twelve months ending December 31, 1918, the imports of alumina were 186,442,200 pounds, or 93,221 tons valued at $2,071,060, as against 174,307,800 pounds, or 87,154 tons valued at $1,866,240 in 1917, and 53,819,000 pounds, or 26,910 tons valued at $1,114,061 in 1916.

The imports of aluminium in ingots, bars, tubes, etc., were in 1918, 286,901 pounds, or 143·5 tons valued at $109,411 besides manufactures of aluminium valued at $274,574, or a total value of $383,985 compared with 702,952 pounds, or 351·5 tons valued at $319,680, besides manufactures of aluminium valued at $240,801, or a total value of $560,481 in 1917.

The exports of aluminium in ingots, bars, tubes, etc., in 1918 amounted to 21,616,500 pounds, or 10,808 tons valued at $7,223,570 together with manufactures of aluminium valued at $197,670, as against 22,324,600 pounds, or 11,162 tons valued at $7,620,953, and manufactures valued at $17,165 in 1917.

Annual Imports of "Alumina."

Calendar Year.	Imports of Alumina		Calendar Year.	Imports of Alumina.	
	Pounds.	Value.		Pounds.	Value.
1905	5,360,800	$ 138,735	1912	22,400,500	$ 448,061
1906	8,975,400	239,136	1913	30,704,200	614,713
1907	12,705,300	268,502	1914	28,557,000	571,419
1908	1,485,500	29,752	1915	35,016,200	892,634
1909	11,794,100	234,544	1916	53,819,000	1,114,061
1910	19,464,400	403,283	1917	174,307,800	1,866,240
1911	18,607,200	372,009	1918	186,442,200	2,071,060

Annual Imports of Aluminium.

Year.	Ingots, Blooms, Bars.		Tubing.		Manufactures.	Leaf 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	19,356	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
1917	698,046	316,591	4,906	3,089	137,636	103,165	560,481
1918	279,858	104,950	7,043	4,461	187,664	86.910	383,985

(a) Not given separately, previous to 1914.

Annual Exports of Aluminium.

Calendar Year.	Exports of Aluminium.			Calendar Year.	Exports of Aluminium.		
	Ingots, Bars, etc.		Manufactures.		Ingots, Bars, etc.		Manufactures.
	Pounds.	Value.	Value.		Pounds.	Value.	Value.
1905.....	2,535,386	$ 508,219	$ 1,588	1912....	18,285,700	$ 2,002,363	$ 10,898
1906.....	1,521,486	899,113	2,244	1913.....	13,015,000	1,762,214	8,203
1907.....	5,478,203	1,109,353	1,499	1914.....	14,510,800	2,364,907	5,571
1908.....	1,713,800	399,785	1,727	1915.....	18,680,800	3,333,726	620,562
1909.....	6,134,500	918,195	3,453	1916.....	18,425,300	5,201,066	26,780
1910	7,722,400	1, 160,242	3.741	1917	22,324,600	7,620,953	17,165
1911.....	4,990,100	747,587	1,555	1918.....	21,616,500	7,223,570	197,670

Prices.—The price of aluminium which was at about 37 cents per pound at the close of 1917 was fixed in March, 1918, by the United States War Industries Board, at a maximum base price of 32 cents per pound, and this price ruled until June when it was raised to 33 cents at which price it remained until the end of the year.

The quotations of prices in 1917 reflect transactions in the market for uncontracted supplies, which is mainly in metal offered for re-sale, including ingots remelted for scrap. The bulk of the aluminium production enters consumption on long terms contracts. Previous to the war the differences between the contractal and the open markets were not very great, but since the beginning of the war they have been very large.

Average Monthly Prices of Ingot Aluminium.

(At New York in cents per pound).

—	1913.	1914.	1915.	1916.	1917. (a)	1918.
January.....	26·31	18·81	19·08	55·00	60·77	37·5
February.....	26·04	18·81	19·22	58·00	59·00	37·0
March	27·05	18·50	19·00	60·25	59·00	32·0
April.....	27·03	18·16	18·88	59·50	59·92	32·0
May	26·44	17·95	22·03	59·00	59·84	32·0
June	24·68	17·75	30·00	61·50	60·00	33·0
July.....	23·38	17·66	32·38	60·20	55·48	33·0
August	22·70	19·88	34·50	60·00	48·88	33·0
September	21·69	19·94	47·75	61·88	43·64	33·0
October.....	20·13	18·50	50·00	65·05	38·90	33·0
November.....	19·35	18·00	57·75	65·12	37·22	33·0
December.....	18·88	18·96	57·13	63·00	36·40	33·0
	23·64	18·63	33·98	60·71	51·59	33·46

(a) *From the Engineering and Mining Journal, January 11, 1919.*

Uses.—The aluminium industry in 1918 was almost entirely engaged in war work and the uses to which aluminium was put are many and diversified. The greatest were in the field of aeronautics and in ordnance.

ANTIMONY.

Shipments of both antimony ore and concentrates and of refined antimony were made from Canadian properties intermittently during the last ten years. Refined antimony has been 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.

In 1918 there was no shipment of antimony either as ore, concentrate, or regulus. The shipments of antimony ore and concentrates in 1917, were reported as 361 tons valued at $22,000, as against 885 tons valued at $94,537 in 1916; no production of refined antimony was reported in 1917 and 1918.

The exports of antimony ore in 1918 amounted to 26 tons valued at $1,430, as against 774 tons valued at $50,476 in 1917.

The imports of antimony were in 1918, 683,803 pounds valued at $111,664 as against 344,429 pounds valued at $68,027 in 1917.

Annual Shipments of Antimony Ore.

Calendar Year.	Antimony ore.		Refined regulus.	
	Tons.	Value.	Pounds.	Value.
1886	665	$ 31,490		
1887	584	10,860		
1888	345	3,696		
1889	55	1,100		
1890	26½	625		
1891	10	60		
1892 to 1897				
1898	1,344	20,000		
1899 to 1904				
1905 (a)	527			
1906 (a)	782			
1907	2,016	65,000	63,850	$ 5,108
1908 (b)	148	5,443		
1909	35	1,575	61,207	4,285
1910	364	13,906		
1911-1914				
1915	1,341	81,283	59,440	11,888
1916	885	94,537	107,185	41,823
1917	361	22,000		
1918				

(a) As recorded by the Nova Scotia Department of Mines; no value given.
(b) Exports.

Exports and Imports of Antimony.

Calendar year.	Exports of antimony ore.		Imports					
			Antimony or regulus of		Antimony salts.		Total imports.	
	Tons.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1907	1,327	$ 37,807	416,512	$ 69,447	117,592	$ 19,083	534,104	$ 88,530
1908	148	5,443	396,904	28,509	29,832	2,452	426,736	30,961
1909	4	120	551,354	37,362	40,176	4,369	591,530	41,731
1910	239	14,095	388,952	25,296	94,330	9,152	483,282	34,448
1911	57	4,946	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	1,149	82,990	1,962,194	344,918	67,956	10,320	2,030,150	355,238
1916	794	48,158	796,728	208,450	41,985	13,891	838,713	222,341
1917	774	50,476	332,137	61,732	12,292	6,295	344,429	68,027
1918	26	1,430	648,882	92,678	34,921	18,986	683,803	111,664

Prices.—The price of antimony in 1918 remained quite steady throughout the year, starting at a little over 14 cents per pound in January and declining slowly to about 12 cents in May; then it started to rise gradually to 14 cents in September after which it declined again dropping to about 8 cents after the signing of the armistice.

"An abundant supply can now be obtained at relatively low cost and the need of the moment is for research to discover new uses and applications for this hitherto comparatively unimportant metal."[1]

Average Prices of Antimony.*

(In cents per pound).

	1914.	1915.	1916.	1917.	1918.
	Ordinaries.	Ordinaries.	Ordinaries.	Ordinaries.	Ordinaries.
January	6·125	15·85	42·45	17·29	14·281
February	6·100	18·21	44·31	29·80	13·823
March	6·053	22·13	44·75	32·89	13·091
April	6·006	24·88	42·06	34·04	12·536
May	6·845	35·30	31·60	25·20	12·846
June	5·825	37·69	20·05	19·51	13·055
July	5·638	38·13	14·70	15·83	13·197
August	13·800	33·00	11·53	15·06	14·000
September	9·940	28·63	11·81	14·94	14·145
October	12·060	31·46	12·70	14·75	13·319
November	14·450	38·88	13·84	13·91	8·771
December	13·310	39·25	14·59	15·06	7·915
	8·763	30·28	25·37	20·69	12,581

*As given by the "Engineering and Mining Journal." "Ordinaries" stand for: Hungarian, Chinese or other "Foreign" brands.

[1] From the "Engineering and Mining Journal," January 11, 1919, p. 65.

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 had 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 Nippissing 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 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 1918, amounted to 1,347,544 pounds, which if valued at $2.50 per pound, would be worth $3,368,860, as against 1,079,572 pounds which at $1.60 per pound were valued at $1,727,315 in 1917.

The 1918 production included 438,229 pounds of metallic cobalt valued by the producers at $1,074,556; 1,147,535 pounds of cobalt oxide valued at $1,813,947, together with other cobalt compounds, such as stellite and cobalt hydroxide amounting to 185,416 pounds valued at $905,149; making a total valuation of $3,793,652.

The production included in 1917, 393,773 pounds of metallic cobalt valued by the producers at $616,633; 802,448 pounds of cobalt oxide valued at $1,104,500; together with other cobalt compounds, such as stellite and cobalt sulphate, amounting to 214,785 pounds valued at $740,032, making a total valuation of $2,461,165.

The 1916 production included 215,215 pounds of metallic cobalt valued 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.

Some of the cobalt residues from the Nippissing mill were shipped to smelter works in Great Britain in 1916 and in 1917.

The total cobalt ores and residues treated in 1918 amounted to 8,354 tons with a cobalt content of 972,679 pounds as against 7,770 tons with a cobalt content of 866,327 pounds in 1917; and 8,127 tons with a cobalt content of 1,254,953 pounds in 1916.

Production of Cobalt and Cobalt-Oxides.

Year.	Metallic cobalt.		Cobalt-oxide.		Other cobalt compounds.
	Pounds.	Value.	Pounds.	Value.	Value.
1912	.....	.....	257,677	$ 128,843	$ 163,988
1913	.....	.....	660,079	525,028	90,266
1914	.....	.....	899,027	571,710	79,995
1915	211,610	$ 197,994	423,717	338,273	.....(a)....
1916	215,215	200,888	670,760	542,341	.....(a)....
1917	393,773	616,633	802,448	1,104,500	740,032
1918	438,229	1,074,556	1,147,535	1,813,947	905,149

(a) Value not given in 1915 and 1916.

Uses:—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. Small amounts of cobalt are also used in the form of resinate of cobalt and linoleate of cobalt as a drying agent in the manufacture of paints and varnishes.

Prices:—The market for cobalt was very poor in 1915, but improved somewhat in 1916 and 1917. The price of cobalt as quoted in New York in 1916, ranged from $1.25 to $1.50 per pound. In 1917 the price of cobalt was around $1.70 per pound, whereas no quotations are available for 1918.

Under the provision of the "Metal Refining Bounty Act," passed by the Ontario Legislature, in 1907, total bounties were paid to refineries amounting to $126,987.08 on cobalt metal, cobalt oxide and salts of cobalt, and $43,153.85 on nickel metal, nickel oxide and salts of nickel, or a total for both cobalt and nickel of $170,140.95. The quantities produced and the bounties paid each year are given in detail in the annual reports of the Ontario Bureau of Mines.

The bounty was at the rate of six cents per pound on the metallic contents of the oxides. The "Act," which expired in April, 1917, and was not re-enacted, was quoted in the Annual Report on Mineral Production of Canada during the Calendar Year 1914, and previous reports of this division.

The results of researches on cobalt and cobalt alloys, undertaken for the Mines Branch, by Dr. H. T. Kalmus, at Queen's University, have been published in five parts.[1] A special report on the subject of cobalt has also been published by the Ontario Bureau of Mines.[2]

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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.

[2] Report of Ontario Bureau of Mines, Vol xxvii, Part III, Sec. I. "Cobalt, its occurrence, metallurgy, uses, and alloys, by Chas. W. Drury, 1919.

COPPER.

The total production of copper in 1918 includes in addition to the refined copper produced at Trail, the recoveries in smelters and the estimated recoveries from ores exported to the United States and amounted to 118,769,434 pounds, which at the average price of copper for the year in New York, 24·628 cents per pound, would be worth $29,250,536.

The production in 1917 estimated on the basis of smelter recovery from ores treated, was 109,227,332 pounds, which, at the average price of 27·180 cents, was valued at $29,687,989. The 1918 production was, in quantity, the highest ever recorded.

Annual Production of Copper.

Calendar year.	Pounds.	Value.	Cents per pound.	Calendar year.	Pounds.	Value.	Cents per pound.
1886	3,505,000	$ 385,550	11·00	1903	42,684,454	$ 5,649,487	13·235
1887	3,260,424	366,798	11·25	1904	41,383,722	5,306,635	12·823
1888	5,562,864	927,107	16·66	1905	48,092,753	7,497,660	15·590
1889	6,809,752	936,341	13·75	1906	55,609,888	10,720,474	19·278
1890	6,013,671	947,153	15·75	1907	56,979,205	11,398,120	20·004
1891	9,529,401	1,226,703	12·87	1908	63,702,873	8,413,876	13·208
1892	7,087,275	818,580	11·55	1909*	52,493,863	6,814,754	12·982
1893	8,109,856	871,809	10·75	1910	55,692,369	7,094,094	12·738
1894	7,708,789	736,960	9·56	1911	55,648,011	6,886,998	12·376
1895	7,771,639	836,228	10·76	1912	77,832,127	12,718,548	16·341
1896	9,393,012	1,021,960	10·88	1913	76,976,925	11,753,606	15·269
1897	13,300,802	1,501,660	11·29	1914	75,735,960	10,301,606	13·602
1898	17,747,136	2,134,980	12·03	1915	100,785,150	17,410,635	17·275
1899	15,078,475	2,655,319	17·61	1916	117,150,028	31,867,150	27·202
1900	18,937,138	3,065,922	16·19	1917	109,227,332	29,687,989	27·180
1901	37,827,019	6,096,581	16·117	1918	118,769,434	29,250,536	24·628
1902	38,804,259	4,511,383	11·626				

*The decrease is not as large as the figures would indicate because of the calculation of part of the 909 production on a different basis from previous years.

The production in 1918 included 44,241 pounds recovered in copper sulphate; 7,617,339 pounds of refined copper; 37,696,668 pounds contained in blister copper; 46,964,651 pounds contained in nickel-copper matte exported for refining; and 26,446,538 pounds the estimated recovery from ores and concentrates exported for smelting and refining (including a small amount of copper matte from Ladysmith smelter).

The production in 1917 included 30,425 pounds recovered in copper sulphate; 43,964,733 pounds contained in blister copper partly exported for refining, and partly refined at Trail, B.C.; 42,392,588 pounds contained in nickel-copper matte exported for refining; and 22,839,586 pounds in ores and concentrates, after allowing for smelter losses, exported for smelting and refining (including a small amount of copper matte from Ladysmith).

Refined copper was produced commercially in quantity for the first time in Canada in 1916 at the Trail refinery of the Consolidated Mining & Smelting Co., and amounted to 483 tons, while the production for 1917 was 3,901 tons, and in 1918 it was reported as 3,809 tons.

The production by provinces was as follows: British Columbia contributed 52·9 per cent of the total as against 52·8 per cent in 1917; Ontario, 39·6 per cent, as against 39·2 per cent in 1917; Quebec, 5·0 per cent as against 4·6 per cent in 1917; Manitoba, 2·0 per cent, and the Yukon 0·5 per cent.

Production of Copper by Provinces, 1916, 1917, and 1918.

Province.	1916.		1917.		1918.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
Quebec	5,703,347	$ 1,551,424	5,015,560	$ 1,363,229	5,869,649	$ 1,445,577
Ontario	44,997,035	12,240,094	42,867,774	11,651,461	47,074,475	11,593,502
Manitoba	...	...	(a) 1,152,960	313,374	2,339,751	576,234
British Columbia	63,642,550	17,312,046	57,730,959	15,691,275	62,865,681	15,482,560
Yukon	2,807,096	763,586	2,460,079	668,650	619,878	152,663
Total	117,150,028	31,867,150	109,227,332	29,687,989	118,769,434	29,250,536

(a) Includes, in 1917, small quantities from New Brunswick and Alberta.

The price of copper was fixed by the United States Government on September 21, 1917, at 23½ cents per pound and this price ruled until July 2, 1918, when the United States War Industries Board raised it to 26 cents effective immediately.

After the armistice in November there was practically no market at the current price, but the producers made an agreement with the Board to maintain the price at 26 cents, and this price ruled until the end of the year—but there was no market in December.

Monthly Average Prices of Electrolytic Copper in New York.

(In cents per pound.)

Months.	1913.	1914.	1915.	1916.	1917.	1918.
January	16·488	14·223	13·641	24·008	28·673	23·500
February	14·971	14·491	14·394	26·440	31·750	23·500
March	14·713	14·131	14·787	26·310	31·481	23·500
April	15·291	14·211	16·811	27·895	27·935	23·500
May	15·436	13·996	18·506	28·625	28·788	23·500
June	14·672	13·603	19·477	26·601	29·962	23·500
July	14·190	13·223	18.796	23·865	26·620	25·904
August	15·400	*	16·941	26·120	25·380	26·000
September	16·328	*	17·502	26·855	25·073	26·000
October	16·337	*	17·686	27·193	23·500	26·000
November	15·182	11·739	18·627	30·625	23·500	26·000
December	14·224	12·801	20·133	31·890	23·500	(a)
Yearly average	15·269	13·602	17·275	27·202	27·180	24·628

* No quotations. (a) No market.

Monthly Average Prices of Standard Copper in London.

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

Months.	1913.	1914.	1915.	1916.	1917.	1918.
January	71·741	64·304	60·756	88·083	131·821	110·000
February	65·519	65·259	63·494	102·667	137·895	110·000
March	65·329	64·276	66·152	107·714	136·750	110·000
April	68·111	64·747	75·096	124·319	133·842	110 000
May	68·807	63·182	77·600	135·457	130·000	110·000
June	67·140	61·335	82·574	112·432	130·000	110·000
July	64·166	60·540	76·011	95·119	128·409	119·913
August	69·200	*	68·673	110·283	122·391	122·000
September	73·125	*	68·915	113·905	117·500	122·000
October	73·383	*	72·601	122·750	110·000	122·000
November	68·275	53·227	77·744	134·659	110·000	122·000
December	65·223	56·841	80·773	145·316	110·000	118·447
Yearly average	68·335	61·524	72·532	116·059	124·892	115·520

*No quotations.

Exports and Imports.—Previous to 1916 the copper production of Canada, with the exception of a small output of copper sulphate, was all exported in the form of ore, concentrate, matte or blister, for refining in the United States, but for the last three years the export also included some refined copper produced at Trail, B.C.

The exports in 1918 were 121,072,400 pounds valued at $20,772,109 and included: copper in ore, matte, regulus, etc., 73,396,400 pounds valued at $9,221,681; copper black or coarse and in pigs, etc., 46,780,700 pounds valued at $11,378,440; and "old and scrap," 895,300 pounds valued at $171,988.

The exports in 1917 amounted to 119,921,400 pounds valued at $23,256,278 and included: copper in ore, matte, etc., 86,556,900 pounds valued at $14,183,264; copper black, or coarse, and in pigs, etc., 17,570,600 pounds valued at $4,776,025; and "old and scrap" 15,793,900 pounds valued at $4,296,989.

Exports of Copper, 1910 to 1918.

Year.	Fine in ore, matte, regulus, etc.		Black or coarse and in pigs, bars, sheets, etc.		Old and Scrap.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1910.	56,964,127	$ 5,840,553	.....	.....	.....	.....	56,964,127	$ 5,840,553
1911.	55,208,054	5,459,770	79,656	$ 7,955	.....	.....	55,287,710	5,467,725
1912.	76,542,643	8,800,267	1,945,921	236,212	.....	.....	78,488,564	9,036,479
1913.	81,879,080	9,479,480	771,280	123,431	24,972	$ 324,903	85,147,560	9,927,814
1914.	68,830,059	7,130,778	6,581,564	908,201	1,987,100	231,710	77,398,723	8,270,689
1915.	81,437,063	8,671,641	21,292,516	3,788,715	4,161,600	616,553	106,891,179	13,076,909
1916.	124,942,400	20,776,536	2,430,400	531,268	5,846,600	1,284,895	133,219,400	22,642,699
1917.	86,556,900	14,183,264	17,570,600	4,776,025	15,793,900	4,296,989	119,921,400	23,256,278
1918.	73,396,400	9,221,681	46,780,700	11,378,440	895,300	171,988	121,072,400	20,772,109

The total recorded imports of copper in 1918 were valued at $6,373,361 and included: crude and manufactured copper 22,324,130 pounds valued at $5,879,007; copper sulphate 2,751,323 pounds valued at $240,775 and the manufactures of copper valued at $253,579.

The total imports in 1917 were valued at $10,015,561 and included: crude and manufactured copper 29,942,394 pounds valued at $9,384,586; copper sulphate 3,155,924 pounds valued at $314,785; and the manufactures of copper valued at $316,190.

Unfortunately the above record does not represent the total copper imports during the last three years 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.

There are also imports of copper in the form of brass. The recorded imports of brass in 1918 included 3,988,637 pounds of metal in crude and manufactured form (see chapter on zinc) valued at $993,574 and containing possibly 2,792,046 pounds of copper; and also manufactures of brass—quantity not recorded—valued at $3,654,298.

In 1917 the imports of brass included 3,962,957 pounds of metal in crude and manufactured form, valued at $1,277,249, and containing about 2,774,070 pounds of copper; and also manufactures of brass valued at $4,051,410.

Imports of Copper, 1917 and 1918.

	1917.		1918.	
	Pounds.	Value.	Pounds.	Value.
Copper, "old and scrap"	116,900	$ 28,867	615,900	$ 134,938
Copper in pigs, ingots or in blocks	5,917,500	1,771,901	4,743,800	1,197,514
Copper in bars, and rods, in coils, or otherwise, in lengths, not less than 6 feet, unmanufactured	20,714,700	6,277,115	14,796,200	3,787,521
Copper, in strips, sheets or plates, not planished or coated, etc.	2,026,500	778,558	1,563,700	513,374
Copper tubing in lengths not less than 6 feet and not polished, bent or otherwise manufactured	1,063,306	487,260	449,348	189,013
Copper rollers, for use in calico printing	.....	.....	.....	181
Copper and manufactures of:—				
Nails, tacks, rivets and burrs or washers	.....	15,277	.....	949
Wire, plain, tinned or plated	81,588	39,133	154,182	56,551
Wire cloth, etc	.....	5,308	.....	3,005
All other manufactures of, n.o.p	.....	295,605	.....	249,444
Copper, precipitate of, crude	21,900	1,752	1,000	96
Copper sulphate (blue vitriol)	3,155,924	314,785	2,751,323	240,775
Total value	.....	10,015,561	.....	6,373,361

Imports of Copper, 1907 to 1918, 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	669,111	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
1917....	5,917,500	1,771,901	116,900	28,867	23,886,094	7,582,066	316,190	21,900	1,752	3,155,924	314,785	10,015,561
1918....	4,743,800	1,197,514	615,900	134,938	16,963,430	4,546,459	253,579	1,000	96	2,751,323	240,775	6,373,361

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 25,500 tons on the basis of the United States record, and allowing 2,500 tons for metal contained in other manufactures of copper and brass. Domestic production was practically all exported together with 3,000 tons of copper "old and scrap" which, if deducted from the imports, gives an estimated consumption of 22,500 tons.

In 1917 the United States trade records report 24,936 tons of refined copper in ingots, bars, etc., as being exported to Canada. If we allow about 5,000 tons for copper in unrefined block, blister and converter copper, and in manufactures of copper and brass, we get a total of 29,936 tons. Domestic production amounted to 54,614 tons and the exports were 59,961 tons, giving a difference of 5,347 tons, which, if deducted from the imports gives an estimated consumption of 24,589 tons. But information from other sources would bring the consumption to 39,000 tons in 1917.

The United States Department of Commerce Report for 1918 exports to Canada as follows: refined copper in ingots, bars, etc., 16,543·5 tons; copper in unrefined block, blister and converter copper, 26·1 tons; and if we allow 3,500 tons in manufactures of copper and brass, we obtain a total of about 20,070 tons.

Domestic production amounted to 59,385 tons and the exports were 60,088 tons (eliminating "old and scrap") giving a difference of 703 tons, which if deducted from the imports gives an estimated consumption of 18,367 tons.

Quebec.

The production of copper in Quebec in 1918 was derived mostly, as in the past, from the Eustis and Weedon mines in the Eastern Townships and amounted to about 5,869,649 pounds valued at $1,445,577 being about 5 per cent of the total production for Canada and representing the estimated recovery from 125,446 tons of ore and concentrates with a metal content of 8,437,563 pounds of copper, as against 5,015,560 pounds valued at $1,363,229 representing the estimated recovery from 122,882 tons of ore and concentrates with a metal content of 7,440,711 pounds of copper in 1917.

Quebec: Production of Copper.

Year.	Pounds.	Value.	Year.	Pounds.	Value.	Year.	Pounds.	Value.
1886	3,340,000	$ 367,400	1898	2,100,235	$ 252,658	1909	1,088,212	$ 141,272
1887	2,937,900	330,514	1899	1,632,560	287,494	1910	877,347	111,757
1888	5,562,864	927,107	1900	2,220,000	359,418	1911	2,436,190	301,503
1889	5,315,000	730,813	1901	1,527,442	246,178	1912	3,282,210	536,346
1890	4,710,606	741,920	1902	1,640,000	190,666	1913	3,455,887	527,679
1891	5,401,704	695,469	1903	1,152,000	152,467	1914	4,201,497	571,488
1892	4,883,480	564,042	1904	760,000	97,455	1915	4,197,482	725,115
1893	4,468,352	430,348	1905	1,621,243	252,752	1916	5,703,347	1,551,424
1894	2,176,430	208,067	1906	1,981,169	381,930	1917	5,015,560	1,363,229
1895	2,242,462	241,288	1907	1,517,990	303,659	1918	5,869,649	1,445,577
1896	2,407,200	261,903	1908	1,282,024	169,330			
1897	2,474,970	279,421				Total	89,483,012	15,797,692

Ontario.

The copper production from Ontario in 1918 amounted to 47,074,475 pounds, valued at $11,593,502 equivalent to 39·6 per cent of the total production for Canada, and was mainly derived, as in the past years, from the nickel-copper ores of the Sudbury district.

The production in 1917 was 42,867,774 pounds valued at $11,651,461 being equal to 39·2 per cent of the total production for Canada.

Details of the production of copper from the nickel-copper ores are given in the article on "Nickel." The production from the copper mines and the Cobalt district amounted to about 0·2 per cent of the total in 1918 and about 1·0 per cent in 1917.

The chief operating companies are:—

International Nickel Company of Canada, Ltd., (formerly 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 1918 and expects to have its plants in full operation in the latter part of 1919.

The Ontario Government offered a bounty on copper over 95 per cent pure metal, and on copper sulphate produced from ore mixed and refined in the Province but no bounties have ever been obtained or earned. The Metal Refining Bounty Act expired 10th April, 1917, and was not re-enacted. 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	1917.....	42,867,774	11,651,461
1896.....	3,167,256	344,598	1907.....	14,104,337	2,821,432	1918.....	47,074,475	11,593,502
						Total.....	433,562,249	79,293,603

Manitoba.

The first production of copper from Manitoba was that of 1917 and amounted to over one million pounds, whereas in 1918 the production was over two million pounds being the estimated recovery from the ores shipped by the Mandy Mining Company operating near Schist lake, in the new Pas district, northern Manitoba. Much development has been carried on during the last few years and this district will soon be an important producer. A special report by Dr. E. L. Bruce on the Schist Lake district was published in 1918.[1]

British Columbia.

The production of copper from British Columbia in 1918 amounted to 62,865,681 pounds valued at $15,482,560 equivalent to 52·9 per cent of the total production for Canada and included: refined copper and copper sulphate produced at Trail; matte and blister copper exported for refining and an estimate of smelter recovery from copper ores exported. This production does not include the copper produced from foreign ores nor those from other provinces treated in British Columbia smelters.

[1]Report on the Schist Lake district, Northern Manitoba, by Dr. E. L. Bruce, Summary Report of the Geol. Surv. of Canada for 1917, Part D.

The production in 1917 was 57,730,959 pounds valued at $15,691,275, or 52·8 per cent of the total production for Canada.

British Columbia: Production of Copper.

Year.	Pounds.	Value.	Year.	Pounds.	Value.	Year.	Pounds.	Value.
1894*	324,680	$ 31,039	1903*	34,359,921	$ 4,547,735	1912	50,526,656	$ 8,256,561
1895*	952,840	102,526	1904*	35,710,128	4,579,110	1913	45,791,579	6,991,916
1896*	3,818,556	415,459	1905*	37,692,251	5,876,222	1914	41,219,202	5,606,636
1897*	5,325,180	601,213	1906*	42,990,488	8,287,706	1915	56,692,988	9,793,714
1898*	7,271,678	874,783	1907*	40,832,720	8,168,177	1916	63,642,550	17,312,046
1899*	7,722,591	1,359,948	1908	37,041,115	4,892,390	1917	57,730,959	15,691,275
1900*	9,977,080	1,615,289	1909	35,658,952	4,629,245	1918	62,865,681	15,482,560
1901*	27,603,746	4,448,896	1910	35,270,006	4,492,693			
1902*	29,636,057	3,445,488	1911	35,279,558	4,366,198	Grand Total	805,937,162	141,868,825

* Metal contents of ores shipped as published by the Provincial Bureau of Mines.

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.

British Columbia: Production of Copper by Districts.*

(In pounds).

—	1913.	1914.	1915.	1916.	1917.	1918.
Cariboo—Omineca	1,838	6,000	2,831,279	1,646,072	852,373	643,843
Cassiar—						
Atlin, Liard and Stikine	.....	.....	.....	.....	.....	11,160
Skeena	1,336	11,123,376	21,915,481	24,065,995	27,978,015	30,190,606
East Kootenay—						
Fort Steele	.....	.....	.....	5,654	9,679	1,768
Windermere	.....	.....	.....	3,400	12,640	.....
West Kootenay—						
Slocan	.....	.....	.....	.....	.....	242
Nelson	815,126	586,764	30,240	176,383	50,946	28,933
Trail Creek	2,538,661	3,779,830	4,651,681	4,200,745	1,730,088	1,654,356
Yale—						
Boundary	28,621,973	16,428,959	17,402,662	17,626,623	10,329,765	9,940,125
Ashcroft and Kamloops	29,505	14,525	295,164	636,594	700,199	525,780
Similkameen	8,073	.....	21,701	182,633	87,326	11,928
Southern Coast—						
Vancouver Island	14,443,793	13,070,245	712,152	869,877	1,461,704	926,886
Mainland			9,058,045	15,965,388	15,794,839	17,548,127
Totals	46,460,305	45,009,699	56,918,405	65,379,364	59,007,565	61,483,754

* As published by British Columbia Bureau of Mines.

Copper mining is now by far the most important form of mining in the Province; in 1918 it formed about 51·0 per cent of the total value of the metalliferous mines, while in 1917 it was 60 per cent, and in 1916 it was about 57 per cent.

In the Boundary district the production was mainly from the mines of the three large smelting companies: The Granby Consolidated Mining, Smelting and Power Company, Limited, The Mother Lode and Sunset Mines of the Canada Copper Corporation, Limited, and the Emma Mine of the Consolidated Mining and Smelting Company.

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.

In the interior the main shippers were, at Rossland: The Centre Star and Le Roi groups, owned by the Consolidated Mining and Smelting Company, and the Le Roi II (Josie) mine.

The Consolidated Mining and Smelting Company operates its own smelter, converts its matte to blister copper, and, since 1916, produces refined copper. It treats also in its refinery blister copper from the other smelters.

The Canada Copper Corporation, Limited, and the Granby Consolidated Mining, Smelting and Power Company, Limited, also operate their own smelters and convert their matte to blister copper.

Shipments were also made from the Nelson district by the Eureka mine and a few other properties.

The Canada Copper Corporation, Ltd., have been steadily developing their properties at Princess camp in the Similkameen, employing a large number of men and will probably be an important producer in 1919. We may look forward to the eventual establishment in that part of the country of another important copper producing centre.

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 Deboule mine after a couple of years of extensive development, has become an important producer.

The large increases in the production of the Coast and Cassiar districts has more than offset the falling off in the Boundary district. This increase has been remarkable for the last four years and is 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 and 1917 was the cause of much activity. The production in 1916 amounted to 2,807,096 pounds, valued at $763,586; in 1917 the production was 2,460,079 pounds valued at $668,650, whereas the production in 1918 amounted only to 619,878 pounds valued at $152,663 equivalent to about 0·5 per cent of the total production for Canada.

The great decrease was due to the closing of the Pueblo mine near Whitehorse.

Yukon: Production of Copper.

Year.	Pounds.	Value.	Year.	Pounds.	Value.
1906 (and previous)	156,000	$ 23,400	1913	1,843,530	$ 281,489
1907	511,838	102,388	1914	1,367,050	185,946
1908	112,264	14,828	1915	533,216	92,113
1909			1916	2,807,096	763 586
1910	286,000	36,431	1917	2,460,079	668,650
1911			1918	619,878	152,663
1912	1,772,660	289,670			
			Total	12,469,61 1	$ 2,611,164

GOLD.

The production of gold in Canada in 1918 amounted to 699,681 fine ounces valued at $14,463,689 and included: (a) gold derived from alluvial workings, $2,423,793, or 16·7 per cent of the total; (b) gold obtained from the crushing of free milling quartz ore, i.e., stamp mill bullion $9,118,759, or 63·1 per cent; (c) gold obtained from ores and concentrates treated at the Canadian copper and lead smelters $1,743,525, or 12·1 per cent; and (d) the estimated gold recoveries from ores and concentrates exported $1,177,612, or 8·1 per cent of the total production.

The production of gold in 1917 amounted to 738,831 fine ounces, valued at $15,272,992, and was made up as follows: (a) gold derived from alluvial workings $4,145,571, or 27·1 per cent of the total; (b) gold obtained from the crushing of free milling quartz ores, i.e., stamp mill bullion $9,248,020, or 60·6 per cent; (c) gold obtained from ores and concentrates sent to Canadian copper and lead smelters $1,266,212, or 8·3 per cent of the total production; and (d) the estimated gold recoveries from ores and concentrates exported $613,189, or 4·0 per cent of the total production.

The falling off in 1917 and 1918 is due to the great increase in the cost of supplies, and difficulty in securing the necessary equipment. Another important factor was the scarcity of labour and especially in gold camps, as the miners are induced to other camps due to the high wages which depend on a sliding scale regulated by the price of metals, gold being the only metal not to benefit by enhanced market price.

With the signing of the armistice conditions have gradually improved and the great activity in the gold camps promises well for 1919.

Annual Production of Gold in Canada, 1858-1918.

Year.	Fine ounces‡	Value.	Year.	Fine ounces ‡	Value.	Year.	Fine ounces ‡	Value.
1858	34,104	$ 705,000	1879	76,547	$ 1,582,358	1899	1,028,529	$ 21,261,584
1859	78,129	1,615,072	1880	63,121	1,304,824	1900	1,350,057	27,908,153
1860	107,806	2,228,543	1881	63,524	1,313,153	1901	1,167,216	24,128,503
1861	128,973	2,666,118	1882	60,288	1,246,268	1902	1,032,161	21,336,667
1862	135,391	2,798,774	1883	53,853	1,113,246	1903	911,559	18,843,590
1863	202,498	4,186,011	1884	51,202	1,058,439	1904	796,374	16,462,517
1864	199,605	4,126,199	1885	55,575	1,148,829	1905	684,951	14,159,195
1865	192,898	3,987,562	1886	70,782	1,463,196	1906	556,415	11,502,120
1866	152,555	3,153,597	1887	57,460	1,187,804	1907	405,517	8,382,780
1867	145,775	3,013,431	1888	53,145	1,098,610	1908	476,112	9,842,105
1868	134,169	2,773,527	1889	62,653	1,295,159	1909	453,865	9,382,230
1869	102,720	2,123,405	1890	55,620	1,149,776	1910	493,707	10,205,835
1870	83,415	1,724,348	1891	45,018	930,614	1911	473,159	9,781,077
1871	105,187	2,174,412	1892	43,905	907,601	1912	611,885	12,648,794
1872	90,283	1,866,321	1893	47,243	976,603	1913	802,973	16,598,923
1873	74,346	1,536,871	1894	54,600	1,128,688	1914	773,178	15,983,007
1874	97,856	2,022,862	1895	100,798	2,083,674	1915	918,056	18,977,901
1875	130,300	2,693,533	1896	133,262	2,754,774	1916	930,492	19,234,976
1876	97,729	2,020,233	1897	291,557	6,027,016	1917	738,831	15,272,992
1877	94,304	1,949,444	1898	666,386	13,775,420	1918	699,681	14,463,689
1878	74,420	1,538,394						

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

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, 1918, was 241,762·77 ounces, which after melting was reduced to

238,245·07 ounces and valued at $4,099,595.80 after deducting office charges. The loss by melting was 1·455 ounces per cwt. The receipts were from British Columbia and the Yukon, with also a few ounces from 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.			ounces.	ounces.	
1908 (*a*)	90,175·48	89,117·76	$ 1,478,394.00	1914	166,148·83	163,523·61	$ 2,029,251.31
1909	48,478·58	47,576·27	789,267.94	1915	183,924·49	179,751·68	2,736,302.31
1910	46,064·31	45,228·92	746,101.92	1916	180,292·83	175,393·10	2,828,239.65
1911	39,784·70	39,069·31	647,416.38	1917	191,626·04	187,884·48	3,257,220.71
1912	59,068·82	57,951·98	974,077.14	1918	241,762·77	238,245·07	4,099,595·80
1913 (*b*)	111,479·94	109,920·49	1,448,625.37				

(*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: (*a*) that of the Royal Mint at Ottawa, which receives shipments of gold from various provinces in the Dominion, and (*b*) that of the Consolidated Mining and Smelting Co. of Canada, Ltd., at Trail, B.C., where gold is mainly recovered from the gold ores, with also recoveries from the high-grade silver-lead 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 extent that in 1918 it produced 58·8 per cent of the total, as against 57·3 per cent in 1917; 52·9 per cent in 1916; 44·3 per cent in 1915, and 14·1 per cent in 1912, when Porcupine came into prominence.

Production of Gold by Provinces, 1916, 1917, and 1918.

	1916.		1917.		1918.	
	Fine ounces ‡	Value.	Fine ounces ‡	Value.	Fine ounces ‡	Value.
Nova Scotia	4,562	$ 94,305	2,210	$ 45,685	1,176	$ 24,310
Quebec	1,034	21,375	1,511	31,235	1,939	40,083
Ontario	492,481	10,180,485	423,261	8,749,581	411,976	8,516,299
Manitoba	.....	.....	440	9,095	6,755	139,638
Alberta	82	1,695	.....	.....	27	558
British Columbia (*a*)	219,633	4,540,216	133,742	2,764,693	175,334	3,624,476
Yukon	212,700	4,396,900	177,667	3,672,703	102,474	2,118,325
Totals	930,492	19,234,979	738,831	15,272,992	699,681	14,463,689

	1916.	1917.	1918.
(*a*) As follows: Gold from placer mining	$ 580,500	$ 496,000	$ 320,000
Gold from vein mining	3,959,716	2,264,693	3,304,476
	4,540,216	2,764,693	3,624,476

‡ 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 1918 were valued at $10,040,813, as against $15,929,051 in 1917, and $18,382,903 in 1916.

The imports during 1918 were: gold bullion valued at $191,133; gold coins $1,444,647; gold fringe $11,135, and manufactures of gold and silver valued at $184,880.

The imports during 1917 were: gold bullion valued at $1,631,708; gold coins $12,743,812; gold fringe $4,857, and manufactures of gold and silver, valued at $221,554.

Exports of Gold in Dust, Nuggets, etc., 1910 to 1918, inclusive.

Year.	Value.	Year.	Value.	Year.	Value.
	$		$		$
1910	5,491,051	1913	12,770,838	1916	18,382,903
1911	7,493,523	1914	15,242,200	1917	15,929,051
1912	10,014,654	1915	16,528,143	1918	10,040,813

Imports of Gold and Silver, 1911 to 1918, inclusive.

	Gold.			Silver.			Manufactures of Gold and Silver.			
	Bullion in bars and blocks.	Coins.	Fringe.	Bullion in bars and blocks.	Coins.	Sterling.	Leaf.	Sweepings.	Manufactures, n.o.p.	Electro-plated ware.
1911	$ 924,233	$ 20,437,799	$ 8,049	$ 847,645	.....	$ 232,792	$63,454	$ 279	$ 44,402	$467,491
1912	1,360,735	7,496,492	18,212	1,100,344	.....	240,235	70,651	10,107	108,879	737,857
1913	840,435	12,495,028	6,993	840,245	.....	393,925	80,772	12,788	58,738	522,402
1914	14,534,482	117,700,824	5,582	629,279	.....	244,376	53,715	4,794	14,914	301,038
1915	1,028,405	19,910,229	7,577	337,254	$ 94	110,683	63,631	2,199	8,433	281,547
1916	18,648,770	17,828,695	4,882	875,157	35	123,774	42,152	2,778	24,167	302,268
1917	1,631,708	12,743,812	4,857	959,153	519	103,746	34,743	3,603	19,042	164,166
1918	(a) 191,133	(a) 1,444,647	11,135	(a) 368,889	.....	68,381	39,068	(a) 1,444	26,440	117,928

(a) Covers only first quarter for 1918. No imports for balance of year.

Nova Scotia.

The gold production in Nova Scotia is derived almost entirely from quartz ores and in 1918 amounted to 1,176 fine ounces valued at $24,310 as against 2,210 ounces valued at $45,685 in 1917. The 1918 production is the smallest ever recorded and the falling off during the past few years is attributed, as in other gold districts, to the high cost of supplies and labour.

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	1917....	5,916	2,210	45,685	7.72
					1918....	1,630	1,176	24,310	14.91
					Total...	2,188,366	907,781	18,765,582	8.58

Quebec.

The gold production in Quebec during 1918 amounted to 1,939 fine ounces valued at $40,083, as against 1,511 ounces valued at $31,235 in 1917.

This production is derived partly from the pyritic mines of the Eastern Townships which are worked chiefly for the sulphur and copper contents of the ore, and partly from the zinc-lead ores of Notre-Dame-des-Anges, Portneuf county. No alluvial production has been reported for a number of years.

Much development is being done at the head-waters of the Harricanaw river, south of Amos station, on the Government Transcontinental Railway, the principal operators being the Martin Gold Mining Company, which is operating a small stamp mill, and the Siscoe Mining Syndicate.

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	1917	1,511	31,235
1890	65	1,350	1904	140	2,900	1918	1,939	40,083
						Total	23,774	471,414

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

Ontario.

The gold production in Ontario during 1918 amounted to 411,976 fine ounces, valued at $8,516,299, as against 423,261 ounces, valued at $8,749,581 in 1917, a decrease of 2·7 per cent. In 1917 there had been a decrease of 14·0 per cent as compared with the production for 1916 when it reached its maximum.

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. The falling off in production during the last two years is due to the abnormal conditions created by the war.

Ontario: Annual Production of Gold.

Year.	Fine ounces. ‡	Value.	Year.	Fine ounces. ‡	Value.	Year.	Fine ounces. ‡	Value.
1887	327	$ 6,760	1898	12,863	$265,889	1909	1,569	$ 32,425
1888	.....	.....	1899	20,394	421,591	1910	3,089	63,849
1889	.....	.....	1900	14,391	297,495	1911	2,062	42,625
1890	.....	.....	1901	11,844	244,837	1912	86,523	1,788,596
1891	97	2,000	1902	11,118	229,828	1913	219,801	4,543,690
1892	344	7,118	1903	9,096	188,036	1914	268,264	5,545,509
1893	708	14,637	1904	1,935	40,000	1915	406,577	8,404,693
1894	1,917	39,624	1905	4,402	91,000	1916	492,431	10,180,485
1895	3,015	62,320	1906	3,202	66,193	1917	423,261	8,749,581
1896	5,563	115,000	1907	3,212	66,399	1918	411,976	8,516,299
1897	9,157	189,294	1908	3,212	66,389	Total	2,432,400	50,282,162

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

The Porcupine district in Timiskaming has, since its development in 1912, been the main producer. The principal shippers, by order of importance, were the following: Hollinger, McIntyre, Porcupine Crown, Dome, Vipond, Schumacher, and Dome Lake.

The Kirkland Lake district, also in Timiskaming, has become an important producer, with the Lake Shore, Tough Oakes, and Teck-Hughes mines as shippers, and the Kirkland Lake as probable shipper in 1919.

In the Boston Creek district, Timiskaming, the promising development work on several properties attracted many prospectors to this area during the last few years and resulted in new discoveries in this district. The Provincial Bureau of Mines had a report made on this district, and published in 1916.[1] The Miller Independence Mines, Ltd., and the Patricia Syndicate were the principal operators in this district.

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

The recent discoveries in the Fort Matachewan district, justified an examination by A. G. Burrows, of the Ontario Bureau of Mines.[2]

A good deal of exploration work has been done in the Kowkash district, Thunder Bay, which is reported on by Mr. P. E. Hopkins of the Ontario Bureau of Mines.[3] 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.

The St. Anthony mine, operated by the Thunder Mining Company, at Sturgeon lake, Thunder Bay, was producing on a small scale during 1917 and 1918.

In the Kenora district much interest has been caused by the report of rich gold findings on the Rognon property, near Contact Bay, Wabigoon lake, and a small production was reported in 1918. The Provincial Bureau of Mines describes this district in the 1916 annual report.[4]

The latest rush was to the Lightning River district near Abittibi lake which has been reported on by Mr. P. E. Hopkins.[5]

Manitoba.

The gold production in Manitoba during 1918 was 6,755 fine ounces valued at $139,638, as against 440 ounces valued at $9,095 in 1917. There was no production recorded previous to 1917.

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. This district was reported on by Mr. F. J. Alcock of the Geological Survey.[6]

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, Limited, and Schist lake near which operations are being carried on by the Mandy Mining Company, Limited, 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.

Dr. E. L. Bruce, of the Geological Survey, has been conducting an exploration of the Pas district for the past four years, and his reports have appeared in the Annual Summary reports of the Geological Survey in 1915, 1916, 1917, and 1918.[7]

Much exploration and development has been done in the last few years in the Big Rice Lake district, east of lake Winnipeg.

A report on Rice Lake, The 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.

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

[2] Matachewan Gold Area. Bulletin No. 34, Ontario Bureau of Mines, 1918.

[3] Bulletin No. 27, 1916, and Annual Report, Vol. xxvi, pp. 190-226, of the Ontario Bureau of Mines, Kowkash gold area.

[4] Dryden Gold Area. Annual Report, Ontario Bureau of Mines, Vol. xxvi, pp. 163-189.

[5] Notes on Lake Abittibi district. Annual Report, Ontario Bureau of Mines. Vol. xxvii, pp. 200-214.

[6] Wekusko Lake Area, Northern Manitoba., by F. J. Alcock, Geol. Survey Summary Report for 1917, Part D., pp. 8-16.

[7] Schist Lake district, Northern Manitoba, by Dr. E. L. Bruce, Geol. Survey Summary Report for 1917, Part D., pp. 1-7.

Reports on Star Lake area and the gold-bearing district of southeastern Manitoba, by Mr. J. R. Marshall, were published in the Summary Report of the Geological Survey for 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 in the western end of the area being examined by Dr. Bruce and referred to under "Manitoba."

Alberta.

A small recovery of gold has been reported every year, being the recovery from the gravels of the Saskatchewan river. Operations were carried on by individuals and the returns are necessarily incomplete. There was no production recorded in 1917, while in 1918, the production was reported as being 27 fine ounces valued at $558.

Alberta: Annual Production of Gold.

Year.	Fine (ounces‡)	Value.	Year.	Fine (ounces.‡)	Value.	Year.	Fine (ounces.‡)	Value.
1887	102	$ 2,100	1898	1,209	$ 25,000	1909	25	$ 525
1888	58	1,200	1899	726	15,000	1910	89	1,850
1889	967	20,000	1900	242	5,000	1911	10	207
1890	193	4,000	1901	726	15,000	1912	73	1,509
1891	266	5,500	1902	484	10,000	1913	.....	.....
1892	508	10,506	1903	48	1,000	1914	48	992
1893	466	9,640	1904	24	500	1915	195	4,026
1894	726	15,000	1905	121	2,500	1916	82	1,695
1895	2,419	50,000	1906	39	800	1917	.....	.....
1896	2,661	55,000	1907	33	675	1918	27	558
1897	2,419	50,000	1908	50	1,037	Total	15,036	310,820

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

British Columbia.

The gold production of British Columbia in 1918 amounted to 175,334 fine ounces valued at $3,624,476 and included: (*a*) placer gold $320,000, or 8·8 per cent of the total; bullion from mill ore $582,904, or 16·1 per cent; (*c*) smelter recoveries $1,615,918, or 44·6 per cent, and (*d*) estimated gold recoveries from ores and concentrates exported $1,105,654, or 30·5 per cent of the total production.

The gold production of British Columbia in 1917 amounted to 133,742 fine ounces, valued at $2,764,693, and included: (*a*) placer gold $496,000, or 18·0 per cent of the total; (*b*) bullion from mill ore $539,762, or 19·5 per cent; (*c*) smelter recoveries $1,232,827, or 44·5 per cent, and (*d*) the estimated gold recoveries from ores exported, $496,104 or 18·0 per cent of the total production.

The total production in 1918 showed an increase of 31·0 per cent. The decrease in production for the last two years as compared with that of previous years is due mostly to the labour troubles and also to the high cost of supplies and high wages exacted by the miners. The production of British Columbia in 1918 amounted to 25·0 per cent of the total production of Canada.

The statistics of lode gold represented, as closely as can be ascertained, the actual gold recovery based on smelter recoveries and bullion shipments, whereas that of placer gold is given as ascertained by the Provincial Mineralogist.

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

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	129,012	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	1917	133,742	2,764,593
						1918	175,334	3,624,476
						Total	8,145,625	168,405,724

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

British Columbia: Production of Gold by Districts, 1917 and 1918.*

Districts.	1917.				1918.			
	Gold Placer.		Gold Lode.		Gold Placer.		Gold Lode.	
	Ounces.	Value.	Ounces.	Value.	Ounces.	Value.	Ounces.	Value.
Cariboo:—								
Cariboo and Quesnel	7,500	$150,000	.....	.....	4,000	$ 80,000	.....	.....
Omineca	600	12,000	931	$ 9,244	400	8,000	985	$ 20,360
Cassiar:—								
Atlin, Liard and Stikine	15,600	312,000	1,000	20,670	11,025	220,500	446	9,219
Skeena, etc	.....	.....	9,805	202,669	.....	.....	48,016	992,491
East Kootenay:—								
Fort Steele	100	2,000	.....	.....	50	1,000	.....	.....
West Kootenay:—								
Ainsworth	.....	.....	1	20	.....	.....	18	372
Nelson	50	1,000	2,521	52,109	50	1,000	7,155	147,894
Slocan	.....	.....	18	372	.....	.....	67	1,385
Trail creek	.....	.....	33,290	688,104	.....	.....	43,745	904,209
Revelstoke, etc	50	1,000	62	1,282	50	1,000	35	723
Lillooet:—								
Lillooet	300	6,000	3,092	63,912	50	1,000	2,473	51,117
Yale:—								
Grand Forks, Greenwood and Osoyoos	50	1,000	53,544	1,210,104	50	1,000	55,353	1,144,147
Similkameen, Nicola and Vernon	400	8,000	111	2,294	250	5,000	1	21
Yale, Ashcroft and Kamloops	100	2,000	1,355	28,008	50	1,000	815	16,848
Southern Coast:—								
Vancouver Island	50	1,000	2,813	58,145	25	500	2,515	51,985
Mainland	.....	.....	980	20,257	.....	.....	3,050	63,043
Total	24,800	496,000	114,523	2,367,190	16,000	320,000	164,674	3,403,812

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

Yukon.

The gold production of the Yukon in 1918 amounted to 102,474 fine ounces valued at $2,118,325; and included 101,744 ounces derived from alluvial workings and 730 ounces from lode mining.

The production in 1917 was 177,667 fine ounces valued at $3,672,703; and included 176,548 ounces from placer mining and 1,119 ounces from lode mining.

The total placer production of the Yukon in 1918 is estimated at $2,125,388; and includes 101,744 fine ounces of gold valued at $2,103,235 and 22,892 fine ounces of silver valued at $22,153.

The total placer production in 1917 was estimated at $3,681,912; and included 176,548 fine ounces of gold valued at $3,649,371 and 39,723 fine ounces of silver valued at $32,341.

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.

Annual Production of Gold in Yukon.

Year.	Fine Ounces.‡	Value.	Year.	Fine Ounces.‡	Value.	Year.	Fine Ounces.‡	Value.
1885 } 1886 }	4,837	$ 100,000	1896...	14,513	$ 300,000	1907...	152,381	$ 3,150,000
1887....	3,386	70,000	1897...	120,937	2,500,000	1908...	174,150	3,600,000
1888....	1,935	40,000	1898...	483,750	10,000,000	1909...	191,565	3,960,000
1889....	8,466	175,000	1899...	774,000	16,000,000	1910*...	221,091	4,570,362
1890....	8,466	175,000	1900...	1,077,553	22,275,000	1911...	224,197	4,634,574
1891....	1,935	40,000	1901...	870,750	18,000,000	1912...	268,447	5,549,296
1892....	4,233	87,500	1902...	701,437	14,500,000	1913...	282,838	5,846,780
1893....	8,514	176,000	1903...	592,594	12,250,000	1914...	247,940	5,125,374
1894....	6,047	125,000	1904...	507,938	10,500,000	1915...	230,173	4,758,098
1895....	12,094	250,000	1905...	381,001	7,876,000	1916...	212,700	4,396,900
			1906...	270,900	5,600,000	1917...	177,667	3,672,703
						1918...	102,474	2,118,325
						Total..	8,340,909	172,421,912

‡ Calculated from the value: one dollar = 0·048375 oz.
* Including a small production from lode mines, from 1910 to 1918 inclusive.

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 per ounce. At the Dominion Government Assay Office at Vancouver, B.C., there was deposited during the twelve months ending December 31, 1918, 121,310·37 ounces from the Yukon valued after all charges had been deducted at $1,921,197.71, or an average of $15.84 per ounce, as against 79,532·35 ounces, valued at $1,262,207, or an average of $15.87 per ounce in 1917.

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	1917	79,532·35	1,262,207	15·87
				1918	121,310·37	1,921,198	15·84

(*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 district for 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.	1913.	1914.	1915.	1916.	1917.	1918.
January.....	19·30	136·50	520·69	3,116·18	2,490·11	1,025·69
February.....	56·90	325·50	·40	566·62	740·73	112·27
March.....	.....	6·75	232·13	1,574·82	1,033·37	176·31
April.....	1,293·69	1,572·65	277·84	859·56	1,290·64	.....
May.....	5,557·35	11,668·10	17,553·29	13,099·13	7,586·43	3,445·55
June.....	67,594·39	67,604·85	57,884·87	38,292·47	33,684·56	14,165·95
July.....	57,873·50	45,067·31	49,478·87	35,598·34	34,339·33	16,876·11
August.....	63,315·92	49,458·17	41,015·41	47,980·26	41,439·50	22,630·91
September.....	58,641·62	62,744·69	47,055·83	45,883·90	33,652·02	25,434·07
October.....	66,798·37	63,365·22	59,984·89	62,927·73	57,227·13	38,306·54
November.....	26,565·50	4,308·00	7,248·17	15,168·23	4,184·74	3,733·89
December.....	5,183·50	3,433·43	6,001·77	1,944·64	3,015·97	1,272·83
	352,900·04	309,691·17	287,254·16	265,013·88	220,684·53	127,180·12

Since 1898 a royalty to the extent of $4,656,868.14 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, is probably due to three factors: (1) the fixing of the value of the gold for royalty purposes at $15 per ounce, (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
" " 1917	3,960,207	.....	3,960,207	99,007.92
" " 1918	3,266,019	.....	3,266,019	81,650.55
Total	124,643,193	7,668,026	116,975,164	4,656,868.14

* From the Report of the Yukon and Mining Lands Branch of the Department of the Interior, Fiscal Year ending March 31.

LEAD.

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 ore or bullion exported. The production has been mainly from British Columbia with occasional small amounts from other provinces and the Yukon Territory.

The production in 1918 amounted to 51,398,002 pounds (25,699 tons) which at the average price for the year 9·250 cents per pound, was valued at $4,754,315, as compared with a production of 32,576,281 pounds (16,288·1 tons), valued at $3,628,020 in 1917, and 41,497,615 pounds (20,748·8 tons), valued at $3,532,692 in 1916. Thus the 1918 production was in value the highest ever recorded, and showed an increase of about 58 per cent in quantity and 31 per cent in value over that of 1917. It included 16,391 tons of lead in bullion produced at the smelters at Trail, B.C., and Galetta, Ont., from Canadian ores; 9,298 tons the estimated recovery from lead ores exported to the United States; and 10 tons, the estimated recovery from the gold and silver ores of Ontario, also shipped to American smelters.

Annual Production of Lead.

Year.	Pounds.	Cents per Pound.	Value.	Year.	Pounds.	Cents per Pound.	Value.
1887	204,800	5·400	$ 9,216	1903	18,139,283	4·237	$ 768,562
1888	674,500	4·420	29,812	1904	37,531,244	4·309	1,617,221
1889	165,100	3·930	6,488	1905	56,864,915	4·707	2,676,632
1890	105,000	4·480	4,704	1906	54,608,217	5·657	3,089,187
1891	88,665	4·350	3,857	1907	47,738,703	5·325	2,542,086
1892	808,420	4·090	33,064	1908	43,195,733	4·200	1,814,221
1893	2,135,023	3·730	79,636	1909	45,857,424	*3·690	1,692,139
1894	5,703,222	3·290	187,636	1910	32,987,508	*3·687	1,216,249
1895	16,461,794	3·230	531,716	1911	23,784,969	†3·480	827,717
1896	24,199,977	2 980	721,159	1912	35,763,476	†4·467	1,597,554
1897	39,018,219	3·580	1,396,853	1913	37,662,703	†4·659	1,754,705
1898	31,915,319	3·780	1,206,399	1914	36,337,765	†4·479	1,627,568
1899	21,862,436	4 470	977,250	1915	46,316,450	†5·600	2,593,721
1900	63,169,821	4·370	2,760,521	1916	41,497,615	†8·513	3,532,692
1901	51,900,958	4·334	2,249,387	1917	32,576,281	†11·137	3,628,020
1902	22,956,381	4·069	934,095	1918	51,398,002	†9·250	4,754,315

* 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 the estimated possible recovery, (on the basis of a 90 per cent recovery) from ores shipped from mines, apparently indicating a reduction in stocks of ores at the smelter, but in 1916 the estimated possible recovery from lead ores shipped from mines exceeded by far the recovery in smelter. In 1917 the possible recovery in ore shipped exceeded only slightly the recovery of lead in smelters, while in 1918 it was below the recovery in smelters.

The total mine shipments in 1918 of lead ore and concentrates were about 75,256 tons valued by the operators at $4,705,573 and containing 46,843,602 pounds of lead, as against 46,799 tons valued at $3,866,862 and containing 38,696,116 pounds of lead in 1917.

Ores Shipped and Metal Contents.

Year.	Lead ores shipped.		Lead Contents in Pounds.	Silver Contents in Ounces.
	Tons.	Value.		
1912	59,814	$2,544,942	45,896,537	2,366,294
1913	85,978	3,276,812	53,807,570	2,564,155
1914	70,207	2,652,802	50,527,130	2,501,820
1915	73,752	2,958,394	48,708,005	2,954,175
1916	84,516	4,568,500	54,124,628	2,582,952
1917	46,799	3,866,862	38,696,116	1,670,064
1918	75,256	4,705,573	46,843,602	2,314,542

Comparative Records of Lead Production, 1916, 1917, and 1918.

	1916.	1917.	1918.
(1) Production: Smelter recoveries from Canadian ore and recoverable lead in ore exported	41,497,615	32,576,281	51,398,002
(2) Lead contents of ores and concentrates shipped from mines in Canada	54,124,628	38,696,116	46,843,602
(3) Total production of lead bullion in Canada (including lead from imported ores.)*	43,100,236	41,427,304	35,834,115
(4) Total production of refined lead in Canada (including lead from imported ores)	33,087,474	32,115,114	31,571,112

*Includes lead bullion shipped from Trail to be refined in the United States: in 1916, 5,075 tons; in 1917, 4,721 tons; in 1918, 2,182 tons.

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, Ont., 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. Operations were carried on for four months in 1917.

The Estate of James Robertson, operating the Kingston lead mine at Galetta, put in a 20-ton open-hearth lead furnace, which was operated in October and November, 1916, and also for six months in 1917, and for about nine months in 1918.

Refined Lead Produced in Canada.*

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	1914	36,443,706
1905	15,804,569	1910	32,987,508	1915	43,518,618
1906	20,471,314	1911	23,525,050	1916	33,087,474
1907	26,607,461	1912	35,893,190	1917	32,115,114
1908	36,549,274	1913	37,923,043	1918	31,571,112

* The refined lead reported includes the lead bullion produced from Canadian and foreign ores and refined at Trail, B.C., with also the pig-lead from the Ontario smelters.

Prices.—The price of lead at Montreal, the main Canadian market, has been higher than the New York and London values for the past six years. The average price of lead at Montreal in 1918 was 9·250 cents per pound, as against 11·137 cents in 1917.

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.

The price of soft lead on the London market was fixed at £30 per long ton in 1917, and at £29 for the first ten months of 1918. The average price in 1918 was £30-2-8.

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

(Value in cents per pound.)

	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.
Montreal	3·480	4·467	4·659	4·479	5·600	8·513	11·137	9·250
London	2·992	3·991	4·072	4·146	4·979	6·715	6·626	6·539
New York	4·420	4·471	4·370	3·862	4·673	6·858	8·787	7·413
St. Louis	4·286	4·360	4·238	3·737	4·567	6·777	8·721	7·222

Monthly Average Prices of Pig-Lead at Montreal.*

(Value in cents per pound.)

Month.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.
January	3·67	3·35	3·48	3·31	3·93	4·32	4·78	4·27	7·29	9·50	8·42
February	3·60	3·38	3·40	3·32	3·97	4·18	4.73	4·58	7·73	11·35	8·73
March	3·54	3·42	3·34	3·34	4·03	4·05	4·57	5·04	9·25	11·77	8·87
April	3·44	3·35	3·21	3·26	4·10	4·42	4·41	5·21	9·60	11·54	8·49
May	3·21	3·26	3·13	3·20	4·08	4·66	4·54	5·26	9·10	13·19	8·46
June	3·11	3·23	3·15	3·27	4·34	4·98	4·55	6·53	8·48	14·62	9·46
July	3·17	3·12	3·13	3·33	4·57	4·93	4·49	6·35	7·79	13·26	9·86
August	3·31	3·03	3·11	3·45	4·84	5·02	4·48	5·62	7·76	13·14	9·86
September	3·24	3·14	3·11	3·63	5·47	5·02	4·42	5·63	8·41	10·93	9·36
October	3·29	3·26	3·23	3·77	5·07	4·99	4·07	5·71	8·61	8·46	9·86
November	3·42	3·28	3·31	3·93	4·53	4·82	4·29	6·39	8·72	7·92	9·86
December	3·37	3·34	3·35	3·95	4·55	4·52	4·41	6·61	9·42	7·92	8·31
Average	3·364	3·268	3·246	3·480	4·467	4·659	4·479	5·600	8·513	11·137	9·25

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

Monthly Average Prices of Lead in New York.†

(Value in cents per pound.)

Month.	1907.	1908.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.
January	6·000	3·691	4·175	4·700	4·483	4·435	4·321	4·111	3·729	5·921	7·626	6·782
February	6·000	3·725	4·018	4·613	4·440	4·026	4·325	4·048	3·827	6·246	8·636	6·973
March	6·000	3·838	3·986	4·459	4·394	4·073	4·327	3·970	4·053	7·136	9·199	7·201
April	6·000	3·993	4·168	4·376	4·412	4·200	4·381	3·810	4·221	7·630	9·288	6·772
May	6·000	4·253	4·287	4 315	4·373	4·194	4·342	3·900	4·274	7·463	10·207	6·818
June	5·760	4·466	4·350	4·343	4·435	4·392	4·325	3·900	5·932	6·936	11·171	7·611
July	5·288	4·447	4·321	4·404	4·499	4·720	4·353	3·891	5·659	6·352	10 710	8·033
August	5·250	4·580	4·363	4·400	4·500	4·569	4·624	3 875	4·656	6·244	10·594	8·050
September	4·813	4·515	4·312	4·400	4·485	5·048	4·698	3·828	4·610	6·810	8·680	8·050
October	4·750	4·351	4·341	4·400	4·265	5·071	4·402	3·528	4·600	7·000	6·710	8·050
November	4·376	4·330	4·370	4·442	4·298	4·615	4·293	3·683	5·155	7·042	6·249	8·050
December	3·658	4·213	4·560	4·500	4·450	4·303	4·047	3·800	5·355	7·513	6·375	6·564
Average	5·325	4·200	4·273	4·446	4·420	4·471	4·370	3·862	4·673	6·858	8·787	7·413

† From the *Engineering and Mining Journal.*

Monthly Average Prices of Lead in London.‡

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

Month.	1909.			1910.			1911.			1912.			1913.		
January	13	3	6	13	3	11	13	0	8	15	11	3	17	1	11
February	13	5	5	13	7	3	13	1	11	15	13	9	16	8	5
March	13	8	8½	13	2	9	13	2	11	15	19	8	15	19	8
April	13	7	0	12	13	9	12	18	5	16	6	6	17	8	10
May	13	5	3	12	11	8	12	19	2	16	10	2	18	14	3
June	13	2	4	12	13	9	13	5	5	17	11	8	19	10	8
July	12	13	3	12	11	8	13	10	11	18	8	9	19	7	10
August	12	10	6	12	10	10	14	1	4	19	5	8	19	15	8
September	12	15	3	12	12	6	14	15	1	21	9	0	19	14	10
October	13	4	4	13	2	0	15	6	1	20	8	0	19	9	5
November	13	1	4½	13	4	6	15	15	5	18	4	7	18	13	9
December	13	2	11½	13	3	9	15	13	4	18	1	6	17	8	8
Yearly average	13	1	8	12	19	0	13	19	3	17	15	11	18	6	2

Month.	1914.			1915.			1916.			1917.			1918.		
January	18	19	10	18	12	0	30	17	5	30	0	0	29	0	0
February	19	2	8	19	3	7	31	18	9	30	0	0	29	0	0
March	19	2	3	21	17	8	34	7	8	30	0	0	29	0	0
April	17	19	8	21	2	1	34	8	0	30	0	0	29	0	0
May	18	4	8	20	9	2	32	19	5	30	0	0	29	0	0
June	18	13	11	25	4	1	30	14	0	30	0	0	29	0	0
July	18	8	6	24	12	3	27	8	11	30	0	0	29	0	0
August	20	9	9	21	18	11	29	2	7	30	0	0	29	0	0
September	18	16	3	23	3	0	29	17	4	30	0	0	29	0	0
October	17	9	8	23	19	9	30	0	0	30	0	0	29	0	0
November	17	19	9	26	2	9	30	0	0	30	0	0	31	12	4
December	18	18	6	28	8	8	30	0	0	30	0	0	40	0	0
Yearly average	18	13	9	22	17	10	30	19	6	30	0	0	30	2	8

‡ As published by the Metal Information Bureau, London.

Exports and Imports.—The exports of lead in 1918 amounted to 30,145,800 pounds, valued at $1,990,697, and consisted in lead in ores, concentrates, bullion, etc., 22,684,100 pounds, valued at $1,321,890, and pig-lead 7,461,700 pounds, valued at $668,807. The exports in 1917 were 14,414,900 pounds, valued at $987,509, and consisted of lead in ores, etc., 13,410,400 pounds, valued at $925,056, and pig-lead 1,004,500 pounds, valued at $62,452.

The large increase in the exports for 1916, 1917, and 1918 is due to the fact that a few thousand tons of base bullion were exported from Trail, B.C., for refining in the United States.

The imports of lead in 1918 were 7,756 tons, valued at $1,350,689, and included certain manufactures of lead valued at $125,550 for which no equivalent quantity is given.

The imports in 1917 were 8,432 tons, valued at $1,732,428, and included manufactures of lead valued at $190,091.

Exports of Lead, 1910 to 1918.

	Lead in Ore Concentrates, etc.		Pig Lead.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1910	46,800	$ 1,308	7,712,253	$248,174	7,759,053	$ 249,482
1911	65,100	1,826	71,951	2,806	137,061	4,632
1912	299,240	8,193	.....	.....	299,240	8,193
1913	329,968	9,136	.....	.....	329,960	9,136
1914	246,100	2,681	510,573	19,507	756,673	22,188
1915	1,845,100	40,273	2,066,929	79,067	3,912,029	119,340
1916	9,048,400	558,180	112,100	7,710	9,160,500	565,890
1917	13,410,400	925,056	1,004,500	62,453	14,414,900	987,509
1918	22,684,100	1,321,890	7,461,700	668,807	30,145,800	1,990,697

Imports of Lead, 1916, 1917, and 1918.

	1916.		1917.		1918.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
Old scrap, pig and block	9,933	$1,258,284	5,755	$958,402	5,499	$759,086
Bars and sheets	492	85,686	523	111,002	445	80,594
Pipe	109	21,450	139	29,502	115	23,542
Shot and bullets	39	6,390	13	2,163	2	512
Manufactures of lead *(a)*	.....	155,278	.....	190,091	.....	125,550
Tea lead	1,073	198,541	245	59,231	295	73,140
Litharge	1,384	211,359	1,404	275,919	974	169,500
Total	13,030	1,936,988	8,079	1,626,310	7,330	1,231,924
Metallic lead contained in imported lead pigments	550	140,908	353	106,118	426	118,765
	13,580	2,077,896	8,432	1,732,428	7,756	1,350,689

(a) Includes nitrate and acetate of lead in 1916, 224,648 pounds valued at $30,445; in 1917, 188,008 pounds valued at $24,327; and in 1918, 100,516 pounds valued at $15,108.

Imports of Lead in Pigs, Bars, Sheets, etc., and Manufactures.

Fiscal year.	Old Scrap, Pig and Block.			Bars and Sheets.			Litharge.		
	Cwt.	Value.	Average price	Cwt.	Value.	Average price.	Cwt.	Value.	Average price.
1907	79,673	$ 363,655	$4·56	19,177	$ 86,338	$ 4·50	17,546	$ 85,557	$4·88
1908	49,825	155,513	3·12	14,402	49,527	3·44	15,524	57,929	3·73
1909	112,980	184,572	1·63	13,412	44,071	3·29	17,049	58,100	3·41
1910	120,591	346,516	2·87	17,697	45,674	2·58	15,541	56,049	3·61
1911	199,774	495,923	2·48	30,837	55,458	1·80	17,979	65,743	3·66
1912	281,787	940,533	3·34	19,212	93,702	4·88	25,925	113,941	4·40
1913	111,995	464,117	4·14	14,944	62,527	4·18	10,009	50,734	5·07
1914	154,441	590,557	3·82	9,615	41,244	4·29	10,863	52,525	4·84
1915	426,162	2,010,006	4·72	9,125	56,331	6·17	15,798	89,232	5·68
1916	198,658	1,258,284	6·33	9,850	85,686	8·70	27,672	211,359	7·64
1917	115,104	958,402	8·33	10,458	111,002	10·61	28,079	275,919	9·83
1918	109,986	759,086	6·90	8,891	80,594	9·06	19,479	169,500	8·70

Calendar Year.	Pipe Lead.			Shot and Bullets.			Tea Lead.			Other Manufactures of Lead (a).
	Pounds.	Value.	Cents per pound.	Pounds.	Value.	Cents per pound.	Pounds.	Value.	Cents per pound.	Value.
1910	403,012	$ 15,365	3·81	6,903	$ 311	4·55	2,371,136	$117,399	4·95	$ 107,688
1911	512,737	19,426	3·79	8,912	1,053	11·82	2,688,211	134,160	4·99	108,012
1912	688,383	32,423	4·70	477,047	23,163	4·86	3,212,861	167,716	5·22	144,571
1913	466,753	21,679	4·64	429,656	19,582	4·56	3,475,171	217,009	6·24	155,178
1914	565,762	26,282	4·65	180,639	10,542	5·84	1,687,029	108,097	6·41	99,285
1915	145,953	8,708	5·97	1,085,196	51,890	4·78	959,189	67,652	7·05	102,439
1916	217,905	21,450	9·84	78,474	6,390	8·14	2,145,854	193,541	9·25	124,833
1917	278,207	29,502	10·60	25,147	2,163	8·60	490,364	59,231	12·08	165,764
1918	229,678	23,542	10·25	4,028	512	12·71	589,071	73,140	12·42	110,442

(a) Does not include nitrate and acetate of lead in 1915, 250,921 pounds, valued at $23,269; in 1916, 224,648 pounds, valued at $30,445; in 1917, 188,008 pounds, valued at $24,327; and in 1918, 100,516 pounds valued at $15,108.

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

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	99,658	5·66
1916	200,256	15,746	59,601	5,203	1,423,351	119,959	1,683,208	140,908	8·37
1917	200,832	19,229	67,383	6,321	833,603	80,568	1,081,580	106,188	9·63
1918	367,755	30,874	38,642	4,166	896,331	83,725	1,303,228	118,765	9·11

Consumption.—The production of lead, as already stated, was in 1918, 25,699 tons, while the exports were 15,073 tons, leaving a balance of 10,626 tons; by adding to this amount the 7,756 tons of imports we get a total consumption of lead for Canada of about 18,382 tons, as against 18,000 tons in 1917, 30,000 in 1916, and 46,000 in 1915.

This estimate of consumption is considered incomplete because of the fact that very large quantities of material 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 from other sources shows that the total annual consumption amounted to about 55,000 tons during the last three years.

Estimated Consumption of Lead.

Year.	Tons.	Year.	Tons.	Year.	Tons.
1908	22,000	1912	39,000	1916	55,000
1909	25,000	1913	30,000	1917	55,000
1910	24,000	1914	29,000	1918	55,000
1911	28,000	1915	46,000		

Quebec.

The production of lead in Quebec during 1918 amounted to 2,110,059 pounds, valued at $195,180, as against 1,378,001 pounds, valued at $153,468 in 1917; and 698,760 pounds, valued at $59,485, in 1916. This production was wholly from the zinc-lead deposits of Notre-Dame-des-Anges.

Ontario.

The Ontario production of lead in 1918 was 1,684,366 pounds, valued at $155,804, as against 1,586,711 pounds, valued at $176,712, in 1917, and 685,932 pounds, valued at $58,393, in 1916.

British Columbia.

The production of refined lead together with lead in ores exported amounted in 1918 to 47,594,328 pounds, valued at $4,402,475, as against 29,483,725 pounds valued at $3,283,602 in 1917, and 39,157,701 pounds valued at $3,333,496 in 1916.

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

In 1917 only a small tonnage was shipped to American smelters but in 1918 a very considerable amount was again shipped across the border, amounting to over 27,000 tons of ore and concentrates most of which was from the Sullivan mine at Kimberly, with also a few thousand tons from the Queen Bess and the Surprise near Sandon and smaller shipments from a number of other operators.

British Columbia: Production of Lead.

Year.	Pounds.	Value.	Cents per pound.	Year.	Pounds.	Value.	Cents per pound.
1887	204,800	$ 9,216	4·40	1903	18,089,283	$ 766,443	4·237
1888	674,500	29,813	4·42	1904	36,646,244	1,579,086	4·309
1889	165,100	6,488	3·93	1905	56,580,703	2,663,254	4·707
1890	.....	.....	.....	1906	52,408,217	2,964,733	5·657
1891	.....	.....	.....	1907	47,738,703	2,542,086	5·325
1892	808,420	33,064	4·09	1908	43,195,733	1,814,221	4·200
1893	2,131,092	79,490	3·73	1909	45,857,424	1,692,130	*3·690
1894	5,703,222	187,636	3·29	1910	32,987,508	1,216,249	*3·687
1895	16,461,794	531,716	3·23	1911	23,784,969	827,717	‡3·480
1896	24,199,977	721,159	2·98	1912	35,763,476	1,597,554	‡4·467
1897	38,841,135	1,390,513	3·58	1913	37,626,899	1,753,037	‡4·659
1898	31,693,559	1,198,017	3·78	1914	36,289,845	1,625,422	‡4·479
1899	21,862,436	977,250	4·47	1915	45,377,064	2,541,116	‡5·600
1900	62,158,621	2,760,031	4·37	1916	39,157,701	3,333,496	‡8·513
1901	51,582,906	2,235,603	4·334	1917	29,433,725	3,283,602	‡11·137
1902	22,536,381	917,005	4·069	1918	47,594,328	4,402,475	‡9·250

*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.

The record given in the preceding table represents the recovery of lead at smelter or refinery as distinguished from the figures given in the table next succeeding, which indicates the quantities of lead contained in ore sent to the smelters.

British Columbia: Production of Lead by Districts.*

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

District.	1912.	1913.	1914.	1915.	1916.	1917.	1918.
Cassiar—							
Atlin, etc	.....	.....	.....	.....	7,260	.....	.....
Skeena, etc	41,512	6,579	.....	30,462	1,077	.....	.....
East Kootenay—							
Fort Steele	18,238,238	18,525,083	24,863,105	26,582,050	24,156,143	13,996,640	18,695,565
Windermere, etc	2,249,237	2,495,255	.....	216,327	571,244	1,774,649	2,659,210
West Kootenay—							
Ainsworth	4,863,894	9,027,861	8,069,525	3,436,184	7,841,869	6,395,350	6,106,262
Nelson	2,293,000	1,936,418	2,004,436	967,775	1,240,784	2,605,666	1,611,166
Slocan	16,944,811	22,648,766	15,233,910	14,925,345	14,415,645	11,808,019	14,575,379
Revelstoke, etc	240,762	521,771	128,912	89,041	206,741	395,321	80,773
Yale—							
Yale—Kamloops	.....	.....	.....	.....	47,380	12,690	.....
Similkameen, etc	.....	.....	.....	.....	.....	10,697	.....
Grand Forks, etc	.....	45,982	1,678	7,127	14,922	36,548	47,738
Cariboo—							
Omineca	.....	156,862	323,482	249,279	224,451	271,885	123,568
	44,871,454	55,364,677	50,625,048	46,503,590	48,727,516	37,307,465	43,899,661

* 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 and 1917 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 in 1916 from the Silver King property on Galena creek to the Selby smelter at San Francisco. Shipments were rather small during 1917 and 1918.

This area is one of the most important placer-gold 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 of 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 £12 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. The "Lead Bounties Act, 1913" expired June 30, 1918, and was not renewed.

There was no bounty paid on lead during the last three fiscal years.

Statement of Bounties Paid on Lead during the Fiscal Years 1899 to 1919.

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	" 31, 1918	.....
" 30, 1905	330,645	" 31, 1912	179,288	" 31, 1919	.....
				Total	1,979,164

MERCURY.

There has been no production of mercury since 1897. The small production reported in 1895, 1896, 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.

Large quantities of mercury have been used during the war in the manufacture of munitions, for detonators and explosives, and since the British Empire is entirely dependent on foreign sources for supplies of this metal, it was considered advisable to make an investigation of the deposits at Copper creek on the north side of Kamloops lake, B.C., as a locality from which a supply might be obtained if other sources were cut off, and an examination was made in July, 1918, by Mr. Chas. Camsell, of the Geological Survey Branch, Department of Mines, Ottawa. His report appeared in the Summary of the Geological Survey for 1918 (Part B., pp. 17-22.)

The imports of mercury during 1918 were 56,936 pounds valued at $68,903, as against 71,608 pounds valued at $76,322 in 1917.

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
1898-1918			

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

Imports of Mercury.

Calendar Year.	Pounds.	Value.	Calendar Year.	Pounds.	Value.
1907	189,841	$ 82,873	1913	219,442	$ 109,493
1908	87,620	44,030	1914	204,229	97,449
1909	285,958	147,625	1915	184,432	159,184
1910	107,888	63,450	1916	79,204	74,461
1911	118,336	67,416	1917*	71,608	76,322
1912	137,474	72,171	1918	56,936	68,903

* Duty free.

Average Monthly Price of Mercury.

(Per flask of 75 pounds.)

Month.	1917.			1918.		
	New York	San Francisco	London.	New York	San Francisco	London.
January	$ 81.04	$ 80.20	£	$ 126.7708	$ 115.5769	£
February	120.90	116.25		119.8863	116.9565	
March	113.30	112.50		121.6346	115.8269	
April	115.64	115.00		121.8654	115.4615	
May	105.98	105.00		118.9730	113.3076	
June	84.34	86.20		122.6600	113.4800	
July	107.80	102.18		126.6346	116.6923	
August	115.00	111.10		125.5555	118.3333	
September	112.21	110.90		127.8125	119.0000	
October	100.94	100.62		127.1759	119.3333	
November	102.50	100.75		124.9130	118.9130	
December	115.90	111.65		117.7000	115.6000	
Year	106.30	104.36		123.4651	116.5401	

MOLYBDENUM.

The total production in 1918 representing the quantity of MoS_2 contents of the concentrates produced, for which payment was made, amounted to 378,029 pounds, which at $1.15 per pound would be worth $434,733. The total production in 1917, representing the MoS_2 contents of the concentrates produced for which payment was made, amounted to 288,705 pounds, which at $1.00 per pound would have a total value of $288,705.

The total shipments of ores and concentrates as stated by the producers were, in 1918, 461·3 tons valued at $428,807, and there were 33,935 tons of ore treated at the concentrating plants; in 1917 the total shipments of ores and concentrates were 1,544·3 tons valued at $320,006, and there were 22,605 tons treated at the concentrating plants.

Production of Molybdenite.

Calendar Year.	Ores mined.	Ores treated.	Ores and concentrates shipped.		MoS_2 Contents of shipments	MoS_2 production. (probable recovery.)	
	Tons.	Tons.	Tons.	[a] Value.	Pounds.	Pounds.	[b] Value.
1902	3	.....	3·3	$ 400	[c]	[c]	[c]
1903	600	.....	85·0	1,275	[c]	[c]	[c]
1904-1913	.....	.....	.....	.....	.....	.....	.....
1914	166	.....	16·5	2,063	3,814	3,814	$ 2,063
1915	2,242	216	39·0	28,920	29,210	29,210	28,450
1916	13,522	9,106	610·0	188,316	156,461	156,461	156,461
1917	26,871	22,605	1554·3	320,006	330,316	288,705	288,705
1918	34,030	33,935	461·3	428,807	378,482	378,029	434,733

[a] Value as given by the operators. [b] Estimated at the average market value of molybdenite.
[c] No figures available.

The ore produced has been 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.

All the ore produced was concentrated in Canadian mills erected for the purpose, and marketed either as concentrates, molybdic acid, ammonia molybdate, or as ferro-molybdenum for the manufacture of which two electric furnace plants have been established: the plant of the Orillia Molybdenum Co. at Orillia, and that of the Tivani Electric Steel Co. at Belleville, both in Ontario.

The concentrating plants are as follows:—[1]

Dominion Molybdenite Co., Ltd., at Quyon, Que.
St. Maurice Mines, Ltd., Indian Peninsula, Timiskaming Co., Que.
International Molybdenum Co., at Renfrew, Ont.
Mines Branch Plant, Ottawa, Ont.
Molybdenum Products Co., Haliburton, Ont.
Renfrew Molybdenum Mines, Ltd., at Mt. St. Patrick, Renfrew Co., Ont.
Steel Alloy Corporation, Dacre, Renfrew, Ont.
Molybdenum Mining and Reduction Co., Alice Arm, B.C.

[1] The American Molybdenite Co's plant was sold to the "Molybdenum Products Co." and was ready for operation early in 1918. The International Molybdenite Co's plant treats customs ore as well as its own, and the Mines Branch plant treats customs ore only.

The world's production of molybdenite (MoS_2) in 1918 was probably much greater than that of any previous year, the production for Canada, as stated above being 189 tons, while that of Queensland was about 105 tons of MoS_2, and the production from the new Climax mine, California, would easily offset any falling off from other countries, on which basis we may assume that the world's production in 1918 was between 600 and 700 tons of MoS_2 or 400 tons of molybdenum, being double that of 1915.

Estimated World's Production of Molybdenum Ores.‡

(In Short Tons.)

—	1915.					1916.				
	Ores and concentrates shipped		MoS_2 Contents.	Per cent of Mo.	Mo. content.	Ores and concentrates shipped		MoS_2 Contents.	Per centof Mo.	Mo. content.
	Tons.	Value.	Tons.		Tons.	Tons.	Value.	Tons.		Tons.
Australia :—		$					$			
New South Wales (1)	35·5	82,427	*	† 51·0	19·2	60·3	107,388	*	† 54·0	32·6
Queensland (2).	109·0	219,292	*	54·0	58·8	91·1	167,262	*	† 54·0	49·2
Southern Australia(3)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Canada	39·0	28,920	14·6	22.4	8·8	610·0	188,316	78·2	7·7	46·9
Japan (4)	11·1	*	*	*	*	37·0	*	*	*	*
Norway (4)	87·0	*	65·2	† 45·0	39·1	140·0	*	*	† 45·0	63·0
Peru (4)	3·0	*	2·5	† 49·0	1·5	6·0	*	*	† 49·0	3·0
Spain (4)	29·0	*	*	† 20·0	5·8	147·2	*	*	† 20·0	29·4
United States (4)	3,498·9	114,866	*	2·6	90·9	1,228·0	205,000	*	8·0	103·4

	1917.					1918.				
Australia :—		$					$			
New South Wales (1)										
Queensland (2)	78·7	153,826	*	† 51·0	40·1	104·1	203,670	*	† 51·0	53·0
Southern Australia(3)	124·5	236,608	*	† 51·0	63·5	123·0	236,453	*	† 51·0	62·7
Canada	0·9	1,747	*	† 51·0	0·5	0·2	477	*	† 51·0	0·1
Japan (4)	1,554·0	320,006	165·1	6·4	99·1	461·3	428,807	189·2	24·6	113·5
Norway (4)	*	*	*	*	*	*	*	*	*	*
Peru (4)	*	*	*	*	†100·0	*	*	*	*	†100·0
Spain (4)	7·0	*	*	*	*	*	*	*	*	*
United States (4).	*	*	*	*	*	*	*	*	*	*
	*	495,350	.....	.....	175·1	2,280·0	1,257,000	.....	18·9	430·8

‡Information gathered from official reports. (*) Figures not available, (†) Estimated.
(1) From the Annual Report of the Department of Mines, New South Wales.
(2) " " " Queensland.
(3) " " " Southern Australia.
(4) " " Mineral Industry, New York.

The Canadian Munition Resources Commission in its first annual report issued in 1918 has published very interesting information *re* the molybdenite industry. Extracts from this report were published in the Report of the Mineral Production of Canada during 1917.

Subsequent to the decision of the Canadian Government that exports of molybdenite and tungsten be licensed for shipment to France and the United States, the testing laboratories of the Department of Mines were requested to undertake the custom milling of molybdenite ores for various private interests, but shipments were received only until July 31, 1918, in order that the operators may have an opportunity of taking advantage of the market in the United States and France, while undertaking the construction of their own concentrating mills.

Customs ores were purchased on the basis of the following prices:—

Schedule of Prices.

Governing the milling of molybdenite ores and concentrates delivered f.o.b. Dominion Government Testing Plant, Ottawa.

Concentrates 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 pounds of crude ore.

(4) Credit will be given for molybdenite only. No allowance will be made for molybdite, or wulfenite.

(5) Recoveries of molybdenite per ton of 2,000 pounds dry ore delivered railway siding, Mines Branch Testing Laboratories, Ottawa:—

For molybdenite ores containing:—

(*a*)	Between	0·5%	and	1·0%	including	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*)	"	2·61%	"	3·0%	"		90%	"	"	"
(*f*)	"	3·0 %	"	...%	"		92%	"	"	"

There are molybdenite deposits in Nova Scotia, Quebec, Ontario, Manitoba, and British Columbia. The principal production comes from the Quyon mine, in Pontiac county, Quebec, which property ranks amongst the largest producers in the whole world.

During the last few years reports have been published on several of the Canadian molybdenite deposits, mention of which will be found in this chapter.[1]

Prices.—The price of molybdenite in New York was quoted in the early part of January, 1918, at $2.25 to $2.30 per pound for 90 per cent MoS_2, remained around this price until the end of February when it started to decline and by April the market was only nominal at $1.80 per pound. The price kept on declining, very little business being done and the year finished with sales at $0.85 per pound.

It would be very difficult to predict the possible future of the molybdenite market. It will largely depend on the discovery of new uses for the metal and its compounds.

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1 (*a*) "Report on the Geology and Mineral Resources of Keekeep and Kewagama Lakes Region, Quebec," by J. A. Bancroft, Report of Bureau of Mines, Quebec, 1911.

(*b*) "Report on the Molybdenite Deposits of the Moss mine, Quyon, Que." By Charles Camsell. Summary Report, Geol. Surv., 1916.

(*c*) "Report on the Arnprior-Quyon district, Ontario and Quebec." By M. E. Wilson. Summary Report of the Geol. Surv., 1917, Part E.

(*d*) "Report on the Deposits of Ontario." By A. L. Parsons. Can. Min. Journal, June 1, 1917.

(*e*) "Report on the Molybdenite Deposits at Falcon lake, Eastern Manitoba." By J. S. Delury. Can. Min. Journal, December 1, 1917.

(*f*) "Report on the Index Molybdenite mine, Lillooet, B.C." By Dr. C. W. Drysdale. Summary Report of the Geol. Surv., 1916.

NICKEL.

The production of nickel in 1918 amounted to 46,253·6 tons valued at $37,002,917, as compared with 42,165·1 tons valued at $33,732,112 in 1917, an increase of 9·7 per cent.

This production includes: (*a*) the nickel in the matte produced from the treatment of the copper-nickel ores of the Sudbury district, and the Alexo mine at Porquis Junction, Timiskaming, Ont., exported for refining; (*b*) 1,204·5 tons of refined nickel, mostly the production from the treatment of the copper-nickel matte at the refinery at Port Colborne, Ont., and including that derived from the treatment of the silver-cobalt nickel ores in the smelters of eastern Ontario; and (*c*) a small quantity being the estimated nickel contents of the nickel-oxides and nickel salts produced at these eastern Ontario smelters.

Annual Production of Nickel.

Calendar Year.	Pounds of nickel.	Cents per pound.	Value.	Calendar Year.	Pounds of nickel.	Cents per pound.	Value.
1889	830,477	60	$ 498,286	1904	10,547,883	40	$ 4,219,153
1890	1,435,742	65	933,232	1905	18,876,315	40	7,550,526
1891	4,035,347	60	2,421,208	1906	21,490,955	42	8,948,834
1892	2,413,717	58	1,399,956	1907	21,189,793	45	9,535,407
1893	3,982,982	52	2,071,151	1908	19,143,111	43	8,231,538
1894	4,907,430	33⅓	1,870,958	1909	26,282,991	36	9,461,877
1895	3,888,525	35	1,360,984	1910	37,271,033	30	11,181,310
1896	3,397,113	35	1,188,990	1911	34,098,744	30	10,229,623
1897	3,997,647	35	1,399,176	1912	44,841,542	30	13,452,463
1898	5,517,690	33	1,820,838	1913	49,676,772	30	14,903,032
1899	5,744,000	36	2,067,840	1914	45,517,937	30	13,655,381
1900	7,080,227	47	3,327,707	1915	68,308,657	30	20,492,597
1901	9,189,047	50	4,594,523	1916	82,958,564	35	29,035,497
1902	10,693,410	47	5,025,903	1917	84,330,280	40	33,732,112
1903	12,505,510	40	5,002,204	1918	92,507,293	40	37,002,917

There were mined in 1918, 1,641,617 tons of ore, and smelted 1,559,892 tons from which were produced 87,184 tons of Bessemer matte carrying approximately 45,885·6 tons of nickel and 23,482·3 tons of copper. The average metal recovery in matte from the ores treated was 2·941 per cent nickel and 1·505 per cent copper.

There were mined in 1917, 1,509,841 tons of ore, and smelted 1,453,661 tons from which were produced 78,897 tons of Bessemer matte carrying approximately 41,887 tons of nickel and 21·196 tons of copper. The average metal recovery in matte from the ores treated was 2·881 per cent nickel and 1·458 per cent copper.

Production of the Sudbury District.

	1913.	1914.	1915.	1916.	1917.	1918.
Ore mined.....Short tons.	781,697	1,000,364	1,364,048	1,566,333	1,518,783	1,641,617
Ore smelted..... "	823,403	947,053	1,272,283	1,521,689	1,453,661	1,559,892
Bessemer matte produced... "	47,150	46,396	67,703	80,011	78,897	87,184
Copper content of matte.... "	12,938	14,448	19,608	22,430	21,196	23,482
Nickel content of matte..... "	24,838	22,759	34,039	41,298	41,887	45,886
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	$5,438,830	$6,606,782
Men employed.....	3,486	3,379	4,033	4,656	4,517	4,701

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 1918 it averaged 52·6 per cent nickel and 26·0 per cent copper, as against 50·6 per cent nickel and 26·9 per cent copper in 1917, 51·6 and 28·0 respectively in 1916, 50·3 and 29·0 respectively 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 28 per cent nickel, which is included in the total given. Monel metal is produced directly from this matte without the intermediate refining of either the nickel or the copper.

A paper on the "Manufactures of Nickel-Copper Alloy Steel or Nicu Steel," by G. M. Colvocoresses, was read at the annual meeting of the Canadian Mining Institute in March, 1918. Practical tests of the processes are said to have been carried on near Sudbury.

The industry based on the mining and metallurgical treatment of the nickel-copper ores of the Sudbury 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.

In 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 of the Mines Branch and Geological Survey at Ottawa, by the Ontario Bureau of Mines, Toronto, and recently by the Royal Ontario Nickel Commission.[1]

Refined metallic nickel has been recovered in Canadian refineries since 1915, but, previous to 1918, only in small quantities and as a by-product in the smelting and refining of the silver-cobalt-nickel ores. Nickel oxide has been recovered in these smelters since 1912. The recovery of nickel-sulphate was reported for the first time in 1915.

The new refinery erected at Port Colborne, Ont., by the International Nickel Company of Canada, Ltd., started operations in July, 1918, and this company has the distinction of being the first to produce refined nickel in Canada from the Sudbury ores.

Thus, in 1918 the production of refined metallic nickel was greatly in excess of that of any of the previous years and amounted to 3,408,945 pounds, or 1,204·5 tons.

The production from the silver-cobalt-nickel ores was 243,186 pounds of metallic nickel, valued by the operators at $88,720, as against 265,896 pounds, valued at $108,334, in 1917; that of nickel-oxide and nickel-sulphate was 962,309 pounds, valued at $215,277, as against 657,549 pounds, valued at $122,963, in 1917.

The total estimated nickel contents of the recoveries from silver-cobalt-nickel ores was in 1918, 736,005 pounds, as against 556,961 pounds in 1917.

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[1] "Report on Nickel and Copper Deposits of Sudbury, Ont." By A. E. Barlow, Geol. Surv., Canada, No. 873, 1901.
"The Sudbury Nickel Region." By A. P. Coleman, Ph.D., Ontario Bureau 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 from the Silver-Cobalt-Nickel Smelters of Eastern Ontario.

Year.	Metallic Nickel.		Nickel-Oxides.		Nickel contents of recoveries.
	Pounds.	Value.	Pounds.	Value.	
		$		$	
1912	.....	.....	* 91,377	9,137	‡
1913	.....	.....	*268,304	30,122	‡
1914	.....	.....	*392,512	34,883	‡
1915	55,325	22,130	†282,025	31,262	231,634
1916	79,360	31,538	†555,868	101,358	361,702
1917	265,896	108,334	†657,549	122,963	556,961
1918	243,186	88,720	†962,309	215,277	736,005

*Does not include the mixed oxides of cobalt and nickel. See chapter on 'Cobalt' for values.
†Nickel-sulphate included with nickel oxides.
‡Figures not available.

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

The International Nickel Company of Canada, Ltd., with smelter at Copper Cliff, Ontario, and refinery at Bayonne, New Jersey. This company has completed the erection of a new refining plant at Port Colborne, Ontario, which started operations on July 1, 1918.

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

The British America Nickel Corporation, Ltd., which started erecting a smelter at the Murray mine, late in 1916, and early in 1918 a refinery near Lake Deschesnes, Hull county, Que., although not shipping during the year, development was actively carried on. It is hoped to have both smelter and refinery in operation before the close of 1919.

The Alexo Mining Company, Ltd., which operated its mine near 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 of the following companies:—

The Coniagas Reduction Company, Thorold, Ont.
The Deloro Smelting and Refining Co., Deloro, Ont.
The Metals Chemical Co., Ltd., Welland, Ont.

Prices.—The price of refined nickel in New York according to quotations published by the "Engineering and Mining Journal," was 45 cents per pound for the first quarter of 1918, 35 to 40 cents for the second quarter, and 40 cents for the balance of the year.

Electrolytic nickel is five cents higher per pound.

The price of nickel in Europe in 1918 as given by the "London Mining Journal" was quoted for exports at a nominal price of £225 per long ton until the end of April when the price rose to £250 and reached a maximum of £260 during most of May. In June business was dull again and the price remained nominal until the end of the year at £195 per long ton for both exports and home quotations.

Exports and Imports. The exports of nickel in 1918 amounted to 87,478,500 pounds, or 43,739·2 tons valued at $11,263,246, and included: nickel in ore and matte 85,767,700 pounds valued at $10,556,040, or an average of 12·31 cents per pound, and nickel fine 1,710,800 pounds valued at $707,206, or an average of 41·34 cents per pound.

The exports in 1917 amounted to 81,272,400 pounds valued at $8,708,650, and in 1916, 80,441,700 pounds valued at $8,662,179.

The exports of nickel in ore and matte and nickel fine were not published separately previous to March 31, 1917.

Exports of Nickel.

Calendar year.	Pounds.	Value.	Cents per pound.	Calendar year.	Pounds.	Value.	Cents per pound.
1903	12,699,227	$ 1,116,099	8·78	1911	32,619,971	$ 3,676,396	11·27
1904	11,233,869	1,091,349	9·71	1912	44,221,860	4,661,758	10·54
1905	17,318,059	1,569,693	9·06	1913	49,459,017	5,195,560	10·50
1906	20,653,845	2,042,965	9·89	1914	46,528,327	5,149,427	11·07
1907	19,376,335	2,280,374	11·76	1915	66,410,442	7,394,446	11·13
1908	19,419,893	1,866,624	9·61	1916	80,441,700	8,662,179	10·77
1909	25,616,398	2,676,483	10·45	1917	81,272,400	8,708,650	10·72
1910	36,014,782	4,030,040	11·19	1918	87,478,500	11,263,246	12·88

The imports of nickel in 1918 were valued at $443,103 and included nickel in ingots, bars, sheets, etc., 638,264 pounds, valued at $238,895, and manufactures of nickel valued at $204,208.

The imports in 1917 were valued at $519,064 and included nickel in ingots, bars, sheets, etc., 853,845 pounds valued at $369,346, and manufactures of nickel valued at $149,718. In 1916 the imports were valued at $414,410 and included nickel in ingots, bars, sheets, 892,436 pounds valued at $325,326, and manufactures of nickel valued at $89,084.

There is also a considerable import of nickel-plated ware.

Imports of Nickel, Nickel-Silver, and German Silver, 1917 and 1918.

	1917.		1918.	
	Pounds.	Value.	Pounds.	Value.
Nickel, nickel-silver, and German silver in ingots or blocks	303,853	$ 123,976	95,306	$ 39,295
Nickel, nickel-silver, and German silver in bars and rods, and also in strips, sheets or plates	549,992	245,370	542,958	199,600
Manufactures of German, Nevada, and nickel-silver, not plated		149,718		204,208
		519,064		443,103

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 35·1 to 55·4 cents per pound with an average of 39·7 cents in 1918, as against 38·5 to 49 cents per pound, with an average of 41 cents in 1917; 37 to 46 cents per pound with an average of 38·7 cents in 1916; and 34 to 43 cents per pound with an average of 38 cents in 1914.

United States: Imports and Exports of Nickel.*

	1917.			1918.		
	Quantity.	Value.	Cents per pound.	Quantity.	Value.	Cents per pound.
Imports into United States—						
Ore and matte ..... Gross tons.	61,053	$9,612,400	12·73	59,621	$11,517,546	15·73
Nickel content ..... Pounds.	75,510,793			73,193,205		
Exports from United States—						
To France ..... Pounds.	1,232,142	562,105	45·62	2,233,736	864,966	38·72
" Italy ..... "	5,470,042	2,392,711	43·74	5,100,847	2,085,912	40·90
" Netherlands ..... "	.....	.....	.....	.....	.....	.....
" Russia in Europe ..... "	168,000	64,700	38·51	.....	.....	.....
" United Kingdom ..... "	14,409,272	5,579,603	38·72	7,803,178	2,739,093	35·10
" Japan ..... "	275,018	134,172	48·79	2,063,933	1,102,197	53·40
" Russia in Asia ..... "	.....	.....	.....	.....	.....	.....
" Other countries ..... "	441,938	207,221	46·89	267,806	134,873	50·30
	21,996,412	8,940,512	40·65	17,469,500	6,927,041	39·65

*From the "Foreign Commerce of the United States," Dec. 1918.

Exports of Nickel, Nickel-Oxide, and Matte from the United States during the following fiscal years, ending June, 1918.*

(In pounds.)

To	1912.	1913.	1914.	1915.	1916.	1917.	1918.
Austria-Hungary	.....	134,400	672,043	67,200	.....	.....	.....
Belgium	551,740	1,719,285	1,230,274	210,612	.....	.....	.....
Denmark	.....	.....	.....	43,830	2,174	28,051	.....
France	5,579,335	4,197,110	4,419,663	3,210,980	1,871,595	2,336,684	1,904,131
Germany	2,527,273	2,346,325	11,084,366	1,036,242	.....	1,168,056	.....
Italy	1,321,733	1,075,303	1,276,905	2,365,177	1,880,661	5,471,426	4,723,940
Netherlands	7,584,653	9,164,012	2,376,216	22,033	139,300	506,588	.....
Norway	.....	.....	.....	31,158	34,460	33,614	.....
Portugal	.....	.....	.....	.....	.....	66,520	14,844
Russia in Europe	.....	7,250	186,626	4,082,280	5,371,089	4,917,075	.....
Spain	.....	.....	.....	700	112,450	158	1,098
Sweden	.....	.....	.....	367,696	313,958	28,554	.....
U. Kingdom—							
England	3,019,833	2,334,845	2,171,511	8,535,418	7,973,478	10,024,301	7,977,562
Scotland	5,970,045	6,878,264	5,433,081	7,817,384	6,113,198	5,820,442	3,024,000
N. America—							
Canada	3,373	16,379	42,529	52,949	11,646	27,169	10,363
Cuba	.....	.....	.....	.....	10	34,410	527
Mexico	.....	.....	.....	1,779	.....	249	4,000
Panama	.....	.....	.....	.....	.....	.....	321
West Indies (British)	.....	.....	.....	300	.....	.....	.....
West Indies (Dutch)	.....	.....	.....	.....	10	.....	.....
Haiti	.....	.....	.....	.....	.....	.....	120
S. America—							
Argentina	.....	.....	.....	.....	.....	.....	3,352
Brazil	.....	1,796	.....	.....	473	7,623	1,291
Chile	.....	.....	.....	.....	100	101	31,543
Colombia	.....	32	.....	.....	.....	70	.....
Venezuela	.....	.....	.....	.....	.....	.....	100
Asia—							
British India	.....	.....	.....	.....	411	.....	.....
China	.....	.....	.....	.....	.....	6,720	69,246
Hong Kong	.....	.....	.....	.....	.....	13,899	31,000
Japan	4,005	5,447	2,028	308,444	597,257	237,944	886,337
German China	.....	.....	.....	.....	.....	.....	2,000
Russia in Asia	.....	.....	.....	1,423,030	1,226,990	.....	.....
Dutch E. Indies	.....	.....	.....	.....	.....	.....	1,361
Oceania—							
British Australia and Tasmania	.....	829	.....	22,400	679	217,280	70,254
Philippine Islands	.....	.....	.....	.....	56	1,510	.....
Egypt	.....	.....	.....	.....	.....	.....	60,822
	26,561,990	27,881,277	28,895,242	29,599,612	25,649,995	31,005,606	18,818,212

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

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

From	1914.		1915.		1916.		1917.		1918.	
	Tons.	Pounds.	Tons.	Pounds.	Tons.	Pounds.	Tons.	Pounds.	Tons.	Pounds.
Belgium	1,243	2,037,008	242	317,971						
France					297	514,828				
Norway	3	5,040	366	530,704						
Canada (*a*)	35,174	41,507,255	29,592	36,607,235	52,742	64,622,286	56,603	70,738,737	56,282	70,710,232
Oceania—										
French					2,618	2,391,922	409	387,805	100	111,207
Australia			601	539,109	1,329	1,268,084	3,120	2,912,298	2,393	2,274,240
Peru					1	118				
Chile									1	91
Totals	36,420	43,549,303	30,801	37,995,019	56,987	68,797,238	60,132	74,038,840	58,776	73,095,770

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

(*a*) Values were: in 1914, $5,621,480; in 1915, $4,788,145; in 1916, $8,596,921; in 1917, $9,219,634, and in 1918, $8,608,555.

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 was 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 Act expired in April 1917, and was not re-enacted.

PLATINUM AND PALLADIUM.

Platinum in Canada is found in the alluvial sands of British Columbia, principally in the Similkameen district, and also occurs in the copper-nickel ores of the Sudbury district, associated with palladium, iridium, gold, silver, and other metals of the so-called platinum group.

Undoubtedly, the most important sources of the metals of the platinum group in Canada, are those of the nickel-copper ores. But due to the fact that these precious metals occur in very small quantities per ton of ore and the difficulty of recovering them in refining operations, no attempt has been made to do so in Canada.

The International Nickel Company has been recovering these metals at their plant in New Jersey, but it would be impossible to determine what production was from Canadian matte, as it was treated with material from other sources.

The recorded production in 1918, from the alluvial sands was 39 crude ounces (25 fine ounces) valued at $2,560, as against 57 crude ounces valued at $3,823 in 1917.

Annual Production of Platinum from Alluvial Sands.

Year.	Value.	Year.	Value.	Year.	Crude Ounces.	Value.
1887	$ 5,600	1896	$ 750	1905		$ 500
1888	6,000	1897	1,600	1906		
1889	3,500	1898	1,500	1907–1912		
1890	4,500	1899	825	1913	18	489
1891	10,000	1900		1914		
1892	3,500	1901	457	1915	23	1,063
1893	1,800	1902	46,502	1916	15	600
1894	950	1903	33,345	1917	57	3,823
1895	3,800	1904	10,372	1918	39	2,560

The Royal Ontario Nickel Commission which investigated the nickel industry in Canada in 1916, made some most interesting observations on the platinum production derived from the Sudbury ores, and the prominence taken by platinum these last few years justified an extensive quotation of their remarks and findings, which appeared in the Annual Report on the Mineral Production of Canada for 1917.

Although it is not possible to state correctly the actual quantity of the platinum metals present in the ores mined, the quantity recovered per ton of ore can be accurately determined from assay of the matte, provided the number of tons of ore smelted per ton of matte produced is known.

The Canadian Copper Company reports that the average content of precious metals per ton of matte for the three years ending 1915 was roughly as follows:—

Gold	0·05 oz. troy.
Silver	1·75 "
Platinum	0·10 "
Palladium	0·15 "

On the basis of this average metal contents the total matte production in 1918, 87,184 tons, would contain 4,359 ounces of gold, 152,572 ounces of silver, 8,718 ounces of platinum, and 13,078 ounces of palladium. With silver at around $1 per ounce, platinum at $105 per ounce, and palladium at $135 per ounce, it would be noted that a very considerable value would accrue to these metals even if only a small percentage of the total contents were recoverable.

The Mond Nickel Company has not furnished figures as to the precious metal content of its matte, but from assays made on behalf of the Commission on samples obtained from that company, it would appear that the matte produced by the Mond Nickel Company, is considerably richer in metals of the platinum group than that from the Canadian Copper Company.

The following table shows the recovery of the precious metals by the International Nickel Company over a period of years together with the quantities of matte refined.

The company points out, as stated above, that during part of the period covered by these figures, it was treating material from other sources, so that the whole of the recoveries could not be attributed to the Sudbury matte.

Recovery at the International Nickel Company's Works—New Jersey, U.S.A.

Year.	Matte Treated. (a)	Gold.	Silver.	Platinum.	Palladium.	Rhodium.
	Tons.	Ounces.	Ounces.	Ounces.	Ounces.	Ounces
1907	17·840	993·572	63,400·70	226·800	607·300	(b)
1908	18·839	5,238·181	139,329·29	172·316	328·287	(b)
1909	18·407	2,113·669	63,138·66	546·627	1,270·598	(b)
1910	24·309	2,649·799	60,256·83	258·325	522·804	(b)
1911	26·840	2,203·052	70,954·38	665·552	753·363	(b)
1912	27·653	2,476·558	62,169·66	496·850	680·130	(b)
1913	38·733	2,336·405	77,924·03	192·863	207·713	191·067
1914	40·267	2,695·957	75,928·18	748·440	756·360	515·801
1915	31·428	3,444·785	101,793·17	452·430	543·240	57·475
1916	56·405	3,495·123	110,285·21	1,016·581	1,344·915	257·070
1917	.....	1,954·934	92,963·67	970·695	1,354·459	325·407
1918	.....	1,968·703	107,076·78	649·737	786·654	472·579

(a) As published by the Royal Ontario Commission, p. 485, 1917.
(b) Figures not given separately.

Exports and Imports.—The exports from Canada into the United States were in 1918, 197 ounces valued at $20,892 and included: platinum in concentrates, etc., 12 ounces valued at $798, and "old and scrap" 185 ounces valued at $20,094.

The exports in 1917 were 331 ounces valued at $29,599 and included: platinum in concentrates, etc., 136 ounces valued at $11,309, and "old and scrap" 195 ounces valued at $18,290.

The imports of platinum in 1918 were valued at $31,140 and included platinum crucibles valued at $6,136, and wire, bars, strips, etc., valued at $25,004. The imports in 1917 were valued at $114,279, and included crucibles valued at $6,834, wire, bars, strips, etc., valued at $107,409, and retorts, pans, etc., valued at $36.

Exports of Platinum.

Year.	Ounces.	Value.	Year.	Ounces.	Value.
1907	242	$ 4,864	1913	158	$ 7,929
1908	43	937	1914	43	2,161
1909	466	2,118	1915	236	11,052
1910	2,254	62,776	1916	532	41,945
1911	39	1,961	1917	331	29,599
1912	92	3,821	1918	197	20,892

Imports of Platinum.*

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	10,741	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
1917	6,834	107,409	36	114,279
1918	6,136	25,004	.....	31,140

* 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.

Prior to the war the world's supply of platinum was derived almost entirely from the Russian Urals, and when hostilities commenced in the fall of 1914 the Russian production was reduced almost one-third, due principally to the conscription of miners for the Russian army.

This state of affairs was further aggravated by the fact that a very large quantity was required by the munition industries of England, France, and the United States in the manufacture of sulphuric acid, and also for the ignition apparatus of all types of internal combustion engines.

In the spring of 1918 the United States Government made official fixed prices of $105 per ounce of refined platinum and adopted stringent regulations governing its purchase and exportation.

The British Government followed suit in the fall of 1918 with the notification that they were prepared to pay the official American price for Canadian platinum.

In view of the serious shortage in the world's supply of platinum and more especially because of its importance as a war metal, the Imperial Munitions Board, in June 1918, requested the Canadian Munition Resources Commission to undertake an examination of certain platinum occurrences in Alberta and British Columbia, which was done by G. C. Mackenzie of the Mines Branch, and Secretary to the Commission. Dr. W. L. Uglow of the Commission staff and Chas. Camsell of the Geol. Survey Branch collaborated with Mr. Mackenzie in this investigation: a detailed report of which will be published in the summer of 1919.

Platinum investigations in British Columbia were also carried on by different members of the Geological Survey Branch during 1918 and reports of same will be found in the Summary of the Survey of 1918, (Parts B and G).

Average Yearly Prices of Platinum.*

(In Dollars per ounce troy).

	1912.	1913.	1914.	1915.	1916.	1917.	1918.
New York refined platinum	45·55	44·88	45·14	47·13	83·40	102·82	105·95
St. Petersburg, Russia, 83%	37·08	36·54	.....	.....	.....	.....	.....
Ekaterinburg crude metal platinum	37·05	36·25	.....	.....	.....	.....	.....

* From quotation in "Engineering and Mining Journal," January, 1919.

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

Country.	1912.	1913.	1914.	1915.	1916.	1917.	1918.
Borneo and Sumatra	200	200	*	*	*	*	.....
Canada	30	50	30	100	60	80	.....
Columbia	12,000	15,000	17,500	18,000	25,000	32,000	.....
New South Wales	778	1,275	1,248	303	222	*	.....
Russia	300,000	250,000	241,200	124,000	63,900	50,000	.....
United States	721	483	570	742	750	605	.....
	313,729	267,008	260,548	143,145	89,932	82,685	

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

SILVER.

The total production of silver in 1918 amounted to 21,383,979 fine ounces valued at $20,693,704 and included: (a) refined silver, or silver contained in silver and gold bullion, 16,430,421 ounces, or 76·9 per cent; (b) silver contained in blister copper and copper matte, 735,090 ounces or 3·4 per cent; and (c) silver estimated as recoverable from ores exported 4,218,468 ounces, or 19·7 per cent.

The total production in 1917 amounted to 22,221,274 ounces valued at $18,091,895 and included: (a) refined silver, or silver contained in silver and gold bullion, 18,214,066 ounces, or 82·0 per cent; (b) silver contained in blister copper and copper matte 606,164 ounces, or 2·7 per cent; and (c) silver estimated as recoverable from ores exported 3,401,044 ounces, or 15·3 per cent.

The total production in 1916 was 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.

For the last few years, the production had shown a falling off both in quantity and value; while in 1916, the production decreased 4·4 per cent, the value increased 26·3 per cent; in 1917 the production again decreased 12·7 per cent while the value increased 8·2 per cent; and in 1918 there was a still further decrease of 3·7 per cent in quantity, and an increase of 14·4 per cent in value.

No official statistics of the production of silver had been published previous to 1887. Nevertheless, the annual reports of operating companies show that, from 1869 to 1885 about four million ounces of silver with a probable value of $4,800,000 were produced mostly from the mines of the Port Arthur district, western Ontario.

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, 1916, 1917, and 1918, this last year's production being the highest ever recorded.

Annual Production of Silver, 1887 to 1918.

Year.	Ounces.	Value.	Cents per ounce.	Year.	Ounces.	Value.	Cents per ounce.
1887	355,083	$ 347,271	98·00	1904	3,577,526	$ 2,047,095	57·22
1888	437,232	410,998	94·00	1905	6,000,023	3,621,133	60·35
1889	383,318	358,785	93·60	1906	8,473,379	5,659,455	66·79
1890	400,687	419,118	104·60	1907	12,779,799	8,348,659	65·33
1891	414,523	409,549	98·00	1908	22,106,233	11,686,239	52·86
1892	310,651	272,130	86·00	1909	27,529,473	14,178,504	51·50
1893		330,128	77·00	1910	32,869,264	17,580,455	53·49
1894	847,697	534,049	63·00	1911	32,559,044	17,355,272	53·30
1895	1,578,275	1,030,299	65·28	1912	31,955,560	19 440,165	60·83
1896	3,205,343	2,149,503	67·06	1913	31,845,803	19,040,924	59·79
1897	5,558,446	3,323,395	59·79	1914	28,449,821	15,593,631	54·81
1898	4,452,333	2,593,929	58·26	1915	26,625,960	13,228,842	49·68
1899	3,411,644	2,032,658	59·58	1916	25,459,741	16,717,121	65·66
1900	4,468,225	2,740,362	61·33	1917 (a)	22,221,274	18,091,895	81·417
1901	5,539,192	3,265,351	58·95	1918 (b)	21,383,979	20,693,704	96·772
1902	4,291,317	2,238,351	52·16				
1903	3,198,581	1,709,642	53·45	Grand total	272,689,426	227,448,615	68·06

(a) Includes a small production from New Brunswick, Alberta, and Manitoba.
(b) Includes a small production from Manitoba

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 1916 to 84·9 per cent; while in 1917 it increased to 86·7 per cent, to decrease again in 1918 to 80·4 per cent of the total for Canada.

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 and in 1916 it was about 13·3 per cent; but in 1917 it decreased to 11·9 per cent, whereas in 1918 it increased again to 18·3 per cent of the total.

The balance of the production 1·3 per cent in 1918 was derived from Quebec, Manitoba, and the Yukon. These provinces produced 1·2 per cent of the total in 1917 including a very small production from New Brunswick and Alberta.

Production of Silver by Provinces, 1887-1918.

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	23,600	15,287	2,996,204	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	16,279,413	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
1917	19,301,835	15,714,975	136,194	110,885	2,655,994	2,162,430	119,605	97,379
1918	17,198,737	16,643,562	178,675	172,907	3,921,336	3,794,755	71,915	69,594
Total	288,565,887	175,107,247	2,313,080	1,966,604	79,010,681	48,706,492	2,748,816	1,649,160

* Does not include small productions from New Brunswick, Alberta, and Manitoba, in 1917 and 1918.

Prices.—The average price of silver in New York for the year 1918 was 96·772 cents per ounce, as against 81·417 cents in 1917, and 65·661 cents in 1916.

"On April 23, 1918, there was approved an Act of the United States Congress entitled 'An Act to conserve the gold supply of the United States, to permit the settlement in silver of trade balances adverse to the United States, and for the above purpose to stabilize the price and encourage the production of silver.'"

"Since the passage of this Act, there has been no free market for silver in the United States, or in London."[1]

[1] From the "Engineering and Mining Journal," January 11, 1919.

The price was fixed by agreement at $1.01⅛ per ounce in the latter part of April and remained so until the end of the year.

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	1914	54·811	25·313
1909	51·503	23·726	1915	49·684	23·675
1910	53·486	24·670	1916	65·661	31·315
1911	53·304	24·592	1917	81·417	40·851
1912	60·835	28·042	1918	96·772	47·516
1913	59·791	27·576			

(a) 925 parts fine.

Average Monthly Prices of Silver.

Months.	New York.—Cents per fine ounce.							London, Pence per Standard ounce. (a)
	1912.	1913.	1914.	1915.	1916.	1917.	1918.	1918.
January	56·260	62·938	57·572	48·855	56·775	75·630	88·702	44·356
February	59·043	61·642	57·506	48·477	56·755	77·585	85·716	42·792
March	58·375	57·870	58·067	50·241	57·935	73·861	88·082	43·620
April	59·207	59·490	58·519	50·250	64·415	73·875	95·346	47·215
May	60·880	60·361	58·175	49·915	74·269	74·745	99·505	48·980
June	61·290	58·990	56·471	49·034	65·024	76·971	99·500	48·875
July	60·654	58·721	54·678	47·519	62·940	79·010	99·625	48·813
August	61·606	59·293	54·344	47·163	66·083	85·407	100·292	49·077
September	63·078	60·646	53·290	48·680	68·515	100·740	101·125	49·500
October	63·471	60·793	50·654	49·385	67·855	87·332	101·125	49·500
November	62·792	58·995	49·082	51·714	71·604	85·891	101·125	48·969
December	63·365	57·760	49·375	54·971	75·765	85·960	101·125	48·492
Average for the year	60·835	59·791	54·811	49·684	65·661	81·417	96·772	47·516

(a) 925 parts fine. From "Engineering and Mining Journal," January 11, 1919.

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 and in recent years from the copper-gold-silver 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 ounces; in 1917, 6,450,075 ounces, and in 1918, 4,992,469 fine ounces.

The bullion shipped from the mines and mills in the Cobalt district in 1918 is reported as 9,412,545 fine ounces, as against 9,921,465 ounces in 1917, 8,551,070 ounces in 1916, 9,204,893 ounces in 1915, and 10,335,527 ounces in 1914.

Shipments from the Cobalt district to United States smelters in 1918 amounted to 7,339 tons of ore and concentrates with a silver content of 2,861,283 ounces, as against 7,347 tons containing 2,986,100 ounces in 1917; 7,180 tons containing 3,409,258 ounces in 1916; and 7,310 tons containing 3,769,308 ounces in 1915.

There was also, for the first time, in 1918, a small production of refined silver at the new refinery of the International Nickel Company of Canada, at Port Colborne, Ontario.

Exports and Imports.—The exports of silver in 1918 were 19,357,076 fine ounces valued at $18,382,902 and included: silver contained in ores, concentrates, etc., 4,225,007 ounces valued at $3,735,830; and silver in bullion 15,132,069 ounces valued at $14,647,072. The exports of silver as bullion and contained in ores, etc., in 1917 were 21,718,784 ounces valued at $17,621,398. The exports have not been published separately previous to April 1917.

The imports of silver bullion into Canada in 1918 were valued at $368,889, as against $959,153 in 1917, and $875,157 in 1916. Silver is also imported as "manufactures of silver" and mention is made in the chapter on "gold."

Exports of Silver in Ore, Concentrate, Bullion, etc.

Calendar Year.	Value.	Calendar Year.	Value.	Calendar Year.	Value.	Calendar Year.	Value.
1886	$ 25,957	1894	$ 359,731	1902	$ 1,820,058	1910	$ 15,649,537
1887	206,284	1895	994,354	1903	1,989,474	1911	15,807,366
1888	219,008	1896	2,271,959	1904	1,904,394	1912	19,494,416
1889	212,163	1897	3,576,391	1905	2,777,218	1913	21,441,220
1890	204,142	1898	2,902,277	1906	5,686,444	1914	15,584,813
1891	225,312	1899	1,623,905	1907	9,941,849	1915	13,812,038
1892	56,688	1900	2,341,872	1908	12,403,482	1916	15,637,885
1893	213,695	1901	2,026,727	1909	15,719,909	1917	17,621,398
						1918	18,382,902

Imports of Silver Bullion.*

Calendar Year.	Value.	Calendar Year.	Value.
1910	$ 975,045	1915	$ 337,254
1911	847,645	1916	875,157
1912	1,100,344	1917	959,153
1913	840,245	1918	368,889
1914	629,279		

* Silver imports are given more fully in the chapter on "Gold."

Quebec.

The small quantity of silver credited to Quebec province for a number of years represents a small silver recovery from 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 1918 was 178,675 fine ounces, valued at $172,907, as against 136,194 ounces, valued at $110,885 in 1917 and 98,610 ounces valued at $64,748 in 1916.

Ontario.

The production of silver in Ontario in 1918 was 17,198,737 fine ounces valued at $16,643,562, as against 19,301,835 ounces valued at $15,714,975 in 1917, a decrease of 10·8 per cent in quantity, but an increase of 5·9 per cent in value.

In 1917 there had been a decrease of 10·8 per cent in quantity and an increase of 10·7 in value; whereas in 1917 there had been also a decrease of 5·0 per cent in quantity, and an increase of 15·5 per cent in value.

The production of 1918 included in addition to the output of the Cobalt camp and adjacent silver camps 72,013 ounces contained in gold bullion, as against 74,358 ounces in 1917.

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 1918, 9,412,545 ounces, or 55 per cent of the output was thus recovered as bullion in the district, while 4,992,467 ounces, or 29 per cent of the total, was recovered by the silver smelters in the Province, so that over 14 million, or 84 per cent of the Ontario production was recovered in the form of bullion within the Province, leaving a balance of 16 per cent treated in the United States.

In 1917 about 51 per cent was recovered as bullion in the district and about 34·0 per cent by the silver smelters, giving a total of 85 per cent as recovered in the form of bullion within the Province.

The following table shows the percentage production by the camp, by the southern Ontario smelters and from ores exported to the United States:—

Percentage Proportion of Production.

—	1914.	1915.	1916.	1917.	1918.
	%	%	%	%	%
Cobalt district	41·0	41·0	39·5	51·1	55·0
Ontario smelters	36·0	43·0	44·7	33·9	29·0
Total for Ontario	77·0	84·0	84·2	85·0	84·0
U.S. smelters	23·0	16·0	15·8	15·0	16·0
Total	100·0	100·0	100·0	100·0	100·0

Manitoba.

The silver production in Manitoba is derived from the gold and copper ores of the new Pas district, and amounted in 1918 to 13,316 fine ounces valued at $12,886, as against 7,201 ounces valued at $5,863 in 1917.

British Columbia.

The silver production in British Columbia based on smelter recoveries amounted in 1918 to 3,921,336 fine ounces, valued at $3,794,755, as against 2,655,994 ounces, valued at $2,162,430, in 1917, an increase of 48 per cent in quantity and 75 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.

Production of Silver in British Columbia by Districts, 1913-18.*

(Silver contents of ore shipped, in fine ounces)

—	1913.	1914.	1915.	1916.	1917.	1918.
Cariboo—						
Omineca division	46,298	135,265	79,155	112,635	82,311	84,125
Cassiar—						
Atlin	.....	.....	.....	3,054	.....	1,115
Skeena, etc	4,714	131,509	175,179	256,802	343,805	416,616
Kootenay, East—						
Fort Steele division	362,311	492,080	481,258	509,693	180,168	261,497
Other divisions	4,756	.....	1,188	29,178	79,685	91,784
Kootenay, West—						
Ainsworth division	477,015	329,586	299,565	321,202	224,461	228,699
Slocan division	1,841,226	1,775,975	1,812,550	1,480,571	1,547,576	1,873,236
Nelson division	129,011	150,263	9,405	32,547	46,229	136,738
Trail Creek division	109,585	136,185	159,584	132,080	47,112	47,203
Revelstoke, Trout Lake, and Lardeau	23,397	11,295	16,740	22,419	37,733	11,761
Yale—						
Boundary	394,048	347,981	273,795	280,578	220,213	227,113
Similkameen Nicola	335	15	347	830	3,470	131
Yale, Ashcroft, and Kamloops	126	57	1,702	4,215	3,525	1,317
Lillooet	295	390	5	.....	276	412
Southern Coast—						
Vancouver Island	103,034	91,574	15,727	17,954	25,727	23,040
Mainland	.....	.....	50,306	98,165	86,925	93,385
Total	3,465,856	3,602,180	3,366,506	3,301,923	2,929,216	3,498,172

* From the Minister of Mines Reports, British Columbia.

Yukon.

The silver production of the Yukon Territory in 1918 amounted to 71,915 fine ounces, valued at $69,594, as against 119,605 ounces, valued at $97,379, in 1917.

The comparatively large increase in the production for the three years 1915, 1916, and 1917 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, and to the activity in the copper mines in the Whitehorse district and the gold mines of the Conrad district.

In 1918 lode mining produced 68·2 per cent of the total, leaving 31·8 per cent as the production from alluvial workings, as against 66·8 per cent from lode mining and 33·2 per cent from alluvial workings in 1917, and 87 per cent from lode mining and 13 per cent from alluvial mining in 1916.

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 Reports of the Geological Survey Branch of the Department of Mines for 1907, 1908, 1910, 1911, and 1912.

Cassiterite occurs in a few scattered crystals in pegmatite dikes in the drainage basin of McDougall creek, Lardeau division, B.C., and it has been found also in black sands in the Atlin district, B.C., and in the alluvial sands of Dublin Gulch, Mayo district, Yukon territory.

The imports of tin in 1918 were valued at $4,204,532, and included tin in blocks, pigs and bars, 3,474,340 pounds, valued at $2,492,257; tin foil and bichloride of tin, valued at $135,167; and tinware and crystals valued at $1,577,108.

The imports of tin in 1917 were valued at $5,656,665, and included tin in blocks, pigs and bars, 3,685,200 pounds, valued at $1,786,212; tin foil, bichloride of tin and strip waste, valued at $267,249; and tinware and crystals valued at $3,603,204.

There is also a large annual import of tin plates and sheets, the quantity in 1918 being 145,687,800 pounds, valued at $11,403,887, as against 133,351,700 pounds, valued at $9,985,631, in 1917, and 115,084,900 pounds, valued at $5,221,163, in 1916.

Annual Imports of Tin.

Calendar Year.	Tin in blocks, pigs and bars.		Tin foil.	
	Pounds.	Value.	Pounds.	Value.
1910	3,231,100	$1,058,778	866,751	$114,602
1911	4,047,500	1,623,670	1,531,877	176,602
1912	4,894,700	2,134,221	1,316,882	183,707
1913	5,085,700	2,252,324	1,074,131	188,779
1914	3,382,700	1,191,466	1,244,628	173,088
1915	2,912,600	1,009,597	1,002,413	151,599
1916	3,457,500	1,372,200	1,507,318	314,970
1917	3,685,200	1,786,212	938,217	266,725
1918	3,474,500	2,492,257	533,648	135,049

Calendar Year.	(a) Tinware, etc.	Tin crystals.	Bichloride of tin.		Strip waste.	
	Value.	Value.	Pounds.	Value.	Pounds.	Value.
1910	$ 389,040	$ 3,903	31,219	$3,846	.....	.....
1911	461,029	4,370	25,797	3,876	.....	.....
1912	540,599	6,308	36,045	5,595	.....	.....
1913	667,158	8,077	19,114	2,422	.....	.....
1914	650,987	7,759	200	29	.....	.....
1915	463,610	9,852	.....	.....	5,335	$138
1916	1,301,008	10,474	81	48	37,021	975
1917	3,588,891	14,313	12	6	16,620	518
1918	1,568,807	8,301	125	118	.....	.....

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

TUNGSTEN.

The only important production of tungsten ore in Canada reported previous to 1918 is that of 1912, being 14 tons of concentrates produced by the Scheelite Mines, Ltd., of Moose River, N.S.

In 1917 a small test shipment of a few hundred pounds was made from Halifax county, N.S., and another from Dublin Gulch, Mayo district, Y.T., amounting in all to 580 pounds running 69·41 per cent WO_3 and netting $234.

The production in 1918 amounted to 13½ tons valued at $11,700 and with a metallic content of 19,915 pounds of WO_3. This production consisted of 11 tons of concentrates shipped to New York by the Acadia Tungsten Mines, Ltd., operating at Burnt Hill, N.B.; with also a few small consignments to the Mines Branch Testing Plant, Ottawa, from Nova Scotia, Manitoba, and the Mayo district, Yukon.

Scheelite was discovered in Halifax county, N.S., in 1908, and reported on by E. R. Faribault in the Summary Report of the Geological Survey for 1908 and 1909. A concentrating mill was erected in 1912 by the Scheelite Mines, Ltd., operating the Moose River property in Nova Scotia.

The occurrence of wolframite was also noted by Dr. T. L. Walker in 1909 in association with molybdenite near the confluence of Burnt Hill brook and the Miramichi river, N.B. This property is now operated by the Acadia Tungsten Mines Company, which erected a concentrating mill during 1916.

The tungsten ore deposits of Canada were reported on by Dr. Walker in 1909[1], and the deposits in New Brunswick and Nova Scotia by Charles Camsell and Dr. D. D. Cairns in the Summary Report of the Geological Survey for 1916. The Burnt Hill mines of New Brunswick were also inspected in 1917 by J. C. Gwillim, acting for the Munition Resources Commission, Ottawa; who reported some tonnage of wolframite ore, but stated that the operators could not afford to produce concentrates at the official British price of 55 shillings per unit.

Scheelite was discovered near Falcon lake, eastern Manitoba, in March, 1918, and operations were carried on in the district during the year by a new company, the War Metals Production Co., Ltd., which contemplates the erection of a mill in the near future.

A description of this district was written by J. S. DeLury, professor at the University of Manitoba.[2]

In British Columbia the Cariboo Chisholm Creek Mining Co., Ltd., Van Winkle, B.C., has been operating the old deposit on Hardscrabble Creek in the Cariboo district.

The occurrence of scheelite sands in the alluvial deposits of Dublin Gulch, Mayo district, Yukon, received a special mention by Dr. Cairns in the Summary Report of the Geological Survey for 1916.

Uses.[3] "The metal tungsten is of primary importance because of certain valuable qualities it imparts to steel when alloyed with it. Its principal use at the present time

[1] Report on the Tungsten Ores of Canada. By Dr. T. L. Walker, Mines Branch No. 25, 1909 (Publication out of print).

[2] "Tungsten ore deposits near Falcon Lake, Manitoba," by J. S. DeLury, Can. Min. Journal, June, 1918—p. 186.

[3] Report of the Canadian Munition Commission, Ottawa, 1918—p. 21.

is in the manufacture of high-speed tool steels so essential for the rapid production of all forms of projectiles, ordnance, and similar munitions.

"Tungsten has so far, distanced its rival molybdenum in this particular field because supplies of its crude ores were more readily obtainable; but the known tungsten resources of the world are limited, and molybdenum production has increased several hundred per cent during the past few years, so that the relative importance of the two metals may eventually be reversed.

"Tungsten enters into the manufacture of armour plate, armour-piercing projectiles, gun liners, and aeroplane engines. It is also used in filaments for electric light bulbs. Alloyed with aluminium it is employed in automobile construction, and with aluminium and copper in propeller blades. It is an important constituent of a new steel alloy called 'Stellite.' With molybdenum it forms an alloy in dentistry as a substitute for platinum."

Prices. The price of scheelite on the New York market was around $26 per unit during January and February. It then dropped very slightly to $24 for May and June, to again increase to $26 in October. With the signing of the armistice business came to a complete stop and there were no quotations for November and December. Efforts were being made by all parties concerned to get the American Government to assist to allow the war situation in the tungsten market to be liquidated in an orderly rather than a panicky fashion.

ZINC.

The zinc production in 1918 which includes the actual recoveries of refined zinc at Trail, B.C., in addition to the estimated recoveries from ores and concentrates shipped to American smelters, amounted to 35,083,175 pounds (17,541·6 tons), which at the average price of zinc for the year—8·159 cents per pound—would be worth $2,862,436. Of the total production thus recorded 2,802,928 pounds are credited to the Notre-Dame-des-Anges ores in Quebec, and the balance—32,280,247 pounds—is credited to British Columbia.

In 1917 the zinc production calculated on the same basis as for 1918 amounted to 29,668,764 pounds (14,834·4 tons), which at the average price for the year of 8·901 cents per pound, was valued at $2,640,817. Of this total 1,786,740 pounds were from Quebec, and the balance, with the exception of a few thousand pounds from Alberta, was credited to British Columbia and amounted to 27,861,441 pounds.

Annual Production of Zinc, 1911-18.

Calendar Year.	*Quantity.	Value.	Average price per pound.
	Pou	$	Cents.
1911	1,877,479	108,105	5·758
1912	4,283,760	297,421	6·943
1913	5,640,195	318,558	5·648
1914	7,246,063	377,737	5·213
1915	9,771,651	1,292,789	13·230
1916	23,364,760	2,991,623	12·804
1917	29.668,764	2,640,817	8·901
1918	35,083,175	2,862,436	8·159

Estimated smelter recoveries, including for 1916, 1917, and 1918, the actual zinc recovered at Trail, B.C.

The total shipments of zinc ores and concentrates from the mines in 1918, including the zinc-lead ores from the Sullivan mine, East Kootenay, B.C., and ores exported to the United States, amounted to about 121,200 tons valued by the operators at $1,228,195 and containing 63,026,464 pounds of zinc.

In 1917 the shipments of ores and concentrates were 116,489 tons, valued by the operators at $1,323,985, and containing 64,655,713 pounds of zinc.

The ores shipped contain also a varying silver content for which payment is made by the smelter 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.

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	7,889	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
1917	116,489	1,323,985	64,655,713
1918	121,200	1,228,195	63,026,464

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

Refining.—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 now be in order to record the production accordingly.

The production of refined zinc at Trail in 1918 was 12,574 tons as against 9,985 tons in 1917 and 2,974 tons in 1916, or a total of 25,533 tons since operations were first started.

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.[1]

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.[2]

A report on the zinc-lead deposits of Notre-Dame-des-Anges, was made by J. A. Bancroft and published in the Annual Report of the Bureau of Mines, Quebec, for 1915.[3]

The Provincial Bureau of Mines of Ontario, also published in 1916 a report on the lead and zinc deposits of Ontario and Eastern Canada.[4]

[1] Mines Branch No. 12. Report of the Commission on the Investigation of the Zinc Resources of British Columbia, 1905. (Out of print.)
[2] Mines Branch No. 428. Report on the Production of Spelter in Canada, 1916, Dr. A. W. G. Wilson.
[3] Geology of Part of the Township of Montauban and Chavigny, and of the Seigneurie de Grondines, by J. A. Bancroft, Annual Report of the Province of Quebec for 1915.
[4] Lead and Zinc Deposits of Ontario and Eastern Canada, by W. L. Uglow, Annual Report of the Ontario Bureau of Mines for 1915. Vol. XXV, Part II.

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

Zinc ores containing 25 per cent or more zinc: 10 per cent on zinc contained therein. Lead bearing ore: ¾ cent per pound on lead contained therein.

There is also a duty of 15 per cent on metallic zinc exported to the United States, and at present an import of 7½ per cent on zinc and other materials imported into Canada from the United States.

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 concentrates shipped, the lead duty applies. The result of the decreased duties has been a considerable increase in zinc shipments.

Prices.—For the first quarter of 1917 the price of spelter remained around 10 cents but the effects of the over production were eventually felt and the price gradually declined closing the year at 7⅝ cents per pound.

In 1918 the price of spelter did not fluctuate very much, varying from 7 cents per pound to a maximum of about 9½ cents in September. At the close of the year it was slightly over 8 cents per pound.

Average Price of Spelter at New York.*

(In cents per pound.)

Month.	1911.	1912.	1913.	1914.	1915.	1916.	1917.	1918.
January	5·452	6·442	6·931	5·262	6·386	16·915	9·619	7·836
February	5·518	6·499	6·239	5·377	8·436	18·420	10·045	7·814
March	5·563	6·626	6·078	5·250	8·541	16·846	10·300	7·461
April	5·399	6·633	5·641	5·113	10·012	16·695	9·459	6·890
May	5·348	6·679	5·406	5·074	14·781	14·276	9·362	7·314
June	5·520	6·877	5·124	5·000	21·208	11·752	9·371	8·021
July	5·695	7·116	5·278	4·920	19·026	8·925	8·643	8·688
August	5·953	7·028	5·658	5·568	12·781	8·730	8·360	8·985
September	5·869	7·454	5·694	5·380	13·440	8·990	8·136	9·442
October	6·102	7·426	5·340	4·909	12·800	9·829	7·983	8·801
November	6·380	7·371	5·229	5·112	15·962	11·592	7·847	8·491
December	6·301	7·162	5·154	5·592	15·391	10·669	7·685	8·163
Year	5·758	6·943	5·648	5·213	13·230	12·804	8·901	8·159

* From the Engineering and Mining Journal, N.Y., Jan. 11, 1919.

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

(In pounds sterling per long ton.)

Month.	1911.			1912.			1913.			1914.			1915.			1916.			1917.			1918.		
January	23	16	7	26	9	11	25	19	1	21	6	6	30	16	1	83	12	5	48	8	3	52	0	0
February	23	3	10	26	6	5	25	4	3	21	7	6	39	16	4	93	10	11	54	4	6	52	0	0
March	22	19	2	25	19	11	24	11	4	21	7	7	44	2	7	90	1	9	54	10	4	52	0	0
April	23	13	8	25	8	11	25	2	4	21	10	2	49	17	9	94	1	8	52	18	11	52	0	0
May	24	6	1	25	11	2	24	10	4	21	5	9	67	19	0	89	11	4	52	0	0	52	0	0
June	24	9	7	25	11	11	21	19	10	21	6	0	100	12	3	63	16	4	52	0	0	52	0	0
July	24	13	10	25	13	1	20	11	2	21	6	7	97	5	0	48	7	6	52	0	0	52	0	0
August	26	11	2	26	1	2	20	14	0	29	0	9	67	15	9	47	19	7	52	0	0	52	0	0
September	27	12	7	26	17	0	21	3	10	25	14	0	67	17	9	48	15	8	52	0	0	52	0	0
October	27	4	10	27	5	10	20	13	9	23	13	6	66	10	11	52	4	4	52	0	0	52	0	0
November	26	13	2	26	14	3	20	14	4	24	14	10	85	6	4	55	0	5	52	0	0	52	7	7
December	26	13	7	26	0	4	21	6	8	27	6	10	82	4	1	54	5	9	52	0	0	54	0	0
Year	25	3	2	26	3	3	22	14	3	23	6	8	66	13	8	68	8	11	52	3	6	52	3	11

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

Exports and Imports.—The exports of zinc ores in 1918 were 10,545 tons valued at $476,791 an average of a little over $45 per ton. In 1917 the exports, which are given separately for 9 months only, were 5,972 tons, valued at $320,296.

The imports of zinc in 1918 amounted to 31,309,236 pounds, valued at $2,718,850 with also manufacturers of zinc valued at $85,177.

The imports of brass, which alloy contains about 30 per cent zinc, were valued at $993,574, and manufactures of brass were valued at $3,654,298.

The imports in 1917 were 37,132,445 pounds of zinc, valued at $3,562,228, with also manufactures of zinc valued at $79,044. The imports of brass were valued at $1,277,249, and the manufactures of brass at $4,051,410.

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

Summary of Imports of Zinc and Zinc Products, 1916-1918.

Zinc and Zinc Products.	1916.			1917.			1918.		
	Product in Pounds.	Value of Product.	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	1,624,600	$ 267,750	1,624,600	2,975,700	$ 450,161	2,975,700	3,536,000	$ 447,090	3,536,000
" as spelter	13,214,800	1,873,605	13,214,800	17,139,600	1,686,568	17,139,600	10,376,700	801,477	10,376,700
" seamless tubing									
" white (80% Zn.)	14,171,673	1,314,629	11,327,338	16,039,236	1,301,405	12,831,389	16,693,590	1,396,392	13,355,059
" dust (90% Zn.)	691,704	162,186	622,534	547,158	91,699	492,442	306,195	42,989	275,575
" sulphate and chloride of (44% Zn.)	297,061	24,306	130,707	430,751	32,395	189,530	396,517	30,902	174,467
Total	29,999,838	3,642,476	26,919,979 (13,460 tons)	37,132,445	3,562,228	33,628,661 (16,814·3 tons)	31,309,236	2,718,850	27,717,614 (13,858·8 tons)
" manufacture of		48,101			79,044			85,177	
Brass, in blocks, pigs and ingots (30% Zn.)	736,000	163,540	220,800	1,191,300	307,740	357,390	2,025,200	441,574	607,560
" old and scrap (30% Zn.)	848,800	183,611	254,640	1,192,700	279,032	357,810	1,102,500	198,383	330,750
" tubing (30% Zn.)	993,119	411,539	297,936	1,053,010	431,277	315,903	512,454	198,819	153,736
" plain wire "	396,757	164,833	119,027	525,947	259,200	157,784	348,482	154,798	104,545
" bars and rods (free) (30% Zn.)									
Total	2,974,676	923,523	892,403 (446·2 tons)	3,962,957	1,277,249	1,188,887 (594·4 tons)	3,988,637	993,574	1,196,591 (598·29 tons)
Brass, bars and rods		362,318			493,859			192,533	
" strips, sheets or plates		242,101			354,908			192,287	
" wire cloth n.o.p.		266,202			454,163			485,798	
" cup for manuf. of shells		1,059,678			442,599			776,185	
" caps for electric batteries		6,985			13,265			6,409	
" hand-pumps		22,795			41,325			37,371	
" nails, tacks, etc		13,796			11,023			949	
" other manufactures, n.o.p.		1,778,976			2,240,268			1,962,766	
Total		3,752,851			4,051,410			3,654,298	

Imports of Zinc in Blocks, Pigs, etc.

Calendar Year.	In blocks, pigs and sheets.		As spelter.		As manufactures of zinc.	Seamless tubing.	
	Cwt.	Value.	Cwt.	Value.	Value.	Pounds.	Value.
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	.....	.....
1917	29,757	450,161	171,396	1,686,568	79,044	.....	.....
1918	35,360	447,090	103,767	801,477	85,177	.....	.....

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	379,515	16,090
1916	14,171,673	1,314,629	691,704	162,186	297,061	24,306
1917	16,039,236	1,300,621	547,158	91,699	430,751	32,395
1918	16,693,824	1,396,392	306,195	42,989	396,517	30,902

Consumption.—The table of imports shows that in 1918, 13,858·8 tons of zinc were imported as zinc and zinc products, with also 598·3 tons of zinc in brass and approximately 1,000 tons as zinc contents of manufactures of zinc and brass, or a total of 15,457 tons, which added to the 12,574 tons of zinc refined in Canada, the output of the Trail refinery, would give a total consumption of 28,031 tons, as against 28,483 tons in 1917; 18,000 tons in 1916, and 14,000 tons in 1915.

It is probable, however, in the case of zinc, as well as that for steel, copper, and lead, that there have been other imports besides those recorded under the usual classification, and that the actual consumption during the last few years was greater than the above estimates. Information from other sources would bring the consumption to about 41,000 tons for 1917.

There are now in Canada three companies operating electrolytic plants, viz: the Electro Zinc Company, formerly at Welland, Ont., and now at Shawinigan Falls, Que., the French Complex Ore Reduction Company, at Nelson, B.C., and the Consolidated Mining and Smelting Co., of Canada, Ltd., at Trail, B.C.

The plant of the Electro Zinc Company, which uses the Watt's process, was designed to recover refined zinc from the ores of Notre-Dames-des-Anges, Quebec.

The French Complex Ore Reduction Co., which uses the French process, 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, but was unable to do so, owing to financial difficulties. Early in 1918, the Pro-

vincial Government guaranteed bonds to the extent of another $25,000 to permit the company to resume operations.

Much delay occurred in making the second issue available, and then the Government deducted over $6,000 to pay interest on the $40,000 bonds. Mr. Thos. Franch, manager of the company, has asked the Government to rescind its action for deducting the $6,131 from the $25,000 issue and he still hopes to be able to demonstrate his process in 1919.

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. Early in 1917 it was reported to be producing 45 tons per day and its capacity is now rated at 70 tons.

The process used at Trail has been described by Mr. S. G. Blaylock, assistant general manager, in his address before the Revelstoke International Mining Corporation.

> "Some of the main points of the process, as carried out, are the continuous counter-current leaching; the neutralization by addition of an excess of calcined ore, in other words, a double leach; the drastic purification of the solutions; the lifts for handling solids and solutions; the proper control of the electrolytic tanks to prevent the breaking up of the electrolyte and the formation of hydrogen; and, also the development of efficient melting furnaces."

> "Much work has been done on the residue and we feel that we will soon be in a position to treat these successfully, the trouble to date being to get the zinc in these tails sufficiently low to allow of their profitable treatment for lead and silver."

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. This Act was cited as "The Zinc Bounties Act, 1916."

A new Act was passed by the House of Commons of Canada, May 24, 1918, 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, 1918.

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, blocks or pigs, in London, England, or St. Louis, United States, as the Minister of Trade and Commerce may determine, is less than nine cents per pound, 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 centum 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 pound and nine cents per pound, 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 or spelter by the producer is nine cents or more per pound.

3. No bounty shall be payable under this Act on zinc or spelter produced after the thirty-first day of July, one thousand nine hundred and twenty.

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, 1913-1918.*

(Contents of ore shipped in pounds.)

—	1913.	1914.	1915.	1916.	1917.	1918.
Kootenay, East—						
Fort Steele division	.....	.....	180,000	14,840,000	20,715,090	26,704,806
Windermere—Golden	.....	.....	311,719	210,000	18,000	.....
Kootenay, West—						
Ainsworth	150,680	280,000	678,940	625,971	918,601	640,991
Nelson	.....	332,003	3,127,209	3,470,036	982,309	14,107,682
Slocan	6,608,088	7,254,464	8,684,572	17,854,357	18,789,573	6,325
Revelstoke, etc	.....	.....	.....	.....	33,279	.....
Boundary-Yale—						
Kamloops, etc	.....	.....	.....	.....	27,564	.....
Cariboo—						
Omineca	.....	.....	.....	168,616	364,097	313,112
	6,758,768	7,866,467	12,982,440	37,168,980	41,848,513	41,772,916

* From the Minister of Mines Report, British Columbia.

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

Country.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.
Australia	.....	560	1,904	2,531	4,105	5,616	(c) 7,500	.....	.....
Austria and Italy	13,931	14,666	18,602	21,609	23,928	.....	.....	.....	.....
Belgium	184,194	190,233	215,050	220,678	217,928	.....	.....	.....	.....
France and Spain	61,859	65,191	79,791	79,543	78,289	(a) 12,944	(a) 8,497	.....	.....
Germany	242,594	251,046	276,008	298,794	312,075	.....	.....	.....	.....
Great Britain	65,422	69,531	73,803	63,086	65,197	.....	.....	.....	.....
Holland	21,548	23,121	25,059	26,380	26,811	18,098	12,243	.....	.....
Japan	.....	.....	.....	.....	.....	6,554	23,421	.....	.....
Poland	8,758	9,514	10,952	9,659	8,389	(c) 7,000	.....	.....	.....
United States	255,760	269,184	286,526	338,806	346,676	353,049	489,519	.....	.....
Norway	.....	.....	7,363	8,959	10,237	(b) 10,028	(b) 17,349	.....	.....
Total	854,066	893,046	986,058	1,070,045	1,093,635	.....	.....	.....	.....

* Mineral Resources of the United States. (a) Spain only. (b) For Sweden. (c) Estimated.

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

Country.	1909.	1910.	1911.	1912.	1913.	1914.	1915.	1916.	1917.
Austria-Hungary	36,155	37,258	47,950	51,588	44,533	.....	.....	.....	.....
Belgium	71,209	84,326	81,240	85,098	84,216	.....	.....	.....	.....
France	73,744	62,059	90,389	90,389	89,286	.....	.....	.....	.....
Germany	207,343	203,374	241,734	248,899	255,734	.....	.....	.....	.....
Great Britain	171,408	195,989	193,674	204,146	214,508	.....	.....	.....	.....
Holland	4,409	4,409	4,409	4,409	4,409	.....	.....	.....	.....
Italy	9,039	8,929	11,133	11,795	12,015	.....	.....	.....	.....
Russia	20,282	27,447	31,856	30,754	36,707	.....	.....	.....	.....
Spain	4,960	4,630	5,291	5,181	6,503	.....	.....	.....	.....
United States	270,730	245,884	280,059	340,372	295,370	.....	.....	.....	.....
Other countries	9,921	13,669	19,621	21,715	23,038	.....	.....	.....	.....
Total	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, 70 tons of refined zinc per day.
Electro Zinc Company, Ltd	Shawinigan Falls, Que.	Experimental. Small plant for recovery of zinc from zinc oxide.
French Complex 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 10 tons	Operated in 1915. 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, Mis.		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 & Mg. 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 Hyman & 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.