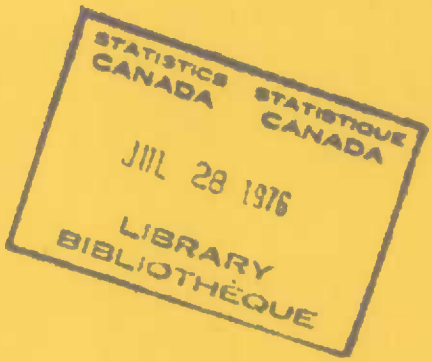
GOVERNMENT OF CANADA



MISCELLANEOUS METALS INDUSTRY

1948

A D.B.S. PUBLICATION

DOMINION BUREAU OF STATISTICS

DEPARTMENT OF TRADE AND COMMERCE

MISCELLANEOUS METALS INDUSTRY

1948

including

Aluminum
Antimony
Barium
Beryllium
Bismuth
Cadmium
Calcium
Cerium
Chromium
Iron
Indium
Magnesium
Manganese
Mercury
Molybdenum
Pitchblende
Selenium
Tantalum-Columbium
Tellurium
Thallium
Tin
Titanium (ilmenite)
Tungsten
Vanadium
Zirconium

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MISCELLANEOUS METALS, 1948

The mining of certain metal-bearing ores, other than those commonly classified as gold, silver, copper, nickel, cobalt, lead and zinc, have been grouped, for statistical purposes, as a single industry by the Dominion Bureau of Statistics. Their production in some instances is confined to a relatively few operators and the annual extraction of certain types often fluctuates in an erratic manner according to demand and supply. Included in this report, with the finally-revised statistics relating to the Canadian production of these ores or metals, are notes and statistical data pertaining to various rare or semi-rare metals or metalliferous ores produced in other countries. Metals and metal-bearing ores produced in Canada during 1948 and classified as miscellaneous include antimony, barium, bismuth, cadmium, calcium, chromite, iron ore, magnesium, manganese ore, molybdenite, pitchblende, selenium, tellurium, titanium ore, tin and tungsten concentrates. In addition to particulars relating to these metals or minerals, the bulletin contains notes of a summary nature on aluminum, beryllium, mercury, vanadium, and a few of the rarer metals.

It should be noted that the majority of the metals listed above as Canadian products and including bismuth, cadmium, selenium and tellurium, represent by-products recovered in the refining of lead, zinc or copper and, for this reason, such statistics as relate to their production in Canada are included with those of either the silver-lead-zinc mining industry, the copper-gold-silver mining industry, or the non-ferrous smelting and refining industry.

There were 25 firms in the miscellaneous metals mining industry in 1948; employees numbered 1,296 to whom $3,878,527 were paid in salaries and wages. The cost of fuel, electricity, process supplies, freight and ore treatment amounted to $4,100,667. The gross value of production was $8,725,661 in 1948 compared with $10,182,339 in the preceding year.

Table 1 - PRINCIPAL STATISTICS (*) OF THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1947 and 1948

			1947	1948
Number of firms			18	25
Number of plants			19	26
Number of employees:	Administrative and office		119	158
	Workmen		1,064	1,138
	Total		1,183	1,296
Salaries and wages:	Salaries	$	378,856	439,847
	Wages	$	2,592,047	3,438,680
	Total	$	2,970,903	3,878,527
Value of production (gross)		$	10,182,339	8,725,661
Cost of fuel and electricity		$	892,619	890,362
Process supplies used		$	619,760	1,303,681
Smelter charges		$	82,091	1,320
Freight		$	2,877,647	1,905,304
Value of production (net)		$	5,710,222	4,624,994

(*) Does not include data relating to smelters and refineries or to mining in the Northwest Territories. Data for 1947 and 1948 cover only chromium, iron, manganese, molybdenum, titanium and tungsten.

Table 2 - AVERAGE NUMBER OF WORKMEN, BY MONTHS, 1947 and 1948

Month	1947				1948			
	Surface		Under-	Mill	Surface		Under-	Mill	
	Male	Female	ground	Male	Male	Female	ground	Male	Female
January	678	5	84	105	662	8	187	101	1
February	691	6	100	98	649	9	206	102	1
March	722	6	94	118	683	11	191	105	1
April	757	6	94	152	718	13	189	115	1
May	788	5	114	153	725	14	202	133	1
June	818	5	163	172	945	16	199	142	1
July	850	5	153	178	950	14	182	134	1
August	872	5	167	183	975	14	184	134	1
September	843	5	170	174	964	21	191	141	1
October	806	5	170	181	864	31	197	148	1
November	759	5	193	157	751	31	225	146	1
December	697	3	108	131	708	30	195	108	1
AVERAGE	774	5	135	150	799	18	195	125	1

Table 3 - FUEL AND ELECTRICITY USED, 1948

Kind		Quantity	Cost at plant
			$
Bituminous coal - Canadian	short ton	1,176	14,908
Imported	short ton	3,838	50,206
Gasoline (including gasoline used in cars and trucks)	Imp.gal.	147,797	44,184
Kerosene or coal oil	Imp.gal.	3,175	1,294
Fuel oil and Diesel oil	Imp.gal.	1,426,804	308,639
Wood	cord	2,505	22,538
Electricity purchased for power and lighting (including service charge)	K.W.H.	57,305,610	284,356
Electricity purchased for other purposes	K.W.H.	51,672,000	164,237
TOTAL	...	...	890,362
Electricity generated for own use	K.W.H.	2,650	...

Table 4 - POWER EQUIPMENT, 1948

Description	Ordinarily in Use		In Reserve or Idle	
	Number of units	Total horse power	Number of units	Total horse power
Diesel engines	57	9,670	...	...
Gasoline, gas and oil engines, other than Diesel engines	44	1,010	1	15
Electric motors operated by purchased power	342	19,915	4	1,300
TOTAL	443	30,595	5	1,315
Stationary power boilers	5	510	...	...
Motor-generator sets	3	14		

A L U M I N U M

Although there is no bauxite (the ore of aluminum) in Canada, the Canadian aluminum industry is exceeded in size only by that of the United States. The principal factor favouring the establishment of the industry in Canada is abundant and low-cost hydro-electric power at points where necessary raw materials can be cheaply and conveniently assembled.

The production of 367,079 short tons of aluminum ingots in 1948 was 22.7 per cent greater than in the previous year, but still far below the peak production of 1943 when nearly a half-million tons of ingots were made.

Production in Canada is entirely by Aluminum Company of Canada, Limited, which has its alumina plant at Arvida and reduction plants at Arvida, Ile Maligne, Shawinigan Falls, La Tuque, and Beauharnois, all in the province of Quebec. These reduction plants have a total rated capacity of about 550,000 tons of aluminum a year, or over 20 per cent of the estimated productive capacity of the world. In 1948 operations were concentrated at Arvida, Ile Maligne and Shawinigan Falls.

Fabricating plants of this company are located at Kingston and Etobicoke in Ontario, and at Arvida and Shawinigan Falls in Quebec. They consume only a small part of the company's production as the Aluminum Company of Canada is primarily a producer and exporter of aluminum ingot.

The principal imported raw materials used in the Canadian aluminum industry are bauxite from British Guiana, coal and coke from United States, fluorspar from Newfoundland, and cryolite from Greenland and the United States.

Aluminum is finding an increasingly wide field of usefulness. It is available from fabricating plants in many forms such as sheets, foil, castings, forgings, rolled and extruded shapes, tubes, rods, wire, powder, and paste. Because of its light weight and strength when alloyed, it is widely used in the making of aircraft and for many other purposes where lightness of the structural metal is particularly desirable. Large tonnages are used for making cable for transmission of electricity, and for making cooking utensils and containers for food and beverages. It is finding an increasing number of architectural uses, being employed for window frames, screens, garage doors, heating and ventilating ducts,

Venetian blinds, and ornamental spandrels on buildings. Small dwelling houses are also being built of aluminum. These uses have increased so rapidly in the past few years that they now constitute the principal use of aluminum insofar as tonnage is concerned.

In the transportation industry, aluminum is used in frames and wheels of cars, trucks and buses, and for the making of pistons. A new development in this field is the use of aluminum tubing for oil, gasoline, and water lines. Aluminum is also used to an increasing extent in the construction of railway equipment, in the fittings of ships, and for the construction of canoes and small boats.

Aluminum is being made into nails and into barbed wire. There has been a very large increase in the use of aluminum foil for wrapping food products, particularly frozen foods. In pre-war years Germany controlled the greater part of the trade in foil but Canada is now supplying a large part of that market.

The price of aluminum ingot was 14 cents per pound in 1948. Effective January 1, 1948, the United States import tariff on aluminum metal and alloys was reduced from 3 cents to 2 cents per pound.

Table 5 - PRODUCTION IN CANADA, CONSUMPTION, IMPORTS AND EXPORTS OF ALUMINUM INGOTS, 1939-1948

Year	Production	Consumption in Canada	Exports	Imports
		(Tons of 2,000 pounds)		
1939	82,840	10,544	70,578	189
1940	109,144	18,197	86,536	135
1941	213,873	19,717	192,757	3
1942	340,596	32,700	314,483	...
1943	495,749	40,100	375,383	1
1944	462,065	38,400	295,226	66
1945	215,712	40,800	382,286	51
1946	194,117	33,825	187,336	246
1947	299,066	50,265	230,175	616
1948	367,079	65,433	328,551	25

Table 6 - IMPORTS OF ALUMINUM AND BAUXITE INTO CANADA, 1947 and 1948

Item	1947		1948	
	Cwt.	Value	Cwt.	Value
		$		$
Alumina	3,694	60,997	2,962	45,793
Bauxite ore	27,853,853	8,565,875	40,169,876	9,884,001
Cryolite	145,167	1,133,192	133,811	1,031,813
Aluminum - Pigs, ingots and blocks	12,320	126,305	492	10,581
Scrap	2,538	13,051	4,134	21,918
Angles, channels and beams	4,206	308,877	5,039	428,334
Bars, rods and wire	1,006	30,106	24,530	587,969
Leaf	...	510,701	...	165,454
Pipes and tubes	804	63,574	1,659	78,756
Plates, sheets and strips	81,387	2,261,158	44,585	1,567,683
Powder	414	23,858	491	32,204
Wire and cable	10	411	56	3,267
Household hollow ware	...	743,667	...	110,432
Manufactures n.o.p.	...	3,340,915	...	3,895,400

Cwt. = 100 pounds.

Table 7 - EXPORTS OF ALUMINUM FROM CANADA, 1947 and 1948

Item	1947		1948	
	Cwt.	Value	Cwt.	Value
		$		$
Aluminum scrap	216,035	1,934,681	456,794	5,141,641
Aluminum wire and cable	...	2,529,927	...	5,521,471
Aluminum manufactures, n.o.p.	...	3,648,551	...	3,325,163
Aluminum in bars, blocks, ingots and blooms	4,274,317	52,610,741	6,542,154	84,191,712
Aluminum in rods, sheets and circles	77,967	2,068,164	123,364	3,403,699
Aluminum kitchen utensils and hollow ware	...	1,163,510	...	464,742

Table 8 - WORLD PRODUCTION OF ALUMINUM, 1946-1948 (From the Annual Report of the American Bureau of Metal Statistics)

Country	1946	1947	1948
	(Tons of 2,000 pounds)		
United States	409,630	571,750	623,485
Canada	193,400	297,838	372,500
Total America	603,030	869,588	995,985
Austria	1,138	4,786	14,725
France	52,729	58,670	71,418
Germany	...	...	8,055
Great Britain	35,329	32,407	33,629
Italy	12,169	27,628	36,466
Norway	18,400	23,947	33,141
Hungary	2,172	3,000	5,679
Spain	1,110	1,065	1,200
Sweden	3,931	3,188	3,850
Switzerland	15,400	19,800	20,900
Total Europe (*)	142,378	174,491	229,059
Japan	3,519	2,976	7,672
India	3,576	3,553	3,771

(*) Excluding Yugoslavia.

ANTIMONY

Since 1945 the production of antimony in Canada has been in the form of antimonial lead. The Consolidated Mining and Smelting Company of Canada, at Trail, British Columbia, produces, intermittently, alloys containing 25 per cent and 12 per cent antimony. In 1948 the antimony content of alloy produced amounted to 310,062 pounds. There has been no production of antimony ore since 1942.

The greatest single use for antimony is as an alloying element with lead, to which it adds hardness and mechanical strength, such as in the manufacture of storage batteries and cable covering. It is alloyed with tin in the manufacture of babbitt bearings, and with lead and tin in solders, foil, collapsible tubes, and type metal. Its property of expansion on cooling when alloyed makes it particularly useful in the manufacture of type metal. During the war it was used to harden the lead used in ammunition and to flame proof canvas goods used by the armed forces.

The Canadian price for antimony was about 40 cents per pound at the end of the year.

Table 9 - PRODUCTION OF ANTIMONY IN CANADA, 1939-1948

Year	In ores exported		Metal produced in Canada		TOTAL	
	Pounds	$	Pounds	$	Pounds	$
1939	25,405	3,139	1,200,180	148,330	1,225,585	151,469
1940	44,700	5,800	2,549,792	392,668	2,594,492	396,468
1941	15,292	2,141	3,169,785	443,770	3,185,077	445,911
1942	78	13	3,041,030	516,975	3,041,108	516,988
1943	...	...	1,114,166	189,408	1,114,166	189,408
1944	...	...	1,937,933	281,000	1,937,933	281,000
1945 (*)	...	...	1,667,951	290,557	1,667,951	290,557
1946 (*)	...	...	642,145	96,332	642,145	96,322
1947 (*)	...	...	1,150,463	384,255	1,150,463	384,255
1948 (*)	...	...	310,062	113,173	310,062	113,173

(*) No refined metal in 1945-1948; figures represent antimony content of antimonial lead.

Table 10 - PRODUCTION OF ANTIMONY METAL IN CANADA, CONSUMPTION, IMPORTS AND EXPORTS, 1939-1948

Year	Production in Canada	Consumption in Canada	Imports	Exports (*)
		(Tons of 2,000 pounds)		
1939	600	426	119	275
1940	1,275	558	118	359
1941	1,585	955	1	676
1942	1,521	1,187	...	166
1943	557	1,303	120	6
1944	968	1,515	779	...
1945	...	778	517	...
1946	...	871	455	...
1947	...	1,189	1,440	...
1948	...	812	547	...

(*) Shipped for export; data not available from customs' records.

Table 11 - CONSUMPTION OF ANTIMONY METAL (*), BY INDUSTRIES, 1944-1948

Industry	1944	1945	1946	1947	1948
			(Tons of 2,000 pounds)		
In White metal foundries	1,191	614	743	948	700
Electrical apparatus plants	183	114	78	213	56
Brass foundries	10	9	21	11	13
Non-ferrous smelters	76	1	...	...	...
Silverware factories	8	9	29	17	23
Ammunition plants	41	26	...	...	...
Miscellaneous	6	5	5	...	20
TOTAL	1,515	778	871	1,189	812

(*) Includes some antimony in antimonial lead.

B A R I U M

Production (shipments) of barium metal in Canada in 1948 totalled 2,552 pounds valued at $7,988 compared with 568 pounds nominally valued at $1,278 in 1947. The commercial production of barium metal was introduced in Canada by the Dominion Magnesium Limited at Haley, Ontario, in 1947.

The price of barium metal is now about $3.00 per pound.

B E R Y L L I U M

Beryllium is not produced in Canada, but there are several occurrences of beryl in pegmatite dikes. No mining of the beryl ore is being done at present.

In Ontario, intermittent work was done prior to 1941 on a beryl pegmatite in Lyndoch township, Renfrew county. A few tons of clean cobbed crystals were obtained, and about 200 tons of milling grade rock was stockpiled. Most of the work on the property was done by the present owners, Canadian Beryllium Mines and Alloys, Limited, 901 Royal Bank Building, Toronto, who, however, have reported no sales. A detailed examination of the main easterly workings, made in 1943 by the Bureau of Mines, Ottawa, and the Metals Controller's Office, indicated an average content of 0.188 per cent beryl in the total rock excavated, with a maximum for the richest quarry sections of 1.24 per cent. Grade of selected clean beryl crystals was 10.41 per cent BeO.

In Manitoba a little work was done several years ago on beryl showings in pegmatites opened originally for feldspar and lithium minerals in the Winnipeg River and Oiseau (Bird) River areas, but no shipments were reported.

In the Northwest Territories, exploration in the area north and east of the Yellowknife gold camp has disclosed numerous occurrences of beryl in pegmatites which also contain lithium minerals and tantalite-columbite. Some of these are considered to be of possible economic interest.

In Quebec, scattered occurrences of beryl are known in La Corne and Preissac townships, Abitibi county, often associated with molybdenite. None of these, however, is believed to be of economic importance.

Beryllium is used chiefly in the form of beryllium-copper alloys, the most important of which contains about 2 per cent beryllium. A beryllium-aluminum alloy containing 5 per cent beryllium is used as a deoxidizer in making aluminum-magnesium products. Straight beryllium metal has only limited applications, notably for the windows of X-ray tubes, where it is used for its transparency to the rays.

Ground beryl is used as a batch ingredient in sparkplugs and other ceramic specialties, to which it imparts high electrical and impact resistance and transverse strength. Some is also used in cooking utensil enamels. Consumption for such uses in the United States is estimated at about 100 tons a year.

New York price quotations, at the end of the year, for beryllium ore, f.o.b. mine, were $26-$30 per unit of BaO, 8 to 12 per cent.

B I S M U T H

Bismuth was produced in Canada in 1948 by the Consolidated Mining and Smelting Company of Canada Limited, at Trail, British Columbia, and by Molybdenum Corporation of Canada Limited at La Corne, Quebec. The production at Trail is from the residues resulting from the electrolytic refining of lead bullion. The La Corne plant closed late in 1947, but shipments were made from the stockpile. Deloro Smelting and Refining Ltd. shipped some bismuth in the form of bismuth-silver-lead alloy.

Bismuth is too brittle to be used alone, but its alloys have many uses, such as in the manufacture of sprinkler plugs and other fire-protection devices, electrical fuses, low melting solders, dental amalgams, and tempering baths for small tools. Like antimony, bismuth expands on solidification and retains this property in a number of alloys, and is used in type metal. This group of bismuth-lead-tin-cadmium alloys is used by the airplane and automotive industries to prepare spotting fixtures, to make moulds for electroforming, to fill thin-walled tubing during bending, and to spray-coat wooden patterns and core boxes in foundries.

According to the "E & M J Metal and Mineral Markets", the price of bismuth during 1948 was $2.00 per pound in ton lots.

Table 12 - PRODUCTION OF PRIMARY BISMUTH IN ALL FORMS (*) IN CANADA, 1939-1948

Year	Pounds	$	Year	Pounds	$
1939	409,449	466,362	1944	123,875	154,844
1940	58,529	81,004	1945	189,815	260,047
1941	7,511	10,396	1946	240,504	336,706
1942	347,556	479,627	1947	284,372	560,213
1943	407,597	562,484	1948	240,242	480,484

(*) Refined metal plus bismuth content of bullion exported.

Table 13 - PRODUCTION OF BISMUTH METAL IN CANADA, CONSUMPTION, IMPORTS AND EXPORTS, 1939-1948

Year	Production	Domestic Consumption	Exports (*)	Imports
		(Tons of 2,000 pounds)		
1939	205	14	64	5
1940	20	12	77	...
1941	...	16	51	...
1942	159	36	199	...
1943	204	65	73	...
1944	62	46	25	...
1945	95	55	41	...
1946	120	40	95	...
1947	142	71	61	...
1948	120	44	79	...

(*) Shipped for export by Canadian producers

Table 14 - CONSUMPTION OF BISMUTH METAL IN CANADA, BY INDUSTRIES, 1944-1948

Industry	1944	1945	1946	1947	1948
	(Tons of 2,000 pounds)				
In Medicinals and pharmaceuticals ...	23	15	11	44	28
White metal foundries	20	16	23	20	15
Miscellaneous	3	4	6	7	1
TOTAL	46	35	40	71	44

C A D M I U M

Cadmium is recovered in Canada as a by-product of the electrolytic refining of zinc. The zinc refineries at Trail, British Columbia, and Flin Flon, Manitoba, both produce metallic cadmium. In British Columbia the greater portion of cadmium is derived from the lead-zinc ores of the Sullivan mine, but also a considerable amount of cadmium is recovered from the customs ores shipped from various mines in the province to the smelter of the Consolidated Mining & Smelting Company of Canada, Limited, at Trail. Cadmium is found in the copper-gold-zinc ores of the Flin Flon deposit on the Saskatchewan-Manitoba boundary and also in the zinc concentrates shipped by Sherritt-Gordon Mines Limited to Flin Flon for smelting and refining.

Cadmium is used mainly in electroplating and in the manufacture of alloys and compounds, the most common use being as a protective coating for steel. To a much lesser extent it is used in copper alloys. The use of cadmium alloys in motor vehicle bearings and for solders has created a strong demand for the metal. Cadmium is used also in the arts, paints, ceramics, and dyeing, etc.

Cadmium is marketed in metallic form, 99.5 per cent pure and better, and as a sulphide. The principal compounds are cadmium sulphide, cadmium oxide, cadmium lithopone, and cadmium selenite.

The New York price for commercial sticks of cadmium in January, 1948 was $1.75 per pound, but in November the price rose to $2.00 per pound.

Table 15 - PRODUCTION OF CADMIUM IN CANADA, 1939-1948

Year	British Columbia		Manitoba		Saskatchewan	
	Pounds	$	Pounds	$	Pounds	$
1939	799,253	563,241	73,830	52,029	66,608	46,939
1940	778,791	905,734	57,742	67,154	71,594	83,264
1941	1,081,374	1,269,533	61,085	71,714	108,832	127,769
1942	972,413	1,147,447	29,236	34,498	147,314	173,831
1943	598,673	688,474	20,985	24,130	166,955	191,998
1944	386,410	425,051	20,921	23,013	119,639	131,603
1945	510,432	505,328	27,891	27,612	107,741	106,663
1946	636,315	776,304	63,410	77,360	102,923	125,566
1947	545,638	938,497	75,030	129,052	97,866	168,330
1948	617,226	1,126,437	67,926	123,965	80,938	147,712

Table 16 - CONSUMPTION IN CANADA AND EXPORTS OF CADMIUM METAL, 1939-1948

Year	Production	Domestic consumption	Exports
	(Tons of 2,000 pounds)		
1939	470	41	525
1940	454	75	399
1941	625	149	455
1942	574	207	400
1943	393	168	286
1944	263	108	192
1945	319	87	175
1946	401	96	296
1947	359	72	309
1948	383	92	275

Note: Statistics on imports are not available.

C A L C I U M

The commercial production of calcium in Canada started in 1945 when the metal was recovered from lime by Dominion Magnesium Limited at its plant located at Haley, Ontario.

Calcium has found increasing use as a deoxidizer in ferrous metallurgy and as an alloy constituent with non-ferrous metals. It has been employed in the reduction of difficultly reducible metals, such as chromium, thorium, uranium, and zirconium. During the war an important calcium use was to make hydride, which is a convenient and portable source of hydrogen for inflating weather balloons. Uranium metal had been made by reaction of calcium with chloride or oxide and by reducing the oxide with calcium hydride; the latter was perhaps the first-applied (1941) relatively large-scale production method. The uranium was, however, in the form of highly impure pyrophoric powder and was not usable in the atomic bomb project. However, by the end of 1942 acceptable metal was being turned out.

In 1948, the New York price for calcium, 97-98 per cent as cast, was $2.05 per pound. The Canadian producer is able to sell an exceptionally high purity product for a much lower price.

Table 17 - PRODUCTION (SHIPMENTS) OF CALCIUM IN CANADA, 1945-1948

Year	Pounds	$
1945	22,720	19,312
1946	53,548	68,720
1947	602,665	642,607
1948	895,203	1,723,266

C E R I U M

Cerium is obtained from monazite, a monoclinic phosphate of cerium metals containing about 32 per cent cerium oxide (Ce_2O_3) and up to 18 per cent thoria (ThO_2). Monazite is distributed widely in igneous rocks throughout the world, especially in gneisses that have been intruded by pegmatites, but usually it forms only a small fraction of one per cent of the containing rock and only the natural concentrations in stream gravels and beach sands have paid for exploration. The chief commercial sources of monazite sand are beach deposits in Brazil and India. There are a few occurrences of monazite in Nova Scotia, Quebec and British Columbia, none of which is of commercial interest. It is usually found as small crystals in granites and pegmatites in the Canadian Shield and small quantities occur in association with the black sands of the Quesnel river, Lillooet district, British Columbia. In the United States there are commercial deposits in Carolina, Florida, and Idaho, and known occurrences in many other States.

In Canada, Shawinigan Chemicals, Limited, Shawinigan Falls, Quebec, has been producing cerium products from imported cerium chloride since 1940. The output is sold to the Belgo Canadian Manufacturing Company, Limited, of Montreal, for the manufacture of sparking flints.

C H R O M I T E

The production of chromite in Canada is obtained from the deposits in the Black Lake area of Quebec.

Chromite is one of the principal alloying elements in a great variety of steels, chief of which in the amount of chromium used are the stainless and the corrosion-resistant steels. It is used in high-speed tool steels, and as a hard, toughening element in vehicle axles and frames, and in aeroplane parts. Chromium in high-temperature alloys is being used for gas turbines, jet-propulsion units, and gas engine superchargers. For metallurgical uses chromite should contain a minimum of 48 per cent Cr_2O_3 with a chrome-iron ratio of 3 to 1 or higher, and the ore should be hard and lumpy.

Chrome ore is used for making refractory bricks or materials used in basic open-hearth furnaces, in arches of furnaces, and in parts of combustion chambers of high-pressure steam boilers, etc. It is used with magnesia to make chrome-magnesia refractories, an important use in Canada being in the manufacture of brucite magnesia bricks that contain up to 30 per cent Cr_2O_3. Refractory chromite should be fairly high in Cr_2O_3 and alumina and as low as possible in silica and iron. The ore should be hard and

lumpy and not under 10-mesh, and the chromite should be present in an evenly and finely distributed form, not as coarse grains mixed with blobs of silicate. The Cr_2O_3 content is usually over 40 per cent.

The United States price, December, 1948, for chrome ore, 48 per cent Cr_2O_3 was $35.00 per long ton, f.o.b. Atlantic ports.

Table 18 - PRODUCTION OF CHROMITE IN CANADA, 1939-1948

Year	Short tons	$	Year	Short tons	$
1939	...	...	1944	27,054	748,494
1940	335	5,780	1945	5,755	160,752
1941	2,372	42,679	1946	3,110	61,123
1942	11,456	343,568	1947	2,162	42,159
1943	29,595	919,878	1948	1,715	33,568

Table 19 - IMPORTS OF CHROME ORES INTO CANADA, 1939-1948

Year	Tons	$	Year	Tons	$
1939	16,584	232,851	1944	39,089	618,231
1940	29,938	554,413	1945	60,691	1,154,985
1941	92,952	1,460,209	1946	15,836	269,248
1942	87,628	1,271,482	1947	98,322	3,138,229
1943	103,471	2,121,228	1948	69,183	1,937,692

Table 20 - IMPORTS OF CHROME ORES INTO CANADA, BY PRINCIPAL COUNTRIES OF SUPPLY, 1947 and 1948

Imported from -	1947		1948	
	Tons	$	Tons	$
Union of South Africa	20,269	318,348	27,140	394,818
Southern Rhodesia	3,358	99,542	4,733	184,111
British India	1,122	42,931	...	...
Cuba	4,480	96,829	465	10,947
Turkey	...	...	1,232	46,429
Portuguese Africa	1,120	40,425	...	...
United States	67,973	2,540,154	31,132	1,206,837
Philippines	...	...	4,480	94,550
TOTAL	98,322	3,138,229	69,183	1,937,692

INDIUM

Indium was commercially recovered in Canada only in 1942 when 470 troy ounces valued at $4,710 were produced at Trail, British Columbia, by the Consolidated Mining and Smelting Company of Canada, Limited. The metal was obtained in the treatment of zinc refinery residues. The United States produces a considerable quantity of indium but data relating to entire world production are not available.

The major use has been in heavy-duty composite metal bearings employed extensively in airplanes, tanks and other mobile equipment. A zinc-indium alloy was used in applying a noncorrosive plating to hollow-steel airplane propellers. Minor uses have been in solder and brazing alloys and alloyed with gold and silver for jewellery and plated articles. The first commercial use about 1927 was as a non-tarnish coating on silverware. Low-melting paint alloys also have been manufactured recently. Indium foil was used as a neutron indicator in the atomic bomb project uranium-graphite piles. Low-energy neutrons, about 1.5 electron-volt, are particularly effective in inducing artificial radioactivity in indium.

At the close of 1948 the quoted price of indium was $2.25 per ounce troy. The price has remained at this level for the past three years.

IRON ORE

Although production of iron ore in Canada was lower than in 1947, developments in the past year provided assurance of an increased production in the near future. All of the output in 1948 continued to come from the Steep Rock and Helen Mines in Ontario, which were preparing for a considerable increase in production. Most of the ore produced by the two mines is for export to the United States as it is found to be economical to use ores brought from the United States, mixed with a small proportion of the Canadian ores, in the blast furnaces of Ontario. The Labrador-New Quebec project advanced to the stage where construction of a railway and port facilities is warranted. Further progress was made in the treatment of iron sulphide concentrate at the Noranda copper-gold mine in Quebec, which gives high-grade iron oxide sinter as a by-product.

Algoma Ore Properties Limited - This company is a wholly-owned subsidiary of Algoma Steel Corporation Limited. It holds a number of mineral properties in the Michipicoten area northeast of Lake Superior, including the Helen Mine, and the Goulais magnetite deposits north of Sault Ste. Marie.

During 1948 the siderite ore for the company's sinter plant at the Helen mine was derived mainly from the Victoria open pit and partly from development of the underground mine beneath the Helen open pit which adjoins the Victoria pit on the west. The larger part of the siderite from the Victoria pit was treated in the sink-float plant to remove quartz, siliceous ore, and dyke rock. A part of the open pit ore and all the ore from the present underground development is sent direct to the sinter plant. The Victoria pit, and an extension of the ore eastward that was found and opened during 1948, will continue to furnish ore until the underground mine is capable of supplying the full requirement of the sinter plant, now being enlarged to an annual capacity of 1,000,000 long tons of sinter.

The underground mine is being developed through a shaft 921 feet deep which will be used ultimately only for servicing the mine. Two levels are being developed, at 300 feet and 600 feet below the floor of the open pit above. These will serve to extract a block of ore 200 to 300 feet wide and 600 feet deep, comprising about 10 million tons. Each level of this block is expected to feed the enlarged sinter plant for five years. The ore is to be stoped by block caving, fed by gravity to a primary crusher, and elevated to surface on a series of belt conveyors. The larger part of the mine development was done by the end of 1948, and it is expected the mine will be in full operation late in 1949.

No work was done on the Britannia (formerly Bartlett) siderite deposit, nor on the Goulais magnetite property. Drilling on the eastern part of the Helen iron range gave encouraging results. The Josephine mine remained flooded. Jones and Laughlin completed drilling of the Ruth siderite deposit, near the Josephine, with results that are reported to be favourable.

Steep Rock Iron Mines Limited - The entire output of hematite continued to come from the "B" pit. This output, however, was well below the million tons anticipated early in 1948. During the summer some of the working faces ran into high sulphur ore, and the orebody in general had not been stripped sufficiently to permit the shovels to move to areas of better grade ore. It is expected that stripping will be advanced sufficiently to permit an output of a million tons or more from "B" pit during the 1949 season.

There were only two shipping grades for 1948, Seine River for blast-furnace feed, and Steep Rock open-hearth lump. The Steep Rock grade was divided into lump ore, minus 10 plus 4 inches, and charge ore, minus 4 plus 1½ inches.

Drilling during 1948 extended the known length of "B" orebody to 3,750 feet, with both ends open. Of this, only the central 3,200 feet can be mined conveniently by open pit. The pit at present is 1,550 feet in length, and the deepest part is at 200 feet, which is half its projected depth of 400 feet. It is estimated that the ore recoverable from "B" open pit will last 10 or 12 years at the rate of a million tons a year. A preliminary investigation of the conditions for underground mining was commenced.

Late in 1948 negotiations were completed to finance the opening up "A" orebody, 1½ miles north of "B". Silt from the lake bottom will be removed by a large suction dredge and it is expected that production from "A" pit will be commenced in 1951. As "A" orebody is considerably wider than "B", it is estimated that it will maintain an output of 2 million tons a year for 12 to 15 years from an open pit.

Initial drilling between "B" and "A" orebodies indicates a substantial tonnage of ore.

Only a small part of the Steep Rock ore is used by Canadian furnaces, and the rest is exported to the United States. The Cleveland-Cliffs Iron Company is sales agent.

Labrador and New Quebec - The hematite deposits in the interior of the Labrador peninsula form part of an iron range 350 miles or more in length and 10 to 60 miles in width. All the orebodies discovered so far are on two concessions held by subsidiaries of Hollinger Consolidated Gold Mines Limited. The M.A. Hanna Company of Cleveland, Ohio, prominent iron ore operator of the Lake Superior region, has a minority interest in both subsidiaries. The concession of Labrador Mining & Exploration Company, Limited covers 20,000 square miles in Labrador, and that of Hollinger North Shore Exploration Company, Limited in Quebec contains 3,900 square miles. In both cases, a smaller area must be selected for retention within a few years.

All the orebodies so far drilled were discovered by the company's geologists and prospectors as surface outcrops, with the exception of one deposit found by accident while testing a drill. No attempt has been made as yet to investigate the intervening ground where it is covered by a thin layer of drift rock. By the end of 1948, twenty-eight separate orebodies were drilled and proved. All are of high grade and economic size, the largest containing 45 million tons. These orebodies stretch for 90 miles on the two concessions, but most of them lie in a fairly small area in the central part. The company's first objective of 300 million tons of proved ore was reached at the end of 1948.

The substantial tonnage of manganiferous ore now proved is particularly interesting. Outcrops of material high enough in manganese to be classed as manganese ore have been found in a number of places, but no body of manganese ore has been proved as yet.

The location for a railway line 350 miles in length has been surveyed from the port of Seven Islands on the St. Lawrence to the main ore zone, with a maximum grade of 0.2 per cent southbound. The port has been surveyed and a suitable site for ore docks and stock piles selected. Navigation is assured for nine or ten months in the year, and probably the year round with the aid of an ice-breaker. A convenient site for hydroelectric power has been found 25 miles from one of the large orebodies.

The ore is strikingly similar to the high-grade ore of the Mesabi range. The conditions of mining will also be similar, except that in Labrador there is little overburden and much of the ore is in ridges above valley level. To test its physical nature underground, two adits have been driven which penetrate 100 feet beneath the surface, and some shallow shafts have been sunk. The ore has the same physical characteristics underground as at surface. Because of late and early frosts, the operating season is expected to be limited to six months.

To the present the camp has been served entirely by air. In 1947 the Knob Lake airport was established, ten miles by road from the base camp at Burnt Creek. By the end of 1948 the company had constructed 90 miles of roads.

The company has announced that 10 million tons annual production is required for operation on a profitable basis. The total investment required is estimated at 200 million dollars. A comparatively small market is expected on the Atlantic coast, including Sydney, Nova Scotia, and it is possible that the financial difficulties of selling ore in Great Britain and Belgium will be overcome. The bulk of the ore, however, will have to be sold in the markets now served by Lake Superior ores.

Table 21 - PRINCIPAL STATISTICS FOR THE IRON ORE MINING INDUSTRY IN CANADA, 1946-1948

		1946	1947	1948
Active firms	No.	11	6	16
Employees - On salary	No.	72	67	86
Wage-earners	No.	751	678	924
Total	No.	823	745	1,010
Salaries and wages - Salaries	$	224,505	246,391	270,885
Wages	$	1,719,931	1,790,563	2,953,465
Total	$	1,944,436	2,036,954	3,224,350
Gross value of production	$	6,822,947	9,313,201	7,487,611
Fuel and electricity used	$	687,011	679,082	825,662
Process supplies used	$	604,081	384,124	1,197,471
Freight and treatment charges	$	2,065,095	2,854,530	1,888,561
Net Value	$	3,466,760	5,395,465	3,575,917

Table 22 - PRODUCTION OF IRON ORE (*) IN CANADA, 1939-1948

Year	Short tons	Value	Year	Short tons	Value
		$			$
1939	123,598	341,594	1944	553,252	1,909,608
1940	414,603	1,211,305	1945	1,135,444	3,635,095
1941	516,037	1,426,057	1946	1,549,523	6,822,947
1942	545,506	1,517,077	1947	1,919,366	9,313,201
1943	641,294	2,032,240	1948	1,237,244	7,487,611

(*) Exclusive of titanium-bearing ores. All iron ore was from mines in Ontario, except 187 tons from Quebec in 1942 and 143,062 tons from New Brunswick in 1943.

Table 23 - IMPORTS INTO CANADA AND EXPORTS OF IRON ORE, 1939-1948

Year	Imports		Total (*)	Exports
	From United States	From Newfoundland		
			(Tons of 2,000 pounds)	
1939	1,205,261	1,606,775	1,764,844	10,540
1940	524,849	716,317	2,418,237	251,626
1941	2,212,437	962,259	3,254,655	282,068
1942	2,033,961	610,871	2,701,968	295,960
1943	2,978,388	911,450	3,906,425	574,677
1944	2,501,737	624,890	3,126,649	308,424
1945	2,988,484	736,665	3,739,867	771,495
1946	1,686,236	518,566	2,281,677	1,145,256
1947	3,126,307	755,612	3,944,550	1,749,976
1948	3,392,063	820,692	4,300,163	1,070,277

(*) Includes some ore from other countries, principally Brazil.

Table 24 - IRON ORE CHARGED TO IRON BLAST FURNACES IN CANADA, 1939-1948

Year	Canadian	Imported	TOTAL
		(Tons of 2,000 pounds)	
1939	50,570	1,425,536	1,476,106
1940	154,643	2,188,074	2,342,717
1941	166,263	2,542,826	2,709,089
1942	229,253	3,383,439	3,612,692
1943	302,780	2,955,671	3,258,451
1944	266,150	3,227,039	3,493,189
1945	235,757	2,797,697	3,033,454
1946	358,173	2,167,900	2,526,073
1947	252,085	3,420,890	3,672,975
1948	193,935	3,716,683	3,910,618

MAGNESIUM

Magnesium metal was produced in 1948 by the Aluminum Company of Canada at Arvida, Quebec. The raw material was brucite obtained from the firm's plant at Wakefield, Quebec. The Dominion Magnesium Limited, at Haley, Ontario, continued to ship magnesium metal and alloys from the stockpile created during the war years. Indications are that this stockpile will have diminished to the point where production may be resumed early in 1950.

The market price of 20.5 cents per pound remained constant through the year.

Table 25 - PRODUCTION OF PRIMARY MAGNESIUM METAL IN CANADA, 1941-1948

Year	Quebec		Ontario		British Columbia		CANADA	
	Pounds	$	Pounds	$	Pounds	$	Pounds	$
1941	...	...	...	...	10,905(*)	2,944	10,905	2,944
1942	141,081	62,076	475,910	208,520	193,727	85,240	808,718	355,836
1943	...	...	7,153,974	2,074,652	...	...	7,153,974	2,074,652
1944	...	...	10,579,778	2,575,695	...	...	10,579,778	2,575,695
1945	...	...	7,358,545	1,607,264	...	...	7,358,545	1,607,264
1946	...	...	320,677	75,538	...	...	320,677	75,538
1947 .....)			Not available for publication.					
1948 .....)								

(*) Magnesium powder.

Table 26 - CONSUMPTION OF MAGNESIUM METAL IN CANADA, 1945-1948

	1945	1946	1947	1948
			(Pounds)	
In non-ferrous smelters	487,773	441,000	340,460	425,088
In white metal alloy foundries ..	37,740	142,445	174,510	382,684
In brass and bronze foundries....	66,116	17,266	13,287	31,782
In aluminum products	45,452	15,061	32,280	58,947
TOTAL ACCOUNTED FOR	637,081	615,772	560,537	898,501

MANGANESE

Manganese ore production in Canada in 1948 was limited to a small test shipment by Quebec Manganese Mines Limited from a deposit on the Magdalen Islands. Operations at this property ceased after much exploratory work indicated that it could not be mined on a profitable basis.

No production was obtained from the bog ore deposit in New Brunswick which commenced development in 1947.

Table 27 - PRODUCTION OF MANGANESE ORE IN CANADA, 1939-1948

Year	Tons	Value	Year	Tons	Value
		$			$
1939	396	3,688	1944	...	...
1940	152	4,315	1945	...	...
1941	(*)	(*)	1946	...	...
1942	435	8,932	1947	225	7,875
1943	48	985	1948	3	88

(*) 7,500 pounds manganese metal produced at the mine from Nova Scotia manganese ore.

Table 28 - IMPORTS OF MANGANESE ORE INTO CANADA, 1939-1948

Year	Tons	$	Year	Tons	$
1939	29,787	621,931	1944	85,795	2,370,109
1940	70,460	777,416	1945	198,277	4,571,592
1941	104,473	1,170,768	1946	144,023	2,484,707
1942	57,389	860,248	1947	223,503	6,145,568
1943	51,234	1,445,252	1948	230,298	6,449,819

Table 29 - IMPORTS OF MANGANESE ORE INTO CANADA, BY PRINCIPAL COUNTRIES OF SUPPLY, 1946-1948

	1946	1947	1948
		(tons)	
From - Gold Coast	130,907	109,903	60,516
British India	...	12,711	...
South Africa	345	...	...
United States	12,768	100,889	169,746
United Kingdom	3	...	36
TOTAL IMPORTS	144,023	225,503	230,298

MERCURY

There has been no production of mercury in Canada since September, 1944, and all shipments since then have been from producers' stocks. All of the Canadian production in the past came from the Pinchi mine of The Consolidated Mining and Smelting Company of Canada, Limited, and from the Takla mine of Bralorne Mines Limited, both mines being in the Omineca Mining Division, British Columbia. The mines have remained idle because world prices have been too low to permit profitable operation.

During 1948 the price of mercury fluctuated from $74 to $90 per 76 pound flask. The European sources of mercury spasmodically released excess quantities which depressed the market. Following this were uncertain periods of withholding which tended to make a rather unstable market.

Table 30 - PRODUCTION OF MERCURY IN CANADA, 1939-1948

Year	Pounds	$	Year	Pounds	$
1939	436	1,226	1944	735,908	1,210,375
1940	153,830	369,317	1945	...	...
1941	536,304	1,335,697	1946	...	...
1942	1,035,914	2,943,807	1947	...	...
1943	1,690,240	4,559,200	1948	...	...

Table 31 - PRODUCTION OF MERCURY IN CANADA, CONSUMPTION, IMPORTS AND EXPORTS, 1939-1948

Year	Production in Canada	Consumption in Canada	Imports	Exports
		(pounds)		
1939	436	89,617	109,252	...
1940	153,830	75,643	78,597	108,000
1941	536,304	151,351	8,599	360,164
1942	1,035,196	185,118	1,971	692,755
1943	1,690,240	201,982	2,047	1,304,692
1944	735,908	130,515	35,428	362,670
1945	...	100,700	27,101	261,720
1946	...	102,320	152,719	57,005
1947	...	344,516	412,649	17,084
1948	...	552,216	805,878	175

Table 32 - CONSUMPTION OF MERCURY IN CANADA BY PRINCIPAL USES, 1944-1948

Industry	1944	1945	1946	1947	1948
			(pounds)		
Pharmaceuticals and fine chemicals	24,307	20,652	26,185	60,578	41,565
Heavy chemicals	78,300	53,701	45,005	260,000	479,000
Electrical apparatus	4,652	2,353	12,192	5,458	15,151
Gold mines	10,000(*)	10,000(*)	6,500	6,000	6,000
Miscellaneous	13,256	11,847	12,490	12,500	12,500
TOTAL	130,515	100,700	102,320	344,516	552,216

(*) Estimated.

MOLYBDENUM

The Molybdenite Corporation of Canada, Limited suspended mining operations at the La Corne mine late in 1947. Shipments of molybdenite were made from the stockpile at La Corne, Quebec during 1948. There was no mining of molybdenum ore in Canada during the period under review.

Molybdenum has a widening range of uses, but by far the greater part of the output is used in steel to intensify the effect of other alloying metals, particularly nickel, chromium, and vanadium. These steels usually contain from 0.15 to 0.4 per cent molybdenum, but in some instances the percentage is considerably higher. For high-speed tool-steels as much as 9 per cent is added.

Molybdenum alloys are used widely for the hard-wearing and other important parts of airplanes. They are used in the automobile industry; in high-grade structural die and stainless steels; in heat and corrosion resistant alloys; and to some extent in high-speed tool steels. Molybdenum is used in cast iron and in permanent magnets. Much molybdenum wire and sheet is used in the incandescent lamp and in the radio industries; and new alloys suitable for electrical resistance and contacts and for heating elements contain molybdenum. An appreciable amount of molybdenum is used in the glass industry in which heavy sheets of the metal act as electrodes to conduct the current through the molten glass in the electric furnaces.

Table 33 - PRODUCTION OF MOLYBDENITE IN CANADA, 1939-1948

Year	Ores milled	Ores and concentrates shipped or used		Total MoS_2 content of shipments
	Tons	Tons	Value (a)	Pounds
			$	
1939	1,492	1.3	816	(b)
1940	3,936	11.1	10,280	(b)
1941	28,100	98.3	88,470	173,991
1942	39,708	113.7	134,963	158,780
1943	120,576	392.4	549,515	653,200
1944	187,130	1064.0	1,079,698	1,870,132
1945	80,575	489.1	411,663	839,419
1946	84,280	368.2	295,640	676,844
1947	83,665	396.0	309,048	759,795
1948	...	173.5	137,143	304,762

(a) Value as given by the operators in 1939; for 1940-1948 value was estimated using market or Government prices.
(b) Not known.

PITCHBLENDE

Pitchblende, the ore of radium and uranium, is mined in Canada only in the Great Bear district of the Northwest Territories. Prospecting reports indicate that radioactive minerals have been found at Contact Lake, Northwest Territories; Lake Athabaska, Saskatchewan; and Theano Point, Ontario.

Statistics on pitchblende ores and products have not been available since 1940.

Table 34 - CANADIAN REFINERY PRODUCTION OF PITCHBLENDE PRODUCTS, 1933-1948

Year	$	Year	$
1933 (a)	247,900	1938	1,045,458
1934	159,400	1939	1,121,553
1935	413,700	1940	410,176
1936	605,500	1941-1948	(b)
1937	876,540		

(a) First production.
(b) Not available for publication.

SELENIUM

The occurrence of selenium is fairly widespread throughout the world, but it is of commercial importance only in its association with copper sulphide ores from which it is recovered as a by-product in the refining of copper. A variety of uses have been developed for the metal, but relatively small quantities are involved. In Canada refined selenium and certain selenium salts are produced and most of the output is exported.

Canadian production of selenium is obtained from the refineries of The International Nickel Company of Canada, Ltd., at Copper Cliff, Ontario, and Canadian Copper Refiners, Ltd., at Montreal East, Quebec. At Copper Cliff, the metal is derived from International Nickel's copper-nickel ores. The plant has a demonstrated capacity of 270,000 pounds of selenium a year and is probably capable of a larger production. At Montreal East, selenium is recovered from the treatment of copper anodes made from the copper-gold ores of Noranda, Quebec, and from blister copper from the copper-zinc ores of Hudson Bay Mining and Smelting Co. Ltd., on the Manitoba-Saskatchewan boundary. The Montreal East plant has an annual rated capacity of 450,000 pounds of selenium, which is larger than any other selenium plant in the world. This plant also produces slenium dioxide, sodium selenate, and sodium selenite.

Selenium is generally marketed as amorphous powder, but cakes and sticks are also obtainable. Other selenium products marketed are ferro-selenium, sodium selenate, sodium selenite, selenious acid, and selenium dioxide. No figures are available to show the relative consumption of selenium by uses. The most important uses are in the glass, rubber, and paint industries, but many new uses have been developed as a result of research during the war. Among the more interesting of the latter is the use of selenium in electrical dry plate rectifiers for radar equipment and aircraft generators. Its use in rectifiers for numerous electronic devices, battery charging, electroplating, and welding has been increasing.

In the manufacture of glass, selenium is used to neutralize the green colour caused by iron impurities. When sufficient selenium is added the glass turns a ruby colour highly suitable for signal lenses. In the manufacture of rubber the addition of selenium in concentrations of from 0.1 to 2.0 per cent promotes resistance to heat, oxidation, and abrasion. It is also used as an accelerator in the vulcanization of synthetic rubber.

The New York price for selenium remained at $2.00 per pound throughout 1948.

Table 35 - PRODUCTION OF SELENIUM IN CANADA, 1939-1948

Year	Pounds	$	Year	Pounds	$
1939	150,771	266,714	1944	298,592	537,466
1940	179,860	343,533	1945	379,187	728,039
1941	406,930	777,236	1946	521,867	949,798
1942	495,369	951,108	1947	501,090	937,038
1943	374,013	654,523	1948	390,894	781,788

TANTALUM-COLUMBIUM

Canada produces no tantalite or columbite and the known Canadian occurrences of these minerals are scarce and of undetermined economic interest. The minerals tantalite and columbite are the tantalate and columbate, respectively, of iron and manganese, with the general formula $(Fe,Mn)(Ta,Cb)_2O_6$. They grade one into the other according as whether tantalum or columbium predominates. Both tantalite and columbite were of increasing importance in the war effort and tantalite was placed in the group of "strategic" minerals having the highest priority rating. The occurrence of all tantalum-columbian minerals is restricted to granite-pegmatites, or to residual or alluvial deposits derived from such rock. The chief world sources of tantalite proper have been Western Australia, Belgian Congo, Southern Rhodesia, Uganda, United States and Brazil. The supply of columbite has come mainly from Nigeria, Belgian Congo, Southwest Africa, Argentina and Brazil. The annual world output of tantalite-columbite is small and complete data on same are not available at present.

Experimental tests on the milling of tantalum-columbite ore from the Pey Tantalum mine, Ross Lake, Northwest Territories, were made by Tantalum Refining and Mining Corporation during 1947.

United States quotations for tantalum ore, December, 1948 were, per pound Ta_2O_5, $2 to $2.75 for 60 per cent concentrate, the price depending on the source. Columbium metal, per kilo, base prices: rod $280; sheet $250. Tantalum metal, per kilo, base prices, $160.60 for C.P. rod; sheet $145; discounts on volume business.

TELLURIUM

Tellurium, like its associated element selenium, is commonly found in small amounts in copper-sulphide and gold ores. The potential production as a by-product in the refining of copper is great but its recovery is restricted to meet the relatively minor quantities required by industry.

Tellurium is recovered commercially in Canada at the Copper Cliff, Ontario, plant of The International Nickel Company of Canada, Limited, and at the Montreal East Refinery of Canadian Copper Refiners, Limited. At Copper Cliff it is recovered from the slimes formed in the process of refining copper produced from the Sudbury nickel-copper ores. At Montreal East it is obtained from the refining of copper anodes made from copper ores at Noranda, Quebec, and from blister copper originating from the copper-zinc ores of Hudson Bay Mining and Smelting Co., Limited at Flin Flon on the Manitoba-Saskatchewan boundary.

The price of tellurium was quoted at $1.75 a pound in New York throughout 1948.

Table 36 - PRODUCTION OF TELLURIUM IN CANADA, 1939-1948

Year	Pounds	$	Year	Pounds	$
1939	2,940	4,769	1944	10,661	18,657
1940	3,491	5,607	1945	484	929
1941	11,453	18,394	1946	15,848	24,405
1942	11,084	17,735	1947	9,194	16,090
1943	8,600	15,050	1948	11,425	19,994

Table 37 - CONSUMPTION OF TELLURIUM METAL IN STEEL AND WHITE METAL FOUNDRIES, 1940-1948

Year	Steel foundries	White metal foundries
	(pounds)	
1940	400	629
1941	185	492
1942	50	612
1943	135	453
1944	398	531
1945	...	308
1946	...	1,372
1947	...	974
1948	...	947

THALLIUM

There has been no production of thallium in Canada since 1944. The first commercial production of this element in this country was in 1944 when 128 pounds valued at $1,690 were contained in residues produced by Hudson Bay Mining and Smelting Company, Limited at the Flin Flon smelter, Manitoba. These residues were exported for treatment in foreign plants. Thallium metal was quoted in the United States at $15.00 per pound nominal, December, 1948.

TIN

No economic deposits of tin have been found in Canada up to the present. Minor occurrences, principally of cassiterite (SnO_2) the most important tin mineral, are found in the New Ross area, Lunenburg county, Nova Scotia; in the Sudbury mining division of Ontario; in the Lac du Bonnet district of southeastern Manitoba; in southern British Columbia; in the Mayo district, Yukon, and in the Yellowknife area, northwest Territories. Those in Nova Scotia, Ontario, Manitoba, and the Northwest Territories are found largely in pegmatite dykes. In Yukon, crystalline cassiterite is found in placer gravels along numerous creeks and in one small lode deposit. In British Columbia, tin is found associated with base metal sulphide ores. The last mentioned type of occurrence is the only one that has been exploited, and is the source of the small Canadian production. The lead-zinc-silver orebody of the Sullivan mine, Kimberley, British Columbia, contains a very small percentage of tin. Since 1941, The Consolidated Mining

and Smelting Company of Canada, Limited has been recovering a portion of this tin as a by-product from the concentration of its lead-zinc ore.

In 1948 the average price of tin quoted in New York was 99.25 cents per pound. The quotation at the year-end was $1.03 per pound. The Canadian price at Montreal was 83.20 cents per pound in January. It increased to $1.05 at mid-year and remained at that level throughout December.

Table 38 - PRODUCTION OF NEW TIN IN CANADA, DOMESTIC CONSUMPTION, IMPORTS AND EXPORTS, 1939-1948

Year	Production in Canada	Domestic consumption	Exports	Imports	Stocks at end of period
		(Tons of 2,000 pounds)			
1939	...	2,787	...	2,913	Not available.
1940	...	3,868	...	5,918	2,655
1941	32	6,436	...	8,719	4,621
1942	619	3,571	...	3,601	5,120
1943	390	2,865	...	1,311	3,920
1944	258	3,383	...	1,341	2,622
1945	425	4,108	...	3,597	2,565
1946	437	4,152	...	3,514	2,430
1947	357	4,063	...	2,601	3,152
1948	344	4,531	...	4,029	2,944

Table 39 - PRODUCTION OF NEW TIN IN CANADA, 1941-1948

Year	Pounds	$	Year	Pounds	$
1941 (*)	64,744	33,667	1945	849,983	492,990
1942	1,237,863	643,689	1946	874,186	507,028
1943	776,937	450,623	1947	714,198	517,794
1944	516,626	299,643	1948	691,332	688,567

(*) First commercial production.

Table 40 - CONSUMPTION OF TIN (Ingots or Bars) IN CANADA, BY PRINCIPAL INDUSTRIES, 1944-1948

	1944	1945	1946	1947	1948
	(Tons of 2,000 pounds)				
In white metal foundries (solder, babbitt, etc.)	1,200	1,320	1,321	1,300	1,636
In steel plants (chiefly for tinplate)	1,517	2,010	2,518	2,347	2,443
In brass and bronze foundries	406	532	208	307	315
In other industries	260	246	105	109	137
TOTAL ACCOUNTED FOR	3,383	4,108	4,152	4,063	4,531

TITANIUM

The Dominion Magnesium Limited, Haley, Ontario, has developed a process for the production of metallic titanium. The properties of this metal are such that wide applications for its use should be found if the cost of production is sufficiently reduced. The metal melts at 1800°C, can be rolled and drawn, has a specific gravity of 4.5 (iron is 7.8) and scratches quartz. It has excellent corrosion resistance, except for certain acids, and shows no tarnish after thirty days' exposure to salt spray. The tensile strength of the annealed metal is 82,000 pounds per square inch. Cold-worked to 50 per cent reduction, the tensile strength is 126,000 pounds per square inch.

In recent years the production of titanium-bearing ores has been from the Baie St. Paul area in Quebec. Development of the ilmenite deposit at Allard Lake in Quebec indicates large tonnages of titanium-iron ore. It is proposed to ship this ore by rail to Havre St. Pierre on the St. Lawrence, thence to a smelter where the iron will be separated as pig iron and the slag will be used to produce titanium compounds.

The paint industry uses, in addition to titanium white, a considerably larger amount of mixed pigments containing titanium, also imported from the United States. Titanium white has many other uses,

such as: to make paper opaque; to make rubber white; in ceramic glazes; for printing inks; in linoleum; in cosmetics; and to de-lustre artificial silk.

Titanium is used in many other forms. Ferrotitanium and ferrocarbon-titanium are used under special circumstances to purify steel. It is all imported from the United States.

Prices (nominal) f.o.b. Atlantic ports at the end of 1948 were: Ilmenite, 56 to 60% TiO_2, $18 to $20 per gross ton. Rutile, 94% TiO_2, 6 to 8 cents per pound. The nominal quotation for titanium metal, 96-98 per cent, was $5 to $6 per pound.

Table 41 - PRODUCTION OF TITANIUM ORE IN CANADA (*), 1939-1948

Year	Short tons	$	Year	Short tons	$
1939	3,694	21,267	1944	33,973	165,195
1940	4,535	24,510	1945	14,147	67,575
1941	12,651	49,110	1946	1,406	7,735
1942	10,031	50,906	1947	7,104	36,036
1943	69,437	308,290	1948	4,441	21,091

(*) All from Quebec.

Table 42 - IMPORTS INTO CANADA OF "ANTIMONY OXIDE, TITANIUM OXIDE AND WHITE PIGMENTS CONTAINING NOT LESS THAN 14 PER CENT BY WEIGHT OF TITANIUM", 1939-1948

Year	From the United Kingdom		From the United States		Total Imports	
	Pounds	$	Pounds	$	Pounds	$
1939	1,689,329	227,805	7,302,923	574,193	9,003,693	803,198
1940	477,912	65,747	8,292,103	717,210	8,700,015	782,957
1941	418,962	64,302	12,801,017	1,257,065	13,219,979	1,321,367
1942	115,360	27,697	14,527,348	1,395,345	14,642,708	1,423,042
1943	33,700	8,094	16,855,800	1,525,368	16,889,500	1,533,462
1944	...	...	20,174,795	1,871,434	20,174,795	1,871,434
1945	79,440	16,752	21,279,636	2,029,137	21,359,076	2,045,889
1946	76,800	11,678	23,854,188	2,182,007	23,930,988	2,193,685
1947	17,920	4,862	27,294,577	2,960,964	27,312,497	2,965,826
1948	121,968	25,057	39,119,325	4,572,006	39,292,704	4,610,340

Table 43 - CONSUMPTION OF TITANIUM OXIDE IN CANADA, BY INDUSTRIES, 1947 and 1948

Industry	1947		1948	
	Pounds	Cost at works	Pounds	Cost at works
		$		$
Paints -				
Extended titanium dioxide pigments ...	14,083,236	1,167,946	17,582,375	1,609,929
Titanium dioxide	8,099,513	1,527,934	11,532,604	2,378,389
Polishes and dressings	276,469	39,424	308,655	43,153
Pulp and paper	654,000	120,611	644,000	130,594
TOTAL ACCOUNTED FOR	23,113,218	2,855,915	30,072,634	4,162,065

Table 44 - CONSUMPTION OF FERROTITANIUM IN MANUFACTURE OF STEEL IN CANADA, 1939-1947

Year	Tons	$	Year	Tons	$
1939	118	23,498	1944	786	149,527
1940	118	24,233	1945	656	123,975
1941	181	52,128	1946	416	73,485
1942	439	66,555	1947	500	86,228
1943	614	118,416	1948	442	81,129

TUNGSTEN

The only producer of tungsten concentrates in Canada during 1948 was the Emerald mine of Canadian Explorations Limited, near Salmo, in southern British Columbia.

The ore at the Emerald mine occurs in several contact metamorphic zones, mainly between granite and argillite and is finely disseminated, usually in impure limestone with garnetite. The main contact metamorphic deposit contains about 250,000 tons of 1.25 per cent WO_3 ore. Treatment in the mill is a combination of wet gravity and flotation.

As an alloying metal in steel, tungsten (usually as ferrotungsten, but sometimes as calcium tungstate or scheelite concentrate) is used essentially to impart hardness and toughness, which are maintained even when the steel is heated to a high temperature. Almost 80 per cent of the consumption of tungsten in the United States is used for the production of high-speed steels for cutting tools, in which the tungsten content is 15 to 20 per cent. Minor amounts of tungsten are used in steels for dies, valves, and valve seats for internal combustion engines, and for permanent magnets. Stellite, the best known non-ferrous alloy, contains 10 to 15 per cent tungsten with higher percentages of chromium and cobalt. Tungsten carbide is widely used as an extra hard cutting tool and is now being used as inserts into detachable bits for rock drilling. Pure tungsten is used in lamp filaments, in radio tubes, contact points, etc.

The price of tungsten concentrate is an arbitrary agreement between the Canadian producer and the buyers. The average price in 1948 was $20 per short ton unit of WO_3.

Table 45 - PRODUCTION (Commercial Shipments) OF CRUDE TUNGSTEN CONCENTRATES IN CANADA, 1939-1948

Year	Crude	WO_3 content	$
	Pounds	Pounds	
1939	8,825	(a)	4,917
1940	12,002	(a)	7,303
1941	82,846(b)	42,356	38,712
1942	520,981	321,847	406,275
1943	1,508,621	817,763	1,083,538
1944	886,745	283,253	245,780
1945	1,153	792	1,045
1946	...	...	...
1947	668,000	496,023	680,792
1948	1,409,297	1,046,160	1,046,160

(a) Not recorded.
(b) Includes export of considerable low-grade material to United States.

Table 46 - CONSUMPTION OF FERROTUNGSTEN IN STEEL FURNACES IN CANADA, 1939-1948

Year	Short tons	Cost at works	Year	Short tons	Cost at works
		$			$
1939	106	173,250	1944	86	287,116
1940	376	829,859	1945	138	455,317
1941	482	1,003,314	1946	260	402,174
1942	203	524,007	1947	366	888,904
1943	550	1,721,967	1948	187	590,584

VANADIUM

Some of the magnetites of the Rainy River district in Ontario are known to contain relatively small quantities of vanadium and some research has been conducted as to its economic recovery. There is no production of either the metal or its ores in Canada at the present time.

The principal world occurrences of vanadium are in Arizona, Colorado and Utah in the United States; Minasragra in Peru; Broken Hill in northern Rhodesia; and Grootfontein district in South West Africa.

The metal is employed chiefly in the manufacture of alloy steels and irons. It is also used in the form of ammonia meta-vanadate as a catalyst in the manufacture of sulphuric acid and in the non-ferrous, glass, ceramic and colour industries.

The United States Bureau of Mines reports that vanadium has been and is now being obtained by some countries from other than vanadium ores, including petroleum, bauxite, phosphate rock and titaniferous magnetites.

Vanadium ore was quoted December, 1948, at 27½ cents per pound contained V_2O_5, f.o.b. shipping point, by "E & M J Metal and Mineral Markets", New York.

DIRECTORY OF FIRMS IN THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1948

(*) Active but not producing.

Name of firm and product	Head office address	Location of mine or plant
Aluminum -		
Aluminum Company of Canada Limited	1700 Sun Life Building, Montreal, Quebec	Arvida, Quebec Shawinigan Falls, Quebec La Tuque, Quebec Ile Maligne, Quebec Beauharnois, Quebec
Antimony -		
Consolidated Mining & Smelting Company of Canada Ltd.	215 St. James St., Montreal, Quebec	Trail, British Columbia
Barium -		
Dominion Magnesium Ltd.	Haley, Ontario	Haley, Ontario
Beryl -		
Canadian Beryllium Mines & Alloys Ltd. (*)	100 Adelaide St. W., Toronto, Ontario	Renfrew County, Ontario
Bismuth -		
Deloro Smelting & Refining Co. Ltd.	900 Victoria Building, Ottawa, Ontario	Deloro, Ontario
Consolidated Mining & Smelting Company of Canada Ltd.	215 St. James St., Montreal, Quebec	Trail, British Columbia
Molybdenite Corp. of Canada Ltd.	59 St. James St. W., Montreal, Quebec	La Corne Tp., Quebec
Cadmium -		
Consolidated Mining & Smelting Company of Canada Ltd.	215 St. James St., Montreal, Quebec	Trail, British Columbia
Hudson Bay Mining & Smelting Co. Ltd.	500 Royal Bank Building, Winnipeg, Manitoba	Flin Flon, Manitoba
Western Exploration	Silverton, British Columbia	Kaslo, British Columbia
Chromite -		
Chrome Association (*)	342 Notre Dame St., Black Lake, Quebec	Black Lake, Quebec
Chromite Ltd. (*)	404 Notre Dame St. W., Montreal, Quebec	Cleveland Tp., Quebec
Pare, Orel	Black Lake, Quebec	Coleraine Tp., Quebec
Iron Ore -		
Babcock Corp. Ltd. (*)	Kazabazua, Quebec	Northfield Tp., Quebec
Kazabazua Mining Corp. Ltd. (*)	Kazabazua, Quebec	Heney Lake, Quebec
Fenimore Iron Mines Ltd. (*)	123 St. James St. W., Montreal, Quebec	New Quebec
Fort Chimo Mines Ltd. (*)	25 King St. W., Toronto, Ontario	New Quebec
Great Mountain Iron Corp. (*)	516 Canada Cement Building, Montreal, Quebec	Connelly Lake, Ungava

DIRECTORY OF FIRMS IN THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1948
(Continued)

Name of firm and product	Head office address	Location of mine or plant
Iron Ore (Concluded) -		
Hollinger North Shore Exploration Co. Ltd. (*)	721 Royal Bank Building, Montreal, Quebec	New Quebec
Mistassini Explorations Ltd. (*)	184 Bay St., Toronto, Ontario	Lake Albanel, Quebec
Norancon Exploration (Quebec) Ltd. (*)	Noranda, Quebec	Ungava district, Quebec
Quebec Labrador Development Co. Ltd. (*)	100 Adelaide St. W., Toronto, Ontario	New Quebec
United Dominion Mining Co. Ltd. (*)	465 St. John St., Montreal, Quebec	Saguenay Co., Quebec
Algoma Ore Properties Ltd.	Cornwall Building, Sault Ste. Marie, Ontario	Algoma district, Ontario
Michipicoten Iron Mines Ltd.	25 King St. W., Toronto, Ontario	Algoma district, Ontario
Rebair Gold Mines Ltd. (*)	9 Adelaide St. E., Toronto, Ontario	Atikokan, Ontario
Steep Rock Iron Mines Ltd.	25 King St. W., Toronto, Ontario	Rainy River district, Ontario
Coast Iron Co. Ltd.	475 Howe St., Vancouver, British Columbia	Quinsam Lake
Indium -		
Consolidated Mining & Smelting Company of Canada Ltd. (*)	215 St. James St., Montreal, Quebec	Trail, British Columbia
Lithium -		
Canadian Lithium Co. Ltd. (*)	57 Queen St., Toronto, Ontario	Abitibi Co., Quebec
La Corne Lithium Mines Ltd. (*)	320 Bay St., Toronto, Ontario	La Corne, Quebec
Manganese -		
Quebec Manganese Mines Ltd.	231 St. James St. W., Montreal, Quebec	Magdalen Islands, Quebec
Magnesium -		
Dominion Magnesium Ltd.	67 Yonge St., Toronto, Ontario	Haley, Ontario
Aluminum Co. of Canada Ltd.	1700 Sun Life Building, Montreal, Quebec	Arvida, Quebec
Mercury -		
Bralorne Mines Ltd. (*)	555 Burrard St., Vancouver, British Columbia	Omineca district, British Columbia
Consolidated Mining & Smelting Company of Canada Ltd. (*)	215 St. James St., Montreal, Quebec	Pinchi Lake, British Columbia
Molybdenite -		
Molybdenite Corp. of Canada Ltd.	59 St. James St. W., Montreal,Quebec	La Corne, Quebec
Quoyon Molybdenite Co. Ltd. (*)	Quoyon, Quebec	Quoyon, Quebec
Selenium-Tellurium -		
International Nickel Co. of Canada Ltd.	Copper Cliff, Ontario	Copper Cliff, Ontario
Canadian Copper Refiners Ltd.	1600 Royal Bank Building, Toronto, Ontario	Montreal East, Quebec
Tantalum-Columbite -		
Tantalum Refining & Mining Corporation of America (*)	11 King St. W., Toronto, Ontario	Ross Lake, Northwest Territories
Thallium -		
Hudson Bay Mining & Smelting Co. Ltd. (*)	500 Royal Bank Building, Winnipeg, Manitoba	Flin Flon, Manitoba
Tin -		
Consolidated Mining & Smelting Company of Canada Ltd.	215 St. James St., Montreal, Quebec	Trail, British Columbia
Mountain Crest Mines Ltd. (*)	1445 MacKay St., Montreal, Quebec	Charlevoix, Quebec

DIRECTORY OF FIRMS IN THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1948
(Concluded)

Name of firm and product	Head office address	Location of mine or plant
Titanium Ore -		
Baie St. Paul Titanic Iron Ore Co. (*)	Baie St. Paul, Quebec	St. Urbain, Quebec
Coulombe, J.	71 Ave. Royal Monument, Quebec, Quebec	St. Urbain, Quebec
Kennco Explorations, Ltd. (*)	244 Bay St., Toronto, Ontario	Allard Lake, Quebec
Quebec Iron and Titanium Corp.	1522 Sherbrooke St. W., Montreal, Quebec	Lac Tio, Quebec
Tungsten Concentrates -		
Canadian Exploration Ltd.	Royal Bank Building, Vancouver, British Columbia	Salmo, British Columbia

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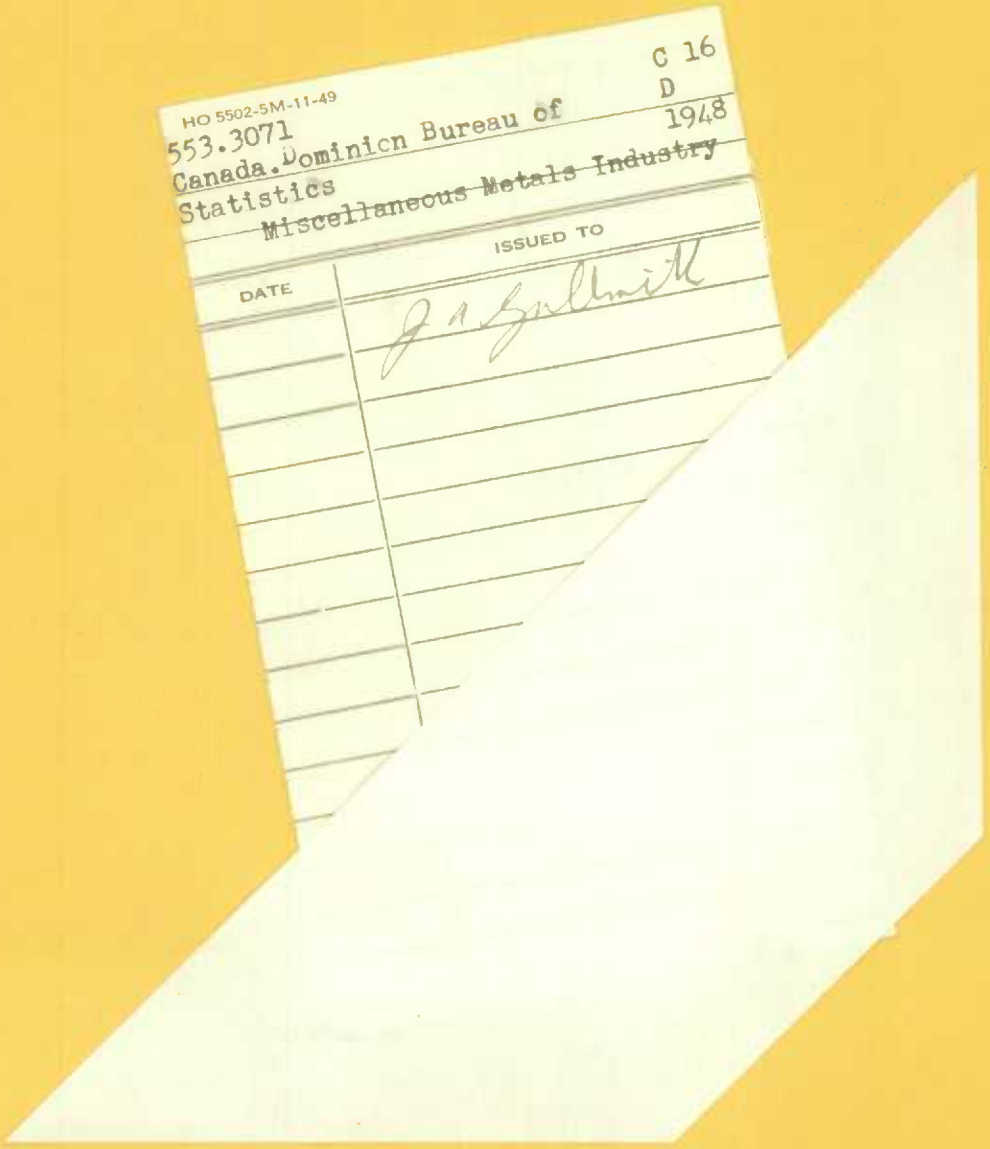
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