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CANADA

DEPARTMENT OF TRADE AND COMMERCE

DOMINION BUREAU OF STATISTICS

CENSUS OF INDUSTRY

MINING, METALLURGICAL & CHEMICAL BRANCH

Report

on

MISCELLANEOUS METALS IN CANADA, 1940

including

Aluminium
Antimony
Barium
Beryllium
Bismuth
Cadmium
Calcium
Chromium
Iron
Lithium
Magnesium
Manganese
Mercury
Molybdenum
Radium - Uranium
Selénium
Tantalum - Columbium
Tellurium
Tin
Titanium (ilmenite)
Tungsten
Vanadium
Zirconium

OTTAWA
1941

Price 50 cents

Dominion Statistician: R. H. Coats, LL.D., F.R.S.C., F.S.S. (Hon.)
Chief - Mining, Metallurgical and Chemical Branch: W. H. Losee, B.Sc.
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MISCELLANEOUS METALS, 1940

Metal-bearing minerals, mined in relatively small quantities by a comparatively few operators, have been grouped by the Dominion Bureau of Statistics for consideration as a single industry. Included with the finally revised statistics relating to the Canadian production of these, are notes and statistical data pertaining to various rare or semi-rare metals or metalliferous ores produced in other countries. Metals or metal-bearing ores produced in Canada during 1940 and classified as miscellaneous include - antimony, bismuth, cadmium, iron ore, mercury, molybdenite, radium and uranium products, selenium, tellurium, tungsten concentrates and titanium ore. In addition to particulars relating to these metals or products, the bulletin contains notes of a summary nature on beryl and beryllium, lithium, magnesium, sodium, calcium, aluminium, tin, vanadium and zirconium.

It is to 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.

The gross value of production credited to this industry in 1940 totalled $2,029,278 compared with $524,977 in 1939. Employees totalled 445 in 1940 and salaries and wages paid amounted to $628,025.

ALUMINIUM - The reduction of aluminium ores and the production of primary aluminium in Canada is confined to the province of Quebec. In this province the Aluminum Company of Canada, Limited, operates an ore treatment plant at Arvida and reduction plants at both Arvida and Shawinigan Falls. These three plants were in continuous operation throughout 1940. At the Arvida ore plant concentrates were made from British Guiana bauxite and aluminium ingot was produced in the two reduction works. The Company also operates fabricating plants at Shawinigan Falls, Quebec, and Toronto, Ontario, and a new plant for the production of aluminium products is now operated by the Company at Kingston, Ontario. Data relating to the aluminium industry are not included with those recorded in tables of this report. Bauxite from British Guiana, used for the production of aluminium, is washed and dried before being shipped; at Arvida, Quebec, it is treated by a standard chemical process to remove impurities, and pure aluminium oxide is recovered. Cryolite, necessary in the production of the metal, is largely imported from Greenland; synthetic cryolite is also used in making aluminium. A very large amount of electrical energy is utilized in the production of new aluminium metal from bauxite concentrates. No bauxite ores are mined in Canada and the principal bauxite producing countries are - France, Hungary, United States, Yugoslavia, Italy, British Guiana, Dutch Guiana and Russia.

Primary aluminium production in the United States during 1940 exceeded the peak reached in 1939 by 26 per cent and consumption rose 35 per cent above that in 1939, according to the Bureau of Mines, United States Department of the Interior. A total of 412,560,000 pounds of new aluminium valued at $75,292,210 was produced in the United States in 1940 contrasted with 327,090,000 pounds valued at $64,600,000 in 1939. The apparent consumption of primary aluminium in 1940 totalled 454,034,409 pounds compared with 335,337,860 pounds in 1939. At the end of 1940 aluminium was being produced at a rate exceeding 500,000,000 pounds annually. In order to meet the requirements of the national defense program, aluminium production will be further increased in 1941 and 1942 at the five reduction plants of the Aluminum Company of America and at a new plant of the Reynolds Metals Company at Lister (near Sheffield), Alabama. Output is expected to reach an annual rate exceeding 690,000,000 pounds by July, 1941 and 825,000,000 pounds by July, 1942, according to a report published by the Advisory Commission to the Council of National Defense.

During 1940 the United States consumed more bauxite, the ore of aluminium, than in any other year, according to the Bureau of Mines, United States Department of the Interior. Apparent domestic consumption in 1940 totalled 958,695 long tons, 22 per cent more than the 782,975 tons consumed in the previous peak year of 1939. While the aluminium industry, which produced 26 per cent more metal in 1940 than in 1939, accounted for most of the increased demand for bauxite, artificial abrasive and chemical manufacturers also used more ore. The larger demand in 1940 was met by a 17 per cent increase in domestic mine shipments and a 21 per cent increase in imports. Domestic shipments were equivalent to 47 per cent and net imports to 53 per cent of total apparent consumption. About three-fourths of the aluminium industry's supply came from abroad, chiefly from Surinam (Dutch Guiana).

United States bauxite output (mine shipments) in 1940 totalled 438,913 long tons (dried ore basis) and was valued at $2,578,968, an increase of 17 per cent in quantity and 19 per cent in value over that in 1939. Of the domestic ore shipped from mine producers' and processors' plants (449,198 tons), the aluminium industry took 48 per cent, abrasive 29 per cent, chemical 18 per cent, and oil refining, refractory, steel and other industries 5 per cent.

Six mining companies operating in Saline and Pulaski Counties, Arkansas, accounted for 97 per cent of the 1940 bauxite output and for virtually all of the increased domestic production. For the first time Virginia produced a small tonnage of ore from very limited reserves in Augusta County. Shipments from Barbour and Henry Counties, Alabama, and from Sumter County, Georgia, continued to decline.

In the latter part of 1939 the British Government signed with the Aluminum Company of Canada a contract under which the United Kingdom takes the entire Canadian exports; although provision was made whereby contracts signed prior to the war would be fulfilled. Additions made to plants in 1940 allow for a considerable increase in Canada's productive capacity. The average nominal price in New York for aluminium 99 per cent pure in 1940 was 19 cents per pound.

Table 1 - IMPORTS INTO CANADA AND EXPORTS OF ALUMINIUM, ALUMINA, BAUXITE AND CRYOLITE, 1939 and 1940

	1939		1940	
	Cwt.	$	Cwt.	$
IMPORTS -				
Alumina	1,973	24,525	1,783	24,027
Bauxite ore (a)	10,139,643	3,373,760	13,510,363	4,889,758
Cryolite (b)	68,959	310,209	450,908	1,495,821
Aluminium angles, etc.	1,460	59,810	2,162	132,854
Aluminium in pigs, ingots, blocks, notch bars, slabs, billets and blooms	3,788	90,049	2,667	119,178
Aluminium scrap	2,081	17,844	1,721	28,570
Aluminium in bars, rods and wire	6,464	251,900	1,626	81,814
Aluminium in plates, sheets and strips, including circles	15,232	537,373	16,744	612,953
Aluminium pipes and tubes	728	52,283	1,175	68,067
Aluminium leaf, less than .005 mm. thick	...	2,070	...	1,208
Aluminium kitchen or household hollowware, n.o.p.	...	116,965	...	166,107
Aluminium, manufactures of, n.o.p.	...	858,603	...	1,044,473
Aluminium leaf, n.o.p., or foil less than .005 inch thick, plain or embossed	...	150,877	...	186,099
Aluminium powder ... lb.	267,568	98,120	278,403	93,416
Aluminium wire and cable	304	5,809	56	1,209
TOTAL - ALUMINIUM AND ITS PRODUCTS	...	5,950,197	...	8,945,554
EXPORTS -				
Aluminium scrap	21,770	265,038	13,033	148,248
Aluminium in bars, blocks, etc. -				
To - United Kingdom	779,155	14,328,385	1,116,564	22,327,183
United States	39,685	547,337	312,216	4,280,279
Brazil	12,935	220,543	71	4,484
China	23,764	433,025	17,900	350,150
Australia	8,638	147,409	19,788	387,030
Japan	420,837	7,801,052	41,549	814,328
Germany	57,964	848,315	...	...
British India	3,531	63,249	...	...
France	33,070	736,731	220,362	4,753,735
Mexico	63	1,683	...	...
Switzerland	1,874	34,921	...	...
Netherlands	6,056	118,587	2,205	52,139
Other countries	24,007	403,239	73	1,414
Total - in bars, blocks, etc.	1,411,579	25,684,476	1,730,728	32,970,742
Aluminium kitchen utensils and hollowware	...	12,838	...	13,389
Aluminium wire and cable	...	242,010	...	208,065
Aluminium, manufactures of, n.o.p.	...	223,824	...	984,375
TOTAL - ALUMINIUM AND ITS PRODUCTS	...	26,428,186	...	34,325,319

Imports of alumina into Canada in 1918 totalled 186,442,200 pounds valued at $2,071,060 compared with 30,704,200 pounds at $614,713 in 1913.

(a) 1,205,783 cwt. from United States and 8,933,490 cwt. from British Guiana in 1939, and 1,828,723 cwt. from United States and 11,391,560 cwt. from British Guiana in 1940.
(b) 62,720 cwt. from Greenland in 1939 and 442,626 cwt. in 1940.

Table 2 - WORLD'S PRODUCTION OF ALUMINIUM, 1937, 1938 and 1939 (From the Year Book of the American Bureau of Metal Statistics)

(In metric tons)

Country	1937	1938	1939
United States	132,759	130,129	148,567
Canada	42,550	66,000	75,000
Total America	175,309	196,129	225,567
France	34,500	45,300	50,000(d)
Switzerland (a)	25,000	26,500	28,000(d)
Germany (a)	127,600	165,600(c)	(x)200,000(c)
Austria (a)	4,000	(c)	(c)
Great Britain (a)	19,400	22,500	25,000(d)
Norway	23,043	29,035	31,000(d)
Italy	22,947	25,768	30,000(d)
Spain	...	800	(x) 800
Russia	45,000	48,000	(x) 60,000
Sweden	1,831	1,892	(x) 1,900
Hungary	1,200	1,500	1,500(d)
Total Europe	304,521	366,895	428,200
Japan	10,000	(x)17,000	25,000(d)
TOTAL WORLD (b)	489,830	580,024	674,567

(a) Metallgesellschaft.
(b) Omitted from this table is a small production in Yugoslavia.
(c) Austrian production for 1938 included with Germany.
(x) Conjectural.
(d) Estimated by U. S. Bureau of Mines.

Table 3 - WORLD'S PRODUCTION OF BAUXITE AND CRYOLITE, 1937, 1938 and 1939 (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries

(Long tons)

Producing Country	1937	1938	1939
BRITISH EMPIRE			
British Guiana (c) -			
60% or more alumina	288,701	447,370	470,147
50 - 60% alumina	7,817	...	...
30 - 50% alumina (b)	64,413	115,646	81,622
Unfederated Malay States	19,000	55,081	92,256
India	15,150	14,768	...
Australia	7,766	1,320	...
Total	403,000	634,000	...
FOREIGN COUNTRIES			
Austria (estimated)	3,000	5,000	...
Czecho-Slovakia	833	(a)	...
France	677,300	671,662	...
Germany	18,000	19,100	...
Greece	135,242	177,045	...
Hungary	524,243	532,177	...
Italy	380,391	355,138	...
Roumania	10,531	11,620	10,604
U.S.S.R. (estimated)	250,000	250,000	...
Yugoslavia	352,167	398,180	313,804
Mozambique	(a)	(a)	180
United States	425,076	310,916	375,307
Brazil (exports)	8,631	12,724	17,990
Dutch Guiana	386,249	371,633	450,055
French Indo-China	7,000	160	...
Netherland East Indies	195,828	241,479	227,025
Total	3,370,000	3,320,000	...
WORLD'S TOTAL	3,770,000	3,950,000	...

NOTE. For footnotes, see Page 4.

Footnotes to Table 3 -
(a) Information not available.
(b) Ore remains at the mines.
(c) The shipments from mines of dried and washed ore were as follows (long tons):

	1937	1938	1939
Metallurgical	241,932	321,912	436,015
Chemical	48,950	46,275	39,138
Refractory	7,295	1,814	855
Abrasive	...	2,596	5

PRODUCTION (EXPORTS) OF CRYOLITE IN GREENLAND -

Year	Long tons
1937	50,822
1938	49,463
1939	...

ANTIMONY - Antimony metal is recovered in the metallurgical works of the Consolidated Mining and Smelting Company Ltd., Trail, B.C. In addition to the production of metal at Trail, the Pioneer Gold Mines of B.C. Limited exported approximately a carload of crude antimony ore to the United Kingdom. This was mined at Stuart Lake in the Omineca Mining District of British Columbia; this property was active in 1940 during the period May to November.

In the province of Quebec, Reed Realties Ltd. reported the clearing out of an old tunnel on an antimony deposit located on Lot 28, Range 1, South Ham; work was conducted here from May 6th to June 22nd, 1940. Prior to the close of 1938 there had been no commercial production of antimony metal in Canada since 1917 and no by-product output of the metal since 1926, in which year it was reported as contained in silver-lead-bismuth bullion produced from cobalt-silver ores mined in Northern Ontario.

Minerals containing antimony occur in Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, British Columbia, and the Yukon Territory. Stibnite (Sb_2S_3) occurs in the veins of the Reliance Gold Mines, Bridge River mining district, British Columbia, and in the same province at the property of the Gray Rock Mining Syndicate in the Truax Creek area, and at the Congress mine adjoining the Reliance property.

In June, 1941 domestic antimony metal was quoted - New York - 14 cents per pound. Antimony ore, per unit of antimony contained, 50 to 55 per cent, $1.30 to $1.40; 58 to 60 per cent, $1.50 to $1.60; 60 to 65 per cent, $1.75 to $1.80; London, 60 to 65 per cent, 9s. per long ton unit, nominal.

Table 4 - ANTIMONY USED IN SPECIFIED CANADIAN INDUSTRIES, 1938 and 1939

Industry	1938 Pounds	1938 $	1939 Pounds	1939 $
White metal alloys	514,027(x)	68,962	671,118	70,855
Electrical apparatus and supplies	76,149	10,997	140,786	18,641

(x) Regulus. In addition, the industry reported the consumption of 114,143 pounds of antimony ore valued at $3,407 in 1939 and 145,440 pounds at $7,575 in 1938.

NOTE: Corresponding data for 1940 not yet available.

Table 5 - IMPORTS OF ANTIMONY AND ANTIMONY PRODUCTS INTO CANADA, 1939 and 1940

	1939 Pounds	1939 $	1940 Pounds	1940 $
Antimony or regulus of, not ground, pulverized or otherwire treated	238,909	27,092	236,071	21,521
Antimony oxide and titanium oxide (x)	9,003,693	803,198	8,700,015	782,957
Antimony salts - tartar emetic, etc.	27,755	7,283	16,773	6,664
Antimony salts for dyeing	537	97	...	...

(x) Including white pigments containing not less than 14 per cent by weight of titanium.

Table 6 - WORLD'S PRODUCTION OF ANTIMONY ORE, 1937, 1938 and 1939 (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)
(in terms of metal)
(Long tons)

Producing Country	1937	1938	1939
BRITISH EMPIRE			
Southern Rhodesia	78	77	61
Union of South Africa	...	12	7
Canada	...	11	547
Burma (estimated)	50	90	...
India	(c)	13	...
Sarawak	5	...	15
Australia	567	(a)	...
FOREIGN COUNTRIES			
Austria	248	(a)	...
Czecho-Slovakia	1,226	(a)	...
Greece	...	(a)	...
Italy	600	910	...
Portugal	61	161	239
Yugoslavia	1,780	3,370	3,700
Algeria	958	1,010	...
Morocco (French)	26	155	...
(Spanish)	206	80	...
Mexico	10,471	7,907	7,749
United States (b)	1,130	580	551
Argentina	10	210	117
Bolivia (exports)	7,014	9,287	9,896
Honduras	(a)	(a)	...
Peru	1,396	662	...
China	15,000	8,000	7,000
French Indo-China	6	102	...
Japan (estimated)	(a)	(a)	...
Korea	10	(a)	...
Turkey	659	490	560

(a) Information not available.
(b) Secondary metal was recovered as follows:

1937	11,018	long tons
1938	7,590	" "
1939	...	" "

BARIUM - A report on barium minerals by the Imperial Institute, London, contains the following information:

A series of lead-calcium-barium alloys known in some cases as Frary metal and others as Ferry metal, are used for bearing purposes. The amount of barium is about 2 per cent and the bulk of the alloy is lead. The alloys are manufactured electrolytically from molten chlorides using a cathode of molten lead, and are used in the same manner as other 'white' metals. Aluminium and barium form a series of alloys which have greater fluidity than pure aluminium. A range of barium-aluminium and barium-magnesium alloys are being produced by an English firm under the trade names 'Baral' and 'Barmag'. The proportion of barium varies up to as much as 50 per cent, but the consumers in the wireless valve trade usually require the 'Baral' alloy to contain 45 to 50 per cent of barium and the 'Barmag' alloy to carry 25 to 30 per cent barium. With nickel, barium forms an alloy (0.2 per cent barium) which is stated to exhibit greater resistance to the action of hot corrosive gases than does pure nickel, and on this account it has been used for the manufacture of sparking plug electrodes.

The U.S. Bureau of Mines reports that barium metal is now made in the United States, chiefly to supply the small requirements for radio, vacuum and thermionic tubes where it is used as a "getter" along with lithium, potassium and calcium. The metal is not yet produced commercially in Canada. Current prices for barium are not available, but in 1936 it was available at approximately $5.00 per pound or less.

BERYLLIUM - The principal ore of beryllium is the mineral beryl - $Be_3Al_2(SiO_3)_6$. There are several known occurrences of this mineral in Canada and shipments of beryl have been made for experimental purposes from deposits in Renfrew county, Ontario, and the Oiseau river area in Manitoba. Beryl usually occurs in pegmatites and is sometimes recovered as a by-product in the mining of the feldspar and mica content of these rocks. No commercial production of beryl has ever been officially reported in Canada. No mining or shipments of beryllium ores were officially reported in Canada during 1940.

The Minerals Year Book of the U.S. Bureau of Mines for 1940 reports on beryllium as follows:

"Beryllium production is still an infant industry, but in 1940 it grew lustily. Most of the metal is now produced as a 4-per cent master alloy with copper, in which form it is sold at $15 per pound of contained beryllium, whereas beryllium metal of domestic manufacture costs approximately $45 a pound compared with $100 formerly charged for German-produced metal of less purity. Wrought beryllium alloys--which are made by remelting the master alloy and which are ready for fabrication--now range from 0.1 to 2.25 per cent in beryllium content. Best-known and longest on the market is a binary alloy containing 2 to 2.25 per cent beryllium. The base price for strip and other merchant forms of this alloy is 96 cents per pound when copper is 10 cents (98 cents at 12-cent copper). By adding a little cobalt (0.25 per cent, for example), which seems to stabilize the properties and improve uniformity as well as to facilitate precipitation hardening, the Be content can be reduced to 1.8 per cent without loss of properties obtainable by heat treatment. Another alloy on the market contains approximately 0.5 per cent beryllium and 2.6 per cent cobalt, and there is also one with only about 0.1 per cent beryllium and 0.3 per cent chromium, the remainder being copper in both instances. These two alloys are primarily electrical alloys (conductivity, approximately 50 and 70 per cent that of copper, respectively) with excellent strength and hardness. The 2.6-per cent cobalt alloy, however, is reported also to have an unusually high endurance limit at temperatures arount 500° F.

"The present high cost of beryllium is not due to the cost of raw materials or lack of efficient processes for recovery of the metal from beryl. Even under present conditions the metal probably could be sold with a good profit at $5.00 per pound, provided the volume of sales was large enough to carry the heavy expenses of laboratory and market research and general overhead. .....Actually the offerings of beryl have greatly exceeded demand, and now both leading American beryllium companies are confident that as the industry grows ore supplies will grow proportionately. Statistics of United States production or consumption of beryllium cannot be published, but information available indicates that United States production of beryl has ranged in recent years from less than 100 to a maximum of not more than 200 tons a year, whereas imports have been increasing. Imports of beryl in 1940 rose to a new record--805 short tons valued at $22,865, of which 422 tons came from Argentina, 377 from Brazil and 6 from South Africa".

Engineering and Mining Journal - New York - in June, 1941 quoted beryllium-copper, master alloy 4 per cent beryllium, remainder copper, in lots one pound or more of beryllium, $15 per pound of contained beryllium. Beryllium ore - per ton (2,000 pounds), carload lots, minimum 10 per cent BeO, $30; minimum 12 per cent, $35 F.O.B.

No imports into Canada of beryllium, described as such, were reported in 1940. It may, however, enter in the form of special alloys.

BISMUTH - Bismuth production in Canada during 1940 and recent years represented the metal recovered from silver-lead ores smelted at Trail, B.C. and the metal contained in silver-lead-bismuth bullion produced in the treatment of silver-cobalt ores at Deloro, Ont. Production in 1939 came entirely from the treatment of silver-lead ores in the Trail smelter and totalled 409,449 pounds valued at $446,362. Production for 1940 has not been released for publication.

Imports of metallic bismuth into Canada in 1940 totalled 5 pounds valued at $11 compared with 10,252 pounds at $10,835 in 1939; these imports came entirely from the United States. Imports of bismuth salts into Canada in 1940 were appraised at $17,516 compared with $8,671 in the preceding year.

"Mineral Industry" states that it is impossible to arrive at any actual figures for world output of bismuth. The United States Bureau of Mines estimated world consumption in 1939 at about 2,600,000 pounds of which Europe accounted for 2,000,000 pounds and the United States for 500,000 pounds. The Cerro de Pasco Copper Corp. is the world's chief producer of bismuth, recovering it as a by-product at its copper and lead plants in Peru. Commercial production of bismuth has been also reported in Australia, Bolivia, Mexico, Argentina, Spain, Japan and Germany.

Bismuth is consumed chiefly in the manufacture of pharmaceuticals and alloys. According to U.S. Bureau of Mines report, pharmaceutical and medicinal manufacturers have heretofore used about 75 per cent and low-melting-point and non-shrinking alloys the balance. The metal is employed in almost all low-melting

metallic alloys used for fusible plugs, safety devices, dental models, soft solders and tempering baths for small tools and pieces. The principal alloying components used with bismuth are lead, tin and cadmium. The recently developed free-cutting aluminium alloy 11S contains a small percentage of bismuth. Bismuth also is used in small quantities in iron castings, in special brake linings, in enamelling and the manufacture of optical glass, in the manufacture of special instruments, and in plastics as bismuth subnitrate. "Metal and Mineral Markets", New York, quoted bismuth metal, June, 1941 - per pound, in ton lots $1.25; London 4s. 6d.

Table 7 - PRODUCTION(x) OF BISMUTH IN CANADA, 1930 - 1939

Year	Pounds	$	Year	Pounds	$
1930	12,732	6,366	1935	13,797	13,245
1931	118,207	157,650	1936	364,165	360,525
1932	16,855	7,340	1937	5,711	5,654
1933	78,303	81,526	1938	9,516	9,754
1934	253,644	301,215	1939	409,449 /	466,362

(x) First commercial production in 1924.
/ High record output.

Table 8 - BISMUTH USED IN THE MANUFACTURE OF CANADIAN MEDICINAL AND PHARMACEUTICAL PREPARATIONS, 1938-1939

Item	1938		1939	
	Pounds	$	Pounds	$
Bismuth metal	26,643	23,951	18,155	16,821
Bismuth salts	12,779	19,107	13,430	21,815

In 1940 Canadian white metal alloy foundries consumed approximately 950 pounds of bismuth metal.

Table 9 - WORLD'S PRODUCTION OF BISMUTH ORE, ETC.(x), 1936, 1937, 1938 and 1939 (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)
(Cwt.)

Producing Country and Description	1936	1937	1938	1939
BRITISH EMPIRE				
Uganda - Ore	...	...	8	...
Union of South Africa - Ore (Bi content)	...	368	52	27
Canada - Metal and content of bullion	3,251	51	85	3,656
Burma - Ore	1	2	...	...
Australia - Ore, etc.	361	174	132	...
FOREIGN COUNTRIES				
France - Mispickel (Bi content)	78	...	(a)	...
Metal	80	...	180	...
Norway - Copper ore (Bi content)	11	7	5	...
Roumania - Bismuth-Molybdenum ore	880	530	3,150	18,700
Mexico - Ore (Bi content)	3,259	2,789	3,657	3,222
Argentina - Ore (Bi content)	310	160	(a)	60
Bolivia (exports) - Ore, etc. (Bi content)	1,257	607	338	250
Peru - Lead-silver bullion, etc. (Bi content) ...	166	357	259)	
Metal	7,341	1,318	3,975)	(b)8,617
Japan - Metal	1,100	(a)	(a)	...

(x) Bismuth ore is also produced in Germany, Spain and China and the metal recovered as a by-product in the United Kingdom, Sweden, U.S.S.R. and the United States.
(a) Information not available.
(b) Exports.

BORON - According to the United States Bureau of Mines, boron alloys are supplied by United States manufacturers, small quantities being used in the nonferrous-metals industries and in steel making. In cast iron, boron opposes graphitization on solidification and exerts an energetic whitening effect, producing a hard strong iron but reducing malleability.

Boron carbide, boron carbide shapes and calcium boride are now produced in Canada.

CADMIUM - Cadmium production in Canada represents the recovery of the metal as a by-product in the electrolytic refining of zinc. Production up to 1935 came entirely from the treatment of zinc-bearing ores at Trail, British Columbia, by the Consolidated Mining and Smelting Company of Canada, Limited. The commercial production of the metal from the copper-gold-silver-zinc ores of the Flin Flon mine was commenced in Manitoba for the first time in 1936.

Cadmium is consumed largely in the manufacture of alloys and for plating, also in the making of such pigments as cadmium lithopone, cadmium yellows, etc. A relatively large quantity of the metal is used in the production of bearing metals for high-speed internal combustion engines. It was reported after the outbreak of war in September that both the demand and market price of cadmium showed a decided increase. "Metal and Mineral Markets", New York, quoted cadmium, June, 1941, per pound, commercial sticks, wholesale quantities, 90 cents.

"Mineral Industry" stated that in 1939, on the basis of the 1938 outputs, Germany now has under its control not only the home output of 432 metric tons, but also the Polish output of 244 tons; the Norwegian, of 208 tons; the Belgian, of 259 tons; and presumably the French output of 116 tons. This is a total of 1,259 tons out of a world total of about 4,100 tons. But it must be remembered that of these countries, Norway, Belgium, and France work almost entirely on imported ores, also much of the output in Germany has in the past been derived from cadmium bearing flue dust imported from Mexico and Southwest Africa.

Table 10 - CADMIUM PRODUCTION IN CANADA, 1928 - 1939

Year	BRITISH COLUMBIA		MANITOBA		SASKATCHEWAN	
	Pounds	$	Pounds	$	Pounds	$
1928 (x)	491,894	341,374	...	...	...	...
1929	773,976	675,294	...	...	...	...
1930	456,582	337,871	...	...	...	...
1931	323,139	180,958	...	...	...	...
1932	65,425	26,824	...	...	...	...
1933	246,041	78,733	...	...	...	...
1934	293,611	95,665	...	...	...	...
1935	580,530	441,203	...	...	...	...
1936	526,034	468,170	148,133	131,838	111,749	99,457
1937	436,451	715,747	164,223	269,326	144,553	237,067
1938	510,342	410,090	115,166	92,543	73,630	59,166
1939	799,255	563,241	73,830	52,029	66,608	46,939

(x) First production.

Table 11 - CADMIUM CONSUMED BY SPECIFIED CANADIAN INDUSTRIES, 1939 - 1940 (Pounds)

Industry	1939	1940/
White metal alloys	77,957	116,525
Steel foundries	1,825	6,000
Iron foundries	2,658	9,528
Non-ferrous smelters	1,344	...
Other industries	309	5,483
Total Accounted For	82,095	137,534

/ Subject to revision.

Statistics relating to Canadian exports or possible imports of cadmium were not published separately by the Department of National Revenue, Ottawa prior to 1939. In 1939 Canada exported 1,049,853 pounds of cadmium valued at $788,180, of which 978,525 pounds worth $750,836 went to the United Kingdom.

Table 12 - WORLD'S PRODUCTION OF CADMIUM, 1937, 1938 and 1939 (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)
(Lb. avdp.)

Producing Country	1937	1938	1939
BRITISH EMPIRE			
United Kingdom	273,688	275,354	...
South West Africa (c)	305,000	255,000	...
Canada	745,207	699,158	959,691
Australia	464,311	439,456	...
FOREIGN COUNTRIES			
Belgium	598,000	400,000	...
France	218,000	265,000	...
Germany	783,000	957,000	...
Italy	200,000	152,000	...
Norway	339,935	456,000	...
Poland	274,000	538,000	...
U.S.S.R.	(a)	(a)	...
United States - Metal	3,995,739	3,753,523	4,141,242
Compounds (metal content)	828,000	451,000	679,000
Mexico (b)	1,366,407	1,680,800	1,800,259

Cadmium is also produced in the Netherlands, Sweden and Japan.
(a) Information not available.
(b) Including cadmium content of flue dust, etc., exported for treatment.
(c) Estimated cadmium content of shipments of dust to Germany.

CALCIUM - There is no commercial production of calcium metal in Canada and data relating to possible imports of metallic calcium into the Dominion are not published. The 1940 Minerals Year Book of the United States Bureau of Mines contains the following information pertaining to the metal:

"Metallic calcium, produced before the European War almost exclusively abroad, chiefly in France, is now made in the United States, the leading consumer. It is employed more and more for grain-refining alloy steels and in small amounts in some magnesium products. Various uses, as summarized by C. L. Mantell, include: (a) Deoxidizer and alloy agent for copper, lead, and other nonferrous metals; (b) preparation of high-temperature, high-resistance nickel-chrome and nickel-chrome-iron alloys; and (c) as a reducing agent, in form of hydride, in the manufacture of rare metals, such as, titanium, uranium, vanadium, and zirconium."

Calcium metal was quoted in the United States, September, 1939 - per pound, 98 to 99 per cent - 75 cents - ton lots - lump. No quotations were published during the first half of 1941.

CHROMITE - The mineral chromite (FeO, Cr_2O_3) is the commercial source of the metal chromium; it is also used extensively in the manufacture of refractory brick. The metal is a necessary constituent of many high-speed cutting tools, certain armour plate, and stainless steels. Chromite is also used in the manufacture of chromic acid for electroplating and in the manufacture of chemicals used chiefly in the dyeing, tanning and pigment industries. The Bureau of Mines, Ottawa, states that metallurgical ores should contain not less than 48 to 50 per cent Cr_2O_3 and as little iron as possible.

The principal chromite producing countries are Russia, South Africa, Turkey, Southern Rhodesia, Cuba, New Caledonia, Yugoslavia, India, and Philippine Islands. Production of the mineral in Canada during recent years has been relatively small, coming almost entirely from the Eastern Townships, Quebec. During the past few years considerable development work was conducted on a chromite deposit located at Obongo Lake, in the Thunder Bay district of Ontario; shipments were made from this property in 1935, 1936 and 1937. The owners of this mine, The Chromium Mining and Smelting Corp. Ltd., also have a modern electric smelting plant at Sault Ste. Marie, Ontario, for the production of ferrochrome and ferrosilicon from imported ores; chrom-X, an exothermic alloying agent is produced at this plant.

Canadian production in 1940 came entirely from the Eastern Townships in the province of Quebec, and chiefly from deposits located on Lot. 7, Range 12, Orford Tp. and Lot 28, Range 10, Brompton Tp. These deposits were worked by H. B. Fletcher. Other chromite mining operations in 1940 included development work on Lot. 17, Range a, Coleraine Tp. by Thetford Ferro-chrome Co. Limited; surface work and diamond drilling at

the Sterrett mine in Cleveland Tp., Richmond County, by Chromite Limited and the cleaning out of old pits on Lot 15, Range 1 of South Ham Tp. by Reed Realties Ltd. During 1940 a trial shipment of chromite was made from the Thetford mines area by W. R. Metulier and a relatively small tonnage of the mineral was recovered as a by-product by the Asbestos Corporation Ltd.

In British Columbia, exploration and development work has been conducted during the past on several chromite deposits but there have been no reports made to the Dominion Bureau of Statistics, Ottawa, of recent activities at these properties.

"Metal and Mineral Markets", New York, quoted chrome ore June, 1941: - Per long ton C.I.F. Atlantic Ports: Turkish concentrates 48 per cent Cr_2O_3, not quoted. Indian and African, 48 per cent metallurgical ore $43 to $45; ordinary ore, $37 to $39; 43 to 45 per cent, refractory ore, $25 to $26. Prices nominal.

Corresponding prices May, 1940 were: - Turkish, 48 per cent Cr_2O_3 concentrate, $29 to $30; Indian, 48 per cent, $25 to $26; 43 to 45 per cent refractory, $21 to $22.

Table 13 - PRODUCTION OF CHROMITE IN CANADA, 1928 - 1939

Year	Short tons	$	Year	Short tons	$
1928	...	...	1935	1,144	14,947
1929	126	900	1936	(a)	13,578
1930	...	...	1937	(a)	43,250
1931	...	...	1938	...	...
1932	78	1,113	1939	...	...
1933	30	343			
1934	111	1,578			

(a) Quantity not published.

Table 14 - IMPORTS OF CHROMIUM AND CHROMIUM PRODUCTS INTO CANADA, 1939 and 1940

	1939		1940	
	Quantity	$	Quantity	$
Chromium metal and tungsten metal, in lumps, etc., when imported by manufacturers for alloying purposes ....lb.	55,428	50,769	148,184	170,103
Nickel chromium in bars or rods for use as electric resistance wire, etc. (x) ....lb.	48,597	48,616	48,620	48,532
Chrome fire brick ....$	...	88,367	...	155,987
Bichromate of potash - crude ....lb.	188,479	16,819	203,573	19,862
Bichromate of soda ....lb.	3,246,413	211,173	4,330,578	307,681
Chrome ore (a) ....lb.	33,168,400	232,851	59,876,300	554,413

(x) Of a kind not manufactured in Canada.
(a) In 1940 - 18,972,800 pounds from S. Rhodesia and 17,492,200 pounds from British India.

Table 15 - CONSUMPTION OF CERTAIN CHROMIUM PRODUCTS AND CHROME ORE IN SPECIFIED CANADIAN INDUSTRIES, 1938 and 1939

Industry	Item	1938		1939	
		Pounds	$	Pounds	$
Ingots and castings ...	Chrome ore ...	504,000	8,440	3,747,520	53,961
Ingots and castings ...	Ferrochrome ...	1,478,000	116,639	2,228,800	175,759
Paints, pigments and varnishes ...	Chrome colours ...	1,425,687	215,524	1,592,092	252,100
Paints, pigments and varnishes ...	Sodium bichromate ...	490,607	34,837	524,675	43,044
Leather tanning ...	Sodium bichromate ...	1,482,653	115,227	625,997	14,569
Glass manufacture ...	Chromite ...	68,000	1,461	20,000	491

NOTE: In addition to the items listed above, a considerable quantity of chromite is utilized in the manufacture of Canadian ferro-alloys, also a relatively small quantity of sodium bichromate is consumed in the chemical industry. Chromite is also employed in Canada in the manufacture of refractories.

Table 16 - WORLD PRODUCTION OF CHROME ORE, 1937 - 1939 (Supplied by Imperial Institute) (Long tons)

Producing country	1937	1938	1939	Estimated Cr_2O_3 content (x) 1937	1938	1939
BRITISH EMPIRE						
United Kingdom	300	466	...	75	117	...
Sierra Leone	(d) 729	1,300	...	328	224	...
Southern Rhodesia	271,265	185,083	136,887	132,900	89,700	...
Union of South Africa	165,958	173,773	157,488	74,349	78,181	71,484
Cyprus	1,615	5,577	7,678	800	2,800	...
Canada	3,814	...	...	800	...	...
India	62,307	44,129	...	51,000	22,000	...
Australia	459	952	...	(a)	(a)	...
TOTAL	506,000	408,000	...	...	...	...
FOREIGN COUNTRIES						
Bulgaria	2,313	1,717	...	1,064	678	...
Greece (b)	51,789	41,793	...	21,000	17,000	...
Italy (Rhode Is.)	(a)	(a)	...	(a)	(a)	...
Norway	173	500	...	78	225	...
U.S.S.R. (c)	(a)	(a)	...	(a)	(a)	...
Yugoslavia	58,918	49,401	44,144	28,000	23,800	...
Cuba	79,420	56,739	51,869	22,000	10,000	...
Guatemala	...	483	590	...	(a)	...
United States	2,321	812	3,614	1,000	350	...
Brazil (exports)	837	920	3,695	352	386	1,552
Japan	(a)	(a)	...	(a)	(a)	...
Philippine Islands	75,209	38,271	71,914	54,000	18,000	...
Turkey	189,468	210,256	180,390	90,000	105,000	...
New Caledonia	47,264	51,391	...	24,000	26,000	...
TOTAL	(a)	(a)	(a)	...	...	...
WORLD'S TOTAL	(a)	(a)	(a)	...	...	...

(x) Only approximate estimates can be given owing to the wide variation in the chromium content of the ore produced in several of the countries concerned.
(a) Information not available.
(b) Figures for 1938 refer to exports.
(c) Probably includes some ore needing concentration.
(d) Shipments.

IRON ORE - No iron ores, known as such, were mined in Canada for some years prior to 1939. Nova Scotia with its large iron and steel industry is not a producer of iron ore. The large deposits of high-grade ore in Newfoundland, owned by the Dominion Steel and Coal Corporation, are much more readily accessible and of a higher and more constant grade than the iron ore deposits in Nova Scotia.

Iron ore was first mined and smelted in the province of Quebec early in the eighteenth century, and from that time until 1883, the industry was carried on almost continuously at Three Rivers in the St. Maurice district. Other furnaces using local ore were operated at Radnor Forges and Drummondville, the last to shut down being the Drummondville furnace in 1911. At the present time only titaniferous ore is mined in Quebec; this ore is produced near Baie St. Paul and is shipped for its titanium content.

A very considerable tonnage of iron ore has been shipped from properties in Ontario during past years. These shipments included both hematite and magnetite. In 1940 commercial shipments of beneficiated ore were continued from the new Helen mine in the Michipicoten district and were made by Algoma Ore Properties Limited. During the year under review, iron ore was also shipped from old dumps of the Bessemer mines in Eastern Ontario, while at Atikokan, in the Rainy River district, exploration of the Steep Rock Lake hematite deposits was continued throughout the year by Steep Rock Iron Mines Limited.

Different varieties of iron ore are found in various parts of British Columbia, the most important of which are the magnetite deposits which occur on the islands along the coast. No work on these deposits was reported in 1940.

Imports of iron ore into Canada during 1940 totalled 2,418,237 short tons valued at $5,513,215 compared with 1,764,844 short tons at $4,179,353 in 1939.

Iron ore quotations in the United States, August, 1939, were as follows: - per long ton, Lower Lake Ports, Lake Superior Ore - Mesabi, non-bessemer, 51½ per cent iron $4.95. Old range, non-bessemer, $5.10. Mesabi, bessemer, 51½ per cent iron $5.10. Eastern ores, cents, per long ton unit, delivered at furnaces: Foundry and Basic, 56 to 63 per cent, 9 to 9¼ cents. June, 1941, quotations for Mesabi, non-bessemer, 51½ per cent iron, $4.45. Old range, non-bessemer, $4.60. Mesabi, bessemer, 51½ per cent iron, $4.60. Old range, bessemer, $4.75. Eastern ores Foundry and Basic, 56 to 63 per cent, 10 cents per long ton unit. Prices for foreign ores nominal.

Table 17 - ORES USED IN CANADIAN STEEL FURNACES, 1938 and 1939

Ore	1938 Long tons	1938 $	1939 (x) Long tons	1939 (x) $
Crude iron ore, imported	74,137	462,773	81,095	501,436
Calcined roasted, or treated ore, imported	81	774	403	2,480
Manganiferous ore, imported	104	1,300	6	267
Chrome ore, imported	252	8,440	326	10,255

In addition to the consumption of ores listed in Table 17, there were 1,272,800 long tons of foreign ore valued at $4,582,210 used during 1939 in blast furnaces for the production of pig iron. Corresponding consumption in 1938 totalled 1,234,433 long tons worth $4,368,325; also in 1939 there were 45,152 tons of beneficiated Canadian iron ore at $187,010 used in blast furnaces.

(x) Complete data for 1940 not yet available.

Table 18 - WORLD PRODUCTION OF IRON ORE (INCLUDING MANGANIFEROUS IRON ORE) 1937 - 1939 (Long tons)
(Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)

Producing Country	ORE 1937	ORE 1938	ORE 1939	Estimated Iron Content 1937	Estimated Iron Content 1938
BRITISH EMPIRE					
Canada	...	...	110,355	...	...
United Kingdom (b)	14,214,995	11,859,191	...	4,264,499	3,557,757
Northern Rhodesia	520	205	136	260	100
Sierre Leone (shipments)	633,985	861,955	...	361,400	491,300
South West Africa	14,054	23,484	19,192	6,605	11,038
Union of South Africa	454,505	497,336	482,397	290,701	314,462
Newfoundland	1,609,718	1,680,213	1,600,761	837,000	873,000
Burma	25,426	16,050	...	16,500	12,000
India	2,870,852	2,743,675	...	1,840,000	1,760,000
Federated Malay States	1,147	923	768	(a)	(a)
Unfederated Malay States	1,660,342	1,580,915	1,941,753	1,060,000	1,010,000
Australia	1,871,631	2,250,491	...	1,235,000	1,485,000
New Zealand	571	1,218	1,586	250	540
TOTAL	23,360,000	21,520,000	...	...	...
FOREIGN COUNTRIES					
Austria	1,854,927	2,605,000	...	661,043	900,000
Belgium	261,415	178,063	...	118,000	(a)
Bulgaria	11,732	16,506	...	7,486	9,880
Czecho-Slovakia	1,807,490	(a)	...	589,960	...
France	37,252,386	32,904,045	...	13,000,000	11,500,000
Germany	9,636,974	10,942,200	...	2,715,044	3,064,000
Greece	295,752	343,107	...	146,034	(a)
Hungary	285,463	364,091	...	95,716	121,000
Italy	1,000,219	989,829	...	520,000	515,000
Luxemburg	7,643,597	5,059,443	...	2,205,083	1,482,780
Norway	992,301	1,402,786	...	643,754	910,000
Poland	767,830	858,369	...	244,000	265,000
Portugal	7,578	(a)	54	3,012	(a)

Table 18 - WORLD PRODUCTION OF IRON ORE (INCLUDING MANGANIFEROUS IRON ORE) 1937 - 1939 (Long tons) (Concluded)
(Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)

Producing Country	Ore			Estimated Iron Content	
	1937	1938	1939	1937	1938
FOREIGN COUNTRIES (Concluded)					
Roumania	127,022	136,987	140,759	57,000	62,000
Spain	975,132	2,474,125	...	460,000	1,160,000
Sweden	14,711,555	13,701,955	...	8,991,129	8,277,616
Switzerland (estimated)	70,000	150,000	...	(a)	(a)
U.S.S.R. (c)	26,000,000	27,000,000	...	(a)	(a)
Yugoslavia	609,713	597,523	656,285	305,000	300,000
Algeria	2,386,927	2,985,582	...	1,265,000	1,500,000
Morocco (French)	65,744	265,547	...	(a)	(a)
Morocco (Spanish)	1,402,231	1,320,468	...	840,719	792,000
Tunis	928,858	809,070	...	471,806	421,857
Cuba (shipments)	488,420	152,099	161,523	220,000	70,000
Mexico	133,869	97,782	139,102	88,300	71,500
United States (d)	73,434,520	28,756,142	52,540,000	36,700,000	14,400,000
Brazil	182,708	362,690	390,669	(a)	(a)
Chile	1,505,542	1,581,670	1,599,948	920,000	950,000
French Indo-China	32,764	128,240	...	16,109	70,746
Japan	(a)	(a)	...	(a)	(a)
Korea	204,200	(a)	...	(a)	(a)
Manchuria	(a)	(a)	...	(a)	(a)
Philippine Islands	681,698	856,310	...	382,000	479,554
Turkey	...	19,980	141,014	...	15,290
New Caledonia	...	35,707	...	...	18,525
TOTAL	190,000,000	144,000,000	...	...	...
WORLD'S TOTAL	215,000,000	165,000,000	...	...	...

(a) Information not available.
(b) In addition bog ore and iron ore (not used for smelting) were produced as follows:

1937	8,243 long tons
1938	6,454 " "

(c) Estimated for 1937 and 1938.
(d) Including shipments of manganiferous iron ore up to 35 per cent Mn.
Iron ore is also produced in China.

The output of iron ore in the United States in 1940 is estimated by the Bureau of Mines, United States Department of the Interior, at 73,806,000 gross tons, an increase of 43 per cent over the quantity mined in 1939. The output in 1940 was, except for 1916 and 1917, the largest on record. The ore shipped from mines in 1940 is estimated at 74,969,000 gross tons valued at $191,734,000, an increase of 37 per cent in quantity and 21 per cent in total value compared with 1939. The above figures do not include ore that contained 5 per cent or more of manganese in the natural state.

The average value of the ore at the United States mines in 1940 is estimated at $2.56 per gross ton; in 1939 it was $2.89. The stocks of iron ore at the mines at the end of 1940, mainly in Michigan and Minnesota, were 3,502,000 gross tons, a decrease of 26 per cent from 1939.

With the United States steel industry operating at 73 per cent of capacity during each of the first quarters of 1940, advancing to 88 during the third quarter, and reaching 95 during the last quarter, thus establishing an all-time record output, operating schedules at iron-ore mines in the Lake Superior district were keyed to meet not only the 1940 requirements but to build up stocks at docks and furnaces sufficient to last until the 1941 navigation season opens. To accomplish this task, the entire ore fleet was engaged part of the season. Although severe storms on the Great Lakes in November resulted in the movement of about 2,000,000 tons less than expected, shipments down the Lakes for the season exceeded 63,000,000 tons and were the third largest on record.

LITHIUM - The principal commercial lithium ores are amblygonite, a fluophosphate of lithium and aluminium; spodumene, a silicate of these two elements, and lepidolite, or lithia mica, also a silicate. The lithia content of these minerals, as mined, commonly ranges around 8 to 9 per cent for amblygonite, 4 to 7 per cent for spodumene, and 3 to 5 per cent for lepidolite. All of the above minerals are known to occur in Canada but there has, as yet, been only a small production, mainly of lepidolite and spodumene. The important deposits are all in Manitoba in the southeastern part of the province. The first commercial shipment of Canadian lithium ore to be officially recorded was reported during 1937. This production came from deposits located at Bernic Lake, Manitoba, and was valued at $1,694; the mineral was consigned to the United States for the manufacture of lithium compounds and possible lithium metal. No commercial shipments of lithium ores from Canadian mines were reported in either 1939 or 1940. Operations were resumed late in 1939 and continued in 1940 at the Bernic Lake lithium deposits of the Lithium Corporation of Canada Limited; and it was reported that commercial shipments of lithium ore might be resumed.

"Metal and Mineral Markets", New York, quoted lithium metal, June, 1941, per pound, 98 to 99 per cent 100 pound lots $15. Amblygonite was quoted, June, 1941, per ton F.O.B. mines 8 to 9 per cent Li_2O $40. Lepidolite, per ton, $24 to $25 for ordinary grades, lump, F.O.B. mines.

Statistics relating to possible imports of lithium, lithium ores or lithium compounds are not shown separately in Canadian trade reports.

The following table shows the production of lithia mica in the specified countries, 1937 - 1939. (Imperial Institute, London).

Table 19 (Long tons)

Country	1937	1938	1939
South West Africa	1,030	...	423
Canada	(£342)	...	...
France	(a)	(a)	...
Portugal	109	...	...
United States (lithium minerals)	1,212	796	1,777
Argentina	181	(a)	...

(a) Information not available.

MAGNESIUM - No magnesium metal has been commercially produced in Canada during recent years. However, in 1918 the manufacture in the Dominion of metallic magnesium was undertaken by the Shawinigan Electro Metals Company Limited at Shawinigan Falls, Quebec, from imported magnesium chloride salts. It is also stated that during the period 1916-1918, the Consolidated Mining and Smelting Company of Canada, Limited, produced approximately 100 tons of metallic magnesium at Trail, British Columbia, from imported magnesium chloride. This same Company reported that in 1939 the development of an improved process on a semi-commercial scale for the production of magnesium at Trail had been successfully concluded.

In 1940 considerable interest was taken in the possibility of developing Canadian brucite-bearing deposits for their magnesium content and it was reported early in 1941 that such deposits occurring in the lower Gatineau River valley of the province of Quebec were being investigated by the Bureau of Mines, Ottawa as to their economic importance as a source of magnesium ores. It was later reported that these deposits were expected to come into commercial production in 1941.

Primary magnesium production in the United States during 1940 totalled 12,500,000 pounds, the largest output in the history of the domestic industry, according to the Bureau of Mines, United States Department of the Interior. The 1940 output was 87 per cent above the previous peak of 6,700,000 pounds attained in 1939. The Dow Chemical Company, at present the sole domestic producer of magnesium, expects to produce 30,000,000 pounds of metal in 1941. In February, 1940 the Company doubled capacity of its plant at Midland, Michigan, which utilizes magnesium chloride derived from underground brine and in January, 1941 production was begun at a newly constructed plant at Freeport, Texas, which employs sea water as the raw material.

Since magnesium metal began to play a vital role in the construction of aircraft, attention has been focused upon world production. While official data are not available, it is believed that total world magnesium output did not exceed 45,000 short tons in 1940. The world producers in 1940 in apparent order of importance are Germany, the United Kingdom, the United States, Japan, France, U.S.S.R., Italy and Switzerland. According to sources believed to be reliable, production in Germany, the largest world producer, was between 18,000 and 21,000 tons in 1940. Germany employed carnallite, potash end-liquor, and some magnesite and

dolomite as raw material in the production of its magnesium. The electrolytic magnesium chloride process was employed but experiments were recently begun on the direct thermal reduction of magnesium oxide. German uses for magnesium, due to the local lack of certain other metals, include telephone switch parts, optical instruments, microscopes, bus bars and aerial bombs. In the manufacture of engraving plates, copper-zinc alloys have been replaced by magnesium alloys. Automobiles, street-cars, and tanks are understood to offer some of the most important outlets for the present German supply of magnesium alloy.

CONSUMPTION IN THE UNITED STATES OF PRIMARY AND SECONDARY MAGNESIUM IN 1940, BY USES, IN POUNDS
(United States Bureau of Mines)

Use	Quantity	Use	Quantity
Structural products 1/	7,363,200	Scavenger and deoxidizer	561,600
Aluminum alloys	3,556,500	Pyrotechnics	43,500
Zinc alloys	68,000	Chemicals	70,200
Other alloys	17,600	Other	50,400
		Total	11,531,000

1/ Castings, sheet, extruded shapes, forgings, etc.

From 7,363,200 pounds of magnesium used in the manufacture of structural products 5,383,670 pounds emerged in finished items. The remaining 1,979,530 pounds (27 per cent) of the metal consumed by this industry was lost in the manufacturing process. This high loss is due to the fact that magnesium oxidizes readily at temperatures above the melting point. The gross weight of finished structural products was 5,916,120 pounds, of which 5,475,530 pounds were sold or used.

In June, 1941 "Metal and Mineral Markets", New York, stated that tremendously increased requirements for aircraft and other military uses calls for a productive capacity in the United States of about 400,000,000 pounds of magnesium a year by the end of 1942, according to the Office of Production Management. It is expected that negotiations for the construction of new facilities will be carried on by the United States War Department, the Defense Plant Corporation and seven or more companies producing or interested in production of magnesium metal.

Table 20 - CONSUMPTION OF MAGNESIUM INGOTS IN CANADA, 1939 and 1940

	1939	1940(x)
	(pounds)	
In non-ferrous smelters	31,990	192,000
In white metal alloy foundries	774	7,770
In brass and bronze foundries	16	163
In aluminium products	...	240
In ammunition	...	404
In pharmaceuticals	200	...
TOTAL ACCOUNTED FOR	32,980	200,577

(x) Subject to revision.

Imports of magnesium oxide into Canada during 1940 totalled 235,650 pounds valued at $38,894 compared with 268,813 pounds at $32,030 in 1939; data relating to imports of magnesium metal into Canada are not published separately. Imports of magnesium alloys into the Dominion in 1940 were appraised at $1,602.

"Metal and Mineral Markets" - New York - Prices September 21, 1939, and June, 1941, were - per pound ingots (4 x 16 in.) 99.8 per cent; carload lots, 27 cents; extruded sticks, carload lots, 34 cents.

MANGANESE - The Department of Mines and Resources, Ottawa, reports that the manganese ores, which have been mined in Canada are pyrolusite, manganite, psilomelane, and bog manganese. These, with the exception of the bog manganese, were mostly ores with a high manganese content and fairly free from deleterious constituents. They were usually in small lots and were derived from various localities in Nova Scotia, New Brunswick and British Columbia.

Although manganese is used in both the ferrous and non-ferrous metallurgical industries, the bulk is consumed in the manufacture of iron and steel. Most of the ore entering this industry is used in the manufacture of ferromanganese and spiegeleisen, the forms in which manganese is usually added to steel. A

considerable quantity of manganese ore is used by producers of storage batteries and certain manganese ores are used by the chemical, ceramic, and glass industries.

A small quantity of manganese ore was produced during 1940 in the Dean and Chapter mines located at New Ross, Lunenburg Co., Nova Scotia. These deposits were worked in 1940 from May 15 to November 30 by the Atlantic Manganese Corporation Limited. In the same province, East Mountain Mining Company extracted and stock piled some high-grade ore from a property near Truro, and in January, 1941 the Company started to erect a reduction plant at Truro to produce metallic manganese by the electro-thermite process. Some recently discovered large bog ore deposits in Cape Breton were prospected in 1940. In New Brunswick, the Sussex Manganese Mining Company Limited reported that prospecting and surface work were conducted during November and December on its property near Sussex. The Company stated that results were encouraging and that it intended to resume operations in 1941. On the Magdalen Islands, Quebec, both surface and underground work on a manganese deposit were carried on in 1940 by the Magdalen Manganese mines; no commercial shipments were made but the Company reported that some 1,200 tons of crude ore were mined; bulk samples from these operations were tested in Ottawa by the Bureau of Mines. In Manitoba, several bog manganese deposits were prospected, mainly in the vicinity of Riding Mountain, near Rossburn and Birtle. During 1940 manganese bearing deposits were also prospected in British Columbia; these were located near Kaslo, Arrowhead and Williams Lake. Samples of manganese ore of varying grade were received in Ottawa from other localities in British Columbia.

Engineering and Mining Journal's "Metal and Mineral Markets" - New York - quoted manganese ore, August 31, 1939, as follows - per long ton unit of manganese, c.i.f. North Atlantic ports, cargo lots, exclusive of duty: Brazilian, 46 to 48 per cent manganese, 27 cents; Chilian, 47 per cent minimum, 27 cents; Indian, 48 to 50 per cent, 28 cents; Caucasian, 52 to 55 per cent, 29 cents; South African, 50 to 52 per cent, 28 cents; 44 to 48 per cent, 24 cents. Prices June, 1941, were: Brazilian, 46 per cent manganese, 65 cents; Chilian, 48 per cent manganese, 70 cents; Indian, 48 to 50 per cent manganese, nominal; South African, 50 to 52 per cent manganese, 70 cents; Cuban, 45 to 47 per cent manganese, not dutiable, 75 cents; 50 to 52 per cent, 80 cents. Prices nominal.

Imports into Canada of manganese oxide during 1940 totalled 140,920,100 pounds valued at $777,416 compared with 59,573,600 pounds at $621,931 in 1939. Of the 1940 imports, 131,100,400 pounds came from the Gold Coast and 7,062,800 pounds from the United States.

Table 21 - PRODUCTION OF MANGANESE ORE IN CANADA FOR YEARS SPECIFIED

Year	Tons	Value	Year	Tons	Value
		$			$
1915	201	9,360	1932-1934	...	...
1916	957	89,544	1935	100	800
1917	158	14,836	1936	221	1,596
1918	440	6,230	1937	85	817
1924	584	4,086	1938	...	...
1925-1929	...	...	1939	396	3,688
1930	273	1,356			
1931	117	2,893			

Table 22 - CONSUMPTION OF MANGANIFEROUS ORE AND MANGANESE COMPOUNDS IN SPECIFIED CANADIAN INDUSTRIES, 1938 and 1939

Industry	Items	1938 Quantity	1938 Value	1939 Quantity	1939 Value
			$		$
Electrical apparatus and supplies	Manganese dioxide.. pound	4,187,176	84,368	5,597,349	108,558
Paints, pigments and varnishes ..	Manganese salts ... pound	46,396	5,427	52,461	6,017
Steel ingots and castings	Ore, manganiferous (foreign) ..... pound	227,296	1,300	13,016,640	25,252
	Spiegeleisen ..... long ton	2,518	86,833	2,790	92,364
	Ferromanganese .... long ton	11,710	614,317	13,961	887,536

NOTE: In addition to the consumption recorded in the table above, a considerable quantity of manganiferous ore is employed in the manufacture of ferro-alloys. Also, in 1940, approximately 58 tons of manganese metal was consumed chiefly in the non-ferrous industries.

Table 23 - WORLD PRODUCTION OF MANGANESE ORE, 1937, 1938 and 1939 (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign countries)
(Long tons)

Producing Country	1937	1938	1939
BRITISH EMPIRE			
Gold Coast (shipments)	527,036	324,207	336,312
Northern Rhodesia	2,341	2,735	2,970
Union of South Africa	621,229	543,028	415,071
Canada	76	...	354
India	1,051,594	967,929	...
Unfederated Malay States	32,793	31,970	31,448
Australia	1,142	594	...
New Zealand	5	90	486
TOTAL	2,240,000	1,870,000	...
FOREIGN COUNTRIES			
Bulgaria	3,000	1,857	...
Czecho-Slovakia	104,664	(a)	...
Germany	177	(a)	...
Greece	6,842	6,963	...
Hungary	24,691	21,870	...
Italy	33,002	47,529	...
Portugal	312	548	591
Roumania	49,947	59,304	40,909
Sweden	6,031	5,983	...
U.S.S.R. (estimated)	2,770,000	2,900,000	...
Yugoslavia	4,369	5,699	5,566
Belgian Congo	30,498	7,603	...
Egypt	183,377	150,694	117,989
Morocco (French)	75,257	85,230	...
Morocco (Spanish)	650	150	...
Bolivia	...	...	244
Costa Rica (exports)	129	299	...
Cuba	113,840	(b)110,523	(d) 96,770
Mexico	17	116	26
Porto Rico (exports)	2,343	1,023	...
United States (c)	40,241	25,321	29,307
Argentina	596	430	641
Brazil	256,054	218,455	(d)186,018
Chile	12,809	(a)	11,049
French Indo China	5,207	2,179	...
Japan	(a)	(a)	...
Netherlands East Indies	10,908	9,534	11,883
Philippine Islands	5,600	40,240	...
Portuguese India	4,013	9,478	...
Turkey	522	2,151	511
TOTAL	3,800,000	3,900,000	...
WORLD'S TOTAL	6,000,000	5,800,000	...

NOTE: Manganese ore is also produced in Spain and China.

(a) Information not available.

(b) Exports.

(c) Shipments. Excluding the following quantities of ore containing 10 to 35 per cent Mn, which are recorded by the United States Bureau of Mines as iron ore: -

1937	151,955	long tons
1938	33,620	" "
1939	239,544	" "

MERCURY - Canada's production of mercury is principally from a deposit at Pinchi Lake in the Omineca mining division, British Columbia. This property is owned and operated by the Consolidated Mining and Smelting Company of Canada, Ltd. In addition to the recovery of the metal made at Pinchi Lake, there were relatively small quantities recovered in the same province in the Bridge River district by Empire Mercury Mines Limited and by Douglas B. Sterrett at Tunlawa Lake in the Kamloops M.D.

Production of mercury in the United States during 1940 more than doubled under the stimulus of a record-breaking average price for the year, according to the annual summary of the industry by the United States Bureau of Mines. Final figures indicate that 37,777 flasks of mercury were produced in 1940, the largest since 1885. Imports into the United States for consumption amounted to 171 flasks in 1940. Exports of quick silver from the United States in 1940 aggregated 9,617 flasks, of which 5,178 flasks went to the United Kingdom, 1,598 to Japan, 775 to Canada and 666 to Australia. The Engineering & Mining Journal average price for mercury, New York, for 1940 was $176.865 per flask, against $103.940 in 1939 and $75.455 in 1938. The New York price, June, 1941, per flask of 76 pounds was $184 to $186.

Table 24 - IMPORTS OF MERCURY INTO CANADA FOR YEARS SPECIFIED

Year	Pounds	$	Year	Pounds	$
1912	137,474	72,171	1918	56,936	68,903
1913	219,442	109,493	1937	394,354	371,178
1914	204,229	97,449	1938	49,584	49,564
1915	184,432	159,184	1939	109,232/	165,489
1916	79,204	74,461	1940	78,597(a)	202,106
1917	71,608	76,322			

/ 59,469 pounds from United States and 37,069 pounds from Italy, and in addition there were $9,486 worth of mercury salts imported.
(a) 77,963 pounds from United States.

"The only known deposits of cinnabar in Canada are in British Columbia, by far the most important development being that on the northwest side of Pinchi Lake, Omineca Mining Division, about 40 miles north of Vanderhoof Station on the Canadian National Railway. The deposit was discovered in the summer of 1937 by J. G. Gray of the Geological Survey, Ottawa, and claims were staked in May, 1938, by A. J. Ostram and others. Late in that year they were optioned to Consolidated Mining and Smelting Company. Prospecting disclosed large cinnabar-bearing areas in veins and impregnations mainly in dolomitized and brecciated limestone along zones of fracturing and shearing. A roasting and condensing plant was erected, and production was started in June, 1940. The grade of ore treated is between 0.5 and 0.75 per cent mercury. Prior to the discovery of the Pinchi Lake deposits, little mercury was produced in Canada and their successful operation has brought about a complete change in the Canadian situation in respect to the metal. The output is now far in excess of the domestic requirements and the ore reserves are estimated to be sufficient to assure continuous output at the present rate for several years." (Bureau of Mines, Ottawa).

Table 25 - CONSUMPTION OF MERCURY IN SPECIFIED CANADIAN INDUSTRIES, 1939 and 1940

	1939	1940(x)
	(Pounds)	
Medicinals and pharmaceuticals	20,473	30,514
Heavy chemicals (catalyst)	58,954	34,888
Electrical apparatus	2,161	1,899
Non-ferrous smelters	857	1,636
Petroleum refineries	359	328
White Metal Refineries	500	537
Gold mines	6,313	6,000(x)
Ammunition	...	4,630
TOTAL ACCOUNTED FOR	80,017	80,428

(x) Subject to revision.

Table 26 - WORLD'S PRODUCTION OF QUICKSILVER, 1937, 1938 and 1939 (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)

(Pounds)

Producing Country	1937	1938	1939
BRITISH EMPIRE			
Canada	...	760	456
Australia	710	...	...
New Zealand	1,344	760	...
Southern Rhodesia	...	...	52
FOREIGN COUNTRIES			
Austria	10,192	(a)	...
Czecho-Slovakia	208,988	220,000	...
Italy	4,868,000	5,073,000	...
Roumania	293	(a)	...
Spain (b)	3,200,000	3,200,000	...
Algeria	9,429	15,252	...
Tunis	1,911	20,536	...
Mexico	375,132	647,460	560,567
United States	1,254,608	1,367,316	1,416,108
Bolivia (exports)	1,217	...	569
China (exports)	131,925	4,941	965
Japan	(c) 44,000	(c)45,000	...
Korea	...	...	...
Turkey	37,269	45,408	...
WORLD'S TOTAL	10,100,000	10,600,000	...

NOTE: Quicksilver is also produced in Germany and U.S.S.R.
(a) Information not available.
(b) Figures are the amounts imported from Spain by the chief consuming countries.
(c) Estimated.

MOLYBDENITE - Molybdenite ore is the chief source of the metal molybdenum, the mineral, a soft steel-blue coloured sulphide, is usually found in pegmatite dykes and along the contacts of limestone and gneiss. The metal is employed chiefly in the manufacture of special alloy steels.

Canadian mine shipments of molybdenite concentrates in 1940 came entirely from the Moss mine, Quyon, Que. and were made by the Quyon Molybdenite Co. Limited. This Company also manufactured molybdenum oxide in 1940. In addition to the operations conducted in 1940 at the Moss mine, development work or exploration on molybdenite deposits was reported by the following operators: Louis Lefebvre in St. Samuel Tp., Frontenac County, Quebec; Cheabella Mine Co., Montbeillard Tp., Quebec; La Pause Gold Mining Corp. Ltd., La Pause, Quebec; La Reine Molybdenum Mines Ltd., La Reine Tp., Abitibi County, Quebec; Norwin Molybdenite Mines Ltd., Eardley Tp., Quebec; Canadian Molybdenite Mines Ltd., Tory Hill and Essonville, Ont.; Nakina Molybdenite Mines Ltd., Burrows Lake, Ont.; North American Molybdenum Corp. Ltd., Renfrew County, Ont.; Peter Stewart, Cranberry Portage, Manitoba and T. Bentham (Molly claims) Powell River, British Columbia.

Early in 1941 operations by the Quyon Molybdenite Co. ceased at Quyon, Que. and the whole property including the mine, mill and furnace plant was sold to V. Poulin of St. Lambert, Que. This is the only plant in Canada for the conversion of molybdenite concentrate into suitable addition agents.

Production of molybdenum in the United States, which had increased progressively from 1935 to 1938 again declined in 1940, according to the Bureau of Mines, United States Department of the Interior. Although there was a greatly increased demand by domestic consumers, exports were drastically curtailed, and as a consequence shipments from mines were 22 per cent less than in 1939, which, however, was an all-time high.

About 77 per cent of the United States output of molybdenum came from the operation of the Climax Molybdenum Co. in Lake County, Colo. Production of molybdenum concentrates was also reported from Arizona, California, New Mexico, Utah, and Washington.

Concentrates shipped from United States mines in 1940 were 25,185,000 pounds of molybdenum with an estimated value of $17,100,000, as compared with 32,415,000 pounds with an estimated value of $22,157,000 in 1939.

Exports of molybdenum concentrates from the United States in 1940 were 6,339 short tons, of which 2,650 tons went to France, 1,993 to the United Kingdom, 825 tons to Italy, and the remainder (871 tons) to Brazil, Canada, Japan, Mexico, Netherlands, Sweden, and the U.S.S.R.

For most purposes molybdenite (MoS_2) is converted, before using, to ferromolybdenum or to calcium molybdate (a compound resulting from the roasting of molybdenite with lime and containing 35 to 45 per cent molybdenum). The latter, states the United States Bureau of Mines, is the cheaper method of preparing molybdenum for industrial applications. Molybdenum oxide in briquets is also used in making molybdenum additions to iron and steel. Improved processes of heat-treating and fabricating high-speed tool steels in which part of the tungsten has been replaced by molybdenum have increased the use of molybdenum in this field.

The only data published as relating to Canadian imports of molybdenum are those pertaining to calcium molybdate. Calcium molybdate imported into Canada during 1940 by manufacturers of steel for use exclusively in the manufacture of steel in their own factories totalled 401,748 pounds valued at $333,211 compared with 222,990 pounds worth $136,321 in 1939. Imports during both years came entirely from the United States. Imports into Canada of alloys used in the manufacture of steel or iron n.o.p. totalled 3,564,100 pounds valued at $1,277,039 in 1940; some of these may have contained molybdenum.

"Metal and Mineral Markets" - New York - quoted molybdenum ore June, 1941 - per pound of contained MoS_2, 90 per cent concentrate, 45 cents F.O.B. mines; London - per long ton unit, nominal at 45s for 85 to 90 per cent concentrate. Molybdenum per pound, 99 per cent, $2.60 to $3.00. Ferromolybdenum per pound of Mo, F.O.B. shipping point, 55 to 65 Mo, 95 cents. Calcium molybdate, per pound of contained Mo, 80 cents.

Table 27 - PRODUCTION OF MOLYBDENITE IN CANADA, 1902-1939

Year	Ores treated	Ores and concentrates shipped		MoS_2 content of shipments
	Tons	Tons	Value (a)	Pounds
			$	
1902	3(c)	3.3	400	(b)
1903	600(c)	85.0	1,275	(b)
1904-1913	...	...	...	...
1914	166(c)	16.5	2,063	3,814
1915	216	39.0	28,920	29,210
1916	9,100	610.0	188,316	156,461
1917	22,605	1,554.3	320,006	330,316
1918	33,935	461.3	428,807	378,482
1919	6,783	46.0	69,203	83,002
1920-1923	...	...	...	...
1924	668	10.0	9,370	18,739
1925	2,779	15.3	11,176	22,350
1926	4,490	12.6	10,472	20,943
1927	...	...	...	...
1928	...	...	...	...
1929	2,900	9.5	6,400	16,150
1930	...	...	...	...
1931	12	0.61	280	1,222
1932-1936	...	...	...	...
1937	5,307	8.25	8,147	(b)
1938	(b)	6.5	4,500	(b)
1939	1,492	1.3	816	(b)

(a) Value as given by the operators.
(b) Not known.
(c) Mined.

Table 28 - WORLD PRODUCTION OF MOLYBDENUM ORES, 1937 - 1939 (Taken from the Mineral Industry, Imperial Institute)

(Cwt.)

Producing Country	1937	1938	1939
BRITISH EMPIRE			
Canada	147	140	24
Burma	81 lbs.	...	...
Australia	1,400	1,163	...
FOREIGN COUNTRIES			
Italy (MoS_2 content)	15	4	...
Roumania (Bi-Mo Ore)	530	3,150	18,700
Norway (MoS_2 content)	11,279	15,167	...
French Morocco (MoS_2 content)	3,200	3,350	...
Mexico (MoS_2 content)	20,655	15,861	17,161
United States (MoS_2 content)	437,783	495,492	451,250
Peru (MoS_2 content)	1,629	3,006	3,775
Japan	(a)	(a)	...
Korea	(a)	(a)	...
Turkey (MoS_2 content)	720	1,340	...

NOTE: Molybdenum ore is also produced in Yugoslavia and China.
(a) Information not available.

RADIUM-URANIUM - The recovery of both radium and uranium in Canada is made in the refinery of Eldorado Gold Mines Limited located at Port Hope, Ontario. Pitchblende concentrates treated in this plant are obtained from the mine of the Company which is situated on Great Bear Lake, Northwest Territories. During the year under review the refinery was in steady production, but operations at the mine were discontinued from June 18th owing to a temporary surplus accumulation of concentrates. Important quantities of silver and some copper also occur with the pitchblende at the Eldorado mine and these metals, in the form of concentrates, are shipped principally to the metallurgical works of other firms for the recovery of the silver and copper content.

No radium-uranium mining operations other than those at the Eldorado mine, were reported in 1940.

The 1940 Minerals Year Book of the United States Bureau of Mines reported on radium as follows:

"The agreement between the Union Minière du Haut Katanga of Belgium and Eldorado Gold Mines, Ltd., of Canada, dividing world markets for radium in a 60:40 ratio, is said to have remained in force during 1940. World events, however, virtually eliminated the continent of Europe as a market for radium, and stocks sent to the United States for safekeeping are reported to be more than adequate to meet any anticipated requirements during the next several years. Normal sales for medical purposes in the United States are estimated at less than 25 grams a year. Luminous paints, which are used on instrument dials for airplane and other military equipment, do not require very large quantities, because a little radium goes a long way. One gram, for example, will furnish all the luminous paint needed for several thousand planes. Metal radiography seems to be growing more important and may be used extensively for the examination of castings, forgings, and other metal parts for munitions, but inasmuch as the radium for these purposes can be used repeatedly and can be transported readily from place to place, 5-or 10-gram lots at a few strategic locations could take care of national defense requirements.

"Owing to a sharp decline in world demand for radium and uranium the Canadian producer stopped all operations at Great Bear Lake in June, 1940. Early reports implied that the shut-down might be brief—only long enough for refinery and sales development to catch up with recent increases in ore output--but later advices indicated that the mine might remain closed at least 2 or 3 years. It is stated that the mine is in excellent condition and that ore reserves are ample to keep the concentrator (100-ton daily capacity) in operation for a long time. During the winter of 1939-40 flotation equipment for cleaning pitchblende was flown in by plane, and other additions and changes were made to increase the efficiency of the mill. Refining capacity at Port Hope, Ontario, was expanded before the end of 1939 to 8 grams of radium and 40 tons of uranium compounds a month. It was rumored that stocks of ore and material in process at Port Hope were ample to keep the refinery busy for 3 years or more. Moreover, it was announced that uranium concentrates from the United States had been received for treatment upon a custom basis.

"Although the radium refinery at Oolen, near Antwerp, fell into German hands upon the surrender of Belgium the mines in Belgian Congo did not come under Hitler's control, and the colonial government decided to permit shipments of copper and other metals and mineral products to Great Britain and the United States. Imports into the United States of uranium compounds dropped to 240,199 pounds valued at $388,355 in 1940 compared with a maximum of 1,439,324 pounds with a value of $1,197,786 in 1939, whereas imports of "uranium ore", normally negligible (5 pounds valued at $10 in 1939) jumped to 2,400,198 pounds valued at $2,110,927 in 1940; all came from Belgian Congo.

"The price of radium advanced slightly to $30 a milligram early in 1940, then remained unchanged throughout the remainder of the year. Imports aggregated only 30.311 grams valued at $24,700 a gram in 1940 compared with 78.631 grams valued at $24,800 a gram in 1939 and 38.75 grams valued at $20,300 a gram in 1938.

"About 85 per cent of the world radium output is employed for medical purposes, 10 per cent in luminous material, and 5 per cent for miscellaneous uses, including the inspection of metal castings and forgings for inner flaws."

The ceramic industry is the largest user of uranium salts, which are employed for the colouring of ceramics and glass. Considerable interest has recently been taken in the separation from uranium metal of its usual content of one per cent of isotope and in what may be done or perhaps is being done in the utilization of energy obtained in splitting of this atom.

Imports of radium into Canada during 1940 were valued at $22,360 compared with $15,929 in 1939; data on Canadian exports are not published.

"Metal and Mineral Markets" - New York - quoted radium May, 1941 - per mg. radium content $25 to $30, as to quantity. June, 1941, New York quotations for uranium were - black oxide kgs. $2.55 - per pound; yellow kgs. $1.65 - per pound.

Table 29 - WORLD'S PRODUCTION OF URANIUM MINERALS, 1937 - 1939 (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)

(Cwt.)

Producing Country	1937	1938	1939
BRITISH EMPIRE			
Canada	(b)	(b)	...
FOREIGN COUNTRIES			
Czechoslovakia (U_3O_8)	217	(a)	...
Portugal (U_3O_8)	(c)	(c)	(c)
United States (U_3O_8)	219	544	624

NOTE: Uranium minerals are also produced in U.S.S.R. and the Belgian Congo.

(a) Information not available.

(b) The production of radium and uranium salts were:

	Radium mgrams.	Uranium salts Lb.
1937	23,770	546,000
1938	(a)	(a)

(c) The content of radium in salts was 2,900 mgrams. in 1937; 5,500 in 1938; 796 in 1939.

SELENIUM - Selenium production in Canada represents a by-product in the electrolytic refining of blister and anode copper made from Saskatchewan, Manitoba, Ontario and Quebec ores. It is recovered at Copper Cliff, Ontario by the International Nickel Company of Canada, Ltd., and at Montreal East, Quebec, by the Canadian Copper Refiners, Ltd. Production for 1940 is not released for publication.

The Minerals Year Book of the United States Bureau of Mines for 1940 reports on selenium as follows:

"Consumption of selenium in glassmaking, by far the leading use, increased in 1940, and several of the numerous minor applications expanded.

"Both selenium and tellurium are employed to improve the machinability of copper and copper alloys and to a very small extent as modifying agents in corrosion-resistant steels. Additions of selenium have been made successfully to 18/8 steels whose work-hardening properties tend to develop extreme surface hardness as soon as they are cast or otherwise worked, the improvement being similar to that obtained by additions of sulphur and without the deleterious effect of sulphur on corrosion resistance and mechanical strength. Fansteel Metallurgical Corporation (North Chicago, Ill.) has announced a new line of industrial rectifiers employing selenium plates. Suggested applications include supply of current for magnetic clutches, solenoid valves, alarm signal and communication systems, and isolated direct-current motors. The International Telephone Development Co. (New York, N.Y.) is also reported to be using selenium rectifiers."

Consumption of selenium in the manufacture of glass in Canada during 1940 was estimated at 4,552 pounds as compared with 4,243 pounds in 1939. Prices in the United States in 1940 for selenium (black, powdered 99.5 per cent) remained at $1.75 per pound. Barium selenite ($BaSeO_3$) was quoted in Glass Industry at $1.40 to $1.60 a pound with commercial (25 per cent Se.) at $0.85 a pound, and sodium selenite (Na_2SeO_3) at $1.50 to $1.65 a pound.

General statistics on employment, etc., as relating to the production of both selenium and tellurium are included with those compiled for the Canadian non-ferrous smelting and refining industry.

Complete data pertaining to world production of selenium and tellurium are not available.

Table 30 - PRODUCTION OF SELENIUM IN CANADA, 1931 - 1939

Year	Pounds	$	Year	Pounds	$
1931 (a)	21,500	40,850	1936	350,857	621,017
1932	...	...	1937	397,227	687,203
1933	48,221	70,345	1938	358,929	622,742
1934	104,924	171,311	1939	150,771	266,714
1935	366,425	703,536			

(a) First commercial production in Canada.

TELLURIUM - As with selenium, the metal is recovered in Canada as a by-product in the electrolytic-refining of anode copper at Montreal East, Quebec, by Canadian Copper Refiners, Limited, and at Copper Cliff, Ontario by the International Nickel Company of Canada, Limited. The production in Ontario represents the recovery of the metal solely from nickel-copper ores; whereas at Montreal East the metal originated in copper-gold ores mined in Manitoba, Saskatchewan, and Quebec. No commercial production was reported in Quebec.

The United States Bureau of Mines Yearbook for 1940 reported on tellurium as follows:

"Small but steadily growing quantities of tellurium are used to toughen rubber and lead. Tellurium lead has been in service long enough now to confirm by practical tests the claims as to its extraordinary resistance to corrosion, wear, and mechanical break-down, which are all the more remarkable in view of the fact that it differs in composition from ordinary good chemical lead only by an addition of less than 0.1 per cent tellurium. Small additions of tellurium, in this instance about 0.5 per cent, are employed in two new free-machining forgeable alloys of copper recently developed and patented by the Chase Brass & Copper Co. Another new development is to improve the quality and lengthen the useful life of chilled-iron car wheels; this is accomplished by introducing very small quantities of graphite and tellurium in correct proportion and balance into each ladle as the metal is poured. A newly patented "daylight lamp" employs tellurium vapor in a tube to fill in certain wave lengths to produce a continuous spectrum. The price of tellurium remained at $1.75 per pound in 1940".

In 1940 Canadian steel foundries consumed 400 pounds of tellurium and white metal foundries 629 pounds. Data relating to Canadian imports and exports of tellurium are not published separately in trade reports.

Table 31 - PRODUCTION OF TELLURIUM IN CANADA, 1934 - 1939

Year	Pounds	$	Year	Pounds	$
1934 (x)	5,130	25,599	1937	41,490	71,777
1935	16,425	32,850	1938	48,237	82,967
1936	35,591	62,997	1939	2,940	4,769

(x) First commercial production in Canada.
1940 production not published.

TIN - Tin is known to occur in the Snowflake and Sullivan mines in British Columbia and in certain pegmatites in southeastern Manitoba. It has also been reported at New Ross, Nova Scotia. No tin ore deposits have been worked or tin ore production recorded in Canada during recent years. No official reports of any primary tin production in Canada were received in 1940 and no development of any Canadian tin bearing deposits was reported.

The only commercial tin ore smelter in the Western Hemisphere in 1940 was in Argentina. In May, 1941 "Metal and Mineral Markets - Engineering & Mining Journal", New York, reported that the tin processing corporation has awarded a contract for construction of a tin smelter at Texas City, Texas; construction of the plant will commence soon and the project sponsored by the Government will cost $3,500,000.

Table 32 - ANNUAL WORLD TIN PRODUCTION AND AVERAGE CASH PRICES (Tin Research Institute)
(Long tons)

	1938	1939	1940
Belgian Congo	7,318	9,663	11,463
Bolivia	25,371	27,215	37,940
French Indo-China	1,575	1,392	1,560(f)
Malaya	43,247	56,001	85,384
Netherlands East Indies	21,024	31,410	44,447
Nigeria	7,313	10,855	10,257
Thailand (Siam)	13,520	16,970	17,447
Total Signatories (a)	119,368	153,506	208,500
Other Countries	30,346	30,825	28,300(x)
WORLD TOTAL	149,700	184,300	236,800
Price, £ per ton	189.6	226.3	256.6

(f) Estimated.
(x) Including 10,000 tons in respect of estimated annual production in China.
(a) International Tin Control Scheme.

Table 33 - CONSUMPTION OF TIN IN CANADA BY INDUSTRIES, 1939-1940

	1939	1940(f)
	(Short tons)	
Brass and bronze foundries	129	301
White metal foundries	1,640	2,034
Steel foundries (chiefly for tin plate)	810	1,270
Iron foundries	52	84
Galvanizing plants	...	90
Jewellery and silverware plants	45	64
Electrical apparatus plants	34	43
Miscellaneous industries	77	82
TOTAL ACCOUNTED FOR	2,787	3,988

(f) Subject to revision.

Production of secondary tin in Canadian plants in 1940 was estimated at 86,274 pounds compared with 185,914 pounds in 1939.

Table 34 - IMPORTS OF TIN AND TIN PRODUCTS INTO CANADA, 1939 and 1940

Item	1939 Pounds	1939 $	1940 Pounds	1940 $
Tin in blocks, pigs or bars (x)	5,825,700	2,833,089	11,837,800	6,235,268
Tinfoil	38,520	12,133	34,335	10,244
Collapsible tubes	...	64,523	...	100,868
Tin bichloride and tin crystals	84,942	22,889	44,732	12,850
Oxide of tin and copper	172,460	61,186	209,182	67,412
Phosphor tin and phosphor bronze in blocks, bars, plates, etc.	740,691	235,420	1,559,689	619,557
Tin plate food containers	...	382,905	...	398,610
Tin plate containers, n.o.p.	...	427,231	...	532,561
Sheets, plate, hoop, etc., tin coated	173,812,900	9,239,372	162,539,700	9,790,471
Manufactures of tin plate and manufactures of tin, n.o.p.	...	516,105	...	456,898
Kitchen or dairy hollow-ware of iron or steel coated with tin	...	54,881	...	95,071
Arseniate, biarseniate and stannate of soda	32,054	6,739	19,350	6,596

(x) Of the 1940 imports, 8,531,400 pounds valued at $4,475,424 came from the Straits Settlements and 2,660,200 pounds at $1,411,642 from United Kingdom. Corresponding imports in 1939 were 3,384,400 pounds at $1,623,553 and 1,816,400 pounds worth $901,143.

Exports of tinware from Canada in 1940 were appraised at $31,433; in 1939, corresponding exports were appraised at $23,190. Exports of tinplate scrap in 1940 totalled 33,821,800 pounds valued at $187,686.

TANTALUM-COLUMBIUM - Neither tantalum nor columbium ores are commercially produced in Canada, however, it is interesting to note that the Department of Mines and Resources, Ottawa, reports that columbite-tentalite has been found in small quantities in a number of feldspar mines in the Dominion.

Ferrocolumbium is used in the manufacture of stainless steels and it has been reported that the pure metal may be utilized in the construction of certain vacuum tubes.

Tantalum is strongly resistant to acid corrosion, is weldable and easily fabricated. It is used in chemical process equipment and electronic tubes. Due to its hardness and high melting point, tantalum carbide is a constituent of hard cutting-tool mixtures. Ferrocolumbium has become an important alloy for the manufacture of weldable high-speed steels.

The United States Bureau of Mines Yearbook for 1940 states:

"Both columbium and tantalum are used indirectly in the manufacture of munitions and to a minor extent directly. Total imports of tantalum ores in 1940 jumped to 490,460 pounds compared with only 56,561 in 1939, the previous high record. Owing to collapse of markets in Europe, tantalum ores from Belgian Congo and other African sources, as well as from Brazil, came to the United States during the latter part of 1940. Such ores substantially augmented available supplies of tantalum, but the fact that they contained more columbium than those from Australia is indicated by a decline in the average value of the imports to less than 53 cents a pound from $1.47 in the preceding year. Imports of columbium ore, including rather small quantities from other countries than Nigeria, which hitherto has furnished virtually all the imports into the United States, advanced to 595,220 pounds, more than five times the quantity imported in 1939 but substantially less than the annual imports during the preceding 4 years. Early in 1941, the Fansteel Metallurgical Corporation, pioneer domestic producer of tantalum metal, was expanding its North Chicago (Ill.) plant at an estimated cost of $150,000. Vascoloy-Ramet Corporation, Jersey City, N.J., a subsidiary, was also expanding manufacturing facilities, according to press reports.

"Tantalum metal was quoted in the United States throughout the year at $160.60 (base) a kilogram for C. P. rod and $143 for sheet, subject to discounts on volume business. Corresponding figures for columbium metal were $560 a kilogram for rod and $500 for sheet. Ferrocolumbium, 50 to 55 per cent, was quoted at $2.25 to $2.35 a pound of columbium contained (f.o.b. producer's plant)."

Data relating to possible imports of tantalum and columbium metals or ores into Canada are not shown separately in trade reports. "Metal and Mineral Markets" - New York - June, 1941 quoted Columbium Metal - per kilo, base prices: rod $560; sheet $500. Tantalum metal per kilo, base price, $160.60 for C. P. rod. Sheet, $143. Tantalum ore per pound Ta_2O_5, $2.00 to $2.50 for 60 per cent concentrate, the price depending on source of supply.

TITANIUM - Ilmenite, the titanium ore so largely employed in the manufacture of pigments, is known to occur at several places in Canada and commercial shipments of the mineral have been made during the past years from deposits located at St. Urbain and Ivry in the province of Quebec. During 1939, Canadian production came entirely from St. Urbain, Quebec, and totalled 3,694 short tons valued at $21,267; the mineral was consigned chiefly to the United States. The Bureau of Mines, Ottawa, reports that the ilmenite deposits of St. Urbain and Ivry carry from 18 to 25 per cent titanium. Rutile occurs in some of the St. Urbain deposits.

The United States Bureau of Mines Yearbook for 1940 states:

"The feature of the titanium industry in 1940 was the phenomenal rise in ocean freight on imported ilmenite. The bulk of the ilmenite consumed in the United States for making pigments and much of that for alloys and miscellaneous uses is imported from British India. A much larger proportion of the domestic consumption of rutile—chiefly for welding-rod coatings and ceramics—is produced in the United States, and substantial quantities of processed rutile of domestic as well as of foreign origin are exported from this country.

"Although the price of ilmenite f.o.b. Travancore actually declined further during 1940 (average invoice value of imports a long ton: $3.75 in 1940, $4.40 in 1939, and $5.05 in 1938), quotations delivered c.i.f. U. S. Atlantic ports advanced during the summer to $18 to $20 a gross ton. Owing to the higher ocean freight and marine insurance, this quotation continued nominal throughout the remainder of the year; it compares with $10 to $12 during 1939 and earlier years.

"Imports of ilmenite declined late in the year, whereas consumption probably increased, as it was encouraged not only by the acceleration of general industrial activity but also by the necessity for conserving zinc and perhaps lead, thus speeding further substitution of titanium pigments for competitive materials. Consideration has been given to the wider use of ferrotitanium in steelmaking as a means of conserving ferromanganese. Mention may be made also of Grainal alloys--complex deoxidizers that contain aluminum, titanium, and a hardening agent such as vanadium, the titanium functioning to protect and intensify the hardening effect of the vanadium so that less of this more expensive element can be used. As the aluminum and titanium develop fine-grained metal by deoxidization, metal so treated develops a desirable combination of strength and ductility, as well as strength and hardness when quenched and drawn. This treatment is applied chiefly to forging steels containing about 0.4 per cent carbon and 1.8 per cent manganese.

"The high opacity and hiding power of titanium pigments are utilized not alone in paint and decorative coatings but to an increasing extent in paper, rubber, cosmetics, rayon, and other products. In papermaking they can be dispersed in starch, glue, and casein size, and their ready retention in paper pulps permits their addition as beater fillers--improving opacity, color, and brightness with a minimum of loading."

Imports into Canada of antimony oxide, titanium oxide and white pigments containing not less than 14 per cent by weight of titanium totalled 8,700,015 pounds valued at $782,957 in 1940 compared with 9,003,693 pounds at $803,198 in 1939. Of the 1940 imports, 477,912 pounds came from the United Kingdom and 8,292,103 pounds from the United States. No imports into Canada of titanium ore or rutile were recorded in 1940.

Engineering and Mining Journal "Metal and Mineral Markets", New York, quoted titanium ore, June, 1941, per gross ton; ilmenite 54 to 60 per cent TiO_2, f.o.b. Atlantic seaboard, $28 to $30, according to grade and impurities. Rutile per pound, guarnateed minimum 94 per cent concentrate 8 to 10 cents, nominal; 88 to 90 per cent, $95 per ton c.i.f. New York.

Table 35 - PRODUCTION OF TITANIUM ORE IN CANADA(x), 1927 - 1939

Year	Short ton	$	Year	Short ton	$
1927	2,029	8,980	1934	2,023	14,161
1928	2,244	6,732	1935	2,288	16,400
1929	2,748	7,359	1936	2,566	18,318
1930	412	1,239	1937	4,229	26,432
1931	1,509	10,261	1938	207	1,449
1932	...	...	1939	3,694	21,267
1933	...	...			

(x) All from Quebec.

Figures for 1940 have not been released.

Table 36 - CONSUMPTION OF TITANIUM PIGMENTS IN CANADIAN PAINT INDUSTRY, 1931 - 1940

Year	Pounds	Cost at works $	Year	Pounds	Cost at works $
1931	745,207	89,761	1936 (x)	2,456,265	269,130
1932	691,304	96,759	1937 (x)	3,748,341	362,869
1933	1,061,249	128,969	1938 (x)	3,903,337	378,548
1934	1,710,188	186,678	1939 (x)	5,088,234	494,914
1935	2,513,026	261,506	1940 (x)	6,136,560	615,945

(x) In 1936 includes 1,396,337 pounds of pure titanium white valued at $193,638. In 1937 the quantity of pure titanium white totalled 1,299,857 pounds valued at $193,107; in 1938, 1,341,359 pounds at $200,552; in 1939, 1,855,288 pounds worth $275,103 and in 1940, 2,295,248 pounds valued at $344,545.

NOTE: Neither titanium white nor titanium alloys are commercially produced in Canada.

In 1939 there were 118 tons of ferrotitanium valued at $23,498 consumed in the manufacture of steel in Canada.

Table 37 - WORLD'S PRODUCTION OF TITANIUM MINERALS, 1937 - 1939 (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)
(Long tons)

Producing Country and Description	1937	1938	1939
BRITISH EMPIRE			
South West Africa - Rutile	16	...	...
Canada (shipments) - Titaniferous iron ore	3,776	185	3,298
Federated Malay States (exports) - Ilmenite	6,252	6,462	11,098
India - Ilmenite	181,047	252,220	...
Australia - Ilmenite	670	(a)	...
Rutile	1,123	(a)	...
Rutile-ilmenite	72	(a)	...
FOREIGN COUNTRIES			
Norway - Ilmenite	66,270	48,404	...
Rutile	184	120	...
Portugal - Ilmenite	1,433	559	403
Cameroon (French) - Rutile	101	116	...
Egypt	315	89	...
Senegal - Ilmenite	3,026	8,303	...
Brazil (exports) - Ilmenite	231	312	192
Rutile	644	211	299

NOTE:- Titanium minerals are also produced in the United States, but figures are not available for publication. In recent years, however, the production of ilmenite has varied between 1,000 and 5,000 tons, and the production of rutile has been several hundred tons.

(a) Information not available.

TUNGSTEN - The Bureau of Mines, Ottawa, states that occurrences of tungsten-bearing minerals, usually in the form of scheelite, are known in Nova Scotia, New Brunswick, Manitoba, British Columbia, and in the Yukon Territory.

In 1939, for the first time in several years, commercial shipments of tungsten concentrates were made from a Canadian mine. These totalled 8,825 pounds valued at $4,917 and were produced by Columbia Tungstens Company, Limited, at its property located at Wells, Cariboo Mining Division, British Columbia. Only development work was conducted by this Company in 1940. Early in 1940 a shipment of tungsten concentrates was made by the Kirkpatrick Tungsten Syndicate from a deposit at Goff, Halifax County, Nova Scotia. Late in 1939 the tungsten property of the Indian Path Mines, Limited, located near Lunenburg, Nova Scotia, was optioned to Siscoe Gold Mines Limited, who carried out diamond drilling and large scale bulk testing from the underground workings on the east and west ends of the property. Work on this property was discontinued by Siscoe Gold Mines early in 1941. At Upper Lakeville, Halifax County, Nova Scotia, exploration work was conducted by Guysborough Mines Ltd. on the tungsten-bearing deposits of the Lake Charlotte Gold Mines Limited. In Ontario, the Bureau of Mines, Ottawa, recovered tungsten minerals in 1941 from ores shipped from the Hollinger Mine, Timmins, Ontario and from the Tungsten Queen mine (E. Phillips), Tyaughton Creek, Lillooet M.D., British Columbia.

Tungsten also occurs in the veins of the Slave Lake Gold Mines Ltd., Outpost Island, Slave Lake, Northwest Territories; this property was under development in 1940.

According to the Bureau of Mines, Ottawa, much interest has been aroused in recent discoveries of scheelite in quartz-dionite stringers near Gilmour Lake, about 50 miles east of Yellowknife Settlement in the Northwest Territories. A 200-pound sample sent to Ottawa early in 1941 assayed 8.9 per cent WO_3.

In Quebec, Manley Gold Mines prospected some scheelite-bearing quartz veins in La Reine township; the mineral also occurs in this province in the ores of the Sullivan, Lamaque, Sigma and Nortrac mines.

Both scheelite and wolframite occur in some of the placer gold gravels in Yukon and the tungsten ore recovered from gold sluicing operations is being set aside for future shipment.

Scheelite also occurs in Ontario in association with gold at the properties of Preston East Dome Mines Limited, South Porcupine; Leitch Gold Mines Limited, Thunder Bay district; Matachewan Consolidated Mines, Matachewan district, and McKenzie Red Lake Gold Mines Limited, Red Lake.

The principal use for tungsten is in the manufacture of high-speed tool steels. It is also employed in certain non-ferrous alloys and special alloy steels. Tungsten carbide cemented with cobalt is used extensively in industry and recent developments include several special grades, including combinations of tungsten carbide and tantalum carbide cement with cobalt or nickel or both, also combinations of tungsten carbide and titanium carbide cemented with cobalt. Tungsten is also utilized in the making of lamp filaments, radio tube filaments and contact points in electrical apparatus; in the chemical industry it is employed in the manufacture of certain types of dyes (lakes), and mordants.

Stimulated by defense activities, production of tungsten ore and concentrates in the United States in 1940 increased 42 per cent over 1939, according to the Bureau of Mines, United States Department of the Interior. Shipments from domestic mines, which were 24 per cent more than in 1939, were not only the largest since 1917 but have been exceeded in only one other year - 1916.

In 1940, 5,319 short tons of concentrated ore (reduced to an equivalent of 60 per cent WO_3) were shipped from United States mines, compared with 4,287 tons in 1939. The reported average value per unit f.o.b. mines of the tungsten concentrates shipped increased to $20.61 in 1940 from $17.11 in 1939. Shipments of tungsten concentrates were made from Arizona, California, Colorado, Idaho, Missouri, Montana, Nevada, New Mexico, Utah, and Washington in 1940; California replaced Nevada as the largest tungsten producer in 1940.

Production of tungsten concentrates (reduced to an equivalent of 60 per cent WO_3) in the United States, was 5,120 short tons in 1940 compared with 3,603 tons in 1939.

General imports of tungsten ore and concentrates (tungsten content) into the United States in 1940 increased 211 per cent over 1939 and amounted to 9,666,228 pounds.

In addition to the ore and concentrates imported for consumption, 1,348,495 pounds of tungsten in concentrates were imported for smelting, refining and export in 1940 compared with 589,828 pounds in 1939.

Imports of tungsten metal and tungsten carbide into the United States in 1940 were 36,652 pounds (metallic content) compared with 39,498 pounds in 1939. There were no imports of tungstic acid and other compounds of tungsten in 1940.

United States exports of tungsten metal, wire, shapes, and alloys other than ferrotungsten (for which export data are not available) increased to 237,940 pounds in 1940 from 195,002 pounds in 1939.

Table 38 - IMPORTS INTO CANADA OF SPECIFIED TUNGSTEN PRODUCTS, 1939 - 1940

	1939		1940	
	Quantity	$	Quantity	$
Tungsten carbide	...	246	...	988
Chromium metal and tungsten metal (a) ..... lb.	55,428	50,769	148,184	170,103
Metallic elements and tungstic acid for lamps	...	157,369	...	187,942

(a) In lumps, powder, scrap alloy, etc. for alloying purposes.

Table 39 - TUNGSTEN WIRE USED IN THE MANUFACTURE OF CANADIAN ELECTRICAL APPARATUS AND SUPPLIES, 1931 - 1939

Year	Value	Year	Value
	$		$
1931	79,659	1936	47,856
1932	53,802	1937	52,768
1933	48,701	1938	50,594
1934	48,996	1939	52,207
1935	52,192		

In 1939 there were 95 long tons of ferrotungsten valued at $173,250 consumed in Canada in the manufacture of steel. Also in 1939 there were 13,089 pounds of tungsten metal used in the manufacture of steel and other alloys (not including tungsten-chromium alloy).

Engineering & Mining Journal "Metal and Mineral Markets" - New York - quoted Tungsten ore June, 1941 as follows: Per short ton, unit of WO_3: Chinese, duty paid, f.o.b. New York, $24.00. Bolivian, Portuguese, etc., duty paid, $24.00, nominal. Domestic scheelite delivered to buyer's plant, $25.00 to $34.00, carload lots, on good known analysis; at mines, small lots, several dollars less.

Table 40 - WORLD'S PRODUCTION OF TUNGSTEN ORE AND CONCENTRATES, 1937 - 1939 (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)
(Long tons)

Producing Country	1937	1938	1939	Estimated WO_3 content 1937	1938	1939
BRITISH EMPIRE						
United Kingdom - Concentrates	127	218	...	83	152	...
Nigeria - Concentrates	8	44	...	5	31	240
South West Africa - Wolfram	28	36	...	19	25	34
Scheelite	9	8	...	5	5	8
Southern Rhodesia - Concentrates	246	299	...	160	194	245
Tanganyika Territory - Wolfram	2	3	...	1	2	...
Uganda - Wolfram	1	1	...	1	1	1
Union of South Africa - Tungsten ore	34	110	...	25	75	85
Burma - Concentrates	5,950	6,150	...	3,850	4,000	...
Federated Malay States - Wolfram	27	29	...	19	20	26
Scheelite	836	573	...	602	412	174
India - Concentrates	13	10	...	8	6	...
Unfederated Malay States - Wolfram	242	289	...	157	187	314
Australia - Wolfram	726	979	...	472	636	...
Scheelite	12	40	...	8	26	...
New Zealand - Concentrates	24	46	...	16	30	41
FOREIGN COUNTRIES						
France - Tungsten ore	1	21	...	...	13	...
Italy - Tungsten ore	5	7	...	2	3	...
Norway - Wolfram	3	17	...	2	11	...
Portugal - Concentrates	1,776	2,381	3,030	1,190	1,603	2,078
Tin-tungsten ores	90	138	99	33	57	24
Sweden - Tungsten ore	136	195	...	75	108	...
Egypt - Tungsten ore	176	1,351	...	2	27	...
Morocco (French) - Tungsten ore	...	6	...	...	4	...
Mexico	30	69	107	20	45	...
United States - Concentrates	3,125	2,718	3,217	1,875	1,631	...
Argentina - Concentrates	752	1,037	1,137	520	700	800
Bolivia (exports) - Concentrates	1,774	2,490	1,176	1,064	1,494	1,970
Brazil (exports) - Tungsten ore	6	2	8	3	1	4
Chile - Concentrates	4	(a)	...	3	(a)	...
Peru - Concentrates	70	157	157	17	100	97
China (exports) - Ore	16,257	12,163	10,520	10,567	7,906	...
French Indo-China - Concentrates	571	879	...	383	571	...
Japan - Scheelite	(a)	(a)	...	(a)	(a)	...
Korea - Ore	1,900	(a)	...	1,230	(a)	...
Netherlands East Indies - Concentrates	...	...	3	...	...	2
Siam - Concentrates	89	227	341	58	147	...

NOTE - Tungsten ores are also produced in U.S.S.R. and Spain. (a) Information not Available. (b) Exports.

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 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 nonferrous, glass, ceramic and color industries.

Possible imports of vanadium or vanadium ores into Canada are not shown separately in Canadian trade reports. "Metal and Mineral Markets" - New York - quoted ferrovanadium, June, 1941 - per pound of vanadium contained, delivered $2.70 to $2.90. Vanadium ore per pound V_2O_5 contained, 27½ cents F.O.B. shipping point.

Table 41 - WORLD PRODUCTION OF VANADIUM IN ORES AND CONCENTRATES, 1937-1939 (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)
(Long tons)

Country	1937	1938	1939
Argentina	...	...	14
Mexico	44	177	146
Northern Rhodesia	232	368	378
Peru	574	813	1,091
South West Africa	583	549	904
United States	485	720	886

The United States Bureau of Mines reported that shipments of vanadium ores in the United States increased substantially in 1939. Shipments of vanadium and complex ores amounted to 273,000 tons as compared with 247,397 tons in 1938.

ZIRCONIUM - The metal is not produced in Canada; zircon is the most common zirconium mineral and the Department of Mines and Resources, Ottawa, states that it, or cyrtolite, commonly occurs in greater or less amount in Canadian Precambrian pegmatites, also in the pegmatitic apatite-phlogopite deposits of the Grenville areas in Ontario and Quebec.

Zircon is used to a steadily growing extent in refractories, specialized porcelaines and heat-resisting glass. The United States Bureau of Mines Yearbook for 1940 reports on the metal as follows:

"Metallic zirconium is employed as powder or ductile metal in photo-flash bulbs, radio-transmitter tubes, ammunition primers, spot welding electrodes, and a variety of other applications. According to information furnished by the Foote Mineral Co. (1609 Summer St., Philadelphia, Pa.), this metal has a unique combination of high corrosion resistance and ability to absorb large volumes of certain gases. Below 100°C., the metal is immune to attack by some of the most corrosive agents known. At 500° to 860° C. it can absorb great quantities of hydrogen and at higher temperatures oxygen, nitrogen, carbon monoxide, carbon dioxide, and other gases. Zirconium, accordingly, is particularly well suited as a "getter" in vacuum tubes and chemical processes to improve and maintain high vacuum. In steelmaking, zirconium acts as a scavenger and deoxidizer, removing nitrogen and oxygen as well as nonmetallic inclusions. In the range 0.08 to 0.10 per cent zirconium the improvement in grain is marked, and above 0.15 per cent the zirconium combines with sulfur to produce a better surface on high-sulfur steels. Cast nickel-silicon bronze and other nonferrous alloys may benefit by additions of zirconium.

"An interesting property of zirconium and of titanium metal is that, when drawn across glass or a glazed ceramic surface, they leave a brilliant, silvery, adherent streak. This affords a means of decorating high-grade glassware and pottery without the present necessity of using platinum compounds, followed by a special firing operation.

"Engineering and Mining Journal quotations at the end of 1940 were: Zircon ore, 55 per cent ZrO_2, f.o.b. Atlantic seaboard, carloads, $70 a short ton. Zirconium metal, commercially pure, powdered, $7 a pound. Zirconium alloys, 12 to 15 per cent Zr, 39 to 43 per cent Si, $102.50 to $107.50 a gross ton; 35 to 40 per cent Zr, 42 to 52 per cent Si, 14 and 16 cents a pound. These quotations are the same as those in 1939

except for zircon ore and the lower-grade alloy (ferrosilicon zirconium). The former remained at $55 a ton until the fourth quarter of the year, when it began to advance by $5 steps to $70 a ton in early December. The alloy was advanced from $97.50 to $102.50, where it had remained for a long time, to $102.50 to $107.50 in July".

There was no commercial production of zirconium minerals in Canada in 1940. Canadian imports of zirconium silicate in 1940 were valued at $12,795 and those of zirconium oxide at $65,688. Consumption of ferro-zirconium in 1939 in the manufacture of steel in Canada totalled 19 long tons valued at $2,122.

Table 42 - PRINCIPAL STATISTICS(x) OF THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1939 and 1940

		1939	1940
Number of firms		31	56
Capital employed (a)	$	3,074,999	2,720,642
Number of employees - On salary		40	71
On wages		291	374
Total		331	445
Salaries and wages - Salaries	$	62,477	113,482
Wages	$	392,801	514,543
Total	$	455,278	628,025
Value of production (gross)	$	524,977	2,029,278
Cost of fuel and electricity	$	92,405	235,861
Process supplies used	$	81,991	86,797
Smelter charges	$	...	364,555
Freight	$	1,177	52,982
Value of production (net)	$	349,404	1,509,105

(x) Does not include data relating to smelters and refineries or to mining in the Northwest Territories.
(a) Exclusive of ore reserves.

Table 43 - AVERAGE NUMBER OF WAGE-EARNERS EMPLOYED, BY MONTHS, 1938 - 1940

	1938	1939	1940		
			Surface	Underground	Mill
January	56	144	213	52	31
February	59	143	181	46	26
March	66	166	180	47	17
April	83	190	231	45	31
May	50	226	263	54	53
June	91	289	271	56	63
July	82	310	313	52	70
August	77	377	278	57	82
September	87	376	287	71	92
October	133	394	332	55	88
November	150	425	316	18	76
December	141	415	319	15	34

Table 44 - FUEL AND ELECTRICITY CONSUMED, 1940

Kind		Quantity	Cost
			$
Bituminous coal - Canadian	short ton	19	180
Imported	short ton	1,177	8,230
Anthracite coal - From United States	short ton	103	1,674
Coke	short ton	14,727	65,976
Gasoline	Imp. gal.	45,982	12,746
Kerosene	Imp. gal.	1,090	277
Fuel oil and diesel oil	Imp. gal.	471,024	58,946
Wood	cord	3,574	14,675
Gas - Manufactured	M cu. ft.	400	32
Electricity purchased	K. W. H.	10,820,482	75,125
TOTAL	$	...	235,861

Table 45 - POWER EQUIPMENT INSTALLED, 1940

Description	Number	Horse Power
Steam engines	1	35
Electric motors	130	4,215
Diesel engines	8	490
Gasoline engines	13	484
Boilers	8	395

DIRECTORY OF FIRMS IN THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1940

Name of Firm and Product	Head Office Address	Location of Mine or Plant
Algoma Ore Properties Ltd. Product - Iron Ore	Sault Ste. Marie, Ont.	Michipicoten Dist., Ont.
Aluminum Company of Canada, Ltd. Product - Aluminium	340 University Ave., Toronto, Ont.	Arvida and Shawinigan Falls, P.Q.
Asbestos Corp. Ltd. (x) Product - Chromite	Canada Cement Bldg., Montreal, P.Q.	Thetford Mines, P.Q.
Atlantic Manganese Corp. Ltd. Product - Manganese ore	Box 6, Truro, N.S.	New Ross, N.S.
Baie St. Paul Titanic Iron Ore Co. Product - Titanium ore	Baie St. Paul, P.Q.	St. Urbain, P.Q.
Canadian Molybdenite Mines Ltd. (x) Product - Molybdenite	56 Toronto St., Toronto, Ont.	Tory Hill and Essonville, Ont.
Canadian Beryllium Mines and Alloys Ltd. Products - Feldspar and Beryl (x)	901 Royal Bank Bldg., Toronto, Ont.	Renfrew Co., Ont.
Cheabella Mine Co. Reg. (x) Product - Molybdenite	413 Aylmer Road, Hull, P.Q.	Montbeillard Tp.
Chromium Mining & Smelting Corp. Ltd. Products - Chromite (x) and ferrochrome	Bank of Commerce Bldg., Hamilton, Ont.	Sault Ste. Marie, Ont.
Chromite Ltd. (x) Product - Chromite	404 Notre Dame St. W., Montreal, P.Q.	Cleveland Tp.
Columbia Tungstens Co. Ltd. (x) Product - Tungsten ore	19 Rector St., New York, N.Y., U.S.A.	Wells, B.C.
Consolidated Mining & Smelting Co. of Canada, Limited Products - Bismuth, cadmium, antimony, lead, zinc, silver, mercury and gold	Trail, B.C.	Trail, B.C. Pinchi Lake, B.C.
Canadian Copper Refiners Ltd. Products - Selenium, tellurium, copper, gold, silver	Royal Bank Bldg., Toronto, Ont.	Montreal East, P.Q.
Coulombe, J. A. & Co. Ltd. Product - Titanium ore	126 rue St. Pierre, Quebec, P.Q.	St. Urbain, P.Q.

DIRECTORY OF FIRMS IN THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1940
(Continued)

Name of Firm and Product	Head Office Address	Location of Mine or Plant
Deloro Smelting & Refining Co. Ltd. Products - Bismuth, cobalt, silver	Deloro, Ont.	Deloro, Ont.
Eldorado Gold Mines, Ltd. Products - Radium-uranium salts and oxides, silver	Star Building, Toronto, Ont.	Great Bear Lake, N.W.T., and Port Hope, Ont.
Empire Mercury Mines Ltd. Product - Mercury	1818 Marine Bldg., Vancouver, B.C.	Bridge River, B.C.
Fenton, I. G. O. (x) Product - Manganese ore	60 Queen St., St. John, N.B.	Turtle Creek, N.B.
Fletcher, H. P. Product - Chromite	Bank St., Sherbrooke, Que.	Orford Tp., Que.
Guysborough Mines Ltd. Product - Tungsten ore (x)	Goldenville, N.S.	Lake Charlotte, N.S.
Hudson Bay Mining & Smelting Co. Ltd. Products - Cadmium, blister copper, zinc, gold and silver	Flin Flon, Man.	Flin Flon, Man.
Indian Path Mine, Product - Tungsten ore	Lunenburg, N.S.	Lunenburg, N.S.
International Nickel Co. of Canada, Ltd. Products - Selenium, tellurium, copper, gold, silver, nickel salts, nickel	Copper Cliff, Ont.	Copper Cliff, Ont. Port Colborne, Ont.
Kirkpatrick Tungsten Synd. Product - Tungsten ore	Goff, N.S.	Goff, N.S.
La Pause Gold Mining Corp. Ltd. (x) Product - Molybdenite	708 Notre Dame W., Montreal, P.Q.	La Pause, P.Q.
La Reine Molybdenum Mines Ltd. (x) Product - Molybdenite	Room 101, 371 Bay St., Toronto, Ont.	La Reine Tp., P.Q.
Lithium Corp. of Canada, Ltd. (x) Product - Lithium ores	403 Avenue Bldg., Winnipeg, Man.	Bernic Lake, Man.
Magdalen Manganese Mines Ltd. Product - Manganese ore	1103 Central Bldg., Toronto, Ont.	Cap aux Meule, M.I.
Metulier, W. R. Product - Chromite	Notre Dame St., Thetford Mines, P.Q.	Eastern Tps., P.Q.
Munro & MacLennan (x) Product - Manganese ore	Bank of Nova Scotia Bldg., Truro, N.S.	East Mountain, N.S.
Nakina Molybdenite Mines Ltd. (x) Product - Molybdenite	Room 714 .. 320 Bay St., Toronto, Ont.	Burrows Lake, Ont.
North American Molybdenum Corp. Ltd. (x) Product - Molybdenite	Room 602, 112 Yonge St., Toronto, Ont.	Renfrew Co., Ont.

DIRECTORY OF FIRMS IN THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1940
(Concluded)

Name of Firm and Product	Head Office Address	Location of Mine or Plant
Norwin Molybdenite Mines Ltd. Product - Molybdenite	26 Queen St. E., Toronto, Ont.	Eardley Tp., P.Q.
Phillips, E. Product - Tungsten ore	Minto Mine, B.C.	Tyaughton Creek, B.C.
Powell River Molly Claims (x) Product - Molybdenite	Box 786, Powell River, B.C.	Powell River, B.C.
Pioneer Gold Mines of B.C. Ltd. Product - Antimony ore	605 Rogers Bldg., Vancouver, B.C.	Stuart Lake, B.C.
Quyon Molybdenite Co. Ltd. Product - Molybdenite	Quyon, P.Q.	Quyon, P.Q.
Reed Realties Ltd. (x) Products - Chromite-antimony	4808 Grosvenor Ave., Montreal, P.Q.	South Ham Tp., P.Q.
Sussex Manganese Mining Co. Ltd. (x) Product - Manganese ore	Room 15 .. 24 King St. W., Toronto, Ont.	Sussex, N.B.
Stewart, P. (x) Product - Molybdenite	164 Harbison Ave., Winnipeg, Man.	Cranberry Portage, Man.
Steep Rock Iron Mines Ltd. (x) Product - Iron ore	25 King St. W., Toronto, Ont.	Atikokan, Ont.
Sterrett, Douglas B. Product - Mercury	Kamloops, B.C.	Kamloops M.D.
Thetford Ferro-Chrome Reg. (x) Product - Chromite	Thetford Mines, P.Q.	Coleraine Tp., P.Q.

(x) Active but not shipping.

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