

CANADA

DEPARTMENT OF MINES

HON. SIR JAMES A. LOUGHEED, MINISTER; CHARLES CAMSELL, ACTING 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

1919
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OTTAWA
THOMAS MULVEY
PRINTER TO THE KING'S MOST EXCELLENT MAJESTY
1920

LETTER OF TRANSMITTAL

DIVISION OF MINERAL RESOURCES AND STATISTICS,

OTTAWA, November 30, 1920.

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 1919," has been compiled by Arthur Buisson, B.Sc., Mining Engineer in this Division.

This report will not be included in the "Annual Report on Mineral Production of Canada during the Calendar Year 1919." A brief synopsis of the statistical data will, however, form part of the Annual Report.

Your obedient servant,

(Signed) John McLeish.

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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 the United States 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, 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, 1919, the imports of alumina were 58,603,100 pounds, or 29,302 tons, valued at \$1,565,264, as against 186,442,200 pounds, or 93,221 tons, valued at \$2,071,060, in 1918.

The imports of aluminium in ingots, bars, tubes, etc., were in 1919, 758,973 pounds, or 379.5 tons, valued at \$247,565, besides manufactures of aluminium valued at \$347,129, or a total value of \$594,694, compared with 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, in 1918.

The exports of aluminium in ingots, bars, tubes, etc., in 1919, amounted to 14,576,300 pounds, or 7,288 tons, valued at \$4,455,031, together with manufactures of aluminium valued at \$59,339, as against 21,616,500 pounds, or 10,808 tons, valued at \$7,223,570, and manufactures valued at \$197,670 in 1918.

Imports of "Alumina"

Calendar Year	Imports of Alumina		Calendar Year	Imports of Alumina	
	Pounds	Value		Pounds	Value
1905.....	5,360,800	\$ 138,765	1913.....	30,704,200	\$ 614,713
1906.....	8,975,400	239,136	1914.....	28,557,000	571,419
1907.....	12,705,300	268,502	1915.....	35,016,200	892,634
1908.....	1,485,500	29,752	1916.....	53,819,000	1,114,061
1909.....	11,794,100	234,544	1917.....	174,307,800	1,866,240
1910.....	19,464,400	403,283	1918.....	186,442,200	2,071,060
1911.....	18,607,200	372,009	1919.....	58,603,100	1,565,264
1912.....	22,400,500	448,061			

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	19,856	9,174	131,938		745,694
1914.....	3,790,353	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
1919.....	749,455	237,475	19,518	10,090	252,065	95,064	594,694

(a) Not given separately, previous to 1914.

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.....	4,521,486	899,113	2,244	1913.....	13,015,000	1,762,214	8,203
1907.....	5,473,203	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
				1919.....	14,576,300	4,455,031	59,339

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 restrictions on the price of aluminium were raised in February, 1919, but there was very little fluctuation throughout the year, the average being 32.14 cents per pound.

Average Monthly Prices of Ingot Aluminium¹

(At New York in cents per pound)

	1913	1914	1915	1916	1917	1918	1919
January.....	26.31	18.81	19.08	55.00	60.77	37.5	33.00
February.....	26.04	18.81	19.22	58.00	59.00	37.0	32.26
March.....	27.05	18.50	19.00	60.25	59.00	32.0	29.81
April.....	27.03	18.16	18.88	59.50	59.92	32.0	30.67
May.....	26.44	17.95	22.03	59.00	59.84	32.0	32.22
June.....	24.68	17.75	30.00	61.50	60.00	33.0	32.83
July.....	23.38	17.66	32.38	60.20	55.48	33.0	32.57
August.....	22.70	19.88	34.50	60.00	48.88	33.0	32.23
September.....	21.69	19.94	47.75	61.88	43.64	33.0	32.50
October.....	20.13	18.50	50.00	65.05	38.90	33.0	32.50
November.....	19.35	18.00	57.75	65.12	37.22	33.0	32.50
December.....	18.88	18.96	57.13	63.00	36.40	33.0	32.48
	23.64	18.63	33.98	60.71	51.59	33.46	32.14

¹From the "Engineering and Mining Journal," 1913 to 1918 inclusive; and from the "Metals Statistics" or 1919.

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, N.B., of the North America Antimony Smelting Company, the latter property having been formerly operated by the Canadian Antimony Company.

In 1918 and 1919 no shipment of antimony either as ore, concentrate, or regulus was reported although a small export of ore is shown in customs records.

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, 1918, and 1919.

The exports of antimony ore in 1919 amounted to 56 tons, valued at \$8,420, as against 26 tons, valued at \$1,430, in 1918.

The imports of antimony and antimony salts were in 1919, 1,041,850 pounds, valued at \$89,805, as against 683,803 pounds, valued at \$111,664, in 1918.

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.....				
1919.....				

(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	\$ 19,033	534,104	\$ 88,530
1908.....	148	5,443	396,004	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	383,952	25,296	94,330	9,152	483,282	34,448
1911.....	57	4,946	561,046	36,405	18,420	2,418	579,466	33,323
1912.....			993,045	60,456	55,633	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	203,450	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
1919.....	56	8,420	1,022,787	81,257	19,063	8,548	1,041,850	89,805

Prices.—The price of antimony in 1918 remained quite steady for the first ten months of 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 of antimony was available early in 1919, and the price generally dropped to a minimum of 6½ cents per pound in April, but few sales were made during the first quarter of the year. Towards the end of April there was a remarkable improvement in the resumption of buying and the price gradually rose to 9 cents in July, remaining fairly steady and closing the year at 9½ cents.

Average Prices of Antimony*

(In cents per pound)*

	1914	1915	1916	1917	1918	1919
	Ordinaries	Ordinaries	Ordinaries	Ordinaries	Ordinaries	Ordinaries
January.....	6.125	15.85	42.45	17.29	14.281	7.43
February.....	6.100	18.21	44.31	29.80	13.823	7.17
March.....	6.053	22.13	44.75	32.89	13.091	6.80
April.....	6.006	24.88	42.06	34.04	12.536	6.79
May.....	6.845	35.30	31.60	25.20	12.846	7.66
June.....	5.825	37.69	20.05	19.51	13.055	8.44
July.....	5.638	38.13	14.70	15.83	13.197	8.99
August.....	13.800	33.00	11.53	15.06	14.000	8.96
September.....	9.940	28.63	11.81	14.94	14.145	8.63
October.....	12.060	31.45	12.70	14.75	13.319	8.71
November.....	14.450	38.88	13.84	13.91	8.771	9.11
December.....	13.310	39.25	14.59	15.06	7.915	9.63
	8.763	30.28	25.37	20.69	12.581	8.19

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

COBALT

The silver-cobalt-nickel arsenides of Coleman and adjacent township, more familiarly known as the Cobalt district, in the province of Ontario, has been for several years the principal sources of the world's supply of cobalt.

The recovery of this metal in Canada has been in the form of cobalt oxide, metallic cobalt, cobalt sulphate, cobalt carbonate, cobalt hydroxide, unseparated oxides, and stellite (the cobalt alloy used for high speed tool metal). These recoveries are produced by the southeastern Ontario smelters treating the ores of the Cobalt district together with cobalt residues produced at the high grade mills of the Mining Corporation of Canada and the Nipissing Mines, Ltd. Formerly these residues have been chiefly exported, but they are now being shipped mainly to Canadian smelters.

The total production of cobalt contained in smelter products shipped and in cobalt residues exported during 1919 amounted to 530,371 pounds, which if valued at \$2.50 per pound would be worth \$1,325,928, as against 737,157 pounds, which at \$2.50 per pound were valued at \$1,842,893 in 1918.¹

The 1919 production included: (a) 113,943 pounds of metallic cobalt, valued by the producers at \$220,676; (b) 429,359 pounds of cobalt oxides, valued at \$611,909; (c) other cobalt compounds such as stellite and cobalt sulphate, amounting to 60,437 pounds, valued at \$34,308; and (d) cobalt ores and residues exported, amounting to 842 tons, containing 93,143 pounds of cobalt, and valued at \$133,294, making a total valuation of \$900,187.

¹The statement of production for 1918, as published in the Annual Report for that year, included some duplications and has been revised.

The 1918 production included 294,476 pounds of metallic cobalt, valued by the producers at \$713,072; 476,053 pounds of cobalt oxides, valued at \$760,121, together with other cobalt compounds, such as stellite and cobalt hydroxide, amounting to 191,304 pounds, valued at \$936,139; making a total valuation of \$2,409,332.

Production of Cobalt and Cobalt Compounds

Calendar Year	Metallic Cobalt		Cobalt-oxide		Other cobalt compounds	Cobalt in Smelter Products Shipped		Average Price per lb.
	Pounds	Value	Pounds	Value	Value	Pounds	Value	Value
1912.....		\$	257,677	\$ 123,843	\$ 163,988	663,093		\$
1913.....			660,079	525,028	90,266	865,937		
1914.....			899,027	571,710	79,995	871,891		
1915.....	211,610	197,994	423,717	338,273	(a)	504,212		
1916.....	215,215	200,888	670,760	542,341	(a)	840,536	924,590	1 10
1917.....	393,773	616,633	802,448	1,104,500	740,032	1,076,572	1,727,315	1 60
1918.....	294,476	713,072	476,053	760,121	936,139	737,157	1,842,893	2 50
1919.....	113,943	220,676	429,359	611,909	34,308	530,371	1,325,928	2 50

(a) Value not given in 1915 and 1916.

The total amount of cobalt ores and residues treated in 1919 in the southern Ontario smelters and including that exported, amounted to 9,084 tons with a cobalt content of 1,070,826 pounds, as against 8,354 tons, with a cobalt content of 972,679 pounds, in 1918.

Ores and Residues of Cobalt treated from 1912 to 1919 inclusive

Year	Quantity (Tons)	Cobalt contents (Pounds)	Cobalt %	Year	Quantity (Tons)	Cobalt contents (Pounds)	Cobalt %
1912.....	8,097	(a)		1917.....	7,770	866,327	5.6
1913.....	6,124	(a)		1918.....	8,354	972,679	5.8
1914.....	6,619	(a)		1919.....	9,084	1,070,826	5.9
1915.....	7,526	828,703	5.5				
1916.....	8,127	1,254,953	7.7				

(a) Figures are not available.

Uses.—Prior to the war the principal demand for cobalt in the form of oxide 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 oleate and resinates of cobalt, as a drying agent in the manufacture of paints and varnishes.

Prices.—The market for cobalt, which was very poor in 1915, gradually increased in 1916, 1917, and 1918. No quotations are available for 1918 and 1919, but the metal as produced in the refineries of Ontario obtained a price of around \$2.50 per pound.

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

Imports into the United States of Cobalt*

Year	Cobalt, cobalt ore and zaffer				Cobalt oxide			
	Pounds	Value	Year	Pounds	Value	Year	Pounds	Value
1909.....	a) 12,132	\$ 11,096	1915....	53,375	\$ 70,283	1913....	45,277	\$ 26,154
1910.....	a) 14,935	6,352	1916....	136,770	175,236	1914....	227,886	220,593
1911.....	a) 602,454	59,151	1917....	223,794	369,950	1915....	154,872	148,828
1912.....	a) 791,242	83,080	1918....	504,391	628,099	1916....	206,639	192,009
1913.....	164,119	69,581	1919....	77,556	144,282	1917....	276,406	275,821
1914.....	106,670	53,945				1918....	208,596	291,099
						1919....	131,424	184,751

*Preliminary Report on Mineral Resources of United States, 1919. Most of the cobalt used in the United States has been imported from Canada. All the cobalt and cobalt oxide imported in 1919 is thought to have come from Canada.

(a) Includes cobalt oxide.

Cobalt—Exports

Year	Metallic		Oxides and Salts		Alloys		General ore	
	Lbs.	Value	Lbs.	Value	Lbs.	Value	Lbs.	Value
1916.....		\$		\$		\$		\$ 712,880
1917.....	282,951	868,843	(a)411,503	468,410	50,974	205,942		1,542,945
1918.....	292,015	748,705	588,229	853,737	73,580	298,496		1,900,938
1919.....	106,835	259,624	468,225	731,506	3,402	14,878		1,006,008

(a) Covers the last 9 months in 1917—no exports recorded for the first quarter of 1917.

Cobalt—Imports

Year	Metallic		Oxides and Salts		Ore		Oxide of Cobalt, Tin and Copper	
	Lbs.	Value	Lbs.	Value	Lbs.	Value	Lbs.	Value
1910.....		\$		\$		\$	174,934	\$ 58,699
1911.....							311,686	113,521
1912.....					200	73	414,728	136,739
1913.....					42,200	11,487	299,482	89,653
1914.....					400	119	356,585	80,574
1915.....							137,710	49,355
1916.....							286,234	104,239
1917.....							153,682	77,368
1918.....							142,407	72,989
1919.....							112,104	44,414

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 Fe₂Co." Report on, by H. T. Kalmus, B.Sc., Ph.D.

² Report of Ontario Bureau of Mines, Vol. XXVII, Part III, Sec. 1, "Cobalt, its occurrence, metallurgy, uses and alloys," by Chas. W. Drury, 1919.

Production of Cobalt

(As reported by the Ontario Bureau of Mines)

Year	Tons	Value	Year	Tons	Value
		\$			\$
1904.....	16	19,960	1912.....	934	314,381
1905.....	118	100,000	1913.....	821	420,386
1906.....	321	80,704	1914.....	(a) 351	590,406
1907.....	739	104,426	1915.....	(b) 206	383,261
1908.....	1,224	111,118	1916.....	(b) 400	805,014
1909.....	1,533	94,965	1917.....	(b) 337	1,133,190
1910.....	1,098	54,699	1918.....	(b) 380	1,640,310
1911.....	852	170,890	1919.....		
			Total.....	9,330	6,028,710

(a) Metallic content of cobalt oxide.

(b) Metallic content of all cobalt compounds.

Operations of Ontario Silver-Cobalt Refineries

(As reported by the Ontario Bureau of Mines)

Year	Ores, etc., treated Tons	Products Shipped					
		Cobalt oxide		Cobalt salts		Cobalt metal	
		Pounds	Value	Pounds	Value	Pounds	Value
			\$		\$		\$
1914.....	5,780	643,891	518,736	Not given	separately	.....	.....
1915.....	7,526	314,906	254,447	Not given	separately	111,558	103,746
1916.....	7,771	691,681	473,713	60,943	19,115	323,563	283,614
1917.....	7,964	418,703	533,489	52,485	13,211	396,395	589,290
1918.....	8,366	477,583	727,170	48,513	25,180	404,248	887,960
1919.....	8,260	426,573	634,553	66,193	46,615	121,926	243,554

COPPER

The total production of copper in 1919 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 75,053,581 pounds, which at the average price of copper for the year in New York, 18.691 cents per pound, would be worth \$14,028,265.

The production in 1918 estimated on the same basis was 118,769,434 pounds, which, at the average price of 24.628 cents, was valued at \$29,250,536. The 1918 production was, in quantity, the highest ever recorded, whereas that for 1919 was down to the pre-war production.

Refined copper, was produced commercially in quantity for the first time in Canada in 1916 at the Trail refinery of the Consolidated Mining and Smelting Co. The production of refined copper in 1919 amounted to 3,467 tons, as against 3,809 tons in 1918, 3,901 tons in 1917, and 483 tons in 1916.

The production of copper in 1919 included: (a) 6,934,000 pounds of refined copper; (b) 23,167,024 pounds, contained in blister copper exported for refining; (c) 24,197,382 pounds, contained in nickel-copper matte partly exported and partly refined in Canada; (d) 41,445 pounds, contained in copper sulphate; and (e) 20,713,730 pounds, the estimated recoveries from ores and concentrates exported for smelting and refining.

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

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	1919.....	75,053,581	14,028,265	18.691

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

The production by provinces was as follows: British Columbia contributed 59.3 per cent of the total, as against 52.9 per cent in 1918; Ontario 32.5 per cent, as against 39.6 per cent in 1918; Quebec 3.6 per cent, as against 5.0 per cent in 1918; Manitoba 4.4 per cent, and the Yukon 0.2 per cent.

Production of Copper by Provinces, 1917, 1918, and 1919

Province	1917		1918		1919	
	Pounds	Value	Pounds	Value	Pounds	Value
Quebec.....	5,015,560	\$ 1,363,229	5,869,649	\$ 1,445,577	2,691,695	\$ 503,105
Ontario.....	42,867,774	11,651,461	47,074,475	11,593,502	24,346,623	4,550,627
Manitoba.....	(a) 1,152,960	313,374	2,339,751	576,234	3,348,000	625,775
British Columbia.....	57,730,959	15,691,275	62,865,681	15,482,560	44,502,079	8,317,884
Yukon.....	2,460,079	668,650	619,878	152,663	165,184	30,874
Total.....	109,227,332	29,687,989	118,769,434	29,250,536	75,053,581	14,028,265

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

Prices.—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.

In January, 1919, the Department of Labour at Washington called a meeting of the labour leaders to present to them the situation of the copper market, which was faced with a large supply on hand held by the producers and the United States Government. The result of this conference was a resumption of a market in February, at 18½ cents, from which figure it gradually declined to 14½ cents per pound. An arrangement was made at the end of March between the United States Government and the producers to handle the heavy stocks still on hand and the result was a rally to 15½ cents towards the end of April. The price gradually increased to 23½ cents to the end of July. There was no real active market until the end of the year, which closed with copper at 18½ cents.

Monthly Average Prices of Electrolytic Copper in New York

(In cents per pound)

Months	1913	1914	1915	1916	1917	1918	1919
January.....	16.488	14.223	13.641	24.008	28.673	23.500	(a)
February.....	14.971	14.491	14.394	26.440	31.750	23.500	16.763
March.....	14.713	14.131	14.787	26.310	31.481	23.500	14.856
April.....	15.291	14.211	16.811	27.895	27.935	23.500	15.246
May.....	15.436	13.996	18.506	28.625	28.788	23.500	15.864
June.....	14.672	13.603	19.477	26.601	29.962	23.500	17.610
July.....	14.190	13.223	18.796	23.865	26.620	25.904	21.604
August.....	15.400	*	16.941	26.120	25.380	26.000	22.319
September.....	16.328	*	17.502	26.855	25.073	26.000	21.755
October.....	16.337	*	17.686	27.193	23.500	26.000	21.534
November.....	15.182	11.739	18.627	30.625	23.500	26.000	19.758
December.....	14.224	12.801	20.133	31.890	23.500	(a)	18.295
Yearly average.....	15.269	13.602	17.275	27.202	27.180	24.628	18.691

*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	1919
January.....	71.741	64.304	60.756	88.083	131.921	110.000	92.238
February.....	65.519	65.259	63.494	102.667	137.895	110.000	78.700
March.....	65.329	64.276	66.152	107.714	136.750	110.000	76.821
April.....	68.111	64.747	75.096	124.319	133.842	110.000	77.300
May.....	68.807	63.182	77.600	135.457	130.000	110.000	77.767
June.....	67.140	61.336	82.574	112.432	130.000	110.000	83.062
July.....	64.166	60.540	76.011	95.119	128.499	119.913	99.576
August.....	69.200	*	68.673	110.283	122.391	122.000	97.800
September.....	73.125	*	68.915	113.905	117.500	122.000	100.767
October.....	73.383	*	72.601	122.750	110.000	122.000	103.418
November.....	68.275	53.227	77.744	134.659	110.000	122.000	98.894
December.....	65.223	56.841	80.773	145.316	110.000	118.447	103.708
Yearly average.....	68.335	61.524	72.532	116.059	124.892	115.530	90.796

*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 four years the export also included some refined copper produced at Trail, B.C.

The exports of copper in 1919 were valued at \$14,654,640, and included: (a) copper in ore, matte, regulus, etc., 40,851,300 pounds, valued at \$5,316,151; (b) blister copper, 19,956,100 pounds, valued at \$3,747,355; (c) copper, black or coarse and in pigs, etc., 18,192,300 pounds, valued at \$4,186,549; (d) copper, "old and scrap," 3,117,000 pounds, valued at \$537,225; and (e) copper wire and cable, valued at \$867,360.

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

Exports of Copper, 1910 to 1919

Calendar Year	Fine in ore, matte, regulus, etc.		Black or coarse and in pigs, bars; sheets, etc.		Old and Scrap	
	Pounds	Value	Pounds	Value	Pounds	Value
		\$		\$		\$
1910.....	56,964,127	5,840,553				
1911.....	55,208,054	5,459,770	79,656	7,955		
1912.....	76,542,643	8,800,267	1,945,921	236,212		
1913.....	81,879,080	9,479,480	771,280	123,431	24,972	324,903
1914.....	68,830,059	7,130,778	6,581,564	908,201	1,987,100	231,710
1915.....	81,437,063	8,671,641	21,292,516	3,788,715	4,161,600	616,553
1916.....	124,942,400	20,776,536	2,430,400	581,268	5,846,600	1,284,895
1917.....	86,556,900	14,183,264	17,570,600	4,776,025	15,793,900	4,296,989
1918.....	73,396,400	9,221,681	46,780,700	11,378,440	895,300	171,988
1919.....	40,851,300	5,316,151	18,192,300	4,186,549	3,117,000	537,225

Calendar Year	Blister copper		Wire and cable	Total exports	
	Pounds	Value	Value	Pounds	Value
		\$	\$		\$
1910.....	(a)			56,964,127	5,840,553
1911.....				55,287,710	5,467,725
1912.....				78,488,564	9,036,479
1913.....				85,147,560	9,927,814
1914.....				77,398,723	8,270,689
1915.....				106,891,179	13,076,909
1916.....				133,219,400	22,642,699
1917.....				119,921,400	23,256,278
1918.....				121,072,400	20,772,109
1919.....				19,956,100	3,747,355	867,360	82,116,700	14,654,640

(a) Not given separately previous to April 1919.

The recorded imports of copper in 1919 were valued at \$3,964,339 and included: crude and manufactured copper, 14,949,465 pounds, valued at \$3,074,368; copper sulphate, 1,874,801 pounds, valued at \$150,388; and the manufactures of copper valued at \$867,541.

The 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.

Imports of Copper, 1918 and 1919

	1918		1919	
	Pounds	Value	Pounds	Value
		\$		\$
Copper, "old and scrap".....	615,900	134,938	1,010,000	133,023
Copper in pigs, ingots or in blocks.....	4,743,800	1,197,514	3,042,197	659,214
Copper in bars, and rods, in coils, or otherwise, in lengths, not less than 6 feet, unmanufactured.....	14,796,200	3,787,521	8,612,800	1,582,919
Copper, in strips, sheets or plates, not planished or coated, etc.....	1,563,700	513,374	1,649,300	461,438
Copper tubing in lengths not less than 6 feet and not polished, bent or otherwise manufactured.....	449,348	189,013	520,374	188,014
Copper rollers, for use in calico printing.....		181		209
Copper and manufactures of:—				
Nails, tacks, rivets and burrs or washers.....		949		
Wire, plain, tinned or plated.....	154,182	56,551	114,744	44,740
Wire cloth, etc.....		3,005		12,421
All other manufactures of, n.o.p.....		249,444		361,911
Copper, precipitate of, crude.....	1,000	96	50	20
Copper sulphate (blue vitriol).....	2,751,323	240,775	1,874,801	150,388
Total value.....		6,373,361		3,599,297

Imports of Copper, 1907 to 1919, inclusive

Calendar Year	Pigs, ingots or in blocks		Old and Scrap		Manufactures of Copper			Crude Precipitate		Copper Sulphate		Total
					Bars, Rods, Sheets, Tube, and Wire		Other Manufactures					
	Pounds	Value	Pounds	Value	Pounds	Value	Value	Pounds	Value	Pounds	Value	Value
		\$		\$		\$	\$		\$		\$	\$
1907.....	3,456,900	699,388	196,300	37,787	13,499,130	3,138,283	108,057	7,397	1,340	2,299,674	142,948	4,127,803
1908.....	2,360,900	353,301	127,700	12,821	12,150,850	1,765,415	88,715	4,209	557	2,768,123	131,057	2,351,866
1909.....	4,200,100	554,273	132,600	14,447	16,208,978	2,340,464	126,769	1,990	257	1,634,751	66,459	3,102,669
1910.....	4,640,500	609,111	273,700	31,070	25,322,906	3,579,270	150,322	4,847	595	1,925,557	77,782	4,448,150
1911.....	5,650,400	705,598	265,300	28,748	29,244,210	3,898,416	215,239	2,608	299	2,191,999	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	22,041,037	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
1919.....	3,042,197	659,214	1,010,000	138,023	10,897,218	2,277,111	374,541	50	20	1,874,801	150,388	3,599,297

Unfortunately the above record of imports does not represent the total copper imported during the war period, due to 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 details of which are given in the chapter on zinc.

The imports of brass in 1919 were valued at \$3,964,339, and included brass in crude and manufactured form, 3,307,553 pounds, valued at \$697,996, and containing approximately 2,315,287 pounds of copper; and also manufactures of brass—quantity not recorded—valued at \$3,266,343.

The imports of brass in 1918 were valued at \$4,647,872, and 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.

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 United States Department of Commerce report exports to Canada in 1919 as follows: Refined copper in ingots, brass, etc., 9,891 tons; copper in unrefined blocks, blister and converter copper, plates and sheets, etc., 1,852 tons; copper in brass, 1,159 tons; and if we allow 1,000 tons in manufactures of copper and brass, we obtain a total of 13,902 tons. Domestic production amounted to 37,527 tons and the exports were 39,500 tons (eliminating "old and scrap"), giving a difference of about 2,000 tons, which if deducted from the imports gives an estimated consumption of about 12,000 tons.

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, sheets and plates, etc., 1,439 tons; and if we allow 3,500 tons in manufactures of copper and brass, we obtain a total of about 23,474 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 about 22,800 tons. Calculated on the same basis the consumption amounted to 46,700 tons in 1917, 54,800 tons in 1916, and 27,700 tons in 1915.

Quebec

The production of copper in Quebec in 1919 was derived mostly, as in the past, from the Eustis and Weedon mines in the Eastern Townships, and amounted to about 2,691,695 pounds, valued at \$503,105, being 3.6 per cent of the total production for Canada, and representing the estimated recovery from 58,865 tons of ore and concentrates with a metal content of 3,763,191 pounds of copper, as against 5,869,649 pounds, valued at \$1,445,577, representing the estimated recovery from 125,446 tons of ore and concentrates with a metal content of 8,437,563 pounds of copper in 1918.

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	480,348	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	1919.....	2,691,695	503,105
1897.....	2,474,970	279,424				Total....	92,174,707	16,300,797

Ontario

The copper production from Ontario in 1919 amounted to 24,346,623 pounds, valued at \$4,550,627, equivalent to 32.4 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 1918 was 47,074,475 pounds, valued at \$11,593,502, being equal to 39.6 per cent of the total production for Canada.

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.....	30,361,464	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
						1919.....	24,346,623	4,550,627
						Total....	457,908,114	83,844,230

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 0.6 per cent of the total in 1919 and about 0.2 per cent in 1918.

The chief operating companies are:—

International Nickel Company of Canada, Ltd. (formerly the Canadian Copper Company, Ltd.), shipping from the Creighton and adjoining properties.

The Mond Nickel Company, Ltd., operating in Coniston.

The Alexo Mining Company, 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 mined and refined in the province, but no bounties have ever been obtained or earned. The Metal Refining Bounty Act expired April 10, 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.

Manitoba

The production of copper from Manitoba in 1919 amounted to 3,348,000 pounds, valued at \$625,775, as against 2,339,751 pounds, valued at \$576,234, in 1918, and 1,116,000 pounds, valued at \$303,329, in 1917, the first year that any production was recorded.

These productions are the estimated recoveries 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 in this district during the past five years. Toward the end of 1919 the Mandy Mining Company suspended operations, and has since sold most of their equipment to a New York syndicate, which is doing extensive development on the Flin Flon group of claims, on Flin Flon lake, in the same district.

A branch extension of the Hudson Bay railway and smelter works are required for the treatment of the ores at the Flin Flon and Mandy mines.

A special report by Dr. E. L. Bruce on the Schist Lake district was published in 1918¹; also a report by Commissioner R. C. Wallace on northern Manitoba was published early in 1920.²

British Columbia

The production of copper from British Columbia in 1919 amounted to 44,502,079 pounds, valued at \$8,317,884, equivalent to 59.3 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.

The production in 1918 was 62,865,681 pounds, valued at \$15,482,560, or 52.9 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	415,450	1905*	37,692,251	5,876,222	1914.....	41,219,202	5,606,636
1897*	5,325,180	601,215	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	1919.....	44,502,079	8,317,884
1902*	29,636,057	3,445,488	1911.....	35,279,558	4,366,198	Total.....	850,439,241	150,186,709

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

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

² Mining and Mineral Prospects in Northern Manitoba, by R. C. Wallace, Commissioner of Northern Manitoba, The Pas, Man.

Since 1909 the method of compilation of statistics of copper production by the Provincial Bureau of Mines of British Columbia, is based upon ore shipments from mines. The value of the product is obtained by taking the amount of copper actually recovered thus covering 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	1919
Cariboo—Omineca.....	1,338	6,000	2,831,279	1,646,072	852,373	643,843	16,205
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	20,411,421
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	176,333	50,946	28,933	21,984
Trail Creek.....	2,538,661	3,779,830	4,651,681	4,200,745	1,730,088	1,654,356	1,112,133
Yale—							
Boundary.....	28,621,973	16,428,959	17,402,662	17,626,623	10,329,765	9,940,125	3,273,655
Ashcroft and Kamloops....	29,505	14,525	295,164	636,594	700,199	525,780	556,681
Similkameen.....	8,073		21,701	182,633	87,326	11,923	5,180
Southern Coast—							
Vancouver Island.....	14,443,793	13,070,245	712,152	869,877	1,461,704	926,886	432,252
Mainland.....			9,058,045	15,965,388	15,794,839	17,548,127	16,629,848
Totals.....	46,460,305	45,009,699	56,918,405	65,379,364	59,007,565	61,483,754	42,459,339

*As published by British Columbia Bureau of Mines.

Copper mining is by far the most important mining in the province; in 1919 it formed about 40 per cent of the total value of the metalliferous mines, while in 1918 it was 51 per cent; in 1917 it was about 60 per cent, and in 1916 about 57 per cent of the total production for British Columbia.

The main production in British Columbia is now derived from the mines of the Pacific Coast and Cassiar district. These mines in order of importance are: the Hidden Creek group, on Observatory inlet; the Britannia group, on Howe sound, the Surf Inlet group, on Surf inlet, and the Marble Bay group, on Texada island. The total production from these mines was about 87 per cent of the British Columbia output.

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 became an important producer during 1916, 1917, and 1918, but ceased operations in the latter part of 1918 and has been idle since.

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

In the Boundary district the production has been mainly from the mines of the three large smelting companies:—

The Granby Consolidated Mining, Smelting and Power Co., Ltd., which ceased operating its mines at Phoenix in June, 1919, and has since that time been dismantling both its mine plant at Phoenix and its smelter plant at Grand Forks.

The Canada Copper Corporation, Ltd., which ceased operations in 1918 and has since dismantled its plants at the mines and smelter at Greenwood.

The Consolidated Mining and Smelting Company which continued their operations at the Emma mine near Phoenix. This mine was the only important producer during 1919, with the exception of the Granby mine, Phoenix, which ceased operating in June.

In the interior the main producers were, as usual, the Rossland group, owned by the Consolidated Mining and Smelting Company, and the Le Roi II (Josie) mine, both located at Rossland.

In the Similkameen district, the Canada Copper Corporation, Ltd., continued their programme of development and construction at the Princess group, Copper Mountain, and the concentrator at Allenby. Labour troubles delayed the completion of the branch railway line to the new camp thus preventing the deliveries of machinery and supplies, so that no production was made in 1919.

The railroad is expected to be ready for operation by June or July, 1920, and milling will be proceeded with immediately.

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, and decreased further in 1919 to 165,184 pounds, valued at \$30,874.

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	1919.....	165,184	30,874
			Total.....	12,634,795	2,642,038

GOLD

The production of gold in Canada from Canadian sources in 1919 amounted to 766,764 fine ounces, valued at \$15,850,423, and included (a) placer or alluvial gold 104,495 ounces, or 13.6 per cent of the total; (b) gold obtained from the crushing of free milling quartz ore, 529,296 ounces, or 69.1 per cent; (c) gold obtained from ores and concentrates treated at the Canadian copper and lead smelters 67,636 ounces, or 8.8 per cent; (d) the estimated gold recoveries from ores and concentrates exported 65,337 ounces, or 8.5 per cent of the total production.

The production of gold in 1918 amounted to 699,681 fine ounces, valued at \$14,463,689, and included: (a) gold derived from alluvial workings, 117,251 ounces, or 16.7 per cent of the total; (b) gold obtained from the crushing of free milling quartz ore, i.e., stamp mill bullion, 441,120 ounces, or 63.1 per cent; (c) gold obtained from ores and concentrates treated at the Canadian copper and lead smelters, 84,343 ounces, or 12.1 per cent; and (d) the estimated gold recoveries from ores and concentrates exported, 56,967 ounces, or 8.1 per cent of the total production.

In 1919 there was an increase in production of 9.6 per cent over that of 1918, nevertheless, it showed a decrease of 17.6 per cent when compared with the production of 1916 which reached the high mark of 930,492 ounces.

The high cost of supplies and labour and the great scarcity of labour in the gold camps have been the cause of the lower production for the last three years.

But these difficulties are being gradually overcome and the year 1920 will probably witness the greatest production ever recorded.

Production of Gold in Canada

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.....	135,301	2,798,774	1883.....	53,853	1,113,246	1903.....	911,559	18,843,590
1863.....	202,498	4,180,011	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	976,663	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				1919.....	766,764	15,860,423
						Total.....	20,640,484	426,676,770

†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, 1919, was 209,026.14 ounces, which after melting was reduced to 205,947.57 ounces and valued at \$3,547,524.93 after deducting office charges. The loss by melting was 1.4728 ounces per hundredweight. The receipts were from British Columbia and the Yukon, with also a few ounces from Alberta.

Receipts at Dominion Assay Office, Vancouver, B.C.

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	1,478,894.00	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	175,303.10	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.....	50,068.82	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	1919.....	209,026.14	205,947.57	3,547,524.93

(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 from abroad; and (b) that of the Consolidated Mining and Smelting Company of Canada, Ltd., at Trail, B.C., where gold is mainly recovered from the gold and copper ores with also recoveries from the high-grade silver-lead and the "dry" ores shipped to the smelter. The Trail refinery treats also small quantities of imported ores.

Refined Gold Produced at Trail, B.C.*

Calendar Year	Gold Fine oz.	Calendar Year	Gold Fine oz.
1904.....	4,336	1912.....	12,118
1905.....	8,602	1913.....	11,977
1906.....	9,993	1914.....	11,088
1907.....	10,395	1915.....	17,813
1908.....	15,346	1916.....	23,608
1909.....	18,241	1917.....	49,661
1910.....	13,298	1918.....	61,212
1911.....	15,270	1919.....	47,283

*Includes some gold derived from imported ores and from occasional shipments from Ontario, Manitoba, Alberta, and the Yukon.

Receipts of Gold Bullion at the Royal Mint, Ottawa, Ont.

Calendar Year	From Canadian sources		From Foreign Countries	
	Oz. Gross	Value Gold contents	Oz. Gross	Value Gold contents
		\$		\$
1908.....	219.19	3,823.03		
1909.....	5,741.43	94,864.81	38.25	673.98
1910.....	65,009.35	1,079,223.42		
1911.....	39,463.11	1,469,087.43	511.24	9,128.55
1912.....	104,825.29	1,676,371.78	742.79	12,451.33
1913.....	212,076.41	3,363,870.30	633.23	11,609.84
1914.....	29,762.24	471,042.90	4,750.19	98,062.84
1915.....	39,231.47	1,402,605.19	871,693.79	15,838,222.01
1916.....	49,195.39	730,074.19	6,637,753.41	121,513,033.93
1917.....	55,779.96	340,265.33	8,196,151.04	143,919,793.43
1918.....	302,785.96	4,982,743.81	3,723,224.05	67,739,887.68
1919.....	654,906.23	10,865,770.57	8,917.02	134,756.38

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 1919 it produced 65.9 per cent of the total, as against 58.8 per cent in 1918; 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, 1917, 1918, and 1919

	1917		1918		1919	
	Fine ounces †	Value	Fine ounces †	Value	Fine ounces †	Value
		\$		\$		\$
Nova Scotia.....	2,210	45,685	1,176	24,310	850	17,571
Quebec.....	1,511	31,235	1,939	40,083	1,470	30,388
Ontario.....	423,261	8,749,581	411,976	8,510,299	505,739	10,454,553
Manitoba.....	440	9,095 (a)	1,926 (a)	39,814	724	14,966
Alberta.....			27	558	24	500
British Columbia.....	133,742	2,764,693 (a)	180,163 (a)	3,724,300	167,252	3,457,406
Yukon.....	177,667	3,672,703	102,474	2,118,325	90,705	1,875,039
Totals.....	738,831	15,272,992	699,681	14,463,689	766,764	15,850,423

†The exact value of fine gold is $\frac{900}{387}$ 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 $\frac{387}{900}$ or 0.43000.

(a) Figures revised, as a certain quantity of gold was wrongly attributed to Manitoba, which belonged to British Columbia.

Exports and Imports.—The exports of gold in dust, nuggets, etc., during 1919 were valued at \$5,037,123, as against \$10,040,813 in 1918, \$15,929,051 in 1917, and \$18,382,903 in 1916.

The imports in 1919 were: gold fringe valued at \$17,949 and manufactures of gold and silver valued at \$459,463. The Customs Department does not report any imports of gold bullion or gold coins after March 31, 1918.

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 1919, 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
				1919.....	5,037,123

Imports of Gold and Silver, 1910 to 1919, 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
	\$	\$	\$	\$	\$	\$	\$	\$ -	\$	\$
1910.....	1,343,537	7,259,524	9,750	975,049		194,625	51,578	10,465	27,643	405,970
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
1919.....			17,949	3,458,097		131,766	36,105	5,303	136,612	281,443

(a) Covers only first quarter for 1918, no imports recorded for balance of year.

Nova Scotia

The gold production in Nova Scotia has been derived almost entirely from quartz ores and in 1919 amounted to 850 fine ounces, valued at \$17,571, as against 1,176 ounces, valued at \$24,310, in 1918, and 2,210 ounces, valued at \$45,685, in 1917.

The 1919 production is the smallest recorded and the falling off during the past few years is attributed mostly, as in other gold districts, to the high cost of supplies and labour.

Nova Scotia: 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	331,095	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	493,563	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	26,450	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	282,636	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
					1919..	1,362	850	17,571	12.90
					Total	2,189,728	908,631	13,783,153	8.58

Quebec

The gold production in Quebec during 1919 amounted to 1,470 fine ounces, valued at \$30,388, as against 1,939 ounces, valued at \$40,083, in 1918, and 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 for the zinc-lead ores of Notre-Dame-des-Anges, Portneuf county. No alluvial production has been reported for a number of years.

Much development and exploration has been done during the last few years in different claims along the shores of lake De Montigny, DuBuisson township, Timiskaming county, about forty miles south of the town of Amos.

The camp is reached by means of gasoline launches travelling along the Harricaw river. The principal operator in 1919 was the British Minerals Corporation, Ltd., which operated the property of Mr. J. J. Sullivan, known as the Sullivan mine, and the Siscoe property, which latter property is situated on a small island not far from the east shore of lake De Montigny.

Prof. A. Mailhot, of the Ecole Polytechnique of Montreal, acting under instructions from the Québec Bureau of Mines, spent part of the summer of 1919 in this district and a preliminary report of his observations appeared in the *Canadian Mining Journal*.¹ Dr. J. A. Bancroft, of McGill University, also reported on the adjoining districts in 1912.²

Quebec: 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.....	368	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.....	327	17,093	1896.....	145	3,000	1910.....	124	2,565
1883.....	360	17,787	1897.....	44	900	1911.....	613	12,672
1884.....	422	8,720	1898.....	295	6,039	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
						1919.....	1,470	30,388
						Total.....	25,244	501,802

† Calculated from the value: one dollar = 0.048375 ounce.

Ontario

The gold production of Ontario in 1919 amounted to 505,739 fine ounces, valued at \$10,454,553, as against 411,976 ounces, valued at \$8,516,299, in 1918, showing an increase of 22.7 per cent over that of 1918.

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 years 1917 and 1918 was due to the abnormal conditions created by the war and though these conditions still persisted to a large extent during the last year the 1919 production was the greatest recorded, and the year 1920 will probably have this record exceeded again.

The principal producers, by order of importance were:—

Porcupine District—

Hollinger, Consolidated Gold Mines, Ltd., operating at Timmins.

McIntyre, Porcupine Mines, Ltd., operating at Schumacher.

Dome Mines Co., Limited, operating at South Porcupine.

Davidson Consolidated Gold Mines, Ltd., operating at South Porcupine.

Dome Lake Mining and Milling Company, operating at South Porcupine.

Kirkland Lake District—

Lake Shore Mines, Ltd., operating at Kirkland Lake.

Teck-Hughes Gold Mines, Ltd., operating at Kirkland Lake.

Kirkland Lake Gold Mining Company, Ltd., operating at Kirkland Lake.

Larder Lake District—

Argonaut Gold, Ltd., operating at Beaver House Lake.

¹ The Upper Harricaw River Gold Area, by Prof. A. Mailhot, Can. Min. Jour., Oct. 14, 1919—pp. 765-770.

² Report on the Geology of the Headwaters of the Harricaw River, by Dr. J. C. Bancroft, Québec Bureau of Mines, Annual Report for 1912—pp. 217-229.

Considerable development has been carried on during the last few years in many areas in the Timiskaming district, the most noticeable being the Kirkland Lake gold area; the Boston Creek and Goodfish areas, near Bourkes, Matheson and Sesekinika stations, on the Timiskaming and Northern Ontario railway; the Matachewan area; and the Lightning area, near Abitibi lake. Reports on these subdistricts have been published by the Ontario Bureau of Mines.¹

Much exploration and development has been done also in the new West Shining Tree gold area, Sudbury district.²

Ontario: 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.....	492,481	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	180,294	1908.....	3,212	66,389	1919.....	505,739	10,454,553
						Total.....	2,938,139	60,736,723

† Calculated from the value: one dollar = 0.048375 ounce.

Manitoba

The gold production in Manitoba during 1919, was 724 fine ounces, valued at \$14,966, as against 1,926 ounces, valued at \$39,814, in 1918, and 440 ounces, valued at \$9,095, in 1917.

There was no production recorded previous to 1917.

About eighty-five miles northeast of The Pas is Herb or Wekusko lake, where several companies have been operating, the principal one, which made its first shipment early in 1917, being the Northern Manitoba Mining and Development Company, which operated the Moosehorn property in 1917 and 1918. A new company called the North Canada Exploration Company, Limited, was formed in 1919 to take over the Northern Manitoba Mining and Development Company, but very little work, if any at all, was done during the year.

The Herb Lake Gold Mines, Limited, took over the Rex Mine during 1919 and started active operations only in April, 1920.

This district was reported on by Mr. F. J. Alcock, of the Geological Survey.³

A few miles southwest from Herb lake are: (a) the Flin Flon lake, where much development has been carried on by the Great Sulphides Gold Mines, Limited, on what is called the Flin Flon group; this property was optioned in 1919 to a New York syndicate which has started on an elaborate plan of development; and (b) Schist lake, near which operations have been carried on for the last three years 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.

¹ (a) Boston Creek and Goodfish Lake gold areas, Bul. No. 29, Ontario Bureau of Mines, 1916.

(b) Matachewan gold area, Bul. No. 34, Ontario Bureau of Mines, 1918.

(c) Abitibi—Night Hawk gold area, Vol. XXVIII, Part II, 28th Annual Report, Ontario Bureau of Mines, 1919.

(d) Larder Lake gold area, Vol. XXVIII, Part II, 28th Annual Report, Ontario Bureau of Mines, 1919.

² West Shining Tree gold area: Bul. No. 39, Ontario Bureau of Mines, 1920.

³ Wekusko Lake area, Northern Manitoba, by F. J. Alcock, Geol. Survey, Summary Report for 1917, Part D, and 1918, Part D.

The Mandy mine was closed in the fall of 1919 and the plant dismantled and sold to the operators of the Flin Flon property.

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 1918.¹

A report on the Mining and Mineral Prospects of Northern Manitoba, by Dr. R. C. Wallace, was published early in 1920 by authority of the Government of Manitoba.

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.

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; and a report on the gold-quartz veins in southeastern Manitoba by Dr. E. L. Bruce was published in the Geological Survey Summary Report for 1918, part D.

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, was examined by Dr. Bruce and referred to under "Manitoba." No work has been reported since 1915.

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, and in 1919 as 24 ounces, valued at \$500.

Alberta: 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	10,500	1903.....	48	1,000	1914.....	48	992
1893.....	466	9,640	1904.....	24	500	1915.....	195	4,026
1894.....	720	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	1919.....	24	500
						Total...	15,060	311,320

†Calculated from the value: one dollar=0.048375 ounce.

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

(b) Athapapuskow Lake district, Northern Manitoba, by Dr. E. L. Bruce, Geol. Survey Summary Report for 1918, Part D.

British Columbia

The gold production of British Columbia in 1919 amounted to 167,252 fine ounces, valued at \$3,457,406, and included: (a) placer or alluvial gold, 13,859 ounces, or 8.4 per cent of the total; (b) bullion from mill ores, 23,483 ounces, or 14.0 per cent; (c) refined gold produced at the Trail refinery from the treatment of British Columbia ores, 46,672 ounces, or 27.9 per cent; (d) smelter recoveries, 19,821 ounces, or 11.8 per cent; and (e) the estimated gold recoveries from ores and concentrates exported, 63,417 ounces, or 37.9 per cent of the total production.

The gold production in 1918 amounted to 180,163 fine ounces, valued at \$3,724,300, and included: (a) placer gold, 15,480 ounces, or 6.00 per cent of the total; (b) bullion from mill ore, 28,198 ounces, or 15.6 per cent; (c) smelter recoveries, 82,999 ounces, or 46.1 per cent, and (d) estimated gold recoveries from ores and concentrates exported, 53,486 ounces, or 29.7 per cent of the total production.

The production of British Columbia in 1919 amounted to about 21.8 per cent of the total production of Canada.

The production for the last three years has varied between two and a half (2½) and three and a half (3½) million dollars and is far below the average of the previous fifteen years, which is between five and six million dollars. This is mostly due to the high costs of production and the labour troubles.

The statistics of lode gold represent, as closely as can be ascertained, the actual gold recovery based on smelter recoveries and bullion shipments, and that of placer gold is given as ascertained by the provincial mineralogist.

British Columbia: Production of Gold

Year	Fine ounces†	Value	Year	Fine ounces†	Value	Year	Fine ounces†	Value
		\$			\$			\$
1858.....	34,104	705,000	1878.....	61,688	1,275,204	1898.....	142,215	2,939,852
1859.....	78,129	1,615,072	1879.....	62,407	1,290,058	1899.....	203,295	4,202,473
1860.....	107,806	2,228,543	1880.....	49,044	1,013,827	1900.....	228,916	4,732,105
1861.....	128,973	2,666,118	1881.....	50,636	1,046,737	1901.....	257,292	5,318,703
1862.....	128,528	2,656,903	1882.....	46,154	954,085	1902.....	288,383	5,961,409
1863.....	189,318	3,913,563	1883.....	38,422	794,252	1903.....	284,108	5,873,036
1864.....	180,722	3,735,850	1884.....	35,612	736,165	1904.....	275,975	5,704,908
1865.....	168,887	3,491,205	1885.....	34,527	713,738	1905.....	285,529	5,902,402
1866.....	128,779	2,662,106	1886.....	43,714	903,651	1906.....	269,886	5,579,039
1867.....	120,012	2,480,868	1887.....	33,558	693,709	1907.....	236,216	4,883,020
1868.....	114,792	2,372,972	1888.....	29,834	616,731	1908.....	286,858	5,929,880
1869.....	85,865	1,774,978	1889.....	28,439	583,923	1909.....	250,320	5,174,579
1870.....	64,675	1,336,956	1890.....	23,918	494,436	1910.....	261,336	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	2,764,693
						1918.....	180,163	3,724,300
						1919.....	167,252	3,457,406
						Total.....	8,818,706	171,962,954

†Calculated from the value: one dollar=0.048375 ounce.

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: Production of Gold by Districts, 1918 and 1919*

Districts	1918				1919			
	Gold Placer		Gold Lode		Gold Placer		Gold Lode	
	Ounces	Value	Ounces	Value	Ounces	Value	Ounces	Value
		\$		\$		\$		\$
Cariboo:—								
Cariboo and Quesnel.....	4,000	80,000			3,500	70,000		
Omineca.....	400	8,000	985	20,360	400	8,000	147	3,038
Cassiar:—								
Atlin, Liard and Stikine.....	11,025	220,500	446	9,219	8,850	177,000		
Skeena, etc.....			48,016	992,491	850	17,000	60,076	1,241,771
East Kootenay:—								
Port Steele.....	50	1,000			50	1,000		
Windermere and Golden.....							2	41
West Kootenay:—								
Ainsworth.....			18	372			26	537
Nelson.....	50	1,000	7,155	147,894	25	500	297	6,139
Slocan and Slocan City.....			67	1,385			95	1,964
Trail Creek.....			43,745	904,209			50,229	1,038,233
Revelstoke, etc.....	50	1,000	35	723	50	1,000	8	165
Yale:—								
Grand Forks, Greenwood and Osoyoos.....	50	1,000	55,353	1,144,147	50	1,000	32,874	679,506
Similkameen, Nicola and Vernon.....	250	5,000	1	21	50	1,000	25	517
Yale, Ashcroft and Kamloops.....	50	1,000	815	16,848	100	2,000	627	12,960
Lillooet:—								
Lillooet.....	50	1,000	2,473	51,117	375	7,500	2,506	51,799
Southern Coast:—								
Vancouver Island.....	25	500	2,515	51,985	25	500	1,164	24,060
Mainland.....			3,050	63,043			4,350	89,915
Total.....	16,000	320,000	164,674	3,403,812	14,325	286,500	152,426	3,150,645

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

Yukon

The gold production of the Yukon Territory in 1919 amounted to 90,705 fine ounces, valued at \$1,875,039, and included: 90,612 ounces derived from alluvial sands and 93 ounces from lode mining.

The gold production 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 1919 is estimated at \$1,895,772 and includes 90,612 fine ounces of gold, valued at \$1,873,116, and 20,388 fine ounces of silver, valued at \$22,656.

The total placer production in 1918 is estimated at \$2,125,388, and includes 101,744 fine ounces of gold, valued at \$2,103,235, and 22,392 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 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.

Yukon: Production of Gold

Year	Fine Ounces†	Value	Year	Fine Ounces†	Value	Year	Fine Ounces†	Value
		\$			\$			\$
1885).....	4,837	100,000	1898.....	483,750	10,000,000	1909.....	191,565	3,960,000
1886).....			1899.....	774,000	16,000,000	1910*.....	221,091	4,570,362
1887.....	3,386	70,000	1900.....	1,077,553	22,275,000	1911.....	224,197	4,634,574
1888.....	1,935	40,000	1901.....	870,750	18,000,000	1912.....	268,447	5,549,296
1889.....	8,466	175,000	1902.....	701,437	14,500,000	1913.....	282,838	5,846,780
1890.....	8,466	175,000	1903.....	592,594	12,250,000	1914.....	247,940	5,125,374
1891.....	1,935	40,000	1904.....	507,938	10,500,000	1915.....	230,173	4,758,098
1892.....	4,233	87,500	1905.....	381,001	7,876,000	1916.....	212,700	4,398,900
1893.....	8,514	176,000	1906.....	270,900	5,600,000	1917.....	177,667	3,672,703
1894.....	6,047	125,000	1907.....	152,381	3,150,000	1918.....	102,474	2,118,325
1895.....	12,094	250,000	1908.....	174,150	3,600,000	1919.....	90,705	1,875,039
1896.....	14,513	300,000				Total.....	8,431,614	174,296,951
1897.....	120,937	2,500,000						

† Calculated from the value: one dollar=0.048375 oz.

* Including a small production from lode mines, from 1910 to 1919 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, 1919, 111,138.65 ounces from the Yukon, valued after all charges had been deducted at \$1,813,883.46, or an average of \$16.32 per ounce, as against 121,310.37 ounces, valued at \$1,921,197.71, or an average of \$15.84 per ounce in 1918, and 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	1914.....	56,564.83	915,914	16.21
1909.....	5,003.12	83,871	16.75	1915.....	87,040.87	1,418,497	16.28
1910.....	3,594.87	62,094	17.27	1916.....	95,005.82	1,525,724	16.06
1911.....	2,073.61	34,994	16.88	1917.....	79,532.35	1,262,207	15.87
1912.....	2,211.88	36,481	16.41	1918.....	121,310.37	1,921,198	15.84
1913 (b).....	15,235.29	247,189	16.22	1919.....	111,138.65	1,813,883	16.32

(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	1914	1915	1916	1917	1918	1919
January.....	136-50	520-69	3,116-18	2,490-11	1,025-60	2,609-39
February.....	325-50	40	566-62	740-73	112-27	491-22
March.....	6-75	232-13	1,574-82	1,033-37	176-31	742-75
April.....	1,572-65	277-84	859-50	1,290-64		1,606-40
May.....	11,668-10	17,553-29	13,099-13	7,536-43	3,445-55	3,978-07
June.....	67,604-85	57,884-87	38,292-47	33,684-56	14,165-95	18,255-81
July.....	45,067-31	49,478-87	35,598-34	34,339-33	16,876-11	12,084-24
August.....	49,458-17	41,015-41	47,980-26	41,439-50	22,630-91	19,939-34
September.....	62,744-69	47,055-83	45,883-90	33,652-02	25,434-07	12,201-85
October.....	63,365-22	59,984-89	62,927-73	57,227-13	38,306-54	36,641-55
November.....	4,208-00	7,248-17	13,168-23	4,184-74	3,733-89	2,040-88
December.....	3,433-43	6,001-77	1,944-64	3,015-97	1,272-83	2,612-82
	309,691-17	287,254-16	265,013-88	220,684-53	127,180-12	113,204-32

Since 1898 a royalty to the extent of \$4,705,545.21 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 and the Royalty Collected*

Fiscal Year	Total Gold Production	Total Exemption	Royalty Collected on	Royalty Paid
	\$	\$	\$	\$ cts.
Ending June, 1898.....	3,072,773	339,845	2,732,928	273,292 82
Ending June, 1899.....	7,582,283	1,699,657	5,882,626	588,262 37
Ending June, 1900.....	9,809,465	2,501,744	7,307,720	730,771 99
Ending June, 1901.....	9,162,083	1,927,660	7,234,416	592,660 98
Ending June, 1902.....	9,566,340	1,190,114	8,367,226	331,436 79
Ending June, 1903.....	12,113,015		12,113,015	302,893 48
Ending June, 1904.....	10,790,663		10,790,663	272,217 96
Ending June, 1905.....	8,222,054		8,222,054	206,760 87
Ending June, 1906.....	6,540,007		6,540,007	163,963 25
Ending March, 1907.....	3,304,791		3,304,791	82,622 42
Ending March, 1908.....	2,820,162		2,820,162	70,504 65
Ending March, 1909.....	3,260,283		3,260,282	81,507 07
Ending March, 1910.....	3,594,251		3,594,251	89,844 10
Ending March, 1911.....	4,126,728		4,126,728	103,168 19
Ending March, 1912.....	4,024,237		4,024,237	100,606 29
Ending March, 1913.....	5,018,412		5,018,412	125,460 52
Ending March, 1914.....	5,301,508		5,301,508	132,537 69
Ending March, 1915.....	4,649,634		4,649,634	116,241 04
Ending March, 1916.....	4,458,278		4,458,278	111,457 19
Ending March, 1917.....	3,960,207		3,960,207	99,007 92
Ending March, 1918.....	3,266,019		3,266,019	81,650 55
Ending March, 1919.....	1,947,082		1,947,082	48,677 07
Total.....	126,590,275		118,922,247	4,705,545 21

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

LEAD

The production of lead in 1919 amounted to 43,827,699 pounds (21,914 tons), which at the average price for the year, 6.966 cents per pound, valued at \$3,053,037, and included: (a) 34,330,920 pounds (17,165.5 tons) of refined lead produced at Trail, B.C., and pig-lead produced at Galletta, Ont.; (b) 9,448,113 pounds (4,724 tons), the estimated recovery from lead ores exported to the United States; and (c) 48,666 pounds (24.3 tons), the estimated recoveries from the gold and silver ores of Ontario, also exported to the United States.

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, and included: (a) 16,391 tons of lead in bullion produced at the smelters at Trail, B.C., and Galletta, Ont., from Canadian ores; (b) 9,298 tons, the estimated recovery from lead ores exported to the United States; and (c) 10 tons, the estimated recovery from the gold and silver ores of Ontario, also shipped to American smelters.

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. Previous to 1909 the figures reported are those published by the British Columbia provincial mineralogist, which represent the metal content of the shipments and are somewhat in excess of the actual amount of lead recovered.

The production has been mainly from British Columbia, with occasional small amounts from other provinces, including Quebec, which has been producing steadily during the last few years.

Production of Lead.

Year	Pounds	Value	Cents per Pound†	Year	Pounds	Value	Cents per Pound†
1887.....	204,800	\$ 9,216	5.400	1903.....	18,139,283	768,562	4.237
1888.....	674,500	29,812	4.420	1904.....	37,531,244	1,617,221	4.309
1889.....	165,100	6,488	3.930	1905.....	56,864,915	2,676,632	4.707
1890.....	105,000	4,704	4.480	1906.....	54,608,217	3,089,187	5.657
1891.....	88,665	3,857	4.350	1907.....	47,738,703	2,542,086	5.325
1892.....	808,420	33,064	4.090	1908.....	43,195,733	1,814,221	4.200
1893.....	2,135,023	79,636	3.730	1909.....	45,887,424	1,692,139	3.690
1894.....	5,793,222	187,636	3.290	1910.....	32,987,508	1,216,249	3.687
1895.....	16,461,794	531,716	3.230	1911.....	23,784,969	827,717	3.480
1896.....	24,199,977	721,159	2.980	1912.....	35,763,476	1,597,554	4.467
1897.....	39,018,219	1,396,853	3.580	1913.....	37,662,703	1,754,705	4.659
1898.....	31,915,319	1,206,399	3.780	1914.....	36,337,765	1,627,568	4.479
1899.....	21,862,436	977,250	4.470	1915.....	46,316,450	2,593,721	5.600
1900.....	63,169,821	2,760,521	4.370	1916.....	41,497,615	3,532,692	8.513
1901.....	51,900,958	2,249,387	4.334	1917.....	32,576,281	3,628,020	11.137
1902.....	22,956,381	934,095	4.069	1918.....	51,398,002	4,754,315	9.250
				1919.....	43,827,699	3,053,037	6.966

†From 1911 to date, average price at Montreal. Quotations furnished by Messrs. Thos. Robertson & Co., Montreal, Que.

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*.

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 and 1919 it was below the recovery in smelters.

The total mine shipments in 1919 of lead ores and concentrates were about 54,508 tons, valued by the operators at \$3,044,839, and containing 32,147,989 pounds of lead, as against 75,256 tons, valued at \$4,705,573, and containing 46,843,602 pounds of lead, in 1918, and 46,799 tons, valued at \$3,866,862, and containing 38,696,116 pounds of lead, in 1917.

Lead 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
1919.....	54,508	3,044,839	32,147,989	2,185,376

Comparative Records of Lead Production, 1914 to 1919, inclusive

	1914	1915	1916
(1) Production: Smelter recoveries from Canadian ore and recoverable lead in ore exported.....	36,337,765	46,316,450	41,497,615
(2) Lead contents of ores and concentrates shipped from mines in Canada.....	50,527,130	48,708,005	54,124,628
(3) Total production of lead bullion in Canada (including lead from imported ores.) (a).....	36,443,706	43,518,618	43,100,236
(4) Total production of refined lead in Canada (including lead from imported ores and the pig-lead produced in Ontario).....	36,443,706	43,518,618	33,087,474

	1917	1918	1919
(1) Production: Smelter recoveries from Canadian ore and recoverable lead in ore exported.....	32,576,281	51,398,002	43,827,699
(2) Lead contents of ores and concentrates shipped from mines in Canada.....	38,696,116	46,843,602	32,147,989
(3) Total production of lead bullion in Canada (including lead from imported ores.) (a).....	41,427,304	35,834,115	34,150,134
(4) Total production of refined lead in Canada (including lead from imported ores and the pig-lead produced in Ontario).....	32,115,114	31,571,112	34,330,920

(a) 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 Smelter Company, Limited, under lease. Operations were carried on for four months in 1917.

The Kingdon Mining, Smelting, and Manufacturing Company, Limited, is the name of the company now operating the Galetta mine and smelter. Operations were carried on throughout the year during the first quarter by the "Estate of James Robertson," and for the balance of the year by the Kingdon Mining, Smelting, and Manufacturing Company, Limited.

During 1918 the property was operated during nine months and for only six months in 1917.

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.....	15,804,509	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
				1919.....	34,330,920

*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 1919 was 6.966 cents per pound, as against 9.250 cents in 1918, and 11.137 cents in 1917.

The Toronto price of lead in 1919 averages 6.832 cents per pound, being 13.4 cents per 100 pounds below the Montreal average price.

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 for the year being £30 2s. 8d., whereas in 1919 the average price was £28 3s. 11d.

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

(Value in cents per pound)

	1912	1913	1914	1915	1916	1917	1918	1919
Montreal.....	4.467	4.659	4.479	5.600	8.513	11.137	9.250	6.966
London.....	3.921	4.072	4.146	4.979	6.715	6.626	6.539	6.216
New York.....	4.471	4.370	3.862	4.673	6.858	8.787	7.413	5.759
St. Louis.....	4.360	4.238	3.737	4.567	6.777	8.721	7.222	5.530

Monthly Average Prices of Pig-Lead at Montreal*

(Value in cents per pound)

Month	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
January.....	3.48	3.31	3.93	4.32	4.78	4.27	7.29	9.50	8.42	6.94
February.....	3.40	3.32	3.97	4.18	4.73	4.58	7.73	11.35	8.73	6.33
March.....	3.34	3.34	4.03	4.05	4.57	5.04	9.25	11.77	8.87	6.51
April.....	3.21	3.26	4.10	4.42	4.41	5.21	9.60	11.54	8.49	6.25
May.....	3.13	3.20	4.08	4.66	4.54	5.26	9.10	13.19	8.46	6.26
June.....	3.15	3.27	4.34	4.98	4.55	6.53	8.43	14.62	9.46	6.43
July.....	3.13	3.33	4.57	4.93	4.49	6.35	7.79	13.26	9.86	6.75
August.....	3.11	3.45	4.84	5.02	4.48	5.62	7.76	13.14	9.86	6.97
September.....	3.11	3.63	5.47	5.02	4.42	5.63	8.41	10.93	9.86	7.19
October.....	3.23	3.77	5.07	4.99	4.07	5.71	8.61	8.46	9.86	7.60
November.....	3.31	3.93	4.53	4.82	4.29	6.39	8.72	7.92	9.86	8.05
December.....	3.35	3.95	4.55	4.52	4.41	6.61	9.42	7.92	8.31	8.32
Average.....	3.246	3.480	4.467	4.659	4.479	5.600	8.513	11.137	9.25	6.966

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

Monthly Average Prices of Lead in New York†

(Value in cents per pound)

Month	1910	1911	1912	1913	1914	1915	1916	1917	1918	1919
January.....	4.700	4.483	4.435	4.321	4.111	3.729	5.921	7.626	6.782	5.432
February.....	4.613	4.440	4.026	4.325	4.048	3.827	6.246	8.636	6.973	5.057
March.....	4.459	4.394	4.073	4.327	3.970	4.053	7.136	9.199	7.201	5.226
April.....	4.376	4.412	4.200	4.381	3.810	4.221	7.630	9.288	6.772	4.982
May.....	4.315	4.373	4.194	4.342	3.900	4.274	7.463	10.207	6.818	5.018
June.....	4.343	4.435	4.392	4.325	3.900	5.932	6.936	11.171	7.611	5.340
July.....	4.404	4.499	4.720	4.353	3.891	5.659	6.352	10.710	8.033	5.626
August.....	4.400	4.500	4.569	4.624	3.875	4.656	6.244	10.594	8.050	5.798
September.....	4.400	4.485	5.048	4.698	3.828	4.610	6.810	8.680	8.050	6.108
October.....	4.400	4.265	5.071	4.402	3.528	4.600	7.000	6.710	8.050	6.487
November.....	4.442	4.298	4.615	4.293	3.683	5.155	7.042	6.249	8.050	6.808
December.....	4.500	4.450	4.303	4.047	3.800	5.355	7.513	6.375	6.564	7.231
Average.....	4.446	4.420	4.471	4.370	3.862	4.673	6.858	8.787	7.413	5.759

†From the *Engineering and Mining Journal*.

Monthly Average Prices of Lead in London‡

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

Month	1910	1911	1912	1913	1914
January.....	13 3 11	13 0 8	15 11 3	17 1 11	18 19 10
February.....	13 7 3	13 1 11	15 13 9	16 8 5	19 2 8
March.....	13 2 9	13 2 11	15 19 8	15 19 8	19 2 3
April.....	12 13 9	12 18 5	16 6 6	17 8 10	17 19 8
May.....	12 11 8	12 19 2	16 10 2	18 14 3	18 4 8
June.....	12 13 9	13 5 5	17 11 8	19 10 8	18 13 11
July.....	12 11 8	13 10 11	18 8 9	19 7 10	18 8 6
August.....	12 10 10	14 1 4	19 5 8	19 15 8	20 9 9
September.....	12 12 6	14 15 1	21 9 0	19 14 10	18 16 3
October.....	13 2 0	15 6 1	20 8 0	19 9 5	17 9 8
November.....	13 4 6	15 15 5	18 4 7	18 13 9	17 19 9
December.....	13 3 9	15 13 4	18 1 6	17 8 8	18 18 6
Yearly average.....	12 19 0	13 19 3	17 15 11	18 6 2	18 13 9

Month	1915	1916	1917	1918	1919
January.....	18 12 0	30 17 5	30 0 0	29 0 0	34 10 0
February.....	19 3 7	31 18 9	30 0 0	29 0 0	26 13 0
March.....	21 17 8	34 7 8	30 0 0	29 0 0	26 16 11
April.....	21 2 1	34 8 0	30 0 0	29 0 0	24 8 7
May.....	20 9 2	32 19 5	30 0 0	29 0 0	23 18 6
June.....	25 4 1	30 14 0	30 0 0	29 0 0	22 12 2
July.....	24 12 3	27 8 11	30 0 0	29 0 0	23 14 2
August.....	21 18 11	29 2 7	30 0 0	29 0 0	25 1 7
September.....	23 3 0	29 17 4	30 0 0	29 0 0	25 12 7
October.....	23 19 9	30 0 0	30 0 0	29 0 0	28 15 11
November.....	26 2 9	30 0 0	30 0 0	31 12 4	34 16 1
December.....	28 8 8	30 0 0	30 0 0	40 0 0	41 7 8
Yearly average.....	22 17 10	30 19 6	30 0 0	30 2 8	28 3 11

‡As published by the Metal Information Bureau, London.

Exports and Imports.—The export of lead in 1919 amounted to 24,469,700 pounds (12,234.8 tons), valued at \$1,389,012, and consisted in lead in ores, concentrates, etc.; 13,142,900 pounds, valued at \$616,278, and pig-lead 11,326,800 pounds, valued at \$772,734.

The exports of lead in 1918 amounted to 30,145,800 pounds (15,072.9 tons), 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 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.

Exports of Lead, 1910 to 1919

	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	71,961	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	553,130	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
1919.....	13,142,900	616,278	11,326,800	772,734	24,469,700	1,389,012

The imports of lead in 1919 were valued at \$1,022,265 and included: (a) lead in pigs, block, "old and scrap"; bars and sheets, etc., 5,718 tons, valued at \$613,539; (b) lead pigments, lead salts and litharge, valued at \$269,997 and with an estimated lead content of 1,326 tons; and (c) manufactures of lead for which no quantity is given, valued at \$138,729.

The imports in 1918 were valued at \$1,350,689 and included: (a) lead in pigs, block, "old and scrap," etc., 6,356 tons, valued at \$936,874; (b) lead pigments, lead salts and litharge, valued at \$303,373 and with an estimated lead content of 1,497 tons; and (c) manufactures of lead valued at \$110,442.

Imports of Lead, 1916, 1917, 1918 and 1919*

	1916		1917		1918		1919	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value
Pig and block.....	9,933	\$ 1,258,284	5,755	958,402	5,499	759,086	4,079	397,053
Old scrap.....	.....	.....	.....	.....	.....	.....	1,123	135,219
Bars and sheets.....	492	85,686	523	111,002	445	80,594	287	35,097
Pipe.....	109	21,450	139	29,502	115	23,542	45	8,013
Shot and bullets.....	39	6,390	13	2,163	2	512	4	976
Tea lead.....	1,073	193,541	245	59,231	295	73,140	180	37,181
Total.....	11,646	1,570,351	6,675	1,160,300	6,356	936,874	5,718	613,539
Lead contained in pigments.....	760	140,908	490	106,188	582	118,765	657	123,720
Lead contained in litharge.....	1,250	211,359	1,264	275,919	877	169,500	619	120,243
Lead contained in nitrate and acetate.....	73	30,445	61	24,327	38	15,108	50	20,034
Total.....	2,083	382,712	1,815	406,434	1,497	303,373	1,326	269,997
Manufactures.....	.....	124,833	.....	165,764	.....	110,442	.....	138,729
Grand total.....	13,729	2,077,896	8,490	1,732,498	7,853	1,350,689	7,044	1,022,265

* The figures of imports of lead are taken from the Reports of the Department of Customs. We have estimated the amounts for lead contained in pigments, litharge, nitrate and acetate of lead.

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

Calendar Year	Old and Scrap, Pig and Block			Bars and Sheets		
	Pounds	Value	Cents per Pound	Pounds	Value	Cents per Pound
1910.....	12,059,100	\$ 346,516	2-37	1,769,700	\$ 45,674	2-58
1911.....	19,977,400	495,923	2-48	3,093,700	55,458	1-80
1912.....	23,178,700	940,583	3-34	1,921,200	93,702	4-88
1913.....	11,199,500	464,117	4-14	1,494,400	62,527	4-18
1914.....	15,444,100	590,557	3-82	961,500	41,244	4-29
1915.....	42,616,200	2,010,006	4-72	912,500	56,331	6-17
1916.....	19,865,800	1,258,284	6-33	985,000	85,686	8-70
1917.....	11,510,400	958,402	8-33	1,045,800	111,002	10-61
1918.....	10,993,600	759,086	6-90	889,100	80,594	9-06
1919.....	10,405,197	532,272	5-11	573,994	35,097	6-11

Calendar Year	Litharge			Acetate and Nitrate of Lead			Other Manufactures
	Pounds	Value	Cents per Pound	Pounds	Value	Cents per Pound	Value
1910.....	1,554,100	\$ 56,049	3-61	696,899	\$ 36,391	5-22	\$ 107,688
1911.....	1,797,900	65,743	3-66	661,295	33,480	5-06	108,012
1912.....	2,592,500	113,941	4-40	507,520	28,243	5-56	144,571
1913.....	1,000,900	50,734	5-07	595,444	35,490	5-96	155,178
1914.....	1,086,300	52,525	4-84	227,386	14,033	6-17	99,285
1915.....	1,579,800	89,232	5-68	250,921	23,269	9-27	102,439
1916.....	2,767,200	211,359	7-64	224,648	30,445	1-35	124,833
1917.....	2,807,900	275,919	9-83	188,008	24,327	1-29	165,764
1918.....	1,947,900	169,500	8-70	100,516	15,108	1-50	110,442
1919.....	3,046,300	126,243	4-14	152,592	20,034	1-31	138,729

Calendar Year	Pipe Lead			Shot and Bullets			Tea Lead		
	Pound	Value	Cents per pound	Pounds	Value	Cents per pound	Pounds	Value	Cents per pound
1910.....	403,012	\$ 15,365	3-81	6,903	\$ 311	4-55	2,371,136	\$ 117,399	4-95
1911.....	512,737	19,426	3-79	8,912	1,053	11-82	2,688,211	134,160	4-99
1912.....	688,383	32,423	4-70	477,047	23,163	4-86	3,212,861	167,716	5-22
1913.....	466,753	21,679	4-64	429,656	19,582	4-56	3,475,171	217,009	6-24
1914.....	565,762	26,282	4-65	180,639	10,542	5-84	1,687,029	108,097	6-41
1915.....	145,953	8,708	5-97	1,085,196	51,890	4-78	959,189	67,652	7-05
1916.....	217,905	21,450	9-84	78,474	6,390	8-14	2,145,854	198,541	9-25
1917.....	278,207	29,502	10-60	25,147	2,163	8-60	490,364	59,231	12-08
1918.....	229,678	23,542	10-25	4,028	512	12-71	589,071	73,140	12-42
1919.....	89,493	8,013	8-95	7,083	976	13-79	359,558	37,181	10-34

Imports of Lead Pigments

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	64,130	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	67,333	6,321	833,603	80,568	1,081,580	106,138	9-63
1918.....	367,755	30,874	38,642	4,166	896,831	83,725	1,303,228	118,765	9-11
1919.....	158,582	13,186	228,806	8,415	1,120,713	102,119	1,518,101	123,720	8-15

Consumption.—The production of lead, as already stated, was in 1919, 21,914 tons, while the exports were, 12,235 tons, leaving a balance of 9,679 tons; by adding to this amount the 7,044 tons of imports, we get a total consumption of lead for Canada of about 16,723 tons.

The production of lead in 1918 was 25,699 tons, while the exports were 15,073 tons, leaving a balance of 10,626 tons; by adding to this amount the 7,853 tons of imports we get a total consumption of lead for Canada of about 18,479 tons.

This estimate of consumption is considered incomplete during the years of the war 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 a much higher figure during the last three years of the war.

Estimated Consumption of Lead

Year	Tons	Year	Tons	Year	Tons
1908.....	22,000	1912.....	39,000	1916.....	64,000
1909.....	25,000	1913.....	30,000	1917.....	43,000
1910.....	24,000	1914.....	29,000	1918.....	26,000
1911.....	28,000	1915.....	46,000	1919.....	17,000

Quebec

The production of lead in Quebec during 1919 amounted to 2,280,000 pounds, valued at \$158,825, as against 2,110,059 pounds, valued at \$195,180, in 1918. This production was wholly from the zinc-lead deposits of Notre-Dame-des-Anges.

Québec: Production of Lead

Year	Quantity	Value	Year	Quantity	Value
1915.....	Pounds 40,401	\$ 2,262	1918.....	Pounds 2,110,059	\$ 195,180
1916.....	698,760	59,485	1919.....	2,280,000	158,825
1917.....	1,378,001	153,468			

Ontario

The Ontario production of lead in 1919 was 1,487,586 pounds, valued at \$103,625, as against 1,684,366 pounds, valued at \$155,804, in 1918.

Ontario: Production of Lead

Year	Quantity	Value	Year	Quantity	Value
	Pounds	\$		Pounds	\$
1913.....	33,000	1,537	1917.....	1,586,711	176,712
1914.....			1918.....	1,684,366	155,804
1915.....	88,985	4,983	1919.....	1,487,586	103,625
1916.....	685,932	58,393			

British Columbia

The production of refined lead together with lead in ores exported amounted in 1919 to 40,060,113 pounds, valued at \$2,790,587, as against 47,594,328 pounds, valued at \$4,402,475, in 1918.

Until recent years almost all the lead ores mined in British Columbia were 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 Kimberley, with also a few thousand tons from the Queen Bess and the Surprise near Sandon, and smaller shipments from a number of other operators, and again in 1919 a considerable amount was shipped to the United States, being 18.6 per cent of the estimated recoveries, as against 34.6 per cent in 1918.

British Columbia: Production of Lead

Year	Pounds	Value	Year	Pounds	Value
		\$			\$
1887.....	204,800	9,216	1903.....	18,089,283	766,443
1888.....	674,500	29,813	1904.....	36,646,244	1,579,086
1889.....	165,100	6,488	1905.....	56,580,703	2,663,254
1890.....			1906.....	52,408,217	2,964,733
1891.....			1907.....	47,738,703	2,542,086
1892.....	808,420	33,064	1908.....	43,195,733	1,814,221
1893.....	2,131,092	79,490	1909.....	45,857,424	1,692,139
1894.....	5,703,222	187,636	1910.....	32,987,508	1,216,249
1895.....	16,461,794	531,716	1911.....	23,784,969	827,717
1896.....	24,199,977	721,159	1912.....	35,763,476	1,597,554
1897.....	38,841,135	1,390,513	1913.....	37,626,899	1,753,037
1898.....	31,693,559	1,198,017	1914.....	36,289,845	1,625,422
1899.....	21,862,436	977,250	1915.....	45,377,064	2,541,116
1900.....	62,158,621	2,760,031	1916.....	39,157,701	3,333,496
1901.....	51,582,906	2,235,603	1917.....	29,483,725	3,283,602
1902.....	22,536,381	917,005	1918.....	47,594,328	4,402,475
			1919.....	40,060,113	2,790,587

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 smelters.

British Columbia: Production of Lead by Districts*

(Lead contained in ore shipped from mines, in pounds)

District	1913	1914	1915	1916	1917	1918	1919
Cassiar—							
Atlin, etc.....				7,260			
Skeena, etc.....	6,579		30,462	1,077			
East Kootenay—							
Fort Steele.....	18,525,083	24,863,105	26,582,050	24,156,143	13,996,640	18,695,565	10,720,433
Windermere, etc.....	2,495,355		216,327	571,244	1,774,649	2,659,210	1,659,279
West Kootenay—							
Ainsworth.....	9,027,861	8,069,525	3,436,184	7,841,869	6,395,350	6,106,262	4,336,602
Nelson.....	1,936,418	2,004,436	967,775	1,240,784	2,605,666	1,611,166	292,010
Slocan.....	22,648,766	15,233,910	14,925,345	14,415,645	11,808,019	14,575,379	12,156,845
Revelstoke, etc.....	521,771	123,912	89,041	206,741	395,321	80,773	44,035
Yale—							
Yale—Kamloops.....				47,380	12,690		29,485
Similkameen, etc.....					10,697		4,594
Grand Forks, etc.....	45,982	1,678	7,127	14,922	36,548	47,738	43,200
Cariboo—							
Omineca.....	156,862	323,482	249,279	224,451	271,885	123,568	180,455
	55,364,677	50,625,048	46,503,590	48,727,516	37,307,465	43,899,661	29,475,968

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

Yukon

During recent years several properties in the Yukon Territory 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. Small productions were reported during 1913 and 1914.

The most important operations being conducted during 1916 and 1917 were in what is known as the "Mayo" area, north of the Stewart river. Heavy shipments of very rich silver-lead ore were made in 1915 and 1916 from the Silver King property on Galena creek to the Selby smelter at San Francisco. Shipments were rather small during 1917 and 1918. No production was recorded in 1919.

This area is one of the most important placer-gold districts of Yukon Territory, but valuable lode deposits have also been discovered.

Bounties.—The Lead Bounty Act of 1913 expired in June, 1918, and was not renewed. The text of this Act and the regulations under which the Act was administered may be consulted in the "Annual Report on Mineral Production for 1914," and previous years.

Statement of Bounties Paid on Lead during the Fiscal Years 1899 to 1920

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
June 30, 1900.....	43,335	March 31, 1907.....	1,995	March 31, 1914.....	8,179
June 30, 1901.....	30,000	March 31, 1908.....	51,001	March 31, 1915.....	3,217
June 30, 1902.....		March 31, 1909.....	307,433	March 31, 1916.....	59
June 30, 1903.....	4,380	March 31, 1910.....	340,542	March 31, 1917.....	
June 30, 1904.....	195,627	March 31, 1911.....	248,534	March 31, 1918.....	
June 30, 1905.....	330,645	March 31, 1912.....	179,238	March 31, 1919.....	
				March 31, 1920.....	
				Total.....	1,979,164

MERCURY

There has been no production of mercury recorded 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.

The Kerr Lake Mines, Ltd., of Cobalt, Ont., in its annual report to the shareholders, reports recoveries of mercury amounting to 545.5 pounds in 1918 and 137.5 pounds in 1919.

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 1919 were 26,465 pounds, valued at \$31,573, as against 56,936 pounds, valued at \$68,903, in 1918.

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
1898-1919.....			

*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	44,020	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
			1919.....	26,465	31,573

Average Monthly Price of Mercury

(Per flask of 75 pounds)

Month	1917		1918		1919	
	New York	San Francisco	New York	San Francisco	New York	San Francisco
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
January.....	81 04	80 20	126 77	115 58	105 50	103 07
February.....	120 90	116 25	119 89	116 96	89 84	91 45
March.....	113 30	112 50	121 63	115 83	71 56	73 68
April.....	115 64	115 00	121 87	115 46	72 94	71 20
May.....	105 98	105 00	118 97	113 31	83 12	78 60
June.....	84 34	86 20	122 66	113 48	93 25	89 83
July.....	107 80	102 18	126 63	116 69	104 68	98 85
August.....	115 00	111 10	125 56	118 33	107 08	103 73
September.....	112 21	110 90	127 81	119 00	102 52	99 83
October.....	100 94	100 62	127 18	119 33	86 85	86 23
November.....	102 50	100 75	124 91	118 91	90 74	82 28
December.....	115 90	111 65	117 70	115 60	93 27	91 13
Year.....	106 30	104 36	123 46	116 54	92 15	89 16

MOLYBDENUM

The total production in 1919 representing the quantity of MoS₂ contents of the concentrates produced, for which payment was made, amounted to 83,002 pounds, valued at \$69,203, or an average of about 83.4 cents per pound. The total production in 1918 representing the MoS₂ contents of the concentrates produced for which payment was made, amounted to 378,029 pounds, which at \$1.15 per pound would have a total value of \$434,733.

The total shipments of concentrates as stated by the producers were in 1919, 46.0 tons, valued at \$69,203, and 6,783 tons of ore were treated at the concentrating plants.

In 1918 the total shipments of ore and concentrates were 461.4 tons, valued at \$428,807, and there were 33,935 tons of ore 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	°	°	°
1903.....	600		85.0	1,275	°	°	°
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	183,316	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
1919.....	7,280	6,783	46.0	69,203	83,002	83,002	69,203

^aValue as given by the operators.
^cNo figures available.

^bEstimated at the average market value of molybdenite.

The war had stimulated the demand for molybdenum ores to a considerable extent, but with the cessation of hostilities, the producers were left with considerable stocks on hand which could not very readily be absorbed in peace times with the limited uses for the metal apart from the making of ferro-molybdenum. The price declined accordingly to as low as 40 to 50 cents per pound for forced sales.

A few companies carried on development work during 1919, but the only producer was the Dominion Molybdenite Company, Ltd., operating the property at Quyon, Que., for part of the year only.

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 in Canada has been 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 were established and operated during 1916, 1917, and 1918.

There has been no production of ferro-molybdenum since February, 1918.

The concentrating plants are as follows:—

- Dominion Molybdenite Co., Ltd., at Quyon, Que.
- St. Maurice Mines, Ltd., Indian Peninsula, Timiskaming Co., Que.
- International Molybdenum Co., at Renfrew, 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.

There are molybdenite deposits in Nova Scotia, Quebec, Ontario, Manitoba, and British Columbia. The principal production has come from the Quyon mine, in Pontiac county, Quebec.

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

Prospective situation of molybdenum.—"Though 1919 has not been a bright year for molybdenum, the prospects for 1920 and for the more distant future are promising. The value of molybdenum as a component part of alloy steel has been demonstrated during the war, and of late English and German research work has established its usefulness also as a very valuable and efficient part in tool and high-speed steel."

"As an alloy steel, however, molybdenum has made its greatest strides during the last two years, and seems to be firmly established as a necessary compound of the best grades."

"Its main application has been found in the aeroplane, automobile, truck, and tractor industry, and this industry has spent large sums in the development of the application of molybdenum.

"Over 4,000" tons of steel containing molybdenum is now consumed monthly in the United States."²

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 of the Molybdenite Deposits of the Moss mine, Quyon, Que." By Chas. 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.

² Extract from "The Molybdenite Market in 1919," by Chas. Hardy. Eng. & Min. Jour., Jan. 17, 1920.

Prices.—The price of molybdenite in New York which was quoted in the early part of January, 1918, at \$2.25 to \$2.30 per pound for 90 per cent MoS₂, 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.

In 1919 the price of molybdenite was quoted at from 65 to 85 cents, throughout the year, with forced sales as low as 60 cents, 50 cents, and even 40 cents per pound.

The exports of molybdenum were reported in 1919 as 113,500 pounds, valued at \$84,226, as against 351,600 pounds valued at \$402,435 in 1918, and 64,700 pounds valued at \$81,173 in 1917.

Estimated World's Production of Molybdenum Ores†

(In Short Tons)

	1916					1917				
	Ores and concentrates shipped		MoS ₂ Contents Tons	Per cent of Mo	Mo content Tons	Ores and concentrates shipped		MoS ₂ Contents Tons	Per cent of Mo	Mo content Tons
	Tons	Value \$				Tons	Value \$			
Australia:—		\$				\$				
New South Wales (1)	60.3	107,388	*	†54.0	32.6	78.7	153,826	*	†51.0	40.1
Queensland (2)	91.1	167,262	*	†54.0	49.2	124.5	236,608	*	†51.0	63.5
Southern Australia (3)						0.9	1,747	*	†51.0	0.5
Canada	610.0	188,316	78.2	7.7	46.9	1,554.0	320,006	165.1	6.4	99.1
Japan (4)	37.0	*	*	*	*	*	*	*	*	*
Norway (4)	140.0	*	*	†45.0	63.0	*	*	*	*	†100.0
Peru (5)	6.3	14,210	5.7	54.0	3.4	7.7	21,545	6.4	49.9	3.9
Spain (4)	147.2	*	*	†20.0	29.4	*	*	*	*	*
United States (6)	1,228.0	205,000	*	8.0	103.4	*	495,350			175.1
		\$				\$				
Australia:—		\$				\$				
New South Wales (1)	104.1	203,670	*	†51.0	53.0					
Queensland (2)	123.0	236,457	*	†51.0	62.7					
Southern Australia (3)	0.2	477	*	†51.0	0.1					
Canada	461.3	428,807	189.2	24.6	113.5	46.0	69,203	41.5	54.0	24.9
Japan (4)	*	*	*	*	*					
Norway (4)	*	*	*	*	†100.0					
Peru (5)	4.6	8,278	3.5	46.0	2.1					
Spain (4)	*	*	*	*	*					
United States (6)	2,280.0	1,253,700		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) From the Annual Report of the Department of Mines, Queensland.
- (3) From the Annual Report of the Department of Mines, Southern Australia.
- (4) From the Annual Report of the Mineral Industry, New York.
- (5) From the "Boletín del Cuerpo de Ingenieros de Minas del Perú".
- (6) From the Annual Report of the U. S. Geological Survey, Washington.

NICKEL

The production of nickel in 1919 amounted to 44,544,883 pounds (22,272.4 tons), valued at \$17,817,953, as against 92,507,293 pounds (46,253.6 tons), valued at \$37,002,917, in 1918, a decrease of 51.8 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, near Porquis Junction, Timiskaming, Ont., part of which matte is exported for refining; (b) the metallic nickel and the estimated nickel contents of the nickel oxides and nickel salts produced in the smelters of eastern Ontario.

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	38½	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
				1919.....	44,544,883	40	17,817,953

There were mined in 1919, 572,400 tons of nickel-copper ore, and smelted 754,567 tons, from which were produced 42,736 tons of Bessemer matte carrying approximately 22,035 tons of nickel and 12,099 tons of copper. The average metal recovery in matte from the ores treated was 2.920 per cent nickel and 1.603 per cent copper.

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.

The average metal recovery in matte from the ores treated in 1917 was 2.881 per cent nickel and 1.458 per cent copper.

Production of the Sudbury District

	1914	1915	1916	1917	1918	1919
Ore mined..... Short tons	1,000,364	1,364,048	1,566,333	1,518,783	1,641,617	572,400
Ore smelted..... " "	947,053	1,272,283	1,521,689	1,453,661	1,559,892	754,567
Bessemer matte produced.... " "	46,396	67,703	80,011	78,897	87,184	42,736
Copper content of matte..... " "	14,448	19,608	22,430	21,196	23,482	12,099
Nickel content of matte..... " "	22,759	34,039	41,298	41,887	45,886	22,035
Wages paid miners and smelters.....	\$3,096,911	\$3,555,912	\$4,841,662	\$5,438,830	\$6,606,782	\$1,967,909
Men employed.....	3,379	4,033	4,656	4,517	4,701	1,252

The nickel-copper ore is reduced in smelters and converters to a Bessemer matte containing from 77 to 81 per cent of the combined metals; in 1919 it averaged 51.6 per cent nickel and 28.3 per cent copper, or a total of 79.9 per cent, while in 1918 the average was 52.6 per cent nickel and 26.0 per cent copper, or a total of 78.6 per cent.

Proportion of Nickel and Copper in Sudbury Matte

Year	Percentage			Year	Percentage		
	Nickel	Copper	Total		Nickel	Copper	Total
1910.....	53.2	27.5	80.7	1915.....	50.3	29.0	79.3
1911.....	52.3	27.5	79.8	1916.....	51.6	28.0	79.6
1912.....	53.5	26.3	79.8	1917.....	50.6	28.9	77.5
1913.....	52.7	27.4	80.1	1918.....	52.6	26.0	78.6
1914.....	49.0	31.1	80.1	1919.....	51.6	28.3	79.9

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 out 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 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, Limited, 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.

The British America Nickel Corporation, Limited, practically completed in 1919 the construction of its smelter at Nickelton, near the Murray mine, and the refinery at Deschenes, Que.

The smelter started operations January 18, 1920, and the refinery shortly afterwards. This latter plant will produce refined nickel and copper and also the precious metals platinum, palladium, iridium, and gold from the treatment of the residues from the nickel-copper refinery.

The production from the Port Colborne refinery and eastern Ontario smelters in 1919 was: (a) metallic nickel, 10,127,884 pounds, or 5,064 tons; (b) nickel oxides, 1,162,899 pounds, valued by the operators at \$340,933; and (c) nickel sulphate and nickel castings, 353,625 pounds, valued at \$39,598.

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."

In 1918 the production was: (a) metallic nickel, 3,408,945 pounds, or 1,704.5 tons; (b) nickel oxides, 364,830 pounds, valued at \$169,447; and (c) nickel salts and nickel castings, 399,238 pounds, valued at \$46,358.

The total estimated nickel contents of the recoveries from the silver-cobalt-nickel ores was in 1919, 474,274 pounds, as against 736,005 pounds in 1918.

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
1919.....	397,884	137,435	†340,389	32,862	474,274

*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, smelting, and refining of nickel ores are:—

(a) The International Nickel Company of Canada, Ltd., with smelter at Copper Cliff, Ont., and refineries at Bayonne, N.J., and at Port Colborne, Ont. This company completed during 1918 the erection of a new refining plant at Port Colborne, Ont., which started operations on July 1, 1918.

(b) The Mond Nickel Company of London, England, with smelter at Coniston, Ont., and refinery at Clydach, Swansea, Wales.

(c) The British American Nickel Corporation, Ltd., which started erecting a smelter at the Murray mine late in 1916, and early in 1918 a refinery at Deschenes, Hull county, Que. Both plants were completed by the end of 1919 and started operations early in 1920.

(d) 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 Company, Deloro, Ont.

The Metals Chemical Company, Ltd., Welland, Ont.

Prices.—The price of electrolytic nickel in New York, according to quotations published by the *Engineering and Mining Journal*, was 45 cents per pound throughout the year.

The price of nickel in London, as given by the *London Mining Journal*, was £195 per long ton until July, when it rose to £205, which price ruled until November, when it reached £215 per long ton.

Exports and Imports.—The exports of nickel in 1919 amounted to 41,016,400 pounds (20,508.2 tons), valued at \$8,077,593, or an average of 19.69 cents per pound, and included: (a) nickel in ore and matte, 30,395,400 pounds, valued at \$4,785,173, or an average of 15.74 cents per pound; and (b) nickel fine, 10,621,000 pounds, valued at \$3,292,420, or an average of 31 cents per pound.

The exports of nickel in 1918 amounted to 87,478,500 pounds (43,739.2 tons), valued at \$11,263,246, and included: (a) nickel in ore and matte, 85,767,700 pounds, valued at \$10,556,040, or an average of 12.31 cents per pound, and (b) nickel fine, 1,710,800 pounds, valued at \$707,206, or an average of 41.34 cents per pound.

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

Exports of Nickel in Ore and Matte and Nickel Fine

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.....	19,419,393	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 (a).....	87,478,500	11,263,246	12.88
				1919 (a).....	41,016,400	8,077,593	19.69

(a) The exports of nickel included nickel fine, in 1918, 1,710,800 pounds valued at \$707,206, and in 1919, 10,621,000 pounds valued at \$3,292,420.

The imports of nickel in 1919 were valued at \$479,022 and included: nickel, nickel silver, German silver, in ingots, bars, sheets, etc., 399,989 pounds, valued at \$135,959; and manufactures of nickel valued at \$343,063.

The imports 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.

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

Imports of Nickel

Year	Nickel, nickel-silver, German silver, ingots and blocks		Nickel, nickel-silver, German silver, bars, rods, strips, sheets and plates		Mfrs. of German, Nevada and nickel-silver not plated.	Nickel-plated ware n.o.p.
	Pounds	Value	Pounds	Value	Value	Value
		\$		\$	\$	\$
1910.....	2,689	1,107	502,582	122,414	78,284	761,235
1911.....	124,710	30,736	409,751	97,639	61,283	1,005,600
1912.....	48,245	17,957	619,523	154,387	85,069	1,311,362
1913.....	42,726	14,705	559,765	147,815	86,672	1,536,387
1914.....	70,564	28,362	549,288	130,065	83,185	986,492
1915.....	74,381	27,361	635,963	169,807	77,538	689,577
1916.....	179,367	66,515	713,072	258,811	39,084	1,097,903
1917.....	303,853	123,976	549,992	245,370	149,718	1,290,220
1918.....	95,306	39,295	542,958	199,600	204,208	1,082,787
1919.....	76,578	29,962	323,411	105,977	343,063	1,455,627

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 36.6 to 60.6 cents per pound, with an average of 44.6 cents in 1919, as against 35.1 to 55.4 cents per pound, with an average of 39.7 cents in 1918.

United States: Imports and Exports of Nickel*

	1918			1919		
	Quantity	Value	Cents per pound	Quantity	Value	Cents per pound
		\$			\$	
<i>Imports into United States—</i>						
Ore and matte..... Gross tons	59,621	11,517,546	15.73	23,057	5,780,380	19.73
Nickel content..... Pounds	73,193,205			29,303,228		
<i>Exports from United States—</i>						
To France..... Pounds	2,233,736	864,966	38.72	1,346,119	533,228	39.61
To Italy..... "	5,100,847	2,085,912	40.90	525,940	192,435	36.59
To Netherlands..... "				61,197	26,409	43.15
To Russia in Europe..... "						
To United Kingdom..... "	7,803,178	2,739,093	35.10	747,437	323,720	43.31
To Japan..... "	2,063,933	1,102,197	53.40	582,946	352,672	60.50
To other countries..... "	267,806	134,873	50.30	551,123	273,085	49.55
	17,469,500	6,927,041	39.65	3,814,762	1,701,549	44.60

*From the "Foreign Commerce of the United States," Dec. 1919.

Imports of Nickel Ore and Matte into the United States*

From	1916 (Fiscal year)		1917 (Fiscal year)		1918 (Fiscal year)		1918 (July 1 to Dec. 31)		1919 (Calendar year)	
	Tons	Pounds	Tons	Pounds	Tons	Pounds	Tons	Pounds	Tons	Pounds
Belgium.....										
France.....	297	514,828								
Norway.....										
Canada (a).....	52,742	64,622,286	56,603	70,738,737	56,282	70,710,232	30,639	37,526,609	20,321	25,563,767
Oceania—										
French.....	2,618	2,391,922	409	387,805	100	111,207			50	83,168
Australia.....	1,329	1,268,084	3,120	2,912,298	2,393	2,274,240	394	381,695	2,686	3,716,293
Peru.....	1	118								
Chile.....					1	91				
New Zealand.....							437	409,023		
Totals.....	56,987	68,797,238	60,132	74,038,840	58,776	73,095,770	31,470	38,317,327	23,057	29,303,228

* 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; from July 1 to Dec. 31, 1918, \$6,940,565; and in 1919, \$5,780,380.

Exports of Nickel, Nickel-Oxide, and Matte from the United States*

(In Pounds)

To	1915 (Fiscal year)	1916 (Fiscal year)	1917 (Fiscal year)	1918 (Fiscal year)	1918 (July 1 to Dec. 31)	1919 (Calendar year)
Austria-Hungary.....	67,200					
Belgium.....	210,612					442,680
Denmark.....	43,830	2,174	28,051			
France.....	3,210,980	1,871,595	2,336,684	1,904,131	557,400	1,346,119
Germany.....	1,036,242		1,168,056			
Italy.....	2,365,177	1,880,661	5,471,426	4,723,940	2,048,462	525,940
Netherlands.....	22,033	139,300	506,538			57,091
Norway.....	31,158	34,460	33,614			10,056
Portugal.....			66,520	14,844	2,912	
Russia in Europe.....	4,082,280	5,371,039	4,917,075			
Spain.....	700	112,450	158	1,098		12,971
Sweden.....	367,696	313,958	28,554		22,400	12,760
U. Kingdom—						
England.....	8,535,418	7,973,478	10,024,301	7,977,562	3,284,387	736,033
Scotland.....	7,817,384	6,113,198	5,820,442	3,024,000		11,404
N. America—						
Canada.....	52,949	11,646	27,169	10,363	2,923	35,972
Cuba.....		10	34,410	527		794
Mexico.....	1,779		249	4,000	1,000	80
Panama.....				321		37
West Indies (British).....	300					
West Indies (Dutch).....		10				
Haiti.....				120		
S. America—						
Argentina.....				3,352	1,550	4,467
Brazil.....		473	7,623	1,291	500	1,327
Chile.....		100	101	31,543		134
Colombia.....			70			500
Venezuela.....				100		
Asia—						
British India.....		411				
China.....			6,720	69,246	26,320	20,780
Hong Kong.....			13,899	31,000		2,740
Japan.....	308,444	597,257	287,944	386,337	1,407,150	582,946
German China.....				2,000		
Russia in Asia.....	1,423,030	1,226,990				
Dutch E. Indies.....				1,361	2,240	
Oceania—						
British Australia and Tasmania.....	22,400	679	217,280	70,254	1,260	281
Philippine Islands.....		56	1,510			20
Egypt.....				60,822		
Switzerland.....					40,320	4,149
Nicaragua.....						166
Dominican Republic.....						1,000
Ecuador.....						200
	29,599,612	25,649,995	31,005,606	18,818,212	7,398,824	3,810,656

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

Bounty on Refined Nickel and Nickel-oxide.—Under the terms of "The Metal Refining Act, 1907," of the province of Ontario (7 Edward VII, Chap. XIV), a bounty 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, previous to 1919.

The International Nickel Company of Canada reported for 1919 a recovery at the Port Colborne refinery, in an impure state, of about 25 ounces of platinum and 62 ounces of palladium, with also a small quantity of fine gold and fine silver.

For many years past there has been a more or less irregular recovery at the New Jersey plant of the International Nickel Company, of metals of the platinum group from the residues obtained in the refining of the Sudbury nickel-copper mattes; but as residues from other sources were treated along with those from the Canadian ores, the total recovery could not be credited to the Canadian ore deposits; nevertheless, it is believed that the Sudbury mattes have been the source of by far the greater part of the platinum group metals recovered. Records of these recoveries are published in one of the following tables.

The Canadian Copper Company (now the International Nickel Company of Canada) reported in 1916 to the Royal Ontario Nickel Commission 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 "

The Mond Nickel Company has not furnished figures as to the precious metal contents 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 British American Nickel Corporation started early in 1920 the operation of its refinery at Deschenes, Que., and as the electrolytic method of refining which is to be used here lends itself much more readily to the recovery of the precious metals, a substantial recovery of platinum group metals in Canada may be anticipated.

The recorded productions in 1919 from the alluvial sands was 25 crude ounces, valued at \$2,150, as against 99 crude ounces, valued at \$2,560, in 1918.

The total production of platinum and palladium at the Port Colborne refinery was 87 crude ounces, valued at \$4,981; no production was made previous to 1919, as explained elsewhere in this chapter.

The total production of the metals of the platinum group at the New Jersey plant was 1,683 ounces, with an estimated value of \$214,000.

There is also a small production of platinum and associate metals from the residues obtained in the refinery of the Ottawa Royal Mint. In 1919 the recovery was: platinum, 114.474 ounces, valued at \$8,055.27; palladium, 0.696 ounces, valued at \$87; and iridium, 20.782 ounces, valued at \$2,268.12. The recovery in 1918 was: platinum, 15.936 ounces, valued at \$1,455.66, and iridium, 49.775 ounces, valued at \$5,432.30.

The platinum is derived from the treatment of Canadian gold bullion and the iridium from the imported South African gold bullion. The figures supplied by the Royal Mint are for the fiscal year ending March 31.

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.....	190	1916.....	15	600
1894.....	950	1903.....		1917.....	57	3,323
1895.....	3,800	1904.....	420	1918.....	39	2,560
				1919.....	25	2,150

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

Year	Matte treated	Gold	Silver	Platinum	Palladium	Rhodium	Others
	Tons	Ounces	Ounces	Ounces	Ounces	Ounces	Ounces
1907.....	17.840	993.572	63,400.70	226.800	607.300	(a)	
1908.....	18.839	5,238.181	139,329.20	172.316	328.287	(a)	
1909.....	18.407	2,113.669	63,138.66	546.627	1,270.598	(a)	
1910.....	24.309	2,649.799	60,256.83	258.325	522.804	(a)	
1911.....	26.840	2,203.052	70,954.38	655.552	753.363	(a)	
1912.....	27.653	2,476.558	62,169.66	496.850	680.130	(a)	
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.....	59.209	1,954.934	92,963.67	970.695	1,354.459	325.407	
1918.....	62.250	1,968.703	107,076.78	649.737	786.654	472.579	
1919.....	19.528	634.043	35,689.79	616.716	762.217	227.294	(b) 76,613

(a) Figures not given separately.

(b) Includes Osmium, Iridium and Ruthenium amounting in 1919 to 76,613 ounces.

Recovery of Platinum Black, Iridium Precipitate and Palladium at the Royal Mint, Ottawa

(For Fiscal Year ending March 31)

Fiscal Year	Platinum		Iridium	
	Ozs. gross	Value	Ozs. gross	Value
		\$		\$
1908.....				
1909.....				
1910.....				
1911.....	2.616	100.01		
1912.....				
1913.....	8.913	302.63		
1914.....	17.355	707.68		
1915.....	20.849	1,303.67		
1916.....	7.504	532.16		
1917.....	17.952	1,663.04		
1918.....	15.936	1,455.66	49.775	5,432.30
1919.....	23.349	1,990.42	20.782	2,268.12
Total recovered.....	114.474	8,055.27	70.557	7,700.42

Palladium recovered in 1919: 0.696 oz. gross value \$87.00.

Exports and Imports.—The exports of platinum from Canada into the United States were in 1919, 671 ounces, valued at \$62,629, and included: (a) platinum in ore, concentrates, etc., 325 ounces, valued at \$28,815; and (b) platinum "old and scrap," 346 ounces, valued at \$33,814.

The exports were in 1918, 197 ounces, valued at \$20,892, and included: (a) platinum in concentrates, etc., 12 ounces, valued at \$798; and (b) "old and scrap," 185 ounces, valued at \$20,094.

Exports of Platinum

Year	Total Exports		Year	Ores and Concentrates		Old and Scrap		Total Exports	
	Ounces	Value		Ounces	Value	Ounces	Value	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.....	136	11,309	195	18,920	331	29,599
1912.....	92	3,821	1918.....	12	798	185	20,094	197	20,892
			1919.....	325	28,815	346	33,814	671	62,629

The imports of platinum in 1919 were valued at \$160,885 and included: (a) platinum crucibles, valued at \$15,642; (b) platinum wire, bars, strips, etc., valued at \$144,989; and (c) platinum retorts, etc., valued at \$254.

The imports in 1918 were valued at \$31,140 and included: (a) platinum crucibles, valued at \$6,136, and (b) platinum wire, bars, strips, etc., valued at \$25,004.

Imports of Platinum*

(In Dollars per ounce troy)

Calendar Year	Crucibles	Wire and bars, strips, sheets, or plates	Retorts, pans, condensers, etc.	Total Imports
	Value	Value	Value	Value
1907.....	\$ 2,974	\$ 89,719	\$ 3,415	\$ 96,108
1908.....	1,709	37,223	5,321	44,253
1909.....	3,617	61,441	9,432	74,590
1910.....	2,133	100,185	10,744	113,062
1911.....	4,549	170,944		175,493
1912.....	7,874	224,216	73	232,163
1913.....	4,557	141,117		145,674
1914.....	9,795	69,736	142	79,673
1915.....	5,147	65,040	13,900	84,087
1916.....	5,430	68,633	14,480	88,543
1917.....	6,834	107,409	36	114,279
1918.....	6,136	25,004		31,140
1919.....	15,642	144,989	254	160,885

* 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 in the fall of 1918 issued 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 Geological Survey Branch, collaborated with Mr. Mackenzie in this investigation, a detailed report of which was published in the spring of 1920.¹

Prices.—The price of platinum in 1919 decreased from \$105 per ounce in January to \$97.50 in March, then increased again gradually, reaching \$105 in May, \$110 in June, rising more rapidly to a maximum of \$150 in December:

Average Yearly Prices of Platinum*

Months	1915	1916	1917	1918	1919
January.....	41.10	90.05	87.83	105.92	104.85
February.....	40.00	90.00	103.75	107.68	100.43
March.....	39.50	90.75	103.33	(a) 108.00	99.20
April.....	38.63	83.10	103.77	(a) 108.00	99.85
May.....	38.50	80.50	105.00	106.27	102.60
June.....	38.00	78.13	104.75	(b) 105.00	105.80
July.....	38.00	63.60	103.88	(b) 105.00	105.90
August.....	39.25	62.56	104.55	(b) 105.00	107.60
September.....	50.00	84.25	104.13	(a) 105.00	123.70
October.....	54.50	89.75	104.00	(b) 105.00	132.21
November.....	62.63	101.25	104.52	(b) 105.00	136.74
December.....	85.50	86.87	104.38	105.54	151.35
Yearly average.....	47.13	83.40	102.82	105.95	114.61

* From quotation in "Engineering and Mining Journal," January, 1920.

(a) Nominal. (b) Government fixed price.

SILVER

The production of silver in 1919 amounted to 16,020,657 fine ounces, valued at \$17,802,474, and included: (a) refined silver and silver contained in silver and gold bullion, 7,306,671 ounces, or 73.1 per cent; (b) silver contained in blister copper and copper matte, 927,308 ounces, or 5.8 per cent; and (c) silver estimated as recoverable from ores exported, 3,375,750 ounces, or 21.1 per cent of the total.

(The production 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,

¹ Final Report of the Canadian Munition Resources Commission, from November, 1915, to March, 1919, inclusive.

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 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.

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 an increase in the value of the production, reaching a maximum of \$20,693,704 in 1918.

It will be noticed in the table of production that the output for 1919, though only 50 per cent of that of 1910 or 1911, when the production was at its maximum, is more than equal in value.

Production of Silver, 1887 to 1919

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	20,091,895	81.417
1901.....	5,539,192	3,265,354	58.95	1918 (b).....	21,383,979	18,693,704	96.772
1902.....	4,291,317	2,238,351	52.16	1919 (b).....	16,020,657	17,802,474	111.122
1903.....	3,198,581	1,709,642	53.45				
				Grand total...	388,710,083	245,251,089	84.947

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

(b) Includes a small production from Manitoba.

Ontario for the last ten years has been the main producer of silver in Canada, its contribution increasing from 41 per cent of the total for Canada in 1905 to a maximum of 94 per cent in 1911; in 1914 it had fallen to 88.4 per cent and has been gradually decreasing monthly each year, reaching 80.4 per cent in 1918 and 75.7 per cent in 1919.

The production of British Columbia, which has varied between two and five million ounces for the last twenty-five years, was from 1914 to 1917 between 11 and 13 per cent of the total production of Canada. In 1918 it increased to 18.3 per cent and in 1919 to 23.1 per cent of the total.

The balance of the production, 2.2 per cent in 1919, as against 1.3 per cent in 1918, was derived from Quebec, Manitoba, and the Yukon Territory.

Production of Silver by Provinces, 1887-1919

Year	Ontario		Quebec		British Columbia		Yukon Territory	
	Ounces	Value	Ounces	Value	Ounces	Value	Ounces	Value
1887	190,495	\$ 1816,30	146,898	143,666	17,690	17,301		
1888	208,064	195,584	149,388	140,425	79,780	74,993		
1889	181,609	169,980	148,517	139,012	53,192	49,787		
1890	158,715	166,066	171,545	179,436	70,427	73,666		
1891	225,633	222,926	185,584	183,357	3,306	3,266		
1892	41,581	36,425	191,910	168,113	77,160	67,592		
1893		8,689		126,439		195,000		
1894			101,318	63,830	746,379	470,219		
1895			81,753	53,369	1,496,522	976,930		
1896			70,000	46,942	3,135,343	2,102,561		
1897	5,000	2,990	80,475	48,116	5,472,971	3,272,289		
1898	85,000	49,521	74,932	43,655	4,292,401	2,500,753		
1899	202,000	120,352	40,231	23,970	2,939,413	1,751,302	230,000	137,034
1900	161,650	99,140	58,400	35,817	3,958,175	2,427,548	290,000	177,857
1901	151,400	89,250	41,459	24,440	5,151,333	3,036,711	195,000	114,953
1902	145,000	75,632	42,500	22,168	3,917,917	2,043,586	185,900	96,985
1903	17,777	9,502	28,600	15,287	2,996,204	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	1,391,053	63,000	33,304
1909	24,822,099	12,784,126	13,233	6,815	2,649,141	1,364,387	45,000	23,176
1910	30,366,366	16,241,755	7,593	4,061	2,407,887	1,287,883	87,418	46,756
1911	30,540,754	16,279,443	18,435	9,827	1,887,147	1,005,924	112,708	60,078
1912	29,214,025	17,772,352	9,465	5,753	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	67,626	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	3,565,352	1,771,658	248,049	123,241
1916	21,608,158	14,188,133	98,610	64,748	3,392,372	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
1919	12,117,878	13,465,628	140,926	156,600	3,713,537	4,126,556	27,556	30,621
Total	300,683,765	188,572,875	2,454,006	2,123,204	32,754,218	52,833,048	2,776,372	1,679,781

* Does not include small productions from New Brunswick, Alberta, and Manitoba, in 1917, and from Manitoba in 1918, and 1919.

Prices.—The average price of silver in New York as quoted by the *Engineering and Mining Journal* for the year 1919 was 111.122 cents per ounce, as against 96.772 cents in 1918, and 81.417 cents in 1917.

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."

On May 6, 1919, the United States Treasury Board lifted the restrictions on exports and removed the maximum price of \$1.01½ per ounce. The price of silver then started to rise and reached the high mark of \$1.37½ in November; the year closed with silver at \$1.31 per ounce.

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	31-215
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	1919.....	111-122	57-059

(a) 925 parts fine.

Average Monthly Prices of Silver

Months	New York—Cents per fine ounce							London, Pence per Standard ounce (a)
	1913	1914	1915	1916	1917	1918	1919	1919
	January.....	62-938	57-572	48-855	56-775	75-630	88-702	101-125	48-438
February.....	61-642	57-506	48-477	56-755	77-585	85-716	101-125	48-027
March.....	57-870	58-067	50-241	57-935	73-861	88-082	101-125	48-171
April.....	59-490	58-519	50-250	64-415	73-875	95-346	101-125	48-886
May.....	60-361	58-175	49-915	74-269	74-745	99-505	107-135	52-104
June.....	58-990	56-471	49-034	65-024	76-971	99-500	110-430	53-896
July.....	58-721	54-678	47-519	62-940	79-010	99-625	106-394	54-133
August.....	59-293	54-344	47-163	66-083	85-407	100-292	111-370	58-835
September.....	60,640	53-290	48-680	68-515	100-740	101-125	114-540	61-668
October.....	60-793	50-654	49-385	67-855	87-332	101-125	119-192	64-049
November.....	58-995	49-082	51-714	71-604	85-891	101-125	127-924	70-065
December.....	57-760	49-375	54-971	75-765	85-960	101-125	131-976	76-432
Average for the year.....	59-791	54-811	49-684	65-661	81-417	96-772	111-122	57-059

(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 Company, Thorold, Ont.; the Deloro Smelting and Refining Company, Deloro, Ont.; the Metals Chemical Company, Welland, Ont.; and the Standard Smelting and Refining Company, Chippewa, Ont. 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. There was also, for the first time, in 1918, and again in 1919, a small production of refined silver at the new refinery of the International Nickel Company of Canada, at Port Colborne, Ont. The silver bullion as a rule finds a market in the United States and in England.

Exports and Imports.—The exports of silver in 1919 were 15,405,161 fine ounces, valued at \$16,410,797, and included: silver contained in ores, concentrates, etc., 2,854,928 ounces, valued at \$2,850,592; and silver in bullion, 12,550,233 ounces, valued at \$13,560,205.

The exports 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, 1907.

The imports of silver in 1919 were: silver bullion valued at \$3,458,097, and sterling silver valued at \$131,766.

In 1918 the imports were: silver bullion valued at \$368,889 (covers only the first quarter for 1918), and sterling silver valued at \$68,381. Silver is also imported as "manufactures of silver," but is included with the manufactures of gold.

Exports of Silver in Ore, Concentrates, 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.....	225,212	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
						1919.....	16,410,797

Imports of Silver, 1910 to 1919, inclusive

Calendar Year	Silver			Manufactures of Gold and Silver			
	Bullion in bars and blocks	Coins	Sterling	Leaf	Sweepings	Manufactures, n.o.p.	Electro-plated ware
	\$	\$	\$	\$	\$	\$	\$
1910.....	975,049		194,625	51,578	10,465	27,643	405,970
1911.....	847,645		232,792	63,454	279	44,402	467,491
1912.....	1,100,344		240,235	70,651	10,107	108,879	737,857
1913.....	840,245		393,925	80,772	12,788	58,738	522,402
1914.....	629,279		244,376	53,715	4,794	14,914	301,038
1915.....	337,254	94	110,683	63,631	2,199	8,433	281,547
1916.....	875,157	35	123,774	42,152	2,778	24,167	302,268
1917.....	959,153	519	103,746	34,743	3,603	19,042	164,166
1918.....	(a) 368,889		68,381	39,068	(a) 1,444	26,440	117,928
1919.....	3,458,097		131,766	36,105	5,303	136,612	281,443

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

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 1919 was 140,926 fine ounces, valued at \$156,600, as against 178,675 ounces, valued at \$172,907, in 1918.

Ontario

The production of silver in Ontario in 1919 was 12,117,878 fine ounces, valued at \$13,465,628, as against 17,198,737 ounces, valued at \$16,643,502, in 1918, a decrease of about 29.0 per cent in quantity and 18.0 per cent in value.

In 1918 there had been a decrease of 10.8 per cent in quantity and an increase of 5.0 per cent in value; whereas in 1917 there had been also a decrease of 10.8 per cent in quantity and an increase of 10.7 per cent in value.

The silver ores of the Cobalt district and adjoining districts, 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 1919, 5,813,840 ounces, or 48.4 per cent of the output, was recovered as bullion in the district, while 4,390,540 ounces, or 36.6 per cent of the total, was recovered by the silver smelters of eastern Ontario, so that over 12,000,000, or 85 per cent of the production, was recovered in the form of bullion within the province, leaving a balance of 15.0 per cent treated in the United States.

During 1918, 9,412,545 ounces, or 55 per cent of the output, was 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 14,000,000, or 84 per cent of the 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 districts and about 34 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	1919
Cobalt district.....	41.0	41.0	39.5	51.1	55.0	48.7
Ontario smelters.....	36.0	43.0	44.7	33.9	29.0	36.4
Total for Ontario.....	77.0	84.0	84.2	85.0	84.0	85.1
U.S. smelters.....	23.0	16.0	15.8	15.0	16.0	14.9
Total.....	100.0	100.0	100.0	100.0	100.0	100.0

Shipments from the silver mines of Ontario to United States smelters amounted in 1919 to 4,901 tons of ore and concentrates, with a silver content of 1,780,617 ounces, as against 7,339 tons, containing 2,861,283 ounces, in 1918.

The production in 1919 included in addition to the output of the silver camp and the recovery at Port Colborne, 92,805 ounces of silver contained in the gold bullion from the gold camps, as against 73,013 ounces in 1918 and 74,358 ounces in 1917.

Manitoba

The silver production in Manitoba is derived from the gold and copper ores of the new Pas district, and amounted in 1919 to 20,760 ounces, valued at \$23,069, as against 13,316 ounces, valued at \$12,886, in 1918, and 7,201 ounces, valued at \$5,863, in 1917.

British Columbia

The silver production in British Columbia amounted in 1919 to 3,713,537 fine ounces, valued at \$4,126,556, as against 3,921,336 ounces, valued at \$3,794,755, in 1918, a decrease of about 5 per cent in quantity, but an increase of 9 per cent in value.

The chief sources of the silver production in this province are the silver-lead-zinc ores of the East and West Kootenays, supplemented by the silver contained in the gold-copper ores of Rossland, the Boundary, and Coast districts, and that derived from the Premier gold mine near Stewart and the Dolly Varden silver mine at Alice Arm.

Of the total production in 1919, 1,378,444 ounces were produced at the Trail refinery of the Consolidated Refining and Smelting Company of Canada from treatment of the silver-lead, zinc, gold and copper ores, 901,528 ounces were contained in blister copper, 1,432,043 ounces were the estimated recoveries from ores exported, and 1,522 ounces were contained in gold bullion.

Production of Silver in British Columbia by Districts, 1914-19*

(Silver contents of ore shipped, in fine ounces)

	1914	1915	1916	1917	1918	1919
Cariboo—						
Omineca division.....	135,265	79,155	112,635	82,311	84,125	72,573
Cassiar—						
Atlin.....			3,054		1,115	
Skeena, etc.....	131,509	175,179	256,802	343,805	416,616	920,413
Kootenay, East—						
Fort Steele division.....	492,080	481,258	509,693	180,168	261,497	205,500
Other divisions.....		1,188	29,178	79,685	91,784	68,634
Kootenay, West—						
Ainsworth division.....	329,586	289,565	321,202	224,461	228,699	167,453
Slocan division.....	1,775,975	1,812,550	1,480,571	1,547,576	1,873,236	1,556,714
Nelson division.....	150,268	9,405	32,547	46,229	136,738	44,280
Trail Creek division.....	136,135	159,584	132,080	47,112	47,203	27,788
Revelstoke, Trout Lake, and Lardeau	11,295	16,740	22,419	37,733	11,761	2,994
Yale—						
Boundary.....	347,981	273,795	280,578	220,213	227,113	222,680
Similkameen Nicola.....	15	347	830	3,470	131	6,823
Yale, Ashcroft, and Kamloops.....	57	1,702	4,215	3,525	1,317	2,096
Lillooet.....	390	5		276	412	365
Southern Coast—						
Vancouver Island.....	91,574	15,727	17,954	25,727	23,040	9,936
Mainland.....		50,306	98,165	86,925	93,385	94,870
Total.....	3,602,180	3,366,506	3,301,923	2,929,216	3,498,172	3,403,119

*From the Minister of Mines Reports, British Columbia.

Yukon

The silver production of the Yukon Territory in 1919 amounted to 27,556 fine ounces, valued at \$30,621, as against 71,915 ounces, valued at \$69,594, in 1918.

The comparatively large increase in the production for the years 1915, 1916, 1917, and 1918 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.

As evidence of this fact, in 1919 lode mining produced only 26 per cent of the total, leaving 74 per cent as the production from alluvial workings, as against 68.2 per cent from lode mining in 1918, 66.8 per cent in 1917, and 87 per cent 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, N.S. 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, Y.T.

The occurrence of tin has been noted in some bodies of sulphide minerals found in the vicinity of West Hawk and Star lakes, near the boundary line between Ontario and Manitoba. Attention is called to these occurrences not on account of their commercial importance, but for the interesting manner of occurrence and the mineral associations¹.

The imports of tin in 1919 were valued at \$3,367,900 and included: (a) tin in blocks, pigs, or bars, 3,716,300 pounds, valued at \$2,105,227; (b) tin foil, bichloride of tin and strip waste, 1,088,340 pounds, valued at \$435,570; and (c) tinware and tin crystals, valued at \$827,103.

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.

There is also a large annual import of tin plates and sheets (iron products tin-plated), the quantity in 1919 being 86,814,800 pounds, valued at \$6,436,047, as against 145,687,800 pounds, valued at \$11,403,887, in 1918; 133,351,700 pounds, valued at \$9,985,631, in 1917, and 115,084,900 pounds, valued at \$5,221,163, in 1916.

Imports of Tin

Calendar Year	Tin in blocks, pigs and bars		Tin foil		Strip waste	
	Pounds	Value	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	5,335	138
1916.....	3,457,500	1,372,200	1,507,318	314,970	37,021	975
1917.....	3,685,200	1,786,212	938,217	266,725	16,620	518
1918.....	3,474,500	2,492,257	533,648	135,049		
1919.....	3,716,300	2,105,227	976,521	412,158	69,144	1,444

Calendar Year	(a) Tinware, etc.	Tin crystals	Bichloride of tin		Total Imports of tin
	Value	Value	Pounds	Value	Value
	\$	\$		\$	\$
1910.....	389,040	3,903	31,219	3,846	1,570,169
1911.....	461,029	4,370	25,797	3,876	2,269,547
1912.....	540,599	6,308	36,045	5,595	2,870,430
1913.....	667,158	8,077	19,114	2,422	3,118,760
1914.....	650,987	7,759	200	29	2,023,329
1915.....	463,610	9,852			1,634,796
1916.....	1,301,008	10,474	81	48	2,999,675
1917.....	3,588,891	14,313	12	6	5,656,665
1918.....	1,568,807	3,301	125	118	4,204,532
1919.....	825,177	1,926	42,675	21,968	3,367,900

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

¹ "An occurrence of tin near the Ontario-Manitoba boundary," by J. S. deLury, *Can. Mining Journal*, June 25, 1920, pp. 520-521.

TUNGSTEN

There was no production of tungsten reported in 1919.

The only important productions of tungsten ore in Canada reported are the following:—

In 1912 there was reported a shipment of 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 was contemplating 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 from 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 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.

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. Mining Journal, June, 1918, p. 186.

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

"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 tungsten ore on the New York market in 1918 varied from \$24 to \$26 until the signing of the armistice, after which there were no quotations. In 1919, due to the heavy stocks on hand and the large imports of Chinese ore, the price was very low, running around \$7.50 throughout the year.

ZINC

The zinc production in 1919, which includes the actual recoveries of refined zinc at Trail, B.C., and the estimated recoveries from ores and concentrates shipped to American smelters, amounted to 32,194,707 pounds (16,097.4 tons), which at the average price of zinc for the year of 7.338 cents per pound, would be worth \$2,362,448.

In 1918 the zinc production calculated on the same basis amounted to 35,083,175 pounds (17,541.6 tons), which at the average price for the year of 8.159 cents per pound was valued at \$2,862,436.

Of the total production thus recorded in 1919, 1,752,000 pounds are credited to the Notre-Dame-des-Anges ores in Quebec, 147,692 to the province of Ontario, and the balance, 30,295,015 pounds, is credited to British Columbia.

Of the total in 1918, 2,802,923 pounds were from Quebec and the balance, 32,280,247 pounds, was credited to British Columbia.

Production of Zinc, 1911-19

Calendar Year	*Quantity	Value	Average price per pound
	Pounds	\$	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
1919.....	32,194,707	2,362,448	7.338

*Estimated smelter recoveries, including for 1916, 1917, 1918 and 1919 the actual zinc recovered at Trail, B.C.

The total shipments of zinc ores and concentrates from the mines in Canada in 1919, including the zinc-lead ores from the Sullivan mine, East Kootenay, B.C., and ores exported to the United States, amounted to about 135,535 tons, valued by the operators at \$1,049,493, or an average of \$7.75, and containing 59,959,709 pounds of zinc.

In 1918 the shipments of ores and concentrates were 121,200 tons, valued by the operators at \$1,228,195, or an average of \$10.13 per ton, and containing 63,026,461 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.

Shipments of Zinc Ores.

Year	Zinc ore shipped		Metallic zinc in ore shipped	Year	Zinc ore shipped		Metallic zinc in ore shipped
	Tons	Value	Pounds		Tons	Value	Pounds
		\$				\$	
1898.....	1,162	11,000	788,000	1909(a).....	18,371	242,699	16,468,204
1899.....	865	13,165	814,000	1910.....	5,063	120,003	4,361,712
1900.....	261	4,810	212,000	1911.....	2,590	101,072	2,346,849
1901*.....				1912.....	6,415	215,149	5,354,700
1902.....	158	1,659	142,200	1913.....	7,889	186,827	7,069,800
1903.....	1,000	10,500	900,000	1914.....	10,893	262,563	9,101,460
1904.....	597	3,700	477,568	1915.....	14,895	554,938	12,231,439
1905*.....	9,413	139,200	*	1916.....	32,077	1,086,249	48,498,078
1906*.....	1,154	23,800	*	1917.....	116,439	1,323,985	64,655,713
1907*.....	1,573	49,100	*	1918.....	121,200	1,228,195	63,026,464
1908*.....	452	3,215	*	1919.....	135,535	1,049,493	59,959,709

*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 its production has been recorded on the same basis.

The production of refined zinc at Trail in 1919 was 12,326 tons, as against 12,574 tons in 1918, 9,985 tons in 1917, and 2,974 tons in 1916, or a total of 37,859 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

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: three-quarter 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 duty 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.

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.

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

Prices.—The price of zinc showed very slight fluctuations during 1919, varying from 6½ cents early in the year to 8½ cents in December, the average for the year being 7.338 cents per pound.

Average Price of Spelter at New York*

(In cents per pound)

Month	1912	1913	1914	1915	1916	1917	1918	1919
January.....	6-442	6-931	5-262	6-386	16-915	9-619	7-836	7-272
February.....	6-490	6-239	5-377	8-436	18-420	10-045	7-814	6-623
March.....	6-626	6-078	5-250	8-541	16-846	10-300	7-461	6-500
April.....	6-633	5-641	5-113	10-012	16-695	9-459	6-890	6-464
May.....	6-679	5-406	5-074	14-781	14-276	9-362	7-314	6-429
June.....	6-877	5-124	5-000	21-208	11-752	9-371	8-021	6-901
July.....	7-116	5-278	4-920	19-026	8-925	8-643	8-688	7-873
August.....	7-028	5-658	5-568	12-781	8-730	8-360	8-985	7-789
September.....	7-454	5-694	5-380	13-440	8-990	8-136	9-442	7-510
October.....	7-426	5-340	4-909	12-800	9-829	7-933	8-801	7-823
November.....	7-371	5-229	5-012	15-962	11-592	7-847	8-491	8-177
December.....	7-162	5-154	5-592	15-391	10-669	7-685	8-163	8-700
Year.....	6-943	5-648	5-213	13-230	12-804	8-901	8-159	7-338

*From the "Engineering and Mining Journal," N. Y., Jan. 17, 1920.

Average Prices of Spelter, Ordinary Brands, in London*

(In pounds sterling per long ton)

Month	1912	1913	1914	1915	1916	1917	1918	1919
January.....	26 9 11	25 19 1	21 6 0	30 16 1	83 12 5	48 8 3	52 0 0	50 15 11
February.....	26 6 5	25 4 3	21 7 6	39 16 4	93 10 11	54 4 6	52 0 0	42 11 6
March.....	25 19 11	24 11 4	21 7 7	44 2 7	90 1 9	54 10 4	52 0 0	37 10 3
April.....	25 8 11	25 2 4	21 10 2	49 17 9	94 1 8	52 18 11	52 0 0	35 18 3
May.....	25 11 2	24 10 4	21 5 9	67 19 0	89 11 4	52 0 0	52 0 0	35 13 9
June.....	25 11 11	21 19 10	21 6 0	100 12 3	63 16 4	52 0 0	52 0 0	36 19 6
July.....	25 13 1	20 11 2	21 6 7	97 5 0	48 7 6	52 0 0	52 0 0	42 3 10
August.....	26 1 2	20 14 0	20 0 9	67 15 9	47 19 7	52 0 0	52 0 0	39 16 9
September.....	26 17 0	21 3 10	25 14 0	67 17 9	48 15 8	52 0 0	52 0 0	41 8 5
October.....	27 5 10	20 13 9	23 13 6	66 10 11	52 4 4	52 0 0	52 0 0	43 17 12
November.....	26 14 3	20 14 4	24 14 10	85 6 4	55 0 5	52 0 0	52 7 7	46 17 3
December.....	26 0 4	21 6 8	27 6 10	82 4 1	54 5 9	52 0 0	54 0 0	53 9 3
Year.....	26 3 3	22 14 3	23 6 8	66 13 8	68 8 11	52 3 6	52 3 11	42 5 3

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

Exports and Imports.—The exports of zinc ores in 1919 were reported by the Customs Department as 6,630 tons, valued at \$296,212, or an average of \$44.68 per ton. The exports of metallic zinc were 7,693,800 pounds (3,847 tons), valued at \$701,249, or an average of 9.11 cents per pound.

The exports of zinc ores in 1918 were 10,545 tons, valued at \$476,791, or an average of a little over \$45 per ton.

In 1917 the exports of ore, which are given separately for nine months only, were 5,972 tons, valued at \$320,296.

The imports of zinc in pigs, sheets, etc., in 1919 amounted to 23,805,630 pounds, valued at \$1,822,376, and with a metal content of 20,109,717 pounds. There were also manufactures of zinc valued at \$43,155.

The imports of brass, which alloy contains about 30 per cent zinc, were valued at \$697,996, and the manufactures of brass were valued at \$3,964,339.

The imports in 1918 were: (a) zinc in pigs, sheets, as spelter, zinc white, etc., 31,309,236 pounds, valued at \$2,718,850, with a metal content of 27,717,614 pounds; and (b) manufactures of zinc valued at \$85,177. The imports of brass were valued at \$993,574 and the manufactures of brass at \$3,654,298.

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, 1917-19

Zinc and Zinc Products	1917			1918			1919		
	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.....	2,975,700	450,161	2,975,700	3,536,000	447,090	3,536,000	962,500	86,459	962,500
Zinc, as spelter.....	17,139,600	1,686,568	17,139,600	10,376,700	801,477	10,376,700	4,993,944	355,528	4,993,944
Zinc, white (80% Zn.).....	16,039,236	1,301,405	12,331,389	16,693,590	1,396,392	13,355,059	16,657,168	1,254,958	13,325,734
Zinc, dust (90% Zn.).....	547,158	91,699	492,442	306,195	42,939	275,575	658,808	86,169	592,927
Zinc, sulphate and chloride of (44% Zn.).....	430,751	32,395	189,530	396,517	30,902	174,467	533,210	39,262	234,612
Total.....	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)	23,805,630	1,822,376	20,109,717 (10,054.9 tons)
Zinc, manufactures of.....		79,044			85,177			43,155	
Grand total.....		3,641,272			2,804,027			1,865,531	
Brass, in blocks, pigs and ingots (30% Zn.).....	1,191,300	307,740	357,390	2,025,200	441,574	607,560	593,000	127,528	177,900
Brass, old and scrap (30% Zn.).....	1,192,700	279,032	357,810	1,102,500	198,383	330,750	1,803,200	216,305	540,960
Brass, tubing (30% Zn.).....	1,053,010	431,277	315,903	512,454	198,819	153,736	742,127	282,897	222,638
Brass, plain wire (30% Zn.).....	525,947	259,200	157,784	348,482	154,798	104,545	169,226	71,266	50,768
Total.....	3,962,957	1,277,249	1,188,887 (594.4 tons)	3,988,637	993,574	1,196,591 (598.29 tons)	3,307,553	697,996	992,266 (496.1 tons)
Brass, bars and rods.....		493,859			192,533			309,267	
Brass, strips, sheets or plates.....		354,908			192,287			306,359	
Brass, wire cloth n.o.p.....		454,163			485,798			392,557	
Brass, cup for manuf. of shells.....		442,599			776,135			201,975	
Brass, caps for electric batteries.....		13,265			6,409			5,779	
Brass, hand-pumps.....		41,325			37,371			22,629	
Brass, nails, tacks, etc.....		11,023			949				
Brass, other manufactures, n.o.p.....		2,240,268			1,962,766			2,027,777	
Total.....		4,051,410			3,654,298			3,266,343	
Grand total.....		5,328,659			4,647,872			3,964,339	

Imports of Zinc in Blocks, Pigs, etc.

Calendar Year	In blocks, pigs and sheets		As spelter		As manufactures of zinc	Seamless tubing	
	Pounds	Value	Pounds	Value	Value	Pounds	Value
1907.....	3,013,000	\$ 198,570	5,843,000	\$ 348,810	\$ 21,812	670	\$ 53
1908.....	2,427,300	130,689	5,478,000	254,225	14,577		
1909.....	3,528,300	199,016	12,061,500	592,148	16,073		
1910.....	3,186,000	191,051	10,908,400	561,170	21,829		
1911.....	3,367,800	206,859	11,699,600	654,097	30,362		
1912.....	10,009,500	617,836	11,784,500	686,585	46,336		
1913.....	4,722,600	291,368	12,605,100	661,207	54,898		
1914.....	3,160,900	189,785	10,845,400	551,031	36,355		
1915.....	1,653,700	226,104	14,265,700	1,784,471	21,711	100	27
1916.....	1,624,600	267,750	13,214,800	1,873,605	48,101		
1917.....	2,975,700	450,161	17,139,600	1,686,568	79,044		
1918.....	3,536,000	447,090	10,376,700	801,477	85,177		
1919.....	962,500	86,459	4,993,944	355,528	43,155		

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

Calendar Year	Zinc white		Zinc dust		Zinc, sulphate and chloride of	
	Pounds	Value	Pounds	Value	Pounds	Value
1910.....	8,496,399	\$ 312,779	97,461	\$ 4,859	237,466	\$ 6,470
1911.....	8,537,498	314,194	86,242	5,718	414,500	15,930
1912.....	10,505,944	425,714	308,239	18,944	941,780	29,104
1913.....	12,682,126	525,643	412,294	26,403	634,634	17,424
1914.....	9,445,397	389,796	362,109	34,295	352,715	9,390
1915.....	11,368,569	656,132	503,143	70,823	379,545	16,090
1916.....	14,171,673	1,314,629	691,704	162,186	297,061	24,306
1917.....	16,039,236	1,300,621	547,158	91,699	430,751	32,395
1918.....	16,693,324	1,396,392	306,195	42,989	396,517	30,902
1919.....	16,657,168	1,284,958	658,808	86,169	533,210	39,262

Consumption.—The table of imports shows that in 1919, 10,054.9 tons of zinc were imported as zinc and zinc products, with also 496.1 tons of zinc in brass and approximately 900 tons as zinc contents of manufactures of zinc and brass, or a total of 11,451 tons, which added to the 12,326 tons of zinc refined in Canada, the output of the Trail refinery, would give a total of 23,777 tons. If we deduct the 3,847 tons of zinc exported we get 19,930 tons as the Canadian consumption of zinc.

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 of steel, copper, and lead, that there have been other imports besides those recorded under the usual classification, and that the actual consumption during the years of the war was greater than the above estimates. Information from other sources would bring the consumption to about 41,000 tons for 1917.

There is at present in Canada only one company operating an electrolytic zinc plant, that of the Consolidated Mining and Smelting Company of Canada, Ltd., at Trail, B.C.

Two other experimental plants were operated during the war only. They were:—
 (a) The plant of the Electro Zinc Company, which used the Watt's process and was designed to recover refined zinc from the ores of Notre-Dame-des-Anges, Que.

(b) The plant of the French Complex Ore Reduction Company, which used the French process and was established near Nelson, B.C.

The Trail plant of the Consolidated Mining and Smelting Company 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 in 1918 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, payable 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.

No bounties were paid until 1919, when \$108,563.32 were paid on 10,107,704 pounds of zinc, covering the period from June, 1918, to March, 1919. During the fiscal year ending March 31, 1920, the amount of bounty paid on zinc was \$249,246.04.

Production of Zinc in British Columbia by Districts, 1914-19*

(Contents of ore shipped in pounds)

	1914	1915	1916	1917	1918	1919
Kootenay, East—						
Fort Steele division.....		180,000	14,840,000	20,715,090	26,704,806	46,460,703
Windermere—Golden.....		311,719	210,000	18,000		
Kootenay, West—						
Ainsworth.....	280,000	678,940	625,971	918,601	640,991	36,785
Nelson.....	332,003	3,127,209	3,470,036	982,309		
Slocan.....	7,254,464	8,684,572	17,854,357	18,789,573	14,107,682	10,015,624
Revelstoke, etc.....				33,279	6,325	
Boundary-Yale—				27,564		
Kamloops, etc.....						
Cariboo—			168,616	364,097	313,112	224,539
Omineca.....						
	7,866,467	12,982,440	37,168,980	41,848,513	41,772,916	56,737,651

* From the Minister of Mines Report, British Columbia.

Zinc Reduction Plants in the United States and Canada (a)

PLANTS WITH ORDINARY RETORTS

Operating company. (A=acid plant; not necessarily at the smelter)	Location	Retorts, June 30, 1919	Retorts, at close of 1919
<i>Arkansas</i>			
Arkansas Zinc & Smelting Corporation.....	Van Buren.....	3,200	3,200
Athletic Mining & Smelting Co.....	Fort Smith.....	2,496	2,496
Fort Smith Spelter Co.....	Fort Smith.....	2,560	2,560
<i>Colorado</i>			
United States Zinc Co.....	Pueblo.....	2,208	2,208
<i>Illinois</i>			
American Zinc Co. of Illinois (A).....	Hillsboro.....	4,864	4,864
Collinsville Zinc Smelter.....	Collinsville.....		
Eagle-Picher Lead Co. (A).....	Hillsboro.....	3,200	3,200
Granby Mining & Smelting Co. (A).....	East St. Louis.....	5,620	5,620
Hegeler Zinc Co. (A).....	Danville.....	5,400	5,400
Illinois Zinc Co. (A).....	Peru.....	5,520	5,520
Matthiesson & Hegeler Zinc Co. (A).....	La Salle.....	6,148	6,132
Missouri Zinc Co.....	Beckemeyer.....	352	352
Mineral Point Zinc Co. (A).....	Depue.....	9,068	9,068
National Zinc Co. (A).....	Springfield.....	(b)	
Sandoval Zinc Co.....	Sandoval.....	(b)	672
<i>Indiana</i>			
Grasselli Chemical Co. (A).....	Terre Haute.....	4,200	4,200
<i>Kansas</i>			
American Zinc, Lead & Smelting Co.....	Caney.....	4,352	3,712
Edgar Zinc Co.....	Cherryvale.....	4,984	4,984
Owen Zinc Co.....	Caney.....	(b)	
Pittsburg Zinc Co.....	Pittsburg.....	(b)	
Prime Western Spelter Co.....	Iola.....	2,320	2,360
Weir Smelting Co.....	Weir.....		

Zinc Reduction Plants in the United States and Canada (a)—Concluded

PLANTS WITH ORDINARY RETORTS

Operating Company. (A=acid plant; not necessarily at the smelter)	Location	Retorts,	
		June 30, 1919	at close of 1919
<i>Missouri</i>			
Missouri Zinc Smelting Co.....	Rich Hill.....	(b)	
Nevada Smelting Co.....	Nevada.....	(b)	
<i>Oklahoma</i>			
Bartlesville Zinc Co.....	Bartlesville.....	5,184	5,184
Bartlesville Zinc Co.....	Blackwell.....	9,600	9,600
Bartlesville Zinc Co. (Lanyon-Starr plant).....	Bartlesville.....	3,456	3,456
Eagle-Picher Lead Co.....	Henryetta.....	4,000	4,000
Kusa Spelter Co.....	Kusa.....	5,360	4,000
National Zinc Co.....	Bartlesville.....	4,256	4,256
Oklahoma Spelter Co.....	Kusa.....	(b)	
Quinton Spelter Co.....	Quinton.....	2,016	2,016
Tulsa Fuel & Manufacturing Co.....	Collinsville.....	6,232	6,232
United States Smelting Co.....	Checotah.....	(b)	
United States Zinc Co.....	Sand Springs.....	6,680	6,680
Victory Metal Co.....	Henryetta.....	3,000	3,000
Western Spelter Co.....	Henryetta.....	3,448	3,448
<i>Pennsylvania</i>			
American Steel & Wire Co. (A).....	Donora.....	8,816	8,208
American Zinc & Chemical Co. (A).....	Langeloth.....	7,296	7,296
New Jersey Zinc Co. (of Pennsylvania).....	Palmerton.....	7,192	7,192
<i>West Virginia</i>			
Clarksburg Zinc Co.....	Clarksburg.....	(b)	
Grasselli Chemical Co. (A).....	Clarksburg.....	5,760	5,760
Grasselli Chemical Co. (A).....	Meadowbrook.....	8,472	8,400
United Zinc Smelting Corporation (A).....	Moundsville.....	1,728	1,728

(a) Includes distillation plants working on ore alone, on ore and drosses, and on drosses alone. These tables are from the report on the Mineral Resources of the United States, and have been compiled by C. E. Siebenthal. (b) Idle.

NOTE.—The Grasselli Chemical Co. operates acid plants in connexion with its zinc-roasting furnaces at Terre Haute and Grasselli, Ind.; Cleveland, Canton, and Lockland (near Cincinnati) Ohio, and Newcastle, Pa., and smelts the roasted zinc concentrates at the smelters at Terre Haute, Ind., and Clarksburg and Meadowbrook, W. Va. The Prime Western Spelter Co. operates roasting furnaces and an acid plant at Tiltonsville, Ohio. The National Zinc Co. has roasting furnaces and an acid plant at Argentine, Kans.

PLANTS WITH LARGE RETORTS (a)

Operating Company	Location	Retorts at the close of	
		1918	1919 ^(c)
Eastern Zinc Refining Co.....	Brooklyn, N. Y.....	16	(b)
John Finn Metal Works.....	San Francisco, Calif.....	12	(c) 12
Michael Hayman & Co.....	Buffalo, N. Y.....	12	(b)
Trenton Smelting & Refining Co.....	Trenton, N. J.....	80	80
Joseph G. Kessler & Co.....	Brooklyn, N. Y.....	8	(b)

(a) Large graphite retorts, yielding 600-800 pounds of spelter per charge. Extract from report on the Mineral Resources of the United States.

(b) Idle.

(c) Used in making zinc dust.

ELECTROLYTIC ZINC PLANTS*

(Exp., experimental work; Op., commercial operation)

Company	Location of Plant	Present daily capacity	Development of Industry 1919
<i>United States</i>			
Anaconda Copper Mining Co.....	Anaconda, Mont.....	25 tons	(a)
Anaconda Copper Mining Co.....	Great Falls, Mont.....	150 tons	Op.
Bully Hill Copper Co.....	Bully Hill, Calif.....	Nominal	(a)
Butters Electrolytic Zinc Syndicate.....	Martinez, Calif.....	Nominal	Exp.
Ducktown Copper, Sulphur & Iron Co. (Ltd.).....	Isabella, Tenn.....	1 ton	(a)
Electrolytic Zinc Co.....	Baltimore, Md.....	10 tons	(b)
Illinois Zinc Co.....	Peru, Ill.....	Nominal	Op.
Judge Mining & Smelting Co.....	Park City, Utah.....	15 tons	Op.
Mammoth Copper Mining Co.....	Kennett, Calif.....	25 tons	(a)
River Smelting & Refining Co.....	Keokuk, Iowa.....	10 tons	Op.
Western Chemical Manufacturing Co.....	Denver, Colo.....	10 tons	Op.
<i>Canada</i>			
Consolidated Mining & Smelting Co. (Ltd.).....	Trail, British Columbia.....	50 tons	Op.
Zinc Co. (Ltd.).....	Shawinigan Falls, Quebec.....	5 tons	(a)
French Complex Ore Reduction Co.....	Nelson, British Columbia.....	Nominal	(a)

* From the report on the Mineral Resources of the United States, April 1920.

(a) Idle. (b) Dismantled.

World's Production of Zinc, 1913-19

(In metric tons, by countries where smelted)

	1913 <i>a</i>	1913	1914	1915	1916	1917	1918	1919
Australia.....	3,724	4,187	5,094	5,393	5,362	4,769	5,712	
Austria.....	21,707	19,508						
Belgium.....	197,703	204,220	145,925	51,660	22,930	10,290	9,245	17,000
Canada.....					2,698	9,058	11,139	11,182
China (exports).....		923	315	2,328	774	432	127	
France.....	64,103	67,890						
Germany.....	283,113	283,113			196,500	180,500	236,000	
Great Britain.....	59,146	66,243	50,000	45,000	60,000	50,000	50,000	35,000
Holland.....	24,323		16,453	11,130				
Italy.....					258	367	1,188	
Japan.....		900	5,881	21,132	33,994	54,716	44,500	20,000
Norway.....	9,287	9,237	19,000	25,000	32,000	22,000		
Russia.....	7,610	10,500	6,300	2,000	1,100			
Siberia.....					213	569		
Spain.....	6,920	6,003	11,733	8,117	8,523	10,155	15,900	
Sweden.....		2,115	2,300	8,588	9,997	7,979	4,098	
Tasmania.....						49	3,883	
United States.....	320,283	314,502	352,049	444,089	606,315	607,433	446,707	422,519
	997,919							

a Statistics from the Metallgesellschaft for 1913, given for comparison.

The foregoing statistics of the world's production of zinc, though incomplete, show approximately the foreign production during the war. There is always a possibility of duplication in figures showing European production, for some countries send crude zinc of poor quality to other countries for refining. Furthermore, secondary zinc is included in the figures showing the foreign production, so that to put the United States on an equal footing in the statistics it would be necessary to include in its production the domestic output of secondary zinc. (From U. S. Geol. Survey Report.)