

CANADA
DEPARTMENT OF MINES

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

MINES BRANCH

JOHN MCLEISH, ACTING DIRECTOR

THE
PRODUCTION OF COPPER, GOLD, LEAD, NICKEL,
SILVER, ZINC, AND OTHER METALS

IN

CANADA

During the Calendar Year

1920

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1921

EXPLANATORY NOTE

The accompanying report on "The Production of Copper, Gold, Lead, Nickel, Silver, Zinc, and Other Metals in Canada, during the Calendar Year 1920," has been compiled by Arthur Buisson, B.Sc., Mining Engineer in the Division of Mineral Resources and Statistics.

Together with similar reports on "Iron and Steel," "Coal and Coke," this report is supplementary to, but not included—as in 1917 and previous years—in the Annual Report on the Mineral Production of Canada.

August 22, 1921.

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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, 1920, the imports of alumina were 57,414.3 tons, valued at \$1,889,064, as against 29,301.6 tons, valued at \$1,565,264, in 1919.

The imports of aluminium in ingots, bars, tubes, etc., were in 1920, 1,870,736 pounds, or 935.4 tons, valued at \$633,733, besides manufactures of aluminium valued at \$589,106, or a total value of \$1,222,839; compared with 768,973 pounds, or 379.5 tons, valued at \$247,565, besides manufactures of aluminium valued at \$347,129, or a total value of \$594,694 in 1919.

The exports of aluminium in ingots, bars, tubes, etc., in 1920, amounted to 19,716,300 pounds, or 9,858 tons, valued at \$6,094,628, together with manufactures of aluminium valued at \$175,057; as against 14,576,300 pounds, or 7,288 tons, valued at \$4,455,031, and manufactures valued at \$59,339 in 1919.

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.....	13,607,200	372,069	1919.....	58,603,100	1,565,264
1912.....	22,400,500	448,061	1920.....	114,823,600	1,889,064

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.....	3,796,353	745,855	15,775	6,898	103,143	4,455	860,351
1915.....	2,661,117	630,504	6,238	2,998	83,281	5,452	722,235
1916.....	1,350,485	523,564	5,018	3,082	95,408	49,044	671,098
1917.....	698,046	316,591	4,906	3,089	137,636	103,165	560,481
1918.....	279,858	104,950	7,043	4,461	187,664	86,910	383,985
1919.....	749,455	237,475	19,518	10,090	252,065	95,064	594,694
1920.....	1,850,687	623,232	20,049	10,501	304,488	194,618	222,839

(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	1913.....	13,015,000	1,762,214	8,203
1906.....	4,521,486	899,113	2,244	1914.....	14,510,800	2,364,907	5,571
1907.....	5,478,203	1,109,353	1,400	1915.....	18,680,800	3,333,726	620,562
1908.....	1,713,800	399,785	1,727	1916.....	18,425,300	5,201,066	26,780
1909.....	6,134,500	918,195	3,453	1917.....	22,324,600	7,620,953	17,165
1910.....	7,722,400	1,160,242	3,741	1918.....	21,616,500	7,223,570	197,670
1911.....	4,990,100	747,587	1,555	1919.....	14,576,300	4,455,031	59,339
1912.....	18,285,700	2,002,363	10,898	1920.....	19,716,300	6,094,628	175,057

Prices.—There was little fluctuation in the price of aluminium in New York during 1919 and 1920. In 1920 the price varied from 32 cents to 35 cents per pound. The average price during the year 1919 was 32.14 cents.

Average Monthly Prices of Ingot Aluminium¹

(At New York in cents per pound)

	1914	1915	1916	1917	1918	1919	1920
January.....	18-31	19-08	55-00	60-77	37-5	33-00	32-00
February.....	18-31	19-22	58-00	59-00	37-0	32-26	31-33
March.....	18-50	19-00	60-25	59-00	32-0	29-81	31-50
April.....	18-16	18-88	59-50	59-02	32-0	30-67	31-61
May.....	17-95	22-03	59-00	59-84	32-0	32-22	31-95
June.....	17-75	30-00	61-50	60-00	33-0	32-83	32-00
July.....	17-66	32-38	60-20	55-48	33-0	32-57	32-00
August.....	19-88	34-50	60-00	48-88	33-0	32-23	32-21
September.....	19-94	47-75	61-88	43-64	33-0	32-50	31-44
October.....	18-50	50-00	65-05	38-90	33-0	32-50	29-13
November.....	18-00	57-75	65-12	37-22	33-0	32-50	27-80
December.....	18-96	57-13	63-00	36-40	33-0	32-48	23-83
	18-63	33-08	60-71	51-59	33-46	32-14	30-61

¹From the "Engineering and Mining Journal," 1913 to 1918 inclusive; and from the "Metals Statistics" for 1919 and 1920.

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.

No shipment of antimony either as ore, concentrate, or regulus has been reported during the last three years, although exports of small quantities of ore for the years 1917 and 1918 are shown in the customs records.

The imports of antimony and antimony salts were in 1920, 1,079,316 pounds, valued at \$97,288, as against 1,041,850 pounds, valued at \$89,805; in 1919.

There were no exports of antimony ore in 1920, whereas in 1919 the exports amounted to 56 tons, valued at \$3,420, as against 26 tons, valued at \$1,430, in 1918.

Shipments of Antimony Ore and Regulus

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.....				
1920.....				

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

(b) Exports.

Exports and Imports of Antimony

Calendar Year	Exports of antimony ore		Imports					
			Antimony or regulus of		Antimony salts		Total imports	
	Tons	Value	Pounds	Value	Pounds	Value	Pounds	Value
1907.....	1,327	\$ 37,807	416,512	\$ 69,447	117,592	\$ 19,083	534,104	\$ 88,530
1908.....	148	5,443	396,904	28,509	29,832	2,452	426,736	30,961
1909.....	4	120	551,354	37,362	40,176	4,369	591,530	41,731
1910.....	239	14,095	388,952	25,296	94,330	9,152	483,282	34,443
1911.....	57	4,946	561,046	36,405	18,420	2,418	579,466	38,823
1912.....			998,045	60,456	55,683	7,197	1,053,728	67,653
1913.....			667,050	49,498	23,649	2,421	690,699	51,829
1914.....			648,516	47,498	45,634	10,217	694,150	57,715
1915.....	1,149	82,990	1,962,194	344,918	67,956	10,320	2,030,150	355,238
1916.....	794	48,158	796,728	208,450	41,985	13,891	838,713	222,341
1917.....	774	50,476	332,137	61,732	12,292	6,295	344,429	68,027
1918.....	26	1,430	648,882	92,678	34,921	18,986	683,893	111,664
1919.....	56	3,420	1,022,787	81,257	19,063	8,548	1,041,850	89,805
1920.....			1,059,249	86,803	20,067	10,485	1,079,316	97,283

Prices.—During 1920 the market for antimony in China was not a question of cost of production or consumption demand. Price fluctuations were based chiefly on China exchange. Chinese miners and smelters are paid for their product in gold, and have to pay for their labour and raw materials in silver in the form of taels. Partly as a result of the business collapse in Japan early in the year, China has entered a period of depression, with great distress to her industries, especially affecting those whose products are not consumed at home, such as antimony.

The strong tone with which the New York market closed the year 1919 continued into 1920, with supplies scarce and a strong demand. The price of antimony rose in January from 9.75 cents to 11¼ cents per pound and in February to a maximum of 11½ cents. Then the decline set in gradually with quotations in December at about 5 cents per pound.¹

¹ Quotation from the annual review number of the "Eng. and Mg. Jour." Jan., 1921.

Average Prices of Antimony*

(In cents per pound)*

	1915	1916	1917	1918	1919	1920
	Ordinaries	Ordinaries	Ordinaries	Ordinaries	Ordinaries	Ordinaries
January.....	15.85	42.45	17.20	14.281	7.43	10.58
February.....	18.21	44.31	29.80	13.823	7.17	11.59
March.....	22.13	44.75	32.80	13.091	6.80	11.06
April.....	24.88	42.06	34.04	12.536	6.79	10.50
May.....	35.30	31.60	25.20	12.846	7.66	9.66
June.....	37.69	20.05	19.51	13.055	8.44	8.29
July.....	38.13	14.70	15.83	13.197	8.90	7.50
August.....	33.00	11.53	15.06	14.000	8.96	7.18
September.....	28.63	11.81	14.94	14.154	8.63	7.11
October.....	31.45	12.70	14.75	13.319	8.71	6.72
November.....	38.88	13.84	13.91	8.771	9.11	6.11
December.....	39.25	14.59	15.06	7.915	9.63	5.53
	30.28	25.37	20.69	12.581	8.19	8.40

*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 in 1920 of cobalt contained in smelter products shipped and cobalt residues exported amounted to 546,023 pounds, which if valued at \$2.50 per pound would be worth \$1,365,058; as against 530,371 pounds at \$2.50 per pound valued at \$1,325,928 in 1919.

Production of Cobalt

Calendar year	Pounds	Value	Average price per pound	Calendar year	Pounds	Value	Average price per pound
		\$				\$	\$
1912.....	663,093			1917.....	1,079,572	1,727,315	1.60
1913.....	865,937			1918.....	737,157	1,842,893	2.50
1914.....	871,891			1919.....	530,371	1,325,928	2.50
1915.....	504,212			1920.....	546,023	1,365,058	2.50
1916.....	840,536	924,590	1.10				

The shipments as reported by the producers included in 1920: (a) 166,375 pounds of metallic cobalt, valued at \$389,708; (b) 536,457 pounds of cobalt oxide, valued at \$1,170,288; and (c) 300 pounds of cobalt compounds, valued at \$600, making a total valuation of \$1,560,596.

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.

Shipments of Metallic Cobalt and Cobalt Compounds

Calendar Year	Metallic Cobalt		Cobalt-oxide		Other cobalt compounds	Total valuation
	Pounds	Value	Pounds	Value	Value	Value
1912.....		\$	257,677	\$ 128,843	\$ 163,988	\$ 292,831
1913.....			660,079	525,028	90,266	615,294
1914.....			899,027	571,710	79,995	651,705
1915.....	211,610	197,994	423,717	338,273	(a)	536,367
1916.....	215,215	200,888	670,760	542,341	(a)	743,229
1917.....	393,773	616,633	802,448	1,104,500	740,032	2,461,165
1918.....	294,476	713,072	476,053	760,121	936,139	2,210,350
1919.....	113,943	220,676	429,359	611,909	34,308	866,893
1920.....	166,375	389,708	536,457	1,170,288	600	1,560,596

(a) Value not given in 1915 and 1916.

The total amount of cobalt ores and residues treated in 1920 in the southern Ontario smelters and including that exported, amounted to 8,988 tons, with a cobalt content of 1,200,040 pounds, or an average cobalt content of 6.7 per cent, as against 9,084 tons, with a cobalt content of 1,070,826 pounds, or an average cobalt content of 5.9 per cent in 1919.

Ores and Residues of Cobalt treated in Southern Ontario Smelters

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	1920.....	8,988	1,200,040	6.7
1916.....	8,127	1,254,953	7.7				

(a) Figures are not available.

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	104,420	1915.....	(b) 206	383,261
1908.....	1,224	111,118	1916.....	(b) 400	805,014
1909.....	1,533	94,965	1917.....	(b) 337	1,138,190
1910.....	1,093	54,699	1918.....	(b) 380	1,640,310
1911.....	852	170,890	1919.....	(b) 298	1,019,479
			1920.....		
			Total.....	9,628	7,048,189

(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	328,563	288,614
1917.....	7,964	418,703	533,459	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
1920.....							

Cobalt—Exports

Year	Metallic		Oxides and salts		Alloys		General ore	
	Lbs.	Value	Lbs.	Value	Lbs.	Value	Lbs.	Value
		\$		\$		\$		\$
1916.....								712,880
1917.....	232,951	868,843	(a)411,503	468,410	50,974	205,942		1,642,945
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
1920.....	304,382	493,425			10,219	43,970		

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

Imports into the United States of Cobalt*

Year	Cobalt, cobalt ore and zaffer						Cobalt oxide		
	Pounds		Year	Pounds		Year	Pounds	Value	
		\$			\$				
1909.....	(a) 12,132	11,696	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.....	154,672	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	1920.....	156,862	331,672	1918.....	208,596	291,699	
						1919.....	131,424	184,751	
						1920.....	202,704	399,605	

*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.

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 resinate 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 from 1916 to 1920. No New York quotations are available for 1918, 1919 and 1920, but the metal as produced in the refineries of Ontario obtained a price of around \$2.50 per pound.

The price of cobalt on the London market was quoted at 10s. 6d. during the first quarter of 1920, at 14s. for the next five months, and 30s. per pound for the last four months of the year.

Monthly Average Prices of Cobalt in London*

(In shillings per pound of metal)

Month	1914	1915	1916	1917	1918	1919	1920
January.....		6/9	7/3	7/	10/-	12/6-13/-	10/6
February.....		7/-	7/3	7/6	10/-	12/6-13/-	10/6
March.....		7/-	7/3	8/-	10/-	12/6-13/-	10/6
April.....		7/-	7/3	8/-	10/-	12/6-13/-	14/-
May.....		7/-	7/3	10/-	10/-	12/6-13/-	14/-
June.....		7/-	6/-	10/-	10/-	12/6-13/-	14/-
July.....		7/6	6/-	10/-	10/-	12/6-13/-	14/-
August.....		7/6	6/-	10/-	12/6	12/6-13/	14/-
September.....		7/6	6/-	10/-	12/6	12/6-13/	30/-nom.
October.....		7/6	7/-	10/-	12/6	12/6-13/	30/-
November.....		7/6	7/-	10/-	12/6	10/6	30/-
December 31.....		7/3	7/-	10/-	12/6	10/6	30/-
December 31.....		7/3					

*Published by The Metal Information Bureau, Limited, 7 East India Ave., London, E.C.

Bounties.—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

COPPER

The production of copper in Canada in 1920 amounted to 81,600,691 pounds, which at the average price of copper for the year in New York—17.456 cents per pound—would be worth \$14,244,217; as against 75,053,581 pounds valued at \$14,028,265, or an average price of 18.691 cents per pound, being an increase of 8.7 per cent in quantity and 1.5 per cent in value.

The production in 1920 included: (a) 31,481,884 pounds contained in blister copper partly exported and partly refined in Canada; (b) 32,000,079 pounds contained

¹Mines 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.

²Report of Ontario Bureau of Mines, Vol. XXVII, Part III, Sec. 1. “Cobalt, its Occurrence, Metallurgy, Uses and Alloys,” by Chas. W. Drury. 1919.

in nickel-copper matte, partly exported and partly refined in Canada; (c) 44,766 pounds, contained in copper sulphate; and (d) 18,073,962 pounds, the estimated recoveries from ores and concentrates exported for smelting and refining.

The production 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.

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 Company. This company completed early in 1921 the construction of a copper rod mill, with a daily capacity of 150 tons of wire rod. The British America Nickel Corporation produced refined copper at the plant at Deschenes for the first time in 1920. The production of refined copper in 1920 amounted to 2,590 tons, as against 3,467 tons in 1919, 3,809 tons in 1918, 3,901 tons in 1917, and 483 tons in 1916.

Production of Copper

alendar 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.....	117,150,023	31,867,150	27.202
1900.....	18,937,138	3,065,922	16.19	1917.....	109,227,332	29,687,989	27.180
1901.....	37,327,019	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
				1920.....	81,600,691	14,244,217	17.456

*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 55.5 per cent of the total, as against 59.3 per cent in 1919; Ontario 39.3 per cent, as against 32.5 per cent in 1919; Quebec 1.1 per cent, as against 3.6 per cent in 1919; Manitoba 3.8 per cent, as against 4.4 per cent in 1919; and the Yukon 0.3 per cent, as against 0.2 per cent in 1919.

Production of Copper by Provinces

Province	1918		1919		1920	
	Pounds	Value	Pounds	Value	Pounds	Value
		\$		\$		\$
Quebec.....	5,869,649	1,445,577	2,691,695	503,105	880,638	153,724
Ontario.....	47,074,475	11,593,502	24,346,623	4,550,627	32,059,993	5,506,392
Manitoba.....	2,330,751	576,234	3,348,000	625,775	3,062,577	534,604
British Columbia.....	62,865,681	15,482,560	44,502,079	8,317,884	45,319,771	7,911,019
Yukon.....	619,878	152,603	165,184	30,874	277,712	48,478
Total.....	118,769,434	29,250,536	75,053,581	14,028,265	81,600,691	14,244,217

Percentage of Copper Production by Provinces

Province	1913	1914	1915	1916	1917	1918	1919	1920
Quebec.....	4.5	5.5	4.2	4.9	4.6	5.0	3.6	1.1
Ontario.....	33.6	38.2	39.1	38.4	39.2	39.6	32.5	39.3
Manitoba.....					1.2	2.0	4.4	3.8
British Columbia.....	59.5	54.4	56.2	54.3	52.8	52.9	59.3	55.5
Yukon.....	2.4	1.9	0.5	2.4	2.2	0.5	0.2	0.3
Total.....	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Prices.—Trade conditions were such in 1920 that the copper producers decided early in the year to reduce considerably their production. Large quantities of copper were exported from the United States to Europe during the first half of the year, but by August the trading had decreased to a great extent, and prices which had been around 18 cents since the beginning of the year, dropped to 16 cents in October, and declined again in November to 13.5 cents, closing the year at about 13 cents per pound.

Monthly Average Prices of Electrolytic Copper in New York

(In cents per pound)

Months	1914	1915	1916	1917	1918	1919	1920
January.....	14.223	13.641	24.008	28.673	23.500	(a)	18.918
February.....	14.491	14.394	26.440	31.750	23.500	16.763	18.569
March.....	14.131	14.787	26.310	31.481	23.500	14.856	18.331
April.....	14.211	16.811	27.895	27.935	23.500	15.246	18.660
May.....	13.996	18.506	28.625	28.788	23.500	15.864	18.484
June.....	13.603	19.477	26.601	29.962	23.500	17.610	18.065
July.....	13.223	18.796	23.865	26.620	25.904	21.604	18.576
August.....	*	16.941	26.120	25.380	26.000	22.319	18.346
September.....	*	17.502	26.855	25.073	26.000	21.755	18.144
October.....	*	17.636	27.193	23.500	26.000	21.534	15.934
November.....	11.739	18.627	30.625	23.500	26.000	19.758	14.257
December.....	12.801	20.133	31.890	23.500	(a)	18.295	13.188
Yearly average.....	13.602	17.275	27.202	27.180	24.628	18.691	17.456

*No quotations. (a) No market.

Monthly Average Prices of Standard Copper in London

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

Months	1914	1915	1916	1917	1918	1919	1920
January.....	64.304	60.756	88.083	131.921	110.000	92.238	118.095
February.....	65.259	63.494	102.667	137.895	110.000	78.700	120.138
March.....	64.276	66.152	107.714	136.750	110.000	76.821	109.533
April.....	64.747	75.096	124.319	133.842	110.000	77.300	103.025
May.....	63.182	77.600	135.457	130.000	110.000	77.767	96.750
June.....	61.336	82.574	112.432	130.000	110.000	83.062	87.864
July.....	60.540	76.011	95.119	128.409	119.913	99.576	90.148
August.....	*	68.673	110.283	122.391	122.000	97.300	93.935
September.....	*	68.915	113.905	117.500	122.000	100.767	96.381
October.....	*	72.601	122.750	110.000	122.000	103.418	93.327
November.....	53.227	77.744	134.659	110.000	122.000	98.894	84.807
December.....	56.841	80.773	145.316	110.000	118.447	103.708	75.702
Yearly average.....	61.524	72.532	116.059	124.892	115.530	90.796	97.480

*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 five years the export also included some refined copper produced at Trail, B.C., and in 1920 refined copper produced at Deschenes, Quebec, by the British America Nickel Corporation, Limited.

The exports of copper in 1920 were valued at \$15,877,306, and included: (a) copper in ore, matte, regulus, etc., 47,329,700 pounds, valued at \$5,918,782; (b) blister copper 38,198,900 pounds, valued at \$8,701,184; (c) copper black, coarse and in pigs, etc., 2,666,500 pounds, valued at \$710,978; (d) copper "old and scrap" 774,400 pounds, valued at \$113,265; and (e) copper wire and cable valued at \$433,097.

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.

Exports of Copper, 1910 to 1920

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	8,071,641	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	14,183,204	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
1920.....	47,329,700	5,918,782	2,666,500	710,978	774,400	113,265

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	9,086,479
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	22,642,690
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
1920.....	38,198,900	8,701,184	433,097	88,969,500	15,877,306

(a) Not given separately previous to April, 1919.

The imports of copper in 1920 were valued at \$10,836,206 and included: (a) copper ore and concentrate 1,220 tons, valued at \$57,640; (b) copper "old and scrap," 2,481,100 pounds valued at \$404,161; (c) copper in pigs, ingots or blocks 9,236,575 pounds valued at \$1,784,370; (d) copper in bars and rods 33,907,300 pounds valued at \$6,408,717; (e) copper in strips, tubing, wire, precipitate, etc., 2,905,207 pounds valued at \$998,461; (f) copper sulphate 2,365,535 pounds valued at \$192,900; and (g) other manufactures of copper valued at \$989,957.

The imports in 1919 were valued at \$7,147,783 and included: (a) copper ore and concentrate 1,684.6 tons, valued at \$78,983; (b) copper "old and scrap," 1,010,000 pounds valued at \$138,023; (c) copper in pigs, ingots or blocks 3,042,197 pounds valued at \$659,214; (d) copper in bars and rods 23,982,500 pounds valued at \$4,971,310; (e) copper in strips, tubing, wire, precipitate, etc., 2,285,812 pounds valued at \$694,842; (f) copper sulphate 1,874,801 pounds valued at \$150,388; and (g) other manufactures of copper valued at \$455,023.

Imports of Copper, 1919 and 1920

	1919		1920	
	Pounds	Value	Pounds	Value
Copper "ore and concentrates".....	*3,369,100	\$ 78,983	2,440,000	57,640
Copper, "old and scrap".....	1,010,000	138,023	2,481,100	404,161
Copper in pigs, ingots or in blocks.....	3,042,197	659,214	9,236,575	1,784,370
Copper in bars or rods when imported by manufacturers of trolleys, telegraph and telephone wires, electric wires and electric cables for use only in the manufacture of such articles in their own factories..	(a) 23,413,500	4,818,942	33,003,800	6,190,637
Copper in bars, and rods, in coils, or otherwise, in lengths, not less than 6 feet, unmanufactured.....	(b) 569,000	152,368	903,500	218,080
Copper, in strips, sheets or plates, not planished or coated, etc.....	1,649,300	461,438	1,716,300	554,840
Copper tubing in lengths not less than 6 feet and not polished, bent or otherwise manufactured.....	520,374	188,014	723,625	272,641
Copper rollers, for use in calico printing.....		209		
Copper and manufactures of:—				
Nails, tacks, rivets and burrs or washers.....	(d).....		(d).....	
Wire single or several covered with cotton, linen, silk, rubber or other materials including cable so covered.....		(c) 80,482		305,189
Wire, plain, tinned or plated.....	114,744	44,740	461,609	169,820
Wire cloth, etc.....		12,421		21,962
All other manufactures of, n.o.p.....		361,911		662,806
Copper, precipitate of, crude.....	50	20		13
Copper sulphate (blue vitriol).....	1,874,801	150,388		192,900
Copper sub-acetate of (verdigris).....	1,344	630	3,657	1,147
Total value.....		7,147,783		10,836,206

* Nine months only.

(a) Includes copper in bars, rods, in coils, etc., for the first five months of 1919.

(b) Imports previous to June 6, 1919, are included with those of copper in bars or rods, for trolleys, telephone wires, etc.

(c) Included with "other wire" under iron and steel, previous to April, 1919. Covers nine months only.

(d) Included with "Brass."

Imports of Copper, 1907 to 1920, 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 Manufac- tures					
	Pounds	Value	Pounds	Value	Pounds	Value		Value	Pounds	Value	Pounds	Value
		\$		\$		\$	\$		\$		\$	\$
1907.....	3,456,900	699,388	196,300	37,787	13,499,130	3,138,283	108,057	7,397	1,340	2,299,674	142,948	4,127,803
1908.....	2,360,900	353,301	127,700	12,821	12,150,850	1,765,415	88,715	4,209	557	2,768,123	131,057	2,351,866
1909.....	4,200,100	554,273	132,600	14,447	16,208,978	2,340,464	126,769	1,990	257	1,634,751	66,459	3,102,669
1910.....	4,640,500	609,111	273,700	31,070	25,322,906	3,579,270	150,322	4,847	595	1,925,557	77,782	4,448,150
1911.....	5,650,400	705,598	265,300	28,748	29,244,210	3,898,416	215,289	2,608	299	2,191,899	88,419	4,936,769
1912.....	5,121,800	806,705	400,500	56,748	35,198,208	5,776,003	305,680	5,703	570	2,105,419	101,650	7,047,356
1913.....	5,314,200	845,095	596,700	87,790	35,101,061	6,002,937	370,313	4,743	515	2,037,714	107,960	7,414,610
1914.....	3,733,300	507,499	127,800	15,717	22,419,715	3,460,106	219,449	2,017	328	1,143,039	53,802	4,256,901
1915.....	4,771,200	777,533	68,500	8,281	15,405,520	2,807,969	264,670	187	35	1,854,850	99,282	3,957,770
1916.....	3,446,300	904,505	96,700	20,777	22,041,087	6,207,116	234,421	9,942	719	1,803,655	198,542	7,566,080
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	10,015,5
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	26,266,918	5,665,502	455,023	50	20	1,874,801	150,388	7,147,783
1920*.....	9,236,575	1,784,370	2,481,100	404,161	36,808,834	7,406,018	989,957	18	13	2,365,535	192,900	10,836,206

*There are also imports of copper ore and concentrate and of sub-acetate of copper, which are not included in this table, and which were not given separately previous to April, 1919. The imports in 1919, which cover 9 months only were: copper ore, etc., 3,369,100 pounds valued at \$78,983, and sub-acetate of copper, 1,344 pounds valued at \$630. The imports in 1920 were: copper ore, etc., 2,440,000 pounds valued at \$57,640, and sub-acetate of copper, 3,657 pounds valued at \$1,147.

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.

Exports and Imports of Brass.—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 1920 were valued at \$6,337,775, and included brass in crude and manufactured form 5,235,335 pounds valued at \$1,097,121 and containing approximately 3,664,735 pounds of copper; and also other manufactures of brass valued at \$5,240,654.

The imports of brass in 1919 were valued at \$4,257,738, 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 \$3,559,742.

The exports of brass in 1920 were valued at \$851,511, and included: (a) brass as "old and scrap" 3,439,800 pounds valued at \$475,809; (b) brass rods, sheets, tubing, etc., 244,000 pounds valued at \$49,728; and (c) brass valves valued at \$325,974.

The exports of brass in 1919 were valued at \$1,685,941 and included: (a) brass "old and scrap" 9,656,900 pounds valued at \$1,275,448; (b) brass rods, sheets, tubing, etc., 535,500 pounds valued at \$173,654; and (c) brass valves valued at \$236,839.

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 consumption is arrived at by deducting from the figure of production the quantity representing the excess of the exports over the imports.

The consumption in 1920 is estimated at 27,300 tons, as against 16,800 tons in 1919.

During the war period, as stated above, large quantities of metals were imported and entered in the Canadian Customs records under one item, so that during the years 1915 to 1918 inclusive the consumption is arrived at by taking the figures of exports from the United States into Canada as published by the United States Department of Commerce.

Estimated Consumption of Copper

(In short tons)

	1915	1916	1917	1918	1919	1920
Production.....	50,392	58,575	54,614	59,385	37,527	40,800
Exports—						
Copper in copper and brass and their manufactures.....	51,365	63,687	52,064	60,181	39,687	44,183
Imports—						
Copper in copper and brass and their manufactures.....	(a) 28,700	(a) 50,900	(a) 49,200	(a) 23,500	18,992	30,689
Excess of exports over imports.....	22,665	12,787	2,864	36,681	20,695	13,494
Consumption.....	27,700	45,800	51,800	22,700	16,800	27,300

(a) Compiled from the reports of the United States Department of Commerce, Washington.

Quebec

The production of copper in Quebec in 1920 was derived mostly, as in the past, from the Eustis and Weedon mines in the Eastern Townships, and amounted to about 880,638 pounds, valued at \$153,724, as against 2,691,695 pounds, valued at \$503,105, in 1919.

This production represents the estimated recovery in 1920 from 15,186 tons of ore and concentrates with a metal content of 1,129,723 pounds of copper, and in 1919 from 58,865 tons of ore and concentrates with a metal content of 3,763,191 pounds of copper.

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	1910.....	877,347	111,757
1887.....	2,937,900	330,514	1899.....	1,632,560	287,494	1911.....	2,436,190	301,503
1888.....	5,562,864	927,107	1900.....	2,220,000	359,418	1912.....	3,282,210	536,346
1889.....	5,315,000	730,813	1901.....	1,527,442	246,178	1913.....	3,455,887	527,679
1890.....	4,710,606	741,920	1902.....	1,640,000	190,666	1914.....	4,201,497	571,488
1891.....	5,401,704	695,469	1903.....	1,152,000	152,467	1915.....	4,197,482	725,115
1892.....	4,833,480	564,042	1904.....	760,000	97,455	1916.....	5,703,347	1,551,424
1893.....	4,468,352	480,348	1905.....	1,621,243	252,752	1917.....	5,015,560	1,363,229
1894.....	2,176,430	208,067	1906.....	1,981,169	381,930	1918.....	5,869,649	1,445,577
1895.....	2,242,462	241,288	1907.....	1,517,990	303,659	1919.....	2,691,695	503,105
1896.....	2,407,200	261,903	1908.....	1,282,024	169,330	1920.....	880,638	153,724
1897.....	2,474,970	279,424	1909.....	1,088,212	141,272			
						Total...	93,055,345	16,454,521

Ontario

The copper production from Ontario in 1920 amounted to 32,059,993 pounds, valued at \$5,596,392, equivalent to 39.3 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 1919 was 24,346,623 pounds valued at \$4,550,627, equivalent to 32.4 per cent of the total.

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 in 1920 to about 60,000 pounds.

The chief operating companies are:—

International Nickel Company of Canada, Limited (formerly the Canadian Copper Company, Limited), shipping from the Creighton and adjoining properties to its smelter at Copper Cliff.

The Mond Nickel Company, Limited, operating in Coniston.

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

The British America Nickel Corporation, Limited, operating at Nickelton.

Ontario: Production of Copper

Year	Pounds	Value	Year	Pounds	Value	Year	Pounds	Value
		\$			\$			\$
1886.....	165,000	18,150	1893.....	8,375,223	1,007,539	1910.....	19,259,016	2,453,213
1887.....	322,524	36,284	1899.....	5,723,324	1,007,877	1911.....	17,932,263	2,219,297
1888.....			1900.....	6,740,058	1,091,215	1912.....	22,250,601	3,635,971
1889.....	1,466,752	201,678	1901.....	8,695,831	1,401,507	1913.....	25,885,929	3,952,522
1890.....	1,303,065	205,233	1902.....	7,408,202	861,273	1914.....	28,948,211	3,937,536
1891.....	4,127,697	531,234	1903.....	7,172,533	949,285	1915.....	39,361,464	6,799,693
1892.....	2,203,795	254,538	1904.....	4,913,594	630,070	1916.....	44,997,035	12,240,094
1893.....	3,641,504	391,461	1905.....	8,779,259	1,368,686	1917.....	42,867,774	11,651,461
1894.....	5,207,679	497,854	1906.....	10,638,231	2,050,838	1918.....	47,074,475	11,593,502
1895.....	4,576,337	492,414	1907.....	14,104,337	2,821,432	1919.....	34,346,623	4,550,627
1896.....	3,167,256	344,598	1908.....	15,005,171	1,981,833	1920.....	32,059,993	5,596,392
1897.....	5,500,652	621,023	1909.....	15,746,699	2,044,237			
						Total...	489,968,107	89,440,632

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 1920 amounted to 3,062,577 pounds, valued at \$534,604, as against 3,348,000 pounds, valued at \$625,775, in 1919, 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 Pas district, northern Manitoba.

Much development has been carried on in this district during the past six years. Toward the end of 1919 the Mandy Mining Company suspended operations and sold most of their equipment to a New York syndicate, which in 1920 carried on development on the Flin-Flon group of claims, on Flin-Flon lake, in the same district. This syndicate represented by the Williams, Bryce, Thompson interests of New York city, and including also the Mining Corporation of Canada, Limited, held an option on the Flin-Flon property which had been purchased in March, 1920, and expired in April, 1921, and was not renewed. An option on this same property held by Hayden, Stone & Company, of New York, had previously been dropped in January, 1920.

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

Commissioner R. C. Wallace, writing about the Flin-Flon property, states as follows: "The all-important question in connection with the development of the deposit is transportation. By air-line the property is 68 miles from The Pas, which is served by the Canadian National Railway. A railway by the most feasible route to the property would probably be 85 miles long. The province of Manitoba has displayed a very commendable interest in the deposit and in the furtherance of its development. If before the House meets a deal is consummated on the property with sufficient guarantees of development, the question of the railway will be considered in the House on the basis of the province of Manitoba making arrangements to finance the building of the railway and its leasing when built to the Canadian National Railway Board, which would then be responsible for its operation."*

In May, 1921, the Provincial Government of Manitoba announced that it was prepared to extend to the new owners of the Flin-Flon mine, providing they would put up a marked cheque for \$1,000,000 as a guarantee that the mine will be developed at once, on undertaking that the railway to the property will be built.

By an Order in Council dated December 16, 1920, and published in the *Canada Gazette* of December 25, 1920, provision was made by the Federal Government that no royalty be charged for a period of ten years on the copper product of the mines at Flin-Flon lake in which the gross recoverable values average less than ten dollars (\$10) per ton and which are reduced to blister copper at the mill and smelter to be erected in this locality.

It was also recommended that permission be granted to export for final treatment such blister copper the product of the mill and smelter for a period of ten years unless in the meantime facilities have been established in Canada for the electrolytic refining of such products as cheaply and efficiently as elsewhere.

* From the "Bulletin of the Canadian Institute of Mining and Metallurgy," for February, 1921.

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 1920 amounted to 45,319,771 pounds, valued at \$7,911,019, equivalent to 55.5 per cent of the total production for Canada, as against 44,502,079 pounds valued at \$8,317,884 in 1919.

This production includes the blister copper produced, partly refined at Trail and partly exported for refining in the United States; the copper sulphate produced at Trail and the estimated recoveries from ores and concentrates exported. But it does not include copper produced from the treatment of foreign ores nor those from other provinces and treated in British Columbia smelters.

British Columbia: Production of Copper

Year	Pounds	Value	Year	Pounds	Value	Year	Pounds	Value
		\$			\$			\$
1894*	324,680	31,039	1903*	34,359,921	4,547,735	1912.....	50,526,656	8,256,561
1895*	952,840	102,526	1904*	35,710,128	4,579,110	1913.....	45,791,579	6,991,916
1896*	3,818,556	415,459	1905*	37,692,251	5,876,222	1914.....	41,219,202	5,606,636
1897*	5,325,180	601,213	1906*	42,990,488	8,287,706	1915.....	56,692,988	9,793,714
1898*	7,271,678	874,783	1907*	40,832,720	8,168,177	1916.....	63,642,550	17,312,046
1899*	7,722,591	1,359,948	1908.....	37,041,115	4,892,390	1917.....	57,730,959	15,691,275
1900*	9,977,080	1,615,289	1909.....	35,658,952	4,629,245	1918.....	62,865,681	15,482,560
1901*	27,603,746	4,448,896	1910.....	35,270,006	4,402,693	1919.....	44,502,079	8,317,884
1902*	29,636,057	3,445,488	1911.....	35,279,558	4,366,198	1920.....	45,319,771	7,911,019
						Total...	895,759,012	158,097,728

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

Since 1909 the method of compilation of statistics of copper production by the Provincial Bureau of Mines of British Columbia, 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)

	1914	1915	1916	1917	1918	1919	1920
Cariboo—Omineca.....	6,000	2,831,279	1,646,072	852,373	643,843	16,205	.....
Cassiar—							
Atlin, Liard and Stikine.....					11,160		
Skeena.....	11,123,376	21,915,481	24,065,995	27,978,015	30,190,606	20,411,421	26,163,406
East Kootenay—							
Port Steele.....			5,654	9,679	1,768		
Wendernere.....			3,400	12,640			1,953
West Kootenay—							
Slocan.....					242		
Nelson.....	586,764	30,240	176,383	50,946	28,933	21,964	755
Trail Creek.....	3,779,830	4,651,681	4,200,745	1,730,088	1,654,356	1,112,133	1,113,085
Yale—							
Boundary.....	16,428,959	17,402,662	17,626,623	10,329,765	9,940,125	3,273,655	582,360
Ashcroft and Kamloops....	14,525	295,164	636,594	700,199	525,780	556,681	260,808
Similkameen.....		21,701	182,633	87,326	11,928	5,180	463,347
Southern Coast—							
Vancouver Island.....	13,070,245	712,152	869,877	1,461,704	926,886	432,252	110,696
Mainland.....		9,058,045	15,965,388	15,794,839	17,548,127	16,620,848	16,201,266
Totals.....	45,009,699	56,918,405	65,379,364	59,007,565	61,483,754	42,459,339	44,887,676

*As published by British Columbia 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.

Copper mining is by far the most important mining in the province; in 1920 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. The Britannia M. & S. Co., closed down its mill in November owing to the steady drop in the price of copper. This mill with a capacity of 2,000 tons per day was destroyed by fire on March 20, 1921.

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 ever 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, Limited, 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 Rol II (Josie) mine, both located at Rossland.

In the Similkameen district, the Canada Copper Corporation, Limited, continued their programme of development and construction at the Princess group, Copper Mountain, and the 2,000-ton 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 until October, 1920. Operations were carried on only for a few weeks and the mine and concentrator were closed in the latter part of November due to the serious decline in the price of copper.

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.

The production in 1920 amounted to 277,712 pounds, valued at \$48,478, as against 165,184 pounds valued at \$30,874 in 1919.

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	102,338	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
			1920.....	277,712	48,478
			Total.....	12,912,507	2,690,516

GOLD

The production of gold in Canada from Canadian sources in 1920 amounted to 765,007 fine ounces, valued at \$15,814,098, as against 766,764 fine ounces, valued at \$15,850,423, in 1919.

The production in 1920 included: (a) placer or alluvial gold 83,469 ounces or 10.9 per cent of the total; (b) gold obtained from the crushing of free milling quartz ore, 581,455 ounces or 76.0 per cent; (c) gold obtained from ores and concentrates treated at Canadian copper and lead smelters 45,886 ounces, or 6.0; and (d) the estimated gold recoveries from ores and concentrates exported 54,197 ounces, or 7.1 per cent of the total production.

The production in 1919 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; and (d) the estimated gold recoveries from ores and concentrates exported 65,337 ounces, or 8.5 per cent of the total production.

The increase in production from the gold fields of Timiskaming district, Ontario, amounting to about 10 per cent was offset by the falling off of the production from the alluvial deposits, the continued decrease in the production from gold lode mining in Nova Scotia, and by the curtailment of operations or closing down at several important mines in British Columbia, so that the expected banner production for 1920 did not materialize.

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	1900.....	1,350,057	27,908,153
1859.....	78,129	1,615,072	1880.....	63,121	1,304,824	1901.....	1,167,216	24,128,503
1860.....	107,806	2,228,543	1881.....	63,524	1,313,153	1902.....	1,032,161	21,336,667
1861.....	128,973	2,666,118	1882.....	60,288	1,246,268	1903.....	911,559	18,843,590
1862.....	135,301	2,798,774	1883.....	53,853	1,113,246	1904.....	796,374	16,462,517
1863.....	202,498	4,186,011	1884.....	51,202	1,068,439	1905.....	684,951	14,159,195
1864.....	199,605	4,126,199	1885.....	55,575	1,148,829	1906.....	556,415	11,502,120
1865.....	192,898	3,987,562	1886.....	70,782	1,463,196	1907.....	405,517	8,382,780
1866.....	152,555	3,153,597	1887.....	57,460	1,187,804	1908.....	478,112	9,842,105
1867.....	145,775	3,013,431	1888.....	53,145	1,098,610	1909.....	453,865	9,382,230
1868.....	134,169	2,773,527	1889.....	62,653	1,295,159	1910.....	493,707	10,205,835
1869.....	102,720	2,123,405	1890.....	55,620	1,149,776	1911.....	473,159	9,781,077
1870.....	83,415	1,724,468	1891.....	45,018	930,614	1912.....	611,885	12,648,794
1871.....	105,187	2,174,412	1892.....	43,905	907,601	1913.....	802,973	16,598,923
1872.....	90,283	1,866,321	1893.....	47,243	976,603	1914.....	778,178	15,983,007
1873.....	74,346	1,536,871	1894.....	54,600	1,128,688	1915.....	918,056	18,977,001
1874.....	97,856	2,022,862	1895.....	100,798	2,083,674	1916.....	980,492	19,234,976
1875.....	130,300	2,693,533	1896.....	133,262	2,754,774	1917.....	738,831	15,272,992
1876.....	97,729	2,020,233	1897.....	291,557	6,027,016	1918.....	699,681	14,463,689
1877.....	94,304	1,949,444	1898.....	666,386	13,775,420	1919.....	766,764	15,850,423
1878.....	74,420	1,538,394	1899.....	1,028,520	21,261,584	1920.....	765,007	15,814,098
						† total...	21,405,491	442,490,868

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

The Dominion of Canada 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, 1920, was 150,869.17 ounces, which after melting was reduced to 147,718.25 ounces and valued at \$2,499,174.41 after deducting office charges. The loss by melting was 2.0885 ounces per hundredweight. The receipts were from British Columbia and the Yukon.

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	165,523.61	2,029,251.31
1909.....	48,478.58	47,576.27	789,267.94	1915.....	183,924.49	179,751.68	2,736,302.31
1910.....	46,064.31	45,228.92	746,101.92	1916.....	180,292.83	175,393.10	2,828,239.65
1911.....	39,784.70	39,069.31	647,416.38	1917.....	191,626.04	187,884.48	3,257,220.71
1912.....	59,088.82	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
				1920.....	150,869.17	147,718.25	2,499,174.41

(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
		1920.....	42,636

*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.....	65,000.35	1,079,223.42		
1911.....	89,463.11	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.....	89,231.47	1,402,605.19	871,693.79	15,833,222.01
1916.....	49,195.39	780,074.19	6,687,758.41	121,513,083.93
1917.....	55,779.98	840,265.33	8,196,151.04	148,919,793.48
1918.....	302,785.96	4,982,743.81	3,728,224.05	67,739,887.68
1919.....	654,906.28	10,865,770.57	8,917.02	134,756.38
1920.....	724,083.34	11,530,413.82		

The production of gold by provinces is given in the following table in which it will be seen that Ontario since the discovery of the Porcupine camp has gradually increased its production, and to such an extent that in 1920 it produced 73.9 per cent of the total, as against 65.9 per cent in 1919, 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, 1918, 1919, and 1920

	1918			1919			1920		
	Fine ounces†	Value	%	Fine ounces†	Value	%	Fine ounces†	Value	%
Nova Scotia.....	1,176	\$ 24,310	0.2	850	\$ 17,571	0.1	690	\$ 14,263	0.1
Quebec.....	1,939	40,083	0.2	1,470	30,388	0.2	955	19,742	0.1
Ontario.....	411,976	8,516,299	58.9	505,739	10,454,553	66.0	564,995	11,679,483	73.9
Manitoba.....	1,926	39,814	0.3	724	14,966	0.1	781	16,145	0.1
Alberta.....	27	558	.....	24	500	.....	.....	.....	.....
British Columbia..	180,163	3,724,300	25.8	167,252	3,457,406	21.8	124,808	2,580,010	16.3
Yukon.....	102,474	2,118,325	14.6	90,705	1,875,039	11.8	72,778	1,504,455	9.5
Totals.....	699,681	14,463,689	100.0	766,764	15,850,423	100.0	765,007	15,814,098	100.0

†The exact value of fine gold is $\frac{32}{1000}$ 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 $\frac{32}{1000}$ or 0.048375.

Exports and Imports.—The exports of gold in dust, nuggets, etc., during 1920 were valued at \$4,642,909, as against \$5,037,123 in 1919, \$10,040,813 in 1918, \$15,929,051 in 1917, and \$18,382,903 in 1916.

The imports in 1920 were: gold fringe valued at \$36,919, and manufactures of gold and silver valued at \$845,089.

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.

Exports of Gold in Dust, Nuggets, etc., 1910 to 1920, inclusive

Year	Value	Year	Value	Year	Value
	\$		\$		\$
1910.....	5,491,051	1914.....	15,242,200	1918.....	10,040,813
1911.....	7,493,523	1915.....	16,528,143	1919.....	5,037,123
1912.....	10,014,654	1916.....	18,382,903	1920.....	4,642,909
1913.....	12,770,838	1917.....	15,929,051		

Imports of Gold and Silver, 1910 to 1920, inclusive

27797-53

	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	10,017	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
1920.....	.....	.....	36,919	2,453,450	100	314,869	108,738	6,605	184,681	545,015

(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 1920 amounted to 690 fine ounces, valued at \$14,263; as against 850 ounces, valued at \$17,571 in 1919.

The 1920 production is the smallest recorded and the falling off during the past few years is attributed partly, as in other gold districts, to the high cost of supplies and labour, and partly to the exhaustion of the mines.

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	1892..	32,552	18,865	389,965	11.98
1863.....	17,000	13,180	272,448	16.02	1893..	42,354	18,430	381,095	8.99
1864.....	21,431	18,883	390,340	18.21	1894..	55,357	18,834	389,338	7.04
1865.....	24,421	24,011	496,357	20.32	1895..	60,600	21,919	453,119	7.47
1866.....	32,157	23,776	491,491	15.28	1896..	69,169	23,876	493,568	7.13
1867.....	31,384	25,763	532,563	16.96	1897..	73,192	27,195	562,165	7.68
1868.....	32,259	19,377	400,555	12.41	1898..	82,747	26,054	538,590	6.50
1869.....	35,144	16,855	348,427	19.91	1899..	112,226	29,876	617,604	5.50
1870.....	30,824	18,740	387,392	12.56	1900..	87,390	28,955	598,553	6.85
1871.....	30,787	18,139	374,972	12.17	1901..	91,948	26,459	546,963	5.32
1872.....	17,089	12,352	255,349	14.94	1902..	93,042	30,348	627,357	6.68
1873.....	17,708	11,180	231,122	13.05	1903..	103,856	25,533	527,806	5.08
1874.....	13,844	8,623	178,244	12.87	1904..	45,436	10,362	214,209	4.71
1875.....	14,810	10,576	218,629	14.76	1905..	57,774	13,707	283,353	4.90
1876.....	15,490	11,300	233,585	15.08	1906..	66,059	12,223	252,676	3.82
1877.....	17,369	15,925	329,205	18.95	1907..	58,550	13,675	282,686	4.82
1878.....	17,989	11,864	245,253	13.63	1908..	61,536	11,842	244,799	3.97
1879.....	15,936	12,980	268,328	16.83	1909..	56,790	10,193	210,711	3.71
1880.....	13,997	12,472	257,823	18.42	1910..	43,006	7,928	163,891	3.81
1881.....	16,556	10,147	209,755	12.66	1911..	18,328	7,781	160,854	8.78
1882.....	21,081	13,307	275,090	13.04	1912..	14,360	4,385	90,638	6.51
1883.....	25,954	14,571	301,207	11.60	1913..	7,324	2,174	44,935	6.13
1884.....	25,186	15,168	313,554	12.44	1914..	13,156	2,904	60,031	4.56
1885.....	28,890	20,945	432,971	14.98	1915..	25,204	6,636	137,180	5.44
1886.....	29,010	22,038	455,564	15.70	1916..	17,497	4,562	94,305	5.38
1887.....	32,280	20,009	413,631	12.81	1917..	5,916	2,210	45,685	7.72
1888.....	36,178	21,137	436,939	12.08	1918..	1,630	1,176	24,310	14.91
1889.....	39,160	24,673	510,029	13.02	1919..	1,362	850	17,571	12.90
1890.....	42,749	22,978	474,990	11.11	1920..	858	690	14,263	16.62
1891.....	36,351	21,841	451,503	12.42					
					Total	2,190,586	909,321	18,797,416	8.58

Quebec

The gold production in Quebec during 1920 amounted to 955 fine ounces, valued at \$19,742, as against 1,470 fine ounces, valued at \$30,388, in 1919.

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-Angers, 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 Harricanean river. The principal operator in 1919 was the British Minerals Corporation, Limited, which operated the property of Mr. J. J. Sullivan, known as the Sullivan mine, and the Sisc6e property, which latter property is situated on a small island not far from the east shore of lake De Montigny. No operations were reported during 1920.

Professor A. Mailhiot, of the Ecole Polytechnique of Montreal, acting under instructions from the Quebec 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 and a final report was published in the Annual Report of the Quebec Bureau of Mines for the year 1919.² Dr. J. A. Bancroft, of McGill University, also reported on the adjoining districts in 1912.³

Quebec: Production of Gold

Year	Fine ounces †	Value	Year	Fine ounces †	Value	Year	Fine ounces †	Value
1877.....	583	\$ 12,057	1892.....	628	\$ 12,987	1907.....		
1878.....	368	17,937	1893.....	759	15,696	1908.....		
1879.....	1,160	23,972	1894.....	1,412	29,190	1909.....	193	3,990
1880.....	1,605	33,174	1895.....	62	1,281	1910.....	124	2,505
1881.....	2,741	56,661	1896.....	145	3,000	1911.....	613	12,672
1882.....	827	17,093	1897.....	44	900	1912.....	642	13,270
1883.....	860	17,787	1898.....	295	6,089	1913.....	701	14,491
1884.....	422	8,720	1899.....	238	4,916	1914.....	1,202	26,708
1885.....	103	2,120	1900.....			1915.....	1,099	22,720
1886.....	193	3,981	1901.....	145	3,000	1916.....	1,034	21,375
1887.....	78	1,604	1902.....	301	8,073	1917.....	1,511	31,235
1888.....	181	3,740	1903.....	180	3,712	1918.....	1,939	40,083
1889.....	58	1,207	1904.....	140	2,900	1919.....	1,470	30,388
1890.....	65	1,350	1905.....	191	3,940	1920.....	955	19,742
1891.....	87	1,800	1906.....	165	3,412	Total.....	26,199	521,544

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

Ontario

The gold production of Ontario in 1920 amounted to 564,995 fine ounces, valued at \$11,679,483, as against 505,739 ounces, valued at \$10,454,553, in 1919, showing an increase of 11.7 per cent over that of 1919.

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 two years, the 1919 production was the greatest recorded, and the year 1920 saw this record exceeded again.

The principal producers by order of importance were:—

Porcupine district—

- Hollinger Consolidated Gold Mines, Limited, operating at Timmins.
- McIntyre Porcupine Mines, Limited, operating at Schumacher.
- Dome Mines Company, Limited, operating at South Porcupine.
- North Crown Porcupine Mines, Limited, operating at Timmins.
- Davidson Consolidated Gold Mines, Limited, operating at South Porcupine.

Kirkland Lake district—

- Lake Shore Mines, Limited, operating at Kirkland Lake.
- Kirkland Lake Gold Mining Company, Limited, operating at Kirkland Lake.
- Teck-Hughes Gold Mines, Limited, operating at Kirkland Lake.

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

² Gold Deposits at Lake De Montigny, Abitibi, P.Q., by Prof. A. Mailhiot. Report of the Bureau of Mines for the year 1919—pp. 125-158.

³ Report on the Geology of the Headwaters of the Harricanaw River, by Dr. J. A. Bancroft, Quebec Bureau of Mines, Annual Report for 1912—pp. 217-229.

Larder Lake district—

Argonaut Gold, Limited, operating at Beaver House Lake.

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, the Lightning area, near Abitibi lake, and the Larder Lake gold area. Reports on these sub-districts 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	1888.....	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	5,545,309
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
1887.....	9,157	189,294	1908.....	3,212	66,389	1919.....	505,739	10,454,553
						1920.....	564,995	11,679,483
						Total.....	3,503,134	72,416,206

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

Manitoba

The gold production in Manitoba during 1920 amounted to 781 fine ounces valued at \$16,145, as against 724 ounces, valued at \$14,966 in 1919; 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 northwest 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.

The Wekusko lake area was reported on by F. J. Alcock, of the Geological survey of Canada.³

A few miles southwest from Herb lake are: (a) the Flin-Flon lake, where much development has been done on what is called the Flin-Flon group; this property was optioned in 1919 to a New York syndicate which included the Thompson interests and the Mining Corporation of Canada. The syndicate carried out an elaborate plan

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.

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

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

of development but dropped their lease when it expired in April, 1921. The property has reverted to the original owners, being Messrs. Hammill and associates, and (b) Schist lake, near which operations have been carried on 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. This 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 conducted an exploration of The Pas district, 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.

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 1920, while in 1919 the production was reported as being 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	3,000	1911.....	10	207
1890.....	193	4,000	1901.....	726	15,000	1912.....	73	1,509
1891.....	266	5,500	1902.....	484	10,000	1913.....		
1892.....	508	10,506	1903.....	48	1,000	1914.....	48	992
1893.....	466	9,640	1904.....	24	500	1915.....	195	4,026
1894.....	726	15,000	1905.....	121	2,500	1916.....	82	1,695
1895.....	2,419	50,000	1906.....	39	800	1917.....		
1896.....	2,691	55,000	1907.....	33	675	1918.....	27	558
1897.....	2,419	50,000	1908.....	50	1,037	1919.....	24	500
						1920.....		
						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 1920 amounted to 124,808 fine ounces, valued at \$2,580,010, as against 167,252 fine ounces, valued at \$3,457,406, in 1919, being a decrease of 25.4 per cent and amounted to 16.3 per cent of the total production of Canada.

The production in 1920 included: (a) placer or alluvial gold, 10,719 ounces, or 8.8 per cent of the total; (b) bullion from milling ores, 16,672 ounces, or 13.4 per cent; (c) smelter recoveries, 44,382 ounces, or 35.6 per cent; and (d) the estimated recoveries from ores and concentrates exported 53,035 ounces, or 42.5 per cent.

The production in 1919 included: (a) placer or alluvial gold, 13,859 ounces, or 8.4 per cent of the total; (b) bullion from milling 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 production for the last four 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	1879.....	62,407	1,290,058	1900.....	228,916	4,732,105
1859.....	78,129	1,615,072	1880.....	49,044	1,013,827	1901.....	257,292	5,318,703
1860.....	107,806	2,228,543	1881.....	50,636	1,046,737	1902.....	288,383	5,961,409
1861.....	128,973	2,666,118	1882.....	46,154	954,085	1903.....	284,108	5,873,036
1862.....	128,528	2,656,903	1883.....	38,422	794,252	1904.....	275,975	5,704,908
1863.....	189,318	3,913,563	1884.....	35,612	736,165	1905.....	285,529	5,902,402
1864.....	180,722	3,735,850	1885.....	34,527	713,738	1906.....	269,886	5,579,039
1865.....	168,887	3,491,205	1886.....	43,714	903,651	1907.....	236,216	4,883,020
1866.....	128,779	2,662,106	1887.....	33,558	693,709	1908.....	286,858	5,929,880
1867.....	120,012	2,480,868	1888.....	29,834	616,731	1909.....	250,320	5,174,579
1868.....	114,792	2,372,972	1889.....	28,489	588,923	1910.....	261,386	5,403,318
1869.....	85,865	1,774,978	1890.....	23,918	494,436	1911.....	238,496	4,930,145
1870.....	64,675	1,336,956	1891.....	20,792	429,811	1912.....	251,815	5,205,485
1871.....	87,048	1,799,440	1892.....	19,327	399,525	1913.....	297,459	6,149,027
1872.....	77,931	1,610,972	1893.....	18,360	379,535	1914.....	252,730	5,224,393
1873.....	63,166	1,305,749	1894.....	25,664	530,530	1915.....	273,376	5,651,184
1874.....	89,233	1,844,618	1895.....	61,289	1,266,954	1916.....	219,633	4,540,216
1875.....	119,724	2,474,904	1896.....	86,504	1,788,206	1917.....	133,742	2,764,693
1876.....	86,429	1,786,648	1897.....	131,805	2,724,657	1918.....	180,163	3,724,300
1877.....	77,796	1,608,182	1898.....	142,215	2,939,852	1919.....	167,252	3,457,406
1878.....	61,688	1,275,204	1899.....	203,295	4,202,473	1920.....	124,808	2,580,010
						Total...	8,443,514	174,542,964

†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, 1919 and 1920*

Districts	1919				1920			
	Gold Placer		Gold Lode		Gold Placer		Gold Lode	
	Ounces	Value	Ounces	Value	Ounces	Value	Ounces	Value
		\$		\$		\$		\$
Cariboo:—								
Cariboo and Quesnel.....	3,500	70,000			3,300	66,000		
Omineca.....	400	8,000	147	3,038	150	3,000	218	4,506
Cassiar:—								
Atlin, Liard and Stikine....	8,850	177,000			6,930	138,600		
Skeena, etc.....	850	17,000	60,076	1,241,771	150	3,000	54,531	1,127,156
East Kootenay:—								
Fort Steele.....	50	1,000			175	3,500		
Windermere and Golden.....			2	41				
West Kootenay:—								
Ainsworth.....			26	537			32	661
Nelson.....	25	500	297	6,139	25	500	1,924	39,769
Slocan and Slocan City.....			95	1,964			73	1,509
Trail Creek.....			50,229	1,038,233			36,425	752,905
Revelstoke, etc.....	50	1,000	8	165	50	1,000	7	145
Yale:—								
Grand Forks, Greenwood and Osoyoos.....	50	1,000	32,874	679,506	25	500	20,366	420,965
Similkameen, Nicola and Vernon.....	50	1,000	25	517	25	500	83	1,716
Yale, Ashcroft and Kam- loops.....	100	2,000	627	12,960	50	1,000	238	4,919
Lillooet:—								
Lillooet.....	375	7,500	2,506	51,799	175	3,500	120	2,480
Southern Coast:—								
Vancouver Island.....	25	500	1,164	24,060	25	500	19	393
Mainland.....			4,350	89,915			6,012	124,268
Total.....	14,325	286,500	152,426	3,150,645	11,080	221,600	120,048	2,481,392

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

Yukon

The gold production of the Yukon Territory in 1920 amounted to 72,778 fine ounces, valued at \$1,504,455, and included 72,750 ounces derived from alluvial sands and 28 ounces from lode mining.

The gold production 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 total placer production of the Yukon in 1920 is estimated at \$1,520,392, and includes 72,750 fine ounces of gold, valued at \$1,503,876, and 16,369 fine ounces of silver, valued at \$16,516.

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 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	1888.....	483,750	10,000,000	1911....	224,197	4,634,574
1886.....			1899.....	774,000	16,000,000	1912....	268,447	5,549,296
1887.....	3,380	70,000	1900.....	1,077,553	22,275,000	1913....	282,838	5,846,780
1888.....	1,935	40,000	1901.....	870,750	18,000,000	1914....	247,940	5,125,374
1889.....	8,466	175,000	1902.....	701,437	14,500,000	1915....	230,173	4,758,098
1890.....	8,466	175,000	1903.....	592,594	12,250,000	1916....	212,700	4,396,900
1891.....	1,935	40,000	1904.....	507,938	10,500,000	1917....	177,667	3,672,703
1892.....	4,233	87,500	1905.....	381,001	7,876,000	1918....	102,474	2,118,325
1893.....	8,514	176,000	1906.....	270,900	5,600,000	1919....	90,705	1,875,039
1894.....	6,047	125,000	1907.....	152,381	3,150,000	1920....	72,778	1,504,455
1895.....	12,094	250,000	1908.....	174,150	3,600,000			
1896.....	14,513	300,000	1909.....	191,565	3,960,000	Total	8,504,392	175,801,406
1897.....	120,937	2,500,000	1910*.....	221,091	4,570,362			

†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, 1920, 74,456.01 ounces from the Yukon, valued, after all charges had been deducted, at \$1,206,579, or an average of \$16.21 per ounce, as against 111,138.65 ounces, valued at \$1,813,883, or an average value of \$16.32 per ounce in 1919.

**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
				1920.....	74,456.01	1,206,579	16.21

(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	1915	1916	1917	1918	1919	1920
January.....	520.69	3,116.18	2,490.11	1,025.69	2,609.39	280.78
February.....	.40	566.62	740.73	112.27	491.22	18.00
March.....	232.13	1,674.82	1,033.37	176.31	742.75	9,497.14
April.....	277.84	859.56	1,290.64	.....	1,666.40	140.52
May.....	17,553.29	13,099.13	7,586.43	3,445.55	3,978.07	44.42
June.....	57,884.87	38,292.47	33,684.56	14,165.95	18,255.81	10,505.24
July.....	49,478.87	35,998.34	34,339.33	16,876.11	12,084.24	11,018.56
August.....	41,015.41	47,980.26	41,439.50	22,630.91	19,939.34	12,865.26
September.....	47,055.83	45,883.90	33,652.02	25,434.07	12,201.85	8,575.41
October.....	59,984.89	62,927.73	57,227.13	38,306.54	36,641.55	32,243.67
November.....	7,248.17	13,168.23	4,184.74	3,733.89	2,040.88	3,992.30
December.....	6,001.77	1,944.64	3,015.97	1,272.83	2,612.82	1,756.72
	287,254.16	265,013.88	220,684.53	127,130.12	113,264.32	90,938.02

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 30,	1898.....	3,072,773	339,845	2,732,928	273,292 82
"	" 1899.....	7,582,283	1,699,657	5,882,626	588,262 37
"	" 1900.....	9,809,465	2,501,744	7,307,720	730,771 99
"	" 1901.....	9,162,083	1,927,666	7,234,416	592,660 98
"	" 1902.....	9,566,340	1,199,114	8,367,226	331,436 79
"	" 1903.....	12,113,015	.....	12,113,015	302,893 48
"	" 1904.....	10,790,663	.....	10,790,663	272,217 96
"	" 1905.....	8,222,054	.....	8,222,054	206,760 87
"	" 1906.....	6,540,007	.....	6,540,007	163,963 25
Ending March 31,	1907.....	3,304,791	.....	3,304,791	82,622 42
"	" 1908.....	2,820,162	.....	2,820,162	70,504 65
"	" 1909.....	3,260,283	.....	3,260,282	81,507 07
"	" 1910.....	3,594,251	.....	3,594,251	89,844 10
"	" 1911.....	4,126,728	.....	4,126,728	103,168 19
"	" 1912.....	4,024,237	.....	4,024,237	100,606 29
"	" 1913.....	5,018,412	.....	5,018,412	125,460 52
"	" 1914.....	5,301,508	.....	5,301,508	132,537 69
"	" 1915.....	4,649,634	.....	4,649,634	116,241 04
"	" 1916.....	4,458,278	.....	4,458,278	111,457 19
"	" 1917.....	3,960,207	.....	3,960,207	99,007 92
"	" 1918.....	3,266,019	.....	3,266,019	81,650 55
"	" 1919.....	1,947,082	.....	1,947,082	48,677 07
"	" 1920.....	1,660,450	.....	1,660,450	41,501 12
"	" 1921.....	1,246,486	.....	1,246,486	31,273 76
Total.....		129,497,111	.....	121,829,183	4,478,320 09

* 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 Canada in 1920 amounted to 35,953,717 pounds (17,977 tons), which at the average price for the year, 8.940 cents per pound, was valued at \$3,214,262, as against 43,827,699 pounds (21,914 tons), which at the average price of 6.966 cents per pound, was valued at \$3,053,037 in 1919.

The production in 1920 included: (a) 28,985,509 pounds (14,492.7 tons) of lead bullion produced at Trail, B.C., and pig-lead produced at Galetta, Ont.; (b) 6,958,637 pounds (3,479.3 tons), the estimated recoveries from lead ores exported to the United States; and (c) 9,490 pounds (4.7 tons), the estimated recoveries from the gold and silver ores of Ontario also exported to the United States.

The production in 1919 included: (a) 34,330,920 pounds (17,165.5 tons) of refined lead produced at Trail, B.C., and pig-lead produced at Galetta, 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 statistics of lead production since 1909 as given in the accompanying table represent the quantity of lead produced in Canada from domestic ores, together with the estimated lead recovery from 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	1904.....	37,531,244	1,617,221	4.300
1888.....	674,500	29,812	4.420	1905.....	50,864,915	2,076,632	4.707
1889.....	165,100	6,488	3.930	1906.....	54,608,217	3,039,187	5.657
1890.....	105,000	4,704	4.480	1907.....	47,738,703	2,542,036	5.325
1891.....	88,665	3,857	4.350	1908.....	43,195,733	1,814,221	4.200
1892.....	808,420	33,064	4.090	1909.....	45,857,424	1,692,139	3.690
1893.....	2,135,023	79,636	3.730	1910.....	32,987,508	1,216,249	3.687
1894.....	5,703,222	187,636	3.290	1911.....	23,784,969	827,717	3.480
1895.....	16,461,794	531,716	3.230	1912.....	35,763,476	1,597,554	4.467
1896.....	24,199,977	721,159	2.980	1913.....	37,662,703	1,754,705	4.659
1897.....	39,018,219	1,396,853	3.580	1914.....	36,337,765	1,627,568	4.479
1898.....	31,915,319	1,206,399	3.780	1915.....	46,316,450	2,593,721	5.600
1899.....	21,862,436	977,250	4.470	1916.....	41,497,615	3,532,692	8.513
1900.....	63,169,821	2,760,521	4.370	1917.....	32,576,281	3,028,020	11.137
1901.....	51,900,958	2,249,387	4.334	1918.....	51,398,002	4,754,315	9.250
1902.....	22,956,381	934,095	4.069	1919.....	43,827,699	3,053,037	6.966
1903.....	18,139,283	768,562	4.237	1920.....	35,953,717	3,214,262	8.940

†From 1911 to date, average price at Montreal. Quotations furnished by Messrs. Thos. Robertson & Co., Montreal, Que., and in 1920 by the Consol. Mg. & Smelting Co. of Canada Ltd.

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 and again in 1916 the estimated possible recovery (on the basis of a 90 per cent recovery) from lead ores shipped from the mines exceeded by far the recovery in smelters.

The total mine shipments in 1920 of lead ores and concentrates amounted to about 69,493 tons, valued by the operators at \$2,985,848, and containing 36,325,507

pounds of lead, as against 54,508 tons, valued at \$3,044,839, and containing 32,147,989 pounds of lead.

Lead Ores and Concentrates 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
1920.....	69,493	2,985,848	36,325,507	2,882,178

Comparative Records of Lead Production, 1915 to 1920, inclusive

	1915	1916	1917
(1) Production: Smelter recoveries from Canadian ore and recoverable lead in ore exported..... Lbs.	46,316,450	41,497,615	32,576,281
(2) Lead contents of ores and concentrates shipped from mines in Canada..... Lbs.	48,708,005	54,124,628	38,696,116
(3) Total production of lead bullion in Canada (including lead from imported ores.) (a)..... Lbs.	43,518,618	43,100,236	41,427,304
(4) Total production of refined lead in Canada (including lead from imported ores and the pig-lead produced in Ontario)..... Lbs.	43,518,618	33,087,474	32,115,114

	1918	1919	1920
(1) Production: Smelter recoveries from Canadian ore and recoverable lead in ore exported..... Lbs.	51,398,002	43,827,699	35,953,717
(2) Lead contents of ores and concentrates shipped from mines in Canada..... Lbs.	46,843,602	32,147,989	36,325,507
(3) Total production of lead bullion in Canada (including lead from imported ores.) (a)..... Lbs.	35,834,115	34,150,134	28,029,866
(4) Total production of refined lead in Canada (including lead from imported ores and the pig-lead produced in Ontario)..... Lbs.	31,571,112	34,330,920	28,720,030

(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 production of refined lead at Trail, B.C., amounted in 1920 to 13,237 tons, as against 16,446 tons in 1919.

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 Kingston plant has been idle these last three years.

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 1919 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. The plant at Galetta operated again in 1920.

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	1910.....	32,987,508	1916.....	33,087,474
1905.....	15,804,509	1911.....	23,525,050	1917.....	32,115,114
1906.....	20,471,314	1912.....	35,893,190	1918.....	31,571,112
1907.....	26,607,461	1913.....	37,923,043	1919.....	34,330,920
1908.....	36,549,274	1914.....	36,443,706	1920.....	28,720,030
1909.....	41,883,614	1915.....	43,518,618		

*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 seven years. The average price of lead at Montreal in 1920 was 8.940 cents per pound, as against 6.966 cents in 1919.

The Toronto price of lead in 1920 averaged 9.041 cents per pound, as against 6.832 cents in 1919.

The price of soft lead in London averaged in 1920, £38 4s. 7d. as against an average of £28 3s. 11d. in 1919.

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

(Value in cents per pound)

	1913	1914	1915	1916	1917	1918	1919	1920
Montreal.....	4.659	4.479	5.600	8.513	11.137	9.250	6.966	8.940
London.....	4.072	4.146	4.979	6.715	6.626	6.539	6.216	8.219
New York.....	4.370	3.862	4.673	6.858	8.787	7.413	5.759	7.957
St. Louis.....	4.238	3.737	4.567	6.777	8.721	7.222	5.530	7.830

Monthly Average Prices of Pig-Lead at Montreal*

(Value in cents per pound)

Month	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January.....	3.31	3.93	4.32	4.78	4.27	7.29	9.50	8.42	6.94	9.93
February.....	3.32	3.97	4.18	4.73	4.58	7.73	11.35	8.73	6.33	10.36
March.....	3.34	4.03	4.05	4.57	5.04	9.25	11.77	8.87	6.51	10.83
April.....	3.26	4.10	4.42	4.41	5.21	9.60	11.54	8.49	6.25	9.95
May.....	3.20	4.08	4.66	4.54	5.26	9.10	13.19	8.46	6.26	9.58
June.....	3.27	4.34	4.98	4.55	6.53	8.48	14.62	9.46	6.43	9.38
July.....	3.33	4.57	4.92	4.49	6.35	7.79	13.26	9.86	6.75	9.19
August.....	3.45	4.84	5.02	4.48	5.62	7.76	13.14	9.86	6.97	8.97
September.....	3.63	5.47	5.02	4.42	5.63	8.41	10.93	9.86	7.19	8.21
October.....	3.77	5.07	4.99	4.07	5.71	8.61	8.46	9.86	7.60	7.70
November.....	3.93	4.53	4.82	4.29	6.39	8.72	7.92	9.86	8.05	7.25
December.....	3.95	4.55	4.52	4.41	6.61	9.42	7.92	8.31	8.32	5.94
Average.....	3.480	4.467	4.650	4.479	5.600	8.513	11.137	9.25	6.966	8.94

*Producers' prices for car load quantities ex-cars Montreal, as furnished by Messrs. Thos. Robertson & Co., Limited, Montreal, and in 1920, by the Consol. Min. & Smel. Co. of Canada, Ltd., Montreal.

Monthly Average Prices of Lead in New York†

(Value in cents per pound)

Month	1911	1912	1913	1914	1915	1916	1917	1918	1919	1920
January.....	4.483	4.435	4.321	4.111	3.729	5.921	7.026	6.782	5.432	8.561
February.....	4.440	4.026	4.325	4.048	3.827	6.246	8.636	6.973	5.057	8.814
March.....	4.394	4.073	4.327	3.970	4.053	7.136	9.199	7.201	5.226	9.145
April.....	4.412	4.200	4.381	3.810	4.221	7.650	9.288	6.772	4.982	8.902
May.....	4.373	4.194	4.342	3.900	4.274	7.463	10,207	6.818	5.018	8.576
June.....	4.435	4.392	4.325	3.900	5.932	6.936	11.171	7.611	5.340	8.323
July.....	4.499	4.720	4.353	3.891	5.659	6.352	10,710	8.033	5.626	8.338
August.....	4.500	4.569	4.624	3.875	4.656	6.244	10.594	8.050	5.798	8.687
September.....	4.485	5.048	4.698	3.828	4.610	6.810	8.680	8.050	6.108	8.179
October.....	4.265	5.071	4.402	3.528	4.600	7.000	6.710	8.050	6.487	7.070
November.....	4.298	4.615	4.293	3.683	5.155	7.042	6.249	8.050	6.808	6.159
December.....	4.450	4.303	4.047	3.800	5.355	7.513	6.375	6.564	7.231	4.727
Average.....	4.420	4.471	4.370	3.862	4.673	6.858	8.787	7.413	5.759	7.957

†From the *Engineering and Mining Journal*.

Monthly Average Prices of Lead in London‡

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

Month	1911	1912	1913	1914	1915
January.....	13 0 8	15 11 3	17 1 11	18 19 10	18 12 0
February.....	13 1 11	15 13 9	16 8 5	19 2 8	19 3 7
March.....	13 2 11	15 19 8	15 19 8	19 2 3	21 17 8
April.....	12 18 5	16 6 6	17 8 10	17 19 8	21 2 1
May.....	12 19 2	16 10 2	18 14 3	18 4 8	20 9 2
June.....	13 5 5	17 11 8	19 10 8	18 13 11	25 4 1
July.....	13 10 11	18 8 9	19 7 10	18 8 6	24 12 3
August.....	14 1 4	19 5 8	19 15 8	20 9 9	21 18 11
September.....	14 15 1	21 9 0	19 14 10	18 16 3	23 3 0
October.....	15 6 1	20 8 0	19 9 5	17 9 8	23 19 9
November.....	15 15 5	18 4 7	18 13 9	17 19 9	26 2 9
December.....	15 13 4	18 1 6	17 8 8	18 18 6	28 8 8
Yearly.....	13 19 3	17 15 11	18 6 2	18 13 9	22 17 10

Month	1916	1917	1918	1919	1920
January.....	30 17 5	30 0 0	29 0 0	34 10 0	47 7 2
February.....	31 18 9	30 0 0	29 0 0	26 13 0	50 12 9
March.....	34 7 8	30 0 0	29 0 0	26 16 11	47 1 10
April.....	34 8 0	30 0 0	29 0 0	24 8 7	40 4 0
May.....	32 19 5	30 0 0	29 0 0	23 18 06	39 3 2
June.....	30 14 0	30 0 0	29 0 0	22 12 2	35 1 4
July.....	27 8 11	30 0 0	29 0 0	23 14 2	35 9 0
August.....	29 2 7	30 0 0	29 0 0	25 1 7	36 8 10
September.....	29 17 4	30 0 0	29 0 0	25 12 7	35 7 6
October.....	30 0 0	30 0 0	29 0 0	28 15 11	35 2 2
November.....	30 0 0	30 0 0	31 12 4	34 16 1	32 5 6
December.....	30 0 0	30 0 0	40 0 0	41 7 8	24 11 10
Yearly average.....	30 19 6	30 0 0	30 2 8	28 3 11	38 4 7

‡As published by the Metal Information Bureau, London.

Exports and Imports.—The exports of lead in 1920 as given by the Customs Department amounted to 7,568,200 pounds (3,784.1 tons) valued at \$387,685, and

consisted of lead in ores, concentrates, etc., 7,549,400 pounds, valued at \$385,839, and pig-lead, 18,800 pounds, valued at \$1,846.

The exports of lead in 1919 amounted to 24,469,700 pounds (12,234.8 tons), valued at \$1,389,012 and consisted of 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 large increase in the exports for the years 1916, 1917, 1918, and 1919, as shown in the table of exports, 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 1920

	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	.....	.....	329,968	9,136
1914.....	246,100	2,681	510,573	19,507	756,673	22,188
1915.....	1,845,100	40,273	2,066,929	79,067	3,912,029	119,340
1916.....	9,048,400	558,180	112,100	7,710	9,160,500	565,890
1917.....	13,410,400	925,056	1,004,500	62,453	14,414,900	987,509
1918.....	22,684,100	1,321,890	7,461,700	668,807	30,145,800	1,990,697
1919.....	13,142,900	616,278	11,326,800	772,734	24,469,700	1,389,012
1920.....	7,549,400	385,839	18,800	1,846	7,568,200	387,685

The imports of lead in 1920 were valued at \$3,008,958 and included: (a) lead in pigs, blocks, "old and scrap," bars and sheets, etc., 14,095 tons, valued at \$2,323,873; (b) lead pigments, lead salts, and litharge, valued at \$419,578 and with an estimated lead content of 1,625 tons; and (c) manufactures of lead for which no quantity is given, valued at \$265,507.

The imports of lead in 1919 were valued at \$1,022,265 and included: (a) lead in pigs, blocks, "old and scrap," bars and sheets, etc., 5,798 tons, valued at \$613,539; (b) lead pigments, lead salts and litharge, valued at \$269,997 and with an estimated lead content of 2,078 tons; and (c) manufactures of lead for which no quantity is given, valued at \$138,729.

Imports of Lead, 1917, 1918, 1919, and 1920*

	1917		1918		1919		1920	
	Tons	Value	Tons	Value	Tons	Value	Tons	Value
Pig and block.....	5,755	\$ 958,402	5,499	\$ 759,086	4,079	\$ 397,053	13,320	\$ 2,182,608
Old and scrap.....	.....	.....	.....	.....	1,203	135,219	182	23,592
Bars and sheets.....	523	111,002	445	80,594	287	35,037	384	67,872
Pipe.....	139	29,502	115	23,542	45	8,013	24	5,185
Shot and bullets.....	13	2,163	2	512	4	976	59	10,497
Tea lead.....	245	59,231	295	73,140	180	37,181	126	34,119
Total.....	6,675	1,160,300	6,356	936,874	5,798	613,539	14,095	2,323,873
Lead contained in pigments.....	490	106,188	582	118,765	657	123,720	469	120,136
Lead contained in litharge.....	1,264	275,919	877	169,500	1,371	126,243	1,106	277,951
Lead contained in nitrate and acetate.....	61	24,327	38	15,108	50	20,084	50	21,491
Total.....	1,815	406,434	1,497	303,373	2,078	269,997	1,625	419,578
Manufactures.....	.....	165,764	.....	110,442	.....	138,729	.....	265,507
Grand total.....	8,490	1,732,493	7,853	1,350,689	7,876	1,022,265	15,720	3,008,958

*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	2-87	1,769,700	45,674	2-58
1911.....	19,977,400	495,923	2-48	3,083,700	55,458	1-80
1912.....	28,178,700	940,582	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.....	10,998,600	759,086	6-90	839,100	80,594	9-06
1919.....	10,405,197	532,272	5-11	573,994	35,097	6-11
1920.....	27,002,717	2,206,200	8-17	768,726	67,872	8-83

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	107,638
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	99,235
1915.....	1,579,800	89,232	5-68	250,921	23,269	9-27	102,439
1916.....	2,767,200	211,359	7-64	224,643	30,445	13-55	124,833
1917.....	2,807,900	275,919	9-83	188,008	24,327	12-94	165,764
1918.....	1,947,900	169,500	8-70	100,516	15,108	15-03	110,442
1919.....	3,046,300	126,243	4-14	152,592	20,034	13-12	138,729
1920.....	2,457,900	277,951	11-30	152,584	21,491	14-08	265,507

Calendar Year	Pipe Lead			Shot and Bullets			Tea Lead		
	Pounds	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	19,532	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	959,139	67,652	7-05
1916.....	217,905	21,450	9-84	78,474	6,390	8-14	2,145,354	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	4,023	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
1920.....	48,769	5,185	10-63	117,224	10,497	8-95	251,273	34,119	13-58

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	32,673	516,032	25,341	3,936,608	153,913	3.91
1910.....	2,076,629	75,463	811,510	37,475	881,788	31,803	3,769,927	144,741	3.84
1911.....	1,467,193	58,335	1,033,732	46,986	1,571,508	64,180	4,072,433	169,501	4.16
1912.....	2,499,725	138,627	714,362	37,916	2,539,767	113,579	5,753,854	290,122	5.04
1913.....	1,162,082	61,424	1,057,653	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	106,188	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
1920.....	34,520	3,003	39,032	5,444	967,533	110,989	1,041,085	120,136	11.54

Consumption.—The production of lead as already stated was in 1920, 17,977 tons, while the exports amounted to 3,784 tons, leaving a balance of 14,193 tons; by adding to this amount the 15,720 tons of imports we get a total consumption of lead for Canada of about 29,900 tons.

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 7,853 tons of imports we get a total consumption of lead for Canada of about 18,500 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	1913.....	30,000	1918.....	26,000
1909.....	25,000	1914.....	29,000	1919.....	18,500
1910.....	24,000	1915.....	40,000	1920.....	29,900
1911.....	28,000	1916.....	64,000		
1912.....	39,000	1917.....	43,000		

Quebec

The production of lead in Quebec during 1920 amounted to 905,472 pounds, valued at \$80,949, as against 2,280,000 pounds, valued at \$158,825, in 1919. This production was derived as in past years wholly from the zinc-lead deposits of Notre-Dame-des-Anges.

Quebec: Production of Lead

Year	Quantity	Value	Year	Quantity	Value
	Pounds	\$		Pounds	\$
1915.....	40,401	2,262	1918.....	2,110,059	195,180
1916.....	698,760	59,485	1919.....	2,280,000	158,825
1917.....	1,378,001	153,468	1920.....	905,472	80,949

Ontario

The production of lead in Ontario during 1920 was 2,255,520 pounds, valued at \$201,643, as against 1,487,586 pounds, valued at \$103,625, in 1919.

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	1920.....	2,255,520	201,643

British Columbia

The production of lead in British Columbia during 1920 amounted to 32,792,725 pounds, valued at \$2,931,670, as against 40,060,113 pounds, valued at \$2,790,587, in 1919. This production included the lead bullion produced at Trail from the treatment of Canadian ores, together with the estimated recoveries from lead ores exported.

Previous to 1915 almost all the lead ores mined in British Columbia were smelted and refined at Trail, B.C. Since 1915 to the present date with the exception of 1917 considerable tonnages of lead ores and concentrates have been exported to the United States. In 1918 these exports amounted to over 27,000 tons of ores and concentrates being mostly from the Sullivan mine at Kimberley, while in 1919 they were reported as being about 7,500 tons and in 1920 as being about 6,000 tons.

British Columbia is the main source of lead production in Canada. Operations in this province have been greatly curtailed during the last year due to the serious labour troubles, the high freight and smelter charges, and the low price of lead and silver.

British Columbia: Production of Lead

Year	Pounds	Value	Year	Pounds	Value
		\$			\$
1887.....	204,800	9,216	1904.....	36,646,244	1,579,036
1888.....	674,500	29,813	1905.....	56,580,703	2,663,254
1889.....	165,100	6,488	1906.....	52,408,217	2,964,733
1890.....			1907.....	47,738,703	2,542,086
1891.....			1908.....	43,195,733	1,814,221
1892.....	808,420	33,064	1909.....	45,857,424	1,692,139
1893.....	2,131,092	79,490	1910.....	32,987,508	1,216,249
1894.....	5,703,222	187,636	1911.....	23,784,969	827,717
1895.....	16,461,794	531,716	1912.....	35,763,476	1,597,554
1896.....	24,199,977	721,159	1913.....	37,626,899	1,753,037
1897.....	38,841,135	1,390,513	1914.....	36,289,845	1,625,422
1898.....	31,693,559	1,198,017	1915.....	45,377,064	2,541,116
1899.....	21,862,436	977,250	1916.....	39,157,701	3,333,496
1900.....	62,158,621	2,760,031	1917.....	29,483,725	3,283,602
1901.....	51,532,906	2,235,603	1918.....	47,594,328	4,402,475
1902.....	22,536,381	917,005	1919.....	40,060,113	2,790,587
1903.....	18,089,283	766,443	1920.....	32,792,725	2,931,670

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	1914	1915	1916	1917	1918	1919	1920
Cassiar—							
Atlin, etc.			7,260				
Skeena, etc.		30,462	1,077				
East Kootenay—							
Fort Steele	24,863,105	26,582,050	24,156,143	13,996,640	18,695,565	10,729,483	26,926,319
Windermere, etc.		216,327	571,244	1,774,649	2,659,210	1,659,279	1,095,486
West Kootenay—							
Ainsworth	8,069,525	3,436,184	7,841,869	6,395,350	6,106,262	4,336,602	4,072,807
Nelson	2,004,436	967,775	1,240,784	2,605,666	1,611,166	292,010	719,219
Slocan	15,233,910	14,925,345	14,415,645	11,808,019	14,575,379	12,156,845	6,135,581
Revelstoke, etc.	128,912	89,041	206,741	395,321	80,773	44,035	83,165
Yale—							
Yale—Kamloops			47,380	12,690		29,485	
Similkameen, etc.				10,697		4,594	2,720
Grand Forks, etc.	1,678	7,127	14,922	36,548	47,738	43,200	106,433
Cariboo—							
Omineca	323,482	249,279	224,451	271,885	123,568	180,455	189,488
	50,625,048	46,503,590	48,727,516	37,307,465	43,899,661	29,475,968	39,331,218

*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 and 1920.

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

The "Mayo area" has taken greater prominence since the discovery of Louis Beauvette in July, 1918, of galena ore carrying high values in silver on Keno hill, which is about 40 miles from Mayo by wagon road.

The Yukon Gold Company, Limited, has taken a bond on a group of claims on Keno hill and carried on extensive development throughout the year 1920. This company expects to have about 3,000 tons of high grade ore hauled to Mayo Landing before navigation opens in the spring of 1921.

The Mayo Valley Railway, Limited, has been granted a Dominion charter for the purpose of building along the Stewart and Mayo rivers a fifty-mile railway line.

Mr. W. E. Cockfield, of the Geological Survey of Canada, spent two weeks in the Mayo field during the summer of 1919, and his report appeared in the 1919 Summary Report of the Geological Survey.

Mr. Cockfield states that "the discovery of deposits of high grade ore on Keno Hill is of great importance, as it shows beyond doubt that the Silver King vein is not an isolated occurrence. That other discoveries will be made from time to time seems highly probable."

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 1921

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
" 1900.....	43,335	March 31, 1907.....	1,995	" 1914.....	8,179
" 1901.....	30,000	" 1908.....	51,001	" 1915.....	3,217
" 1902.....		" 1909.....	307,433	" 1916.....	59
" 1903.....	4,380	" 1910.....	340,542	" 1917.....	
" 1904.....	195,627	" 1911.....	248,534	" 1918*.....	
" 1905.....	330,645	" 1912.....	179,288		
				Total.....	1,979,164

*The Lead Bounty Act of 1913 expired in June, 1918, and was not renewed.

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, Limited, 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 of 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 1920 were 209,020 pounds, valued at \$272,152 as against 26,465 pounds, valued at \$31,573, in 1919.

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
1898-1920.....			

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

Imports of Mercury

Calendar Year	Pounds	Value	Calendar Year	Pounds	Value
		\$			\$
1907.....	189,841	82,873	1914.....	204,229	97,449
1908.....	87,620	44,020	1915.....	184,432	159,184
1909.....	235,958	147,625	1916.....	79,204	74,461
1910.....	107,888	63,450	1917.....	71,608	76,322
1911.....	118,336	67,416	1918.....	56,936	68,903
1912.....	137,474	72,171	1919.....	26,465	31,573
1913.....	219,442	109,493	1920.....	209,020	272,152

Average Monthly Price of Mercury*

(Per flask of 75 pounds)

Month	1918		1919		1920	
	New York	San Francisco	New York	San Francisco	New York	San Francisco
	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.	\$ cts.
January.....	126 77	115 58	105 50	103 07	90 192	.....
February.....	119 89	116 96	89 84	91 45	84 432	.....
March.....	121 63	115 83	71 56	73 68	92 611	.....
April.....	121 87	115 46	72 94	71 20	1,02 192	.....
May.....	118 97	113 31	83 12	78 60	89 560	.....
June.....	122 60	113 48	93 25	89 83	90 154	.....
July.....	126 63	116 69	104 68	98 85	90 333	.....
August.....	125 56	118 33	107 08	103 73	83 806	.....
September.....	127 81	119 00	102 52	99 83	75 000	.....
October.....	127 18	119 33	86 35	86 23	67 200	.....
November.....	124 91	118 91	90 74	82 28	58 417	.....
December.....	117 70	115 60	98 27	91 13	49 577	.....
Year.....	123 46	116 54	92 15	89 16	81 123	.....

*From the "Eng. and Mg. Jour." January 22, 1921.

MOLYBDENUM

There was no production of molybdenite in Canada during 1920.

The total production in 1919 representing the quantity of MoS_2 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 MoS_2 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 concentration 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	*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	188,316	156,461	156,461	156,461
1917.....	26,871	22,605	1554.3	320,006	330,316	288,705	288,705
1918.....	34,030	33,935	461.3	428,807	378,482	378,029	434,733
1919.....	7,280	6,783	46.0	69,203	83,002	83,002	69,203
1920.....							

*Value as given by the operators.

^bEstimated at the average market value of molybdenite.

°No figures available.

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 and 1920, but the only producer in 1919 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 MoS₂, but included small quantities of ore running from 2 to 15 per cent MoS₂ 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., Limited, at Quyon, Que.

St. Maurie Mines, Limited, Indian Peninsula, Timiskaming Co., Que.

International Molybdenum Co., at Renfrew, Ont.

Molybdenum Products Co., Haliburton, Ont.

Renfrew Molybdenum Mines, Limited, 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

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. Camseil. Summary Report, Geol. Survey, 1916.

(c) "Report on the Arnprior-Quyon district, Ontario and Quebec." By M. E. Wilson. Summary Report of the Geol. Survey, 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. Survey, 1916.

Prices.—“The market started in January, 1920, with sellers quoting 75 cents per pound MoS₂ for 90 per cent concentrate, with buyers at approximately 60 cents and this rate of price difference kept up through the year. The little business done was at a comprise figure.”¹

Estimated World's Production of Molybdenum Ores†

(In short tons)

	1917					1918				
	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).....	78.7	153,826	*	†51.0	40.1	104.1	203,670	*	†51.0	53.0
Queensland (2).....	124.5	236,608	*	†51.0	63.5	123.0	236,457	*	†51.0	62.7
Southern Australia (3).....	0.0	1,747	*	†51.0	0.5	0.2	477	*	†51.0	0.1
Canada.....	1,554.0	320,006	165.1	6.4	99.1	461.3	428,807	189.2	24.6	113.5
Japan (4).....	*	*	*	*	*	*	*	*	*	*
Norway (4).....	*	*	*	*	†100.0	*	*	*	*	†100.0
Peru (5).....	7.7	21,545	6.4	49.9	3.9	4.6	8,278	3.5	46.0	2.1
Spain (4).....	*	*	*	*	*	*	*	*	*	*
United States (6).....	*	495,350	.....	.....	175.1	2,280.0	1,253,700	.....	18.9	430.8
		\$								
Australia:—										
New South Wales (1).....										
Queensland (2).....										
Southern Australia (3).....										
Canada.....	46.0	69,203	41.5	54.0	24.9					
Japan (4).....										
Norway (4).....										
Peru (5).....										
Spain (4).....										
United States (6).....										

†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 1920 amounted to 61,335,706 pounds (30,667.9 tons), valued at \$24,534,282, as against 44,544,883 pounds (22,272.4 tons), valued at \$17,817,953, in 1919, an increase of 37.7 per cent.

This production includes: (a) the nickel in the matte produced from the treatment of the copper-nickel ores of the Sudbury district, and the Alexo mine, 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.

¹ Extract from "The Molybdenite market in 1920." By Chas. Hardy. *Eng. & Min. Jour.*, January 22, 1921.

Production of Nickel

Calendar Year	Pounds of nickel	Cents per pound	Value	Calendar Year	Pounds of nickel	Cents per pound	Value
1898	830,477	60	\$ 498,286	1905	18,876,315	40	7,550,526
1899	1,435,742	65	933,232	1906	21,490,955	42	8,948,834
1891	4,035,347	60	2,421,208	1907	21,189,793	45	9,535,407
1892	2,413,717	58	1,399,956	1908	19,143,111	43	8,231,538
1893	3,982,982	52	2,071,151	1909	26,282,991	36	9,461,877
1894	4,907,430	38½	1,870,958	1910	37,271,033	30	11,181,310
1895	3,888,525	35	1,360,984	1911	34,098,744	30	10,229,623
1896	3,397,113	35	1,188,990	1912	44,841,542	30	13,452,463
1897	3,997,647	35	1,399,176	1913	49,676,772	30	14,903,032
1898	5,517,690	33	1,820,838	1914	45,517,937	30	13,655,381
1899	5,744,000	36	2,067,840	1915	68,308,657	30	20,492,597
1900	7,080,227	47	3,327,707	1916	82,958,564	35	29,035,497
1901	9,189,047	50	4,594,523	1917	84,330,280	40	33,732,112
1902	10,693,410	47	5,025,903	1918	92,507,293	40	37,002,917
1903	12,505,510	40	5,002,204	1919	44,544,833	40	17,817,953
1904	10,547,883	40	4,210,153	1920	61,335,706	40	24,534,282

There were mined in 1920, 1,135,792 tons of nickel-copper ore, and smelted 1,086,159 tons, from which were produced 57,938 tons of Bessemer matte carrying approximately 30,557 tons of nickel and 16,000 tons of copper. The average metal recovery in matte from the ores treated was 2.69 per cent nickel and 1.41 per cent copper.

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 2.92 per cent nickel and 1.60 per cent copper.

Production of the Sudbury District

	1915	1916	1917	1918	1919	1920
Ore mined..... Short tons	1,364,048	1,566,333	1,518,783	1,641,617	572,400	1,135,792
Ore smelted..... "	1,272,283	1,521,689	1,453,661	1,559,892	754,567	1,086,159
Bessemer matte produced.... "	67,703	80,011	78,897	87,184	42,736	57,938
Copper content of matte..... "	19,608	22,430	21,196	23,482	12,099	16,000
Nickel content of matte..... "	34,039	41,298	41,887	45,886	22,035	30,557
Wages paid miners and smelters.....	\$3,555,912	\$4,841,662	\$5,438,830	\$6,606,782	\$3,212,622	\$5,485,058
Men employed.....	4,033	4,656	4,517	4,701	2,274	3,222

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 1920 it averaged 52.7 per cent nickel and 27.6 per cent copper, or a total of 80.3 per cent, while in 1919 it averaged 51.6 per cent nickel and 28.3 per cent copper, or a total of 79.9 per cent, and 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	26.9	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
				1920	52.7	27.6	80.3

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 of Canada, 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 production from the refineries at Port Colborne, Ont., and Deschenes, Que., and from the eastern Ontario smelters in Ontario in 1920 were: (a) metallic nickel, 10,962,792 pounds (5,481.4 tons), valued at \$3,836,782; (b) nickel oxides, 4,889,571 pounds, valued at \$1,151,164; and (c) nickel-sulphate and nickel castings, 33,836 pounds, valued at \$10,116.

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.

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 produced refined nickel and copper and will also recover later on the precious metals platinum, palladium, iridium, and gold from the treatment of the residues from the nickel-copper refinery.

The total estimated nickel contents of the recoveries from the silver-cobalt-nickel ores was in 1920, 221,150 pounds, as against 474,274 pounds in 1919, and 736,005 pounds in 1918.

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

(a) The International Nickel Company, of Canada, Limited, 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.

¹ "Report on Nickel and Copper Deposits of Sudbury, Ont." By A. E. Barlow, Geol. Survey, 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."

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

(c) The British America Nickel Corporation, Limited, 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, Limited, which operated a 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. This company did not operate during 1920.

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, Limited, Welland, Ont.

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	31,202	231,634
1916	79,360	31,538	†555,868	101,358	361,702
1917	265,896	108,334	†657,549	122,063	556,961
1918	243,186	88,720	†962,309	215,277	736,005
1919	397,884	137,435	†340,389	32,862	474,274
1920	204,537	71,287	†24,112	6,312	221,150

*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.

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 years 1919 and 1920. This price rules for relatively small quantities of nickel; the average price is about 40 cents, or possibly less.

The price of nickel in London, as given by the "London Mining Journal," was £215 in January, then increased to £225 in February, and £230 in March, at which price it remained until November, when it receded to £220, dropping again in December to £215.

Exports and Imports.—The exports of nickel in 1920 amounted to 60,199,300 pounds (30,099.7 tons), valued at \$11,988,857, or an average of 19.92 cents per pound, and included: (a) nickel in ore and matte, 51,701,000 pounds, valued at \$9,006,140, or an average of 17.4 cents per pound; and (b) nickel fine, 8,498,300 pounds, valued at \$2,982,717, or an average of 35.1 cents per pound.

The exports 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 37,478,500 pounds (43,739.2 tons), valued at \$11,263,246, and included: (a) nickel in ore and matte, 35,767,700 pounds,

valued at \$10,556,040, or an average of 21.31 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	1912.....	44,221,860	4,661,758	10.54
1904.....	11,233,869	1,091,349	9.71	1913.....	49,459,017	5,195,560	10.50
1905.....	17,318,059	1,569,693	9.06	1914.....	46,528,327	5,149,427	11.07
1906.....	20,653,845	2,042,965	9.89	1915.....	66,410,442	7,394,446	11.13
1907.....	19,376,335	2,280,374	11.76	1916.....	80,441,700	8,662,179	10.77
1908.....	19,419,893	1,866,624	9.61	1917.....	81,272,400	8,708,650	10.72
1909.....	25,616,398	2,676,483	10.45	1918 (a).....	87,478,500	11,263,246	12.88
1910.....	36,014,782	4,030,040	11.19	1919 (a).....	41,016,400	8,077,593	19.69
1911.....	32,619,971	3,676,396	11.27	1920.....	60,199,300	11,988,857	19.92

(a) The exports of nickel included nickel fine, in 1918, 1,710,800 pounds valued at \$707,206, or an average of 41.3 cents per pound, in 1919, 10,621,000 pounds valued at \$3,292,420, or an average of 31 cents per pound, and in 1920, 8,498,300 pounds valued at \$2,982,717, or an average of 35.1 cents per pound.

The imports of nickel in 1920 were valued at \$827,543, and included: (a) nickel, nickel-silver, German silver, in ingots, blocks, etc., and in bars, sheets, etc., 735,663 pounds, valued at \$256,559; and (b) manufactures of nickel, valued at \$570,984.

The imports in 1919 were valued at \$585,405, and included: (a) nickel, nickel-silver, German silver, nickel in ingots, etc., 726,408 pounds, valued at \$242,342; and (b) manufactures of nickel, valued at \$343,063.

There are also imports of nickel-plated ware valued in 1920 at \$2,000,767, as against \$1,455,627 in 1919.

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	1,536,397
1914.....	70,564	25,362	549,288	130,065	83,155	986,492
1915.....	74,381	27,361	635,963	169,807	77,538	689,577
1916.....	179,367	66,515	713,072	258,811	89,084	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	647,830	212,380	343,063	1,455,627
1920.....	7,197	3,260	(a) 728,466	253,299	570,984	2,000,767

(a) Imports for 1920 include 75,510 pounds of nickel in bars, rods, strips, et cetera, valued at \$24,786, which item was not given separately, in previous years.

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 43.8 to 50.7 cents per pound, with an average of 47.3 cents in 1920, as against 36.6 to 60.6 cents per pound, with an average of 44.6 cents, in 1919.

United States: Imports and Exports of Nickel*

	1919			1920		
	Quantity	Value	Cents per pound	Quantity	Value	Cents per pound
		\$			\$	
<i>Imports into United States—</i>						
Ore and matte..... Gross tons	23,057	5,780,380	19.73	32,650	8,463,872	20.35
Nickel content..... Pounds	20,303,223			41,586,103		
<i>Exports of nickel, nickel oxide and matte from United States to—</i>						
Belgium (a)..... Pounds				594,976	279,365	46.95
France..... "	1,346,119	533,228	39.61	72,912	36,895	50.60
Italy..... "	525,940	192,435	36.59			
Netherlands..... "	61,197	26,409	43.15			
United Kingdom..... "	747,437	323,720	43.31	69,622	30,501	43.81
Japan..... "	582,946	352,672	60.50	352,834	164,781	46.70
Other countries..... "	551,123	273,085	49.55	124,888	63,303	50.69
	3,814,762	1,701,549	44.60	1,215,232	574,845	47.30

*From the "Foreign Commerce of the United States," Dec. 1920.

(a) Not separately stated prior to 1920.

Imports of Nickel Ore and Matte into the United States*

From	1917 (Fiscal Year)		1918 (Fiscal Year)		1918 (July 1 to Dec. 31)		1919 (Calendar Year)		1920 (Calendar Year)	
	Tons	Pounds	Tons	Pounds	Tons	Pounds	Tons	Pounds	Tons	Pounds
Belgium.....									703	857,381
France.....										
Norway.....										
Canada (a).....	56,603	70,738,737	56,282	70,710,232	30,639	37,526,609	20,321	25,503,767	29,627	37,737,459
Chile.....			1	91						
Peru.....										
Oceania—										
French.....	409	387,805	100	111,207			50	83,168	1,240	1,595,267
Australia.....	3,120	2,912,298	2,393	2,274,240	394	381,695	2,636	3,716,293	1,080	1,396,001
New Zealand.....					437	409,023				
Totals.....	60,132	74,038,840	58,776	73,095,770	31,470	38,317,327	23,057	29,303,228	32,650	41,586,108

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

(a) Values were: in 1917, \$9,219,634, and in 1918, \$8,608,555; from July 1 to Dec. 31, 1918, \$6,940,565; in 1919, \$5,780,380, and in 1920, \$8,463,872.

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

(In Pounds)

To	1916 (Fiscal Year)	1917 (Fiscal Year)	1918 (Fiscal Year)	1918 (July 1 to Dec. 31)	1919 (Calendar Year)	1920 (Calendar Year)
Belgium.....					442,680	594,976
Denmark.....	2,174	28,051				
France.....	1,871,595	2,336,684	1,904,131	557,400	1,346,119	72,912
Germany.....		1,168,056				5,600
Italy.....	1,880,661	5,471,426	4,723,940	2,048,462	525,940	
Netherlands.....	139,300	506,583			57,091	
Norway.....	34,460	33,614			10,056	
Portugal.....		66,520	14,844	2,912		
Russia in Europe.....	5,371,089	4,917,075				
Spain.....	112,450	153	1,098		12,971	
Sweden.....	313,953	28,554		22,400	12,769	908
Switzerland.....						89,169
United Kingdom—						
England.....	7,973,478	10,024,301	7,977,562	3,284,387	736,033	69,622
Scotland.....	6,113,198	5,820,442	3,024,000		11,404	
North America—						
Canada.....	11,646	27,169	10,363	2,923	35,972	1,145
Cuba.....	10	34,410	527		794	
Mexico.....		249	4,000	1,000	80	110
Panama.....			321		37	
West Indies (Dutch).....	10					
Haiti.....			120			
South America—						
Argentina.....			3,352	1,550	4,467	236
Brazil.....	473	7,623	1,291	500	1,327	10,064
Chile.....	100	101	31,543		134	1,219
Colombia.....		70			500	
Venezuela.....			100			
Asia—						
China.....		6,720	69,246	26,320	20,780	547
German China.....			2,000			
British India.....	411					
Dutch East Indies.....			1,361	2,240		
Hong Kong.....		13,899	31,000		2,740	
Japan.....	597,257	287,944	886,337	1,407,150	582,946	352,834
Russia in Asia.....	1,226,990					
Oceania—						
British Australia and Tasmania.....	679	217,280	70,254	1,260	281	
New Zealand.....						15,890
Philippine Islands.....	56	1,510			20	
Egypt.....			60,822			
Switzerland.....				40,320	4,149	
Nicaragua.....					166	
Dominican Republic.....					1,000	
Ecuador.....					200	
	25,649,995	31,005,606	18,818,212	7,398,824	3,810,656	1,215,232

*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, chapter 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.

The recorded production in 1920 from the alluvial sands was 17 crude ounces, valued at \$719, as against 25 crude ounces, valued at \$2,150, in 1919, and 39 crude ounces, valued at \$2,560, in 1918.

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 1920 a recovery at the Port Colborne refinery, in an impure state, of about 89 ounces of platinum, 174 ounces of palladium, and about 20 ounces of rhodium, osmium, etc., with also a certain quantity of gold and silver; the recovery in 1919 was 25 ounces of platinum and 62 ounces of palladium, with also a small quantity of gold and 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.

The recoveries at the New Jersey refinery were in 1920, 488.9 ounces of platinum, 739.2 ounces of palladium, 390.3 ounces of rhodium, and 102.4 ounces of osmium, iridium and ruthenium. The recoveries in 1919 were: 616.7 ounces of platinum, 762.2 ounces of palladium, 227.3 ounces of rhodium, and 76.6 ounces of osmium, iridium and ruthenium.

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 America Nickel Corporation started early in 1920 the operation of its refinery at Deschenes, Que., and as the electrolytic method of refining which is 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. This company has been storing its residues awaiting the perfection of their process for the recovery of the precious metals.

There is also a small production of platinum and associate metals from the residues obtained in the refinery of the Royal Mint, Ottawa.

The recovery at the Royal Mint, Ottawa, in 1920 was: 14.6 crude ounces of platinum, valued at \$775.07. In 1919 the recovery was: platinum, 23.3 ounces, valued at \$1,990.42; palladium, 0.7 ounces, valued at \$87; and iridium, 20.8 ounces, valued at \$2,268.12. The recovery in 1918 was: platinum, 15.9 ounces, valued at \$1,455.66; and iridium, 49.8 ounces, valued at \$5,432.30.

The platinum recovered at the Royal Mint 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	1897.....	1,600	1907-1912.....		
1888.....	6,000	1898.....	1,500	1913.....	18	489
1889.....	3,500	1899.....	825	1914.....		
1890.....	4,500	1900.....		1915.....	23	1,063
1891.....	10,000	1901.....	457	1916.....	15	600
1892.....	3,500	1902.....	190	1917.....	57	3,823
1893.....	1,800	1903.....		1918.....	39	2,560
1894.....	950	1904.....	420	1919.....	25	2,150
1895.....	3,800	1905.....	500	1920.....	17	719
1896.....	750	1906.....				

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	139,329-29	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	1,016-531	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	949-737	786-654	472-579	
1919.....	19-528	634-043	35,639-79	616-716	762-217	227-294 (b)	76,613
1920.....	30-740	613-338	81,882-78	488-901	739-158	390-336 (b)	102,363

(a) Figures not given separately.

(b) Includes Osmium, Iridium and Ruthenium.

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 (a).....	23-349	1,990-42	20-782	2,268-12
1920.....	14-613	775-07		
Total recovered.....				

(a) Palladium recovered in 1919: 0.696 oz. gross value \$87.00, and not included in the above table.

Exports and Imports.—The exports of platinum in 1920 were 790 ounces, valued at \$85,740, and included: (a) platinum in ore, concentrates, etc., 473 ounces, valued at \$53,956; and (b) platinum "old and scrap," 317 ounces, valued at \$31,784.

The exports of platinum 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.

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	1914.....		\$		\$	43	\$ 2,161
1908.....	43	937	1915.....					236	11,052
1909.....	466	2,118	1916.....					532	41,945
1910.....	2,254	62,776	1917.....	136	11,309	195	18,920	331	29,599
1911.....	39	1,961	1918.....	12	798	135	20,094	197	20,892
1912.....	92	3,821	1919.....	325	28,815	346	33,814	671	62,629
1913.....	158	7,929	1920.....	473	53,956	317	31,784	790	85,740

The imports of platinum in 1920 were valued at \$125,977 and included: (a) platinum crucibles, valued at \$13,772; (b) platinum wire, bars, strips, etc., valued at \$105,718, and (c) platinum retorts, etc., valued at \$6,487.

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.

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
1920.....	13,772	105,718	6,487	125,977

*Platinum wire and platinum in bars, strips, sheets or plates; platinum retort, 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. The subsequent internal troubles have further crippled the platinum industry in that country and only a relatively small production has been made during the last few years.

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

The price of platinum in 1920 was quoted at \$150 to \$155 per ounce during January and February. It then gradually declined to a minimum of about \$75 in July. It again increased to \$115 by the end of August, at which price it remained until the middle of October, when it started to decrease again, finishing the year at around \$75 per ounce.

Average Yearly Prices of Platinum*

Months	1916	1917	1918	1919	1920
January.....	90.05	87.83	105.92	104.85	.....
February.....	90.00	103.75	107.68	100.43	.....
March.....	90.75	103.33	(a) 108.00	99.20	.....
April.....	83.10	103.77	(a) 108.00	99.85	.....
May.....	80.50	105.00	106.27	102.60	.....
June.....	78.13	104.75	(b) 105.00	105.80	.....
July.....	63.60	103.88	(b) 105.00	105.90	.....
August.....	62.56	104.55	(b) 105.00	107.60	.....
September.....	84.25	104.13	(b) 105.00	128.70	.....
October.....	89.75	104.00	(b) 105.00	132.21	.....
November.....	101.25	104.52	(b) 105.00	136.74	.....
December.....	86.87	104.38	105.54	151.35	.....
Yearly average.....	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 1920 amounted to 13,330,357 fine ounces, which at the average price for the year of 100.90 cents, was valued at \$13,450,330, as against 16,020,657 fine ounces, which at the average price of 111.122 cents, was valued at \$17,802,474 in 1919, being a decrease of 16.8 per cent in quantity and 24.5 per cent in value.

The production in 1920 included: (a) refined silver and silver contained in silver and gold bullion, 9,201,094 ounces, or 69.1 per cent; (b) silver contained in blister copper and lead bullion 2,373,650 ounces, or 17.8 per cent; and silver estimated as recoverable from ores, etc., exported, 1,755,613 ounces, or 13.1 per cent.

The production in 1919 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.

No official statistics of the production of silver had been published previous to 1887. Nevertheless, the annual reports of the 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

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

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 1920

Year	Ounces	Value	Cents per ounce	Year	Ounces	Value	Cents per ounce
		\$				\$	
1887.....	355,033	347,271	98.00	1904.....	3,577,526	2,047,095	57.22
1888.....	427,232	410,998	94.00	1905.....	6,000,023	3,621,133	60.35
1889.....	383,318	358,735	93.60	1906.....	8,473,379	5,659,455	66.79
1890.....	400,637	419,118	104.60	1907.....	12,779,799	8,348,659	65.33
1891.....	414,523	409,549	98.00	1908.....	22,106,233	11,636,239	52.86
1892.....	310,651	272,130	86.00	1909.....	27,529,473	14,178,504	51.50
1893.....		330,123	77.00	1910.....	32,369,264	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	1,080,299	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.....	5,553,446	3,323,395	59.79	1914.....	23,449,321	15,593,631	54.81
1898.....	4,452,333	2,593,929	58.26	1915.....	26,625,960	13,228,842	49.68
1899.....	3,411,644	2,032,658	59.58	1916.....	25,459,741	16,717,121	65.66
1900.....	4,468,225	2,740,362	61.33	1917 (a).....	22,221,274	18,091,895	81.417
1901.....	5,539,192	3,265,354	58.95	1918 (b).....	21,333,979	20,693,704	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	1920 (b).....	13,330,357	13,450,330	100.900
				Grand total...	402,040,440	253,701,419	64,347

(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 of 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 each year, reaching 80.4 per cent in 1918; 75.5 per cent in 1919, and 74.3 per cent in 1920.

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; in 1919 to 23.1 per cent, and in 1920 to 25.0 per cent of the total.

The balance of the production, 0.7 per cent in 1920, as against 2.2 per cent in 1919, and 1.3 per cent in 1918, was derived from Quebec, Manitoba, and the Yukon Territory.

Production of Silver by Provinces, 1887-1920*

Year	Ontario		Quebec		British Columbia		Yukon Territory	
	Ounces	Value	Ounces	Value	Ounces	Value	Ounces	Value
1887	100,495	\$ 181,630	146,898	\$ 143,666	17,690	\$ 17,301		\$
1888	208,064	195,584	149,388	140,425	70,780	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	73,066		
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	3,272,239		
1898	85,000	49,521	74,932	43,655	4,292,401	2,600,753		
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	6,521,173	16,000	10,452	2,745,448	1,793,519	35,988	23,510
1908	19,398,545	10,254,847	13,209	7,030	2,631,389	1,391,058	63,000	33,304
1909	24,822,099	12,784,126	13,233	6,815	2,649,141	1,364,337	45,000	23,176
1910	30,366,366	16,241,755	7,693	4,061	2,407,887	1,287,833	87,418	46,756
1911	30,540,754	16,279,443	13,435	9,827	1,887,147	1,005,924	112,708	60,078
1912	29,214,025	17,772,352	9,465	5,758	2,651,002	1,612,737	81,068	49,318
1913	28,411,261	16,987,377	34,573	20,672	3,312,343	1,980,433	87,626	52,392
1914	25,139,214	13,779,055	57,737	31,640	3,159,897	1,731,971	92,973	50,959
1915	22,748,609	11,302,419	63,450	31,524	3,565,852	1,771,658	248,049	123,241
1916	21,608,158	14,188,133	98,610	64,748	3,392,872	2,227,794	360,101	236,446
1917	19,301,835	15,714,975	136,194	110,885	2,655,994	2,162,430	119,605	97,379
1918	17,198,737	16,643,662	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
1920	9,907,626	9,996,795	61,003	61,552	3,327,028	3,356,971	19,190	19,363
Total	310,591,391	198,569,670	2,515,009	2,184,756	86,081,246	56,190,019	2,795,562	1,609,144

*Does not include small productions from New Brunswick, Alberta, and Manitoba, in 1917, and from Manitoba in 1918, 1919, and 1920.

Prices.—The average price of silver in New York as quoted by the *Engineering and Mining Journal* for the year 1920 was 100.9 cents per ounce, as against 111.122 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 1919 closed with silver at \$1.31 per ounce.

By the end of January, 1920, the price of silver reached \$1.35 per ounce, then it started to decline gradually to about \$1 towards the middle of May, finishing the year at the low figure of 63 cents per ounce.

Purchase of domestic silver in the United States under the Pittman Act began in May, 1920, at the rate of \$1 per ounce 1,000 fine.

The causes of the sudden rise and fall in silver prices, as stated by the *Engineering and Mining Journal* are given as follows:—

As to the rise:—

(1) Heavy demand for Indian currency since 1914.

(2) Enormous bullion purchases by the English Government on Indian account.

- (3) Large excess of merchandise exports from Bombay, Calcutta, and other Eastern ports.
 (4) Huge military expenditures in India, Egypt, Mesopotamia and Palestine.
 (5) Embargo on silver imports on private account.

As to the fall:—

- (1) Cessation of bullion purchases on government account in 1919.
 (2) Unfavourable balance of trade against India for the last six months, as shown by the large amount of Reserve Council Bills sold.
 (3) Unfavourable monsoon, or lack of rain during last summer and autumn.
 (4) The substitution of paper money in place of the silver rupee.

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
			1920.....	100.900	61.590

(a) 925 parts fine.

Average Monthly Prices of Silver

Months	New York—Cents per fine ounce							London, Pence per Standard ounce (a)
	1914	1915	1916	1917	1918	1919	1920	
January.....	57.572	48.855	56.775	75.030	88.702	101.125	132.827	79.846
February.....	57.506	48.477	56.755	77.585	85.716	101.125	151.295	85.005
March.....	58.067	50.241	57.935	73.851	88.082	101.125	125.551	74.194
April.....	58.519	50.250	64.415	73.875	95.346	101.125	119.779	68.848
May.....	58.175	49.915	74.269	74.745	99.505	107.135	102.585	60.010
June.....	56.471	49.034	65.024	76.971	99.500	110.430	90.957	51.096
July.....	54.678	47.519	62.940	79.010	99.625	106.394	91.921	53.786
August.....	54.344	47.163	66.083	85.407	100.292	111.370	96.168	59.875
September.....	53.290	48.680	68.515	100.740	101.125	114.540	93.675	59.476
October.....	50.654	49.385	67.855	87.332	101.125	119.192	83.480	54.197
November.....	49.082	51.714	71.604	85.891	101.125	127.924	77.734	50.952
December.....	49.375	54.971	75.765	85.960	101.125	131.970	64.774	41.845
Average for the year.....	54.811	49.684	65.661	81.417	96.772	111.122	100.900	61.590

(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 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 Ontario Smelters and Refiners, Ltd., with plants at Welland and Chippewa, Ont.

Silver bullion varying from 850 to 998.2 is produced at these works, other products being white arsenic, metallic nickel and cobalt nickel and cobalt oxides, and salts of nickel and cobalt.

There has been also since 1918 a small production of refined silver at the new refinery of the International Nickel Company of Canada, at Port Colborne, Ont.

The silver bullion from Ontario as a rule finds a market in the United States and in England.

Exports and Imports.—The exports of silver in 1920 were 11,834,504 fine ounces, valued at \$12,238,209, and included: (a) silver contained in ores, concentrates, etc., 1,903,130 ounces, valued at \$2,007,550, and (b) silver in bullion, 9,931,374 ounces, valued at \$10,230,659.

The exports in 1919 were 15,405,161 fine ounces, valued at \$16,410,797, and included: (a) silver contained in ore, etc., 2,854,928 ounces, valued at \$2,850,592, and (b) silver in bullion, 12,550,223 ounces, valued at \$13,560,205.

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

Calendar Year	Value	Calendar Year	Value	Calendar Year	Fine Ounces	Value
	\$		\$			\$
1886.....	25,957	1898.....	2,902,277	1909.....	31,126,504	15,719,909
1887.....	206,284	1899.....	1,623,905	1910.....	30,699,270	15,649,537
1888.....	219,008	1900.....	2,341,872	1911.....	31,216,725	15,807,366
1889.....	212,163	1901.....	2,026,727	1912.....	34,911,922	19,494,416
1890.....	204,142	1902.....	1,820,058	1913.....	37,371,569	21,441,220
1891.....	225,212	1903.....	1,989,474	1914.....	28,020,089	15,584,813
1892.....	56,688	1904.....	1,904,394	1915.....	27,672,481	13,812,038
1893.....	213,695	1905.....	2,777,218	1916.....	25,279,359	15,637,885
1894.....	359,731	1906.....	5,686,444	1917.....	21,718,784	17,621,398
1895.....	994,354	1907.....	9,941,849	1918.....	19,357,076	18,382,902
1896.....	2,271,959	1908.....	12,403,482	1919.....	15,405,161	16,410,797
1897.....	3,576,391			1920.....	11,834,504	12,238,209

The imports of silver in 1920 were: (a) silver bullion, valued at \$2,453,450; (b) sterling silver, valued at \$314,869; (c) silver coins, valued at \$100; and (d) silver medals, valued at \$14,043.

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.

Imports of Silver, 1910 to 1920, 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
1920 (b).....	2,453,450	100	314,869	108,788	6,605	184,681	545,015

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

(b) Imports in 1920 of silver medals, valued at \$14,043 and not included in above table.

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 1920 was 61,003 fine ounces, valued at \$61,552, as against 140,926 ounces, valued at \$156,600, in 1919.

Ontario

The production of silver in Ontario in 1920 was 9,907,626 fine ounces, valued at \$9,996,795, as against 12,117,878 ounces, valued at \$13,465,628, in 1919, a decrease of about 16.2 per cent in quantity and 25.8 per cent in value.

In 1919 there had been a decrease of 29.0 per cent in quantity and 18.0 per cent in value, whereas in 1918 there was also a decrease of 10.8 per cent in quantity, but an increase of 5.0 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 1920, 5,711,494 ounces, or 58.6 per cent, was recovered as bullion in the Cobalt district; 3,334,724 ounces, or 33.7 per cent, was recovered by the silver smelters of Eastern Ontario; and 99,311 ounces, or 1.0 per cent, was contained in the gold bullion, so that 92 per cent of the total production was recovered in the form of bullion within the province, leaving a balance of 762,097 ounces, or 7.7 per cent, recovered from materials treated in the United States.

During 1919, 5,813,840 ounces, or 48.4 per cent of the output was recovered as bullion in the Cobalt 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.

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

Percentage Proportion of Production

	1915	1916	1917	1918	1919	1920
	%	%	%	%	%	%
Cobalt and adjoining districts.....	41.0	39.5	51.1	55.0	48.7	58.6
Eastern Ontario smelters.....	43.0	44.7	33.9	29.0	36.4	33.7
Total for Ontario.....	84.0	84.2	85.0	84.0	85.1	92.3
U.S. smelters.....	16.0	15.8	15.0	16.0	14.9	7.7
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 1920 to 1,724 tons of ore and concentrates, with a silver content of 675,918 ounces, as against 4,901 tons, containing 1,780,617 ounces in 1919, and 7,339 tons, containing 2,861,283 ounces, in 1918.

The production in 1920 included in addition to the output of the silver camp and the recovery at Port Colborne, 99,311 ounces of silver contained in the gold bullion from the gold camps, as against 92,805 ounces in 1919, 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 1920 to 15,510 ounces, valued at \$15,649, as against 20,760 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 1920 to 3,327,028 fine ounces, valued at \$3,356,971, as against 3,713,537 ounces, valued at \$4,126,556, in 1919, a decrease of about 10.4 per cent in quantity and of 18.6 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.

The production in 1920 included: (a) 1,145,165 ounces, or 34.4 per cent of the total contained in blister copper; (b) 1,131,116 ounces, or 34.0 per cent contained in lead bullion; (c) 713,125 ounces, or 21.4 per cent contained in lead and zinc ores and concentrates exported; and (d) 337,622 ounces, or 10.2 per cent contained in gold, silver and copper ores exported.

Production of Silver in British Columbia by Districts, 1915-20*

(Silver contents of ore shipped, in fine ounces)

—	1915	1916	1917	1918	1919	1920
Cariboo—						
Omineca division.....	79,155	112,635	82,311	84,125	72,573	103,020
Cassiar—						
Atlin.....		3,054		1,115		
Skeena, etc.....	175,179	256,802	343,805	416,616	920,413	1,317,832
Kootenay, East—						
Fort Steele division.....	481,258	509,693	180,168	261,497	205,500	362,143
Other divisions.....	1,188	29,178	79,685	91,784	68,634	53,510
Kootenay, West—						
Ainsworth division.....	289,565	321,202	224,461	228,699	167,453	266,963
Slocan division.....	1,812,550	1,480,571	1,547,576	1,873,236	1,556,714	738,515
Nelson division.....	9,405	32,547	46,229	136,738	44,280	7,065
Trail Creek division.....	159,584	132,080	47,112	47,203	27,788	36,411
Revelstoke, Trout Lake, and Lardeau	16,740	22,419	37,733	11,761	2,994	7,979
Yale—						
Boundary.....	273,795	280,578	220,213	227,113	222,680	385,681
Similkameen-Nicola.....	347	830	3,470	131	6,823	4,876
Yale, Ashcroft, and Kamloops.....	1,702	4,215	3,525	1,317	2,096	437
Lillooet.....	5		276	412	365	
Southern Coast—						
Vancouver Island.....	15,727	17,954	25,727	23,040	9,936	2,745
Mainland.....	50,306	98,165	86,925	93,385	94,870	90,672
Total.....	3,366,506	3,301,923	2,920,216	3,498,172	3,403,119	3,377,849

*From the Minister of Mines Reports, British Columbia.

Yukon

The silver production of the Yukon Territory in 1920 amounted to 19,190 fine ounces, valued at \$19,368, as against 27,556 ounces, valued at \$30,621, in 1919, and 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 1920 lode mining produced only 14.6 per cent of the total, leaving 85.4 per cent as the production from alluvial workings, and in 1919 lode mining produced only 26 per cent of the total, leaving 74 per cent as the production from alluvial sands, 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 associations.¹

The imports of tin in 1920 were valued at \$4,627,732, and included: (a) tin in blocks, pigs or bars, 4,801,000 pounds, valued at \$3,029,964; (b) tin foil, bichloride of tin and strip waste, and tin crystals, 2,013,388 pounds, valued at \$543,031; and (c) tinware, valued at \$932,398.

The imports of tin in 1919 were valued at \$3,454,995 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, tin crystals, and collapsible tubes, valued at \$914,198.

There is also a large annual import of tin plates and sheets (iron products tin-plated) the quantity in 1920 being 68,183 tons, valued at \$10,130,224, as against 43,407 tons, valued at \$6,436,047, in 1919; 72,844 tons, valued at \$11,403,887, in 1918; 66,676 tons, valued at \$9,985,631, in 1917; and 57,542 tons, valued at \$5,221,163, in 1916.

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

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	1,507,313	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
1920.....	4,801,000	3,020,964	1,834,220	513,688	128,120	5,082

Calendar Year	Collapsible tubes	(a) Tinware, etc	Tin crystals	Bichloride of tin		Total imports of tin
				Pounds	Value	
	Value	Value	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	8,301	125	118	4,204,532
1919.....	87,095	825,177 (b)	1,926	42,675	21,968	3,454,995
1920.....	122,339	932,308 (c)		51,048	24,261	4,627,732

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

(b) Covers first quarter of 1919, after April 1, 1919, tin crystals are included with bichloride of tin.

(c) Include with bichloride of tin.

TUNGSTEN

There was no production of tungsten reported in 1919 and 1920.

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, Limited, 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 $13\frac{1}{2}$ 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, Limited, 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, Limited, 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., Limited, 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., Limited, 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.

"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.

In 1920 the price of tungsten was quoted between \$6 and \$7, until September when it dropped to about \$5. The price for the last few months of 1920 was about \$4.50 per pound.

ZINC

The production of zinc in 1920 amounted to 39,863,912 pounds (19,932 tons), which at the average price for the year of 7.871 cents per pound, was valued at \$3,057,961, as against 32,194,707 pounds (16,097 tons), valued at \$2,362,448, or an average of 7.338 cents per pound in 1919.

The production in 1920 included: (a) 37,034,000 pounds of refined zinc produced at Tadanac, B.C., and (b) 2,829,912 pounds being the estimated recoveries from ores and concentrates exported to the United States.

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.

Of the total production thus recorded, 1,120,200 pounds are credited to the ores of Notre-Dame-des-Anges, Quebec, and the balance to British Columbia, with the exception of about 14,000 pounds, being the recovery from gold ores of Porcupine, Ontario.

The production in 1919 included: (a) 24,652,000 pounds of refined zinc, and (b) 7,542,707 pounds, the estimated recoveries from ores and concentrates exported. Of the total production thus recorded in 1919, 1,752,000 pounds are credited to the ores of Notre-Dame-des-Anges, Quebec, about 148,000 pounds to Ontario, and the balance to British Columbia.

Production of Zinc, 1911-20

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
1920.....	39,863,912	3,057,961	7.671

*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 1920, including the zinc-lead ores from the Sullivan mine, East Kootenay, B.C., and ores exported to the United States, amounted to about 249,136 tons, valued by the operators at \$1,157,844, or an average of \$4.65, and containing 91,033,202 pounds of zinc.

In 1919 the shipments of ores and concentrates were 135,535 tons, valued by the operators at \$1,049,493, or an average of \$7.75 per ton, and containing 59,959,709 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	18,165	814,000	1910.....	5,063	120,003	4,361,712
1900.....	261	4,810	212,000	1911.....	2,500	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.....	82,077	1,086,249	48,498,078
1906*.....	1,154	23,800	*	1917.....	116,489	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
				1920.....	249,136	1,157,844	91,033,202

*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 1920 was 18,517 tons, as against 12,326 tons in 1919, 12,574 tons in 1918, 9,985 tons in 1917, and 2,974 tons in 1916, or a total of 56,376 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 1915³.

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

Prices.—The price of zinc in 1920 in New York was at about 9.5 cents per pound in January and gradually declined to about 7.5 cents in September. There were no New York quotations for the last quarter of 1920.

The price of zinc in St. Louis averaged 9.13 cents in January and gradually declined to an average of 5.82 cents in December, or an average for the year of 7.671 cents per pound.

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. 423. 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.

Monthly Average Price of Zinc (Spelter) at Montreal* from 1916 to 1920, inclusive

(In cents per pound)

	1916	1917	1918	1919	1920
January.....	19-55	10-74	8-48	8-00	11-284
February.....	21-51	11-27	8-50	7-215	11-275
March.....	19-45	11-64	8-17	7-03	9-856
April.....	20-01	10-45	7-51	6-968	10-279
May.....	17-12	10-19	7-87	6-954	9-812
June.....	13-76	20-16	8-62	7-624	9-817
July.....	10-43	9-48	9-28	8-912	10-085
August.....	9-78	9-11	9-60	9-067	10-113
September.....	9-93	8-88	10-23	8-777	9-239
October.....	10-76	8-70	9-64	9-086	8-41
November.....	12-82	8-50	9-24	9-489	7-759
December.....	12-13	8-35	9-04	10-289	6-769
Average.....	14-77	9-79	8-85	8-284	9-558

*Producers prices for carload quantities ex cars Montreal, as furnished by Messrs. The Consolidated Mining and Smelting Company of Canada, Ltd., Montreal.

Average Price of Spelter at New York*

(In cents per pound)

Month	1913	1914	1915	1916	1917	1918	1919	1920
January.....	6-931	5-262	6-386	16-915	9-619	7-836	7-272	9-483
February.....	6-239	5-377	8-436	18-420	10-045	7-814	6-623	9-058
March.....	6-078	5-250	8-541	16-846	10-300	7-461	6-500	8-881
April.....	5-641	5-113	10-012	16-695	9-459	6-890	6-464	8-534
May.....	5-406	5-074	14-781	14-276	9-362	7-314	6-429	7-938
June.....	5-124	5-000	21-208	11-752	9-371	8-021	6-901	7-815
July.....	5-278	4-920	19-026	8-925	8-643	8-688	7-873	8-070
August.....	5-658	5-568	12-781	8-730	8-300	8-985	7-789	8-185
September.....	5-694	5-380	13-440	8-990	8-136	9-442	7-510	7-717
October.....	5-340	4-909	12-800	9-829	7-983	8-801	7-823	**
November.....	5-229	5-012	15-962	11-592	7-847	8-491	8-177	**
December.....	5-154	5-592	15-391	10-669	7-685	8-163	8-700	**
Year.....	5-648	5-213	13-230	12-804	8-901	8-159	7-338	.....

*From the "Engineering and Mining Journal," N. Y., Jan. 1921.

**No quotations for last three months in 1920.

Average Prices of Spelter, Ordinary Brands, in London*

(In pounds sterling per long ton)

Month	1913	1914	1915	1916	1917	1918	1919	1920
January.....	25 19 1 21	6 6 30 16	1 83 12 5 48	8 3 52 0 0 50	15 11 59 10 4			
February.....	25 4 3 21	7 6 39 16	4 93 10 11 54	4 6 52 0 0 42	11 6 62 3 7			
March.....	24 11 4 21	7 7 44 2 7 90	1 9 54 10 4 52	0 0 37 10 3 54	16 8 8			
April.....	25 2 4 21	10 2 49 17 9 94	1 8 52 18 11 52	0 0 35 18 3 48	9 5			
May.....	24 10 4 21	5 9 67 19 0 89	11 4 52 0 0 52	0 0 35 13 9 46	0 9			
June.....	21 19 10 21	6 0 100 12 3 63	16 4 52 0 0 52	0 0 36 19 6 42	2 11			
July.....	20 11 2 21	6 7 97 5 0 48	7 6 52 0 0 52	0 0 42 3 10 42	13 4			
August.....	20 14 0 29	0 9 67 15 9 47	19 7 52 0 0 52	0 0 39 16 9 41	19 6			
September.....	21 3 10 25	14 0 67 17 9 48	15 8 52 0 0 52	0 0 41 8 5 40	5 6			
October.....	20 13 9 23	13 6 66 10 11 52	4 4 52 0 0 52	0 0 43 17 12 40	5 6			
November.....	20 14 4 24	14 10 85 6 4 55	0 5 52 0 0 52	7 7 46 17 3 35	14 8			
December.....	21 6 8 27	6 10 82 4 1 54	5 9 52 0 0 54	0 0 53 9 3 28	11 6			
Year.....	22 14 3 23	6 8 66 13 8 68	8 11 52 3 6 52	3 11 42 5 3 45	4 6			

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

Exports and Imports.—The exports of zinc ores in 1920 were reported by the Customs Department as 3,126 tons, valued at \$122,387, or an average of \$39.15 per ton. The exports of metallic zinc were 6,979,900 pounds (3,490 tons), valued at \$512,279, or an average of 7.34 cents per pound.

The exports of zinc ores in 1919 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 7,603,800 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 1920 were 27,272,102 pounds, valued at \$2,458,205, and with a metal content of 22,629,856 pounds. There were also manufactures of zinc valued at \$96,961. The imports of zinc in pigs, sheets, etc., in 1919 amounted to 26,445,461 pounds, valued at \$2,088,021, and with a metal content of 22,749,548 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 in 1920 at \$1,097,121, besides manufactures of brass valued at \$5,240,654, as against \$697,996 and manufactures valued at \$3,539,742 in 1919.

The exports of brass in 1920 were valued at \$851,511, as against \$1,685,941 in 1919, and included in 1920: (a) brass, "old and scrap," 3,439,800 pounds, valued at \$475,809; (b) brass rods, sheets, etc., 244,000 pounds, valued at \$49,728; and (c) brass valves, valued at \$325,974; while in 1919 the exports included: (a) brass, "old and scrap," 9,656,900 pounds, valued at \$1,275,448; (b) brass rods, sheets, and tubing, 535,500 pounds, valued at \$173,654; and (c) brass valves, valued at \$236,839.

Exports of Brass, 1915 to 1920 .

	1915		1916		1917	
	Pounds	Value	Pounds	Value	Pounds	Value
Brass, old and scrap.....	12,068,500	\$ 1,468,165	37,503,700	\$ 6,064,779	59,500,000	\$ 9,615,627
Brass, rods, sheets, and tubings.....						
Brass, valves.....						
	1918		1919		1920	
	Pounds	Value	Pounds	Value	Pounds	Value
Brass, old and scrap.....	9,184,900	\$ 1,454,451	9,656,900	\$ 1,275,448	3,439,800	\$ 475,809
Brass, rods, sheets, and tubings.....	2,636,800	703,227	535,500	173,654	244,000	49,728
Brass, valves.....				236,839		325,974

Summary of Imports of Zinc and Zinc Products, 1917-20

Zinc and Zinc Products	1918			1919			1920		
	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.....	3,536,000	\$ 447,090	3,536,000	3,602,331	\$ 352,104	3,602,331	3,452,892	\$ 410,772	3,452,892
Zinc, as spelter.....	10,376,700	801,477	10,376,700	4,993,944	355,528	4,993,944	1,555,068	122,745	1,555,068
Zinc, white (80% Zn).....	16,693,824	1,396,392	13,355,059	16,657,168	1,254,958	13,325,734	21,254,272	1,829,620	17,003,418
Zinc, dust (90% Zn).....	306,195	42,989	275,575	658,808	86,169	592,927	378,556	50,597	340,700
Zinc, sulphate and chloride of (44% Zn).....	396,517	30,902	174,467	533,210	39,262	234,612	631,314	44,471	277,778
Total.....	31,309,236	2,718,850	27,717,614 (13,858.8 tons)	26,445,461	2,088,021	22,749,548 (11,374.7 tons)	27,272,102	2,458,205	22,629,856 (11,314.9 tons)
Zinc, manufactures of.....		85,177			43,155			96,961	
Grand total.....		2,804,027			2,131,176			2,555,166	
Brass, in blocks, pigs and ingots (30% Zn).....	2,025,200	441,574	607,560	593,000	127,528	177,900	360,400	72,451	108,120
Brass, old and scrap (30% Zn).....	1,102,500	198,383	330,750	1,803,200	216,305	540,960	3,538,700	533,534	1,061,610
Brass, tubing (30% Zn).....	512,454	198,819	153,736	742,127	282,897	222,638	1,076,278	400,149	322,883
Brass, plain wire (30% Zn).....	348,482	154,798	104,545	169,226	71,266	50,768	259,957	90,987	77,987
Total.....	3,988,637	993,574	1,196,591 (598.29 tons)	3,307,553	697,996	992,266 (496.1 tons)	5,235,335	1,097,121	1,570,600 (785.3 tons)
Brass, bars and rods.....	(a)	192,533		(a)	309,267		2,267,400	525,235	
Brass, strips, sheets or plates.....	(a)	192,287		(a)	306,359		1,482,200	431,236	
Brass, wire cloth, n.o.p.....		485,798			392,557			485,198	
Brass, cup for manuf. of shells.....		776,185			201,975			247,698	
Brass, caps for electric batteries.....		6,409			5,779			7,508	
Brass, hand-pumps.....		37,371			22,629			22,258	
Brass, nails, tacks, etc.....		4,929			5,524			9,050	
Brass and copper rivets, burrs, washers.....		18,288			20,138			35,789	
Brass, valves.....					267,737			562,153	
Brass, other manufactures, n.o.p.....		1,962,766			2,027,777			2,914,529	
Total.....		3,676,566			3,559,742			5,240,654	
Grand total.....		4,670,140			4,257,738			6,337,775	

(a) Quantities not given previous to 1920.

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	3,166,000	191,051	10,908,400	561,170	21,829		
1911	3,367,800	206,859	11,609,600	654,097	30,862		
1912	10,009,500	617,836	11,784,500	636,585	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	3,602,331	352,104	4,993,944	355,528	43,155		
1920	3,452,892	410,772	1,555,068	122,745	96,961	470	146

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	162,136	297,061	24,306
1917	16,039,236	1,300,621	547,158	91,699	430,751	32,395
1918	16,693,824	1,396,392	306,195	42,939	396,517	30,902
1919	16,637,168	1,254,953	653,808	86,169	533,210	39,262
1920	21,254,272	1,829,620	378,556	50,597	631,314	44,471

Consumption.—The table of imports shows that in 1920, 11,314.9 tons of zinc were imported as zinc and zinc products, with also 785.3 tons of zinc in brass and approximately 2,000 tons as zinc contents of manufactures of zinc and brass, or a total of 12,100 tons, which added to the 18,517 tons of zinc, would give a total of 30,617 tons refined in Canada. If we deduct the 3,490 tons of refined zinc exported, we get 27,200 tons as the Canadian consumption of zinc.

The table of imports shows that in 1919, 11,374.7 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 11,871 tons, which added to the 12,326 tons of zinc, would give a total of 24,197 tons. If we deduct the 3,847 tons of refined zinc exported we get about 20,400 tons as the Canadian consumption of zinc.

Calculated on the same lines the consumption for 1918 would be 28,000, as against 28,500 in 1917, 18,000 in 1916, and 15,000 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, Limited, 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.

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 "Zinc Bounties Act, 1916."

A new Act was passed by the House of Commons of Canada, May 24, 1918, and cited as "The Zinc Bounties Act, 1918." The text of this Act was given in the report of this Division for the year 1919.

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, and for the year ending March 31, 1921, the amount paid was \$42,190.64.

Production of Zinc in British Columbia by Districts, 1914-20*

(Contents of ore shipped in pounds)

	1915	1916	1917	1918	1919	1920
Kootenay, East—						
Fort Steele division.....	180,000	14,840,000	20,715,090	26,704,806	46,460,703	42,881,092
Windermere—Golden.....	311,719	210,000	18,000			
Kootenay, West—						
Ainsworth.....	678,940	625,971	918,601	640,991	36,785	158,193
Nelson.....	3,127,209	3,470,036	982,309			
Slocan.....	8,684,572	17,854,357	18,789,573	14,107,682	10,015,624	3,715,471
Revelstoke, etc.....			33,279	6,325		
Boundary-Yale—						
Kamloops, etc.....			27,564			
Cariboo—						
Omineca.....		168,616	364,007	313,112	224,539	453,512
	12,982,440	37,168,980	41,848,513	41,772,916	56,737,651	47,208,268

*From the Minister of Mines Report, British Columbia.

Zinc Reduction Plants in 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 at the close of	
		June 30, 1919	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, Kan.

PLANTS WITH LARGE RETORTS (a)

Operating company	Location	Retorts at the close of	
		1918	1919
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, 1913-20

(In metric tons, by countries where smelted)

	1913 ^a	1913	1914	1915	1916	1917	1918	1919	1920
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	38,994	54,716	44,500	20,000	
Norway.....	9,287	9,287	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.)