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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, 1939

including

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

OTTAWA
1940

Price 50 cents

DEPARTMENT OF TRADE AND COMMERCE
DOMINION BUREAU OF STATISTICS
MINING, METALLURGICAL AND CHEMICAL BRANCH
OTTAWA - CANADA

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.
Mining Statistician: R. J. McDowall, B.Sc.

MISCELLANEOUS METALS, 1939.

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 1939 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.

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 1939. 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 has been constructed 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.

A report issued by the United States Bureau of Mines contains the following information:- "Virgin aluminium production in the United States during 1939 was the largest on record. The 1939 peak output of new aluminium amounted to 327,090,000 pounds, valued at $64,600,000. The large increase in demand for light but strong metal was caused by national preparations for defense and by the war abroad. In 1939 the aircraft industry consumed twice the amount of aluminium that it did in 1937, the previous record year. The Aluminum Company of America announced that there would be no increase in the basic ingot price of 20 cents per pound during the first quarter of 1940. War time needs caused the largest exportation of aluminium from the United States in history. Exports of crude and semi-crude aluminium totalled 74,169,742 pounds. The increasing demand for aluminium led the Aluminum Company of America to announce a $30,000,000 expansion program to begin in 1940. The large consumption of aluminium in the aircraft industries has resulted in the installation of new production equipment and the accumulation of stocks of standard aircraft products."

Table 1 - IMPORTS INTO CANADA and EXPORTS OF ALUMINIUM, ALUMINA, BAUXITE and CRYOLITE, 1938 and 1939.

	1938		1939	
	Cwt.	$	Cwt.	$
IMPORTS -				
Alumina	1,457	17,302	1,973	24,525
Bauxite ore	7,365,187	2,359,933	10,139,643(a)	3,373,760
Cryolite	127,985	542,397	68,959(b)	310,209
Aluminium angles, etc.	1,526	62,526	1,460	59,810
Aluminium in pigs, ingots, blocks, notch bars, slabs, billets and blooms	1,381	36,780	3,788	90,049
Aluminium scrap	11,003	102,742	2,081	17,844
Aluminium in bars, rods and wire	1,817	69,163	6,464	251,900
Aluminium in plates, sheets and strips, including circles	17,091	615,540	15,232	537,373
Aluminium pipes and tubes	1,197	64,058	728	52,283
Aluminium leaf, less than .005 mm. thick	...	7,523	...	2,070
Aluminium kitchen or household hollowware, n.o.p.	...	84,725	...	116,965
Aluminium, manufactures of, n.o.p.	...	774,997	...	858,603
Aluminium leaf, n.o.p., or foil less than .005 inch thick, plain or embossed	...	107,321	...	150,877
Aluminium powder lb.	146,251	53,735	267,568	98,120
Other	...	512	...	5,809
TOTAL - ALUMINIUM and ITS PRODUCTS	...	4,836,728	...	5,950,197
EXPORTS -				
Aluminium scrap	20,124	276,539	21,770	265,038
Aluminium in bars, blocks, etc. -				
To - United Kingdom	678,251	12,012,734	779,155	14,328,385
United States	22,337	343,577	39,685	547,337
Brazil	2,104	47,278	12,935	220,543
China	33,465	648,350	23,764	433,025
Australia	3,685	83,578	8,638	147,409
Japan	310,963	6,005,450	420,837	7,801,052
Germany	123,912	1,687,465	57,964	848,315
British India	7,541	157,890	3,531	63,249
Belgium	2,402	48,792	...	...
Mexico	406	10,093	63	1,683
Switzerland	1,111	20,796	1,874	34,921
Russia	42,643	936,926	...	...
Other countries	65,667	1,049,623	63,133	1,258,557
Total - in bars, blocks, etc.	1,294,487	23,052,552	1,411,579	25,684,476
Aluminium kitchen utensils and hollowware	...	22,776	...	12,838
Aluminium wire and cable	...	...	...	242,010
Aluminium, manufactures of, n.o.p.	...	392,020	...	223,824
TOTAL - ALUMINIUM and ITS PRODUCTS	...	23,743,887	...	26,428,186

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.
(b) 62,720 cwt. from Greenland.

Table 2 - WORLD'S PRODUCTION OF ALUMINIUM, 1929, 1935, 1938 and 1939. (From the Year Book of the American Bureau of Metal Statistics)

(In metric tons)

Country	1929	1935	1938	1939(/)
United States	102,100	54,113	130,129	148,367
Canada	42,000	20,556	66,000	75,000
Total America	144,100	74,669	196,129	223,367
France	29,083	22,006	45,300	
Switzerland (a)	20,700	11,700	26,500	
Germany (a)	33,300	70,800	165,600(c)	
Austria (a)	2,700	2,400	(c)	
Great Britain (a)	13,900	15,100	22,500	
Norway	29,142	14,987	29,035	
Italy	7,373	13,777	25,768	
Spain	1,000	1,200	800	
Russia	...	24,500	48,000	
Sweden	...	1,817	1,892	
Hungary	...	300	1,500	
Total Europe	137,198	178,587	366,895	
Japan	...	4,434	(+) 20,000	
Total World (b)	281,298	257,690	583,024	

(a) Metallgesellschaft.
(b) Omitted from this table is a small production in Yugoslavia.
(c) Austrian production for 1938 included with Germany.
(+) Conjectural.
(/) Data not complete.

Table 3 - WORLD'S PRODUCTION OF BAUXITE and CRYOLITE, 1936, 1937 and 1938. (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)

(Long tons)

Producing Country	1936	1937	1938
BRITISH EMPIRE			
British Guiana - (c)			
60 % or more alumina	157,945	288,701	447,370
50 - 60% alumina	11,525	7,817	...
30 - 50% alumina (b)	39,851	64,413	115,646
Unfederated Malay States	36	19,000	55,081
India	3,644	15,150	14,768
Australia	740	7,766	1,320
Total	214,000	403,000	634,000
FOREIGN COUNTRIES			
Austria (estimated)	3,000	3,000	5,000
Czecho-Slovakia	...	833	(a)
France	639,250	677,300	671,662
Germany	12,229	18,000	19,100
Greece	127,846	135,242	(a)
Hungary	323,893	524,243	532,177
Italy	258,104	380,391	355,138
Roumania	10,658	10,531	11,620

Table 3 - WORLD'S PRODUCTION OF BAUXITE and CRYOLITE, 1936, 1937 and 1938. (Concluded) (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)

(Long tons)

Producing Country	1936	1937	1938
U.S.S.R. (estimated)	200,000	250,000	250,000
Yugoslavia	287,560	352,167	398,180
Mozambique	29	(a)	(a)
United States	372,005	420,232	311,354
Brazil (exports)	6,889	8,631	12,724
Dutch Guiana	231,136	386,249	371,633
French Indo-China	30	7,000	160
Netherland East Indies	131,619	195,828	241,479
Total	2,600,000	3,370,000	3,320,000
WORLD'S TOTAL	2,820,000	3,770,000	3,950,000

(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):

	1936	1937	1938
Metallurgical	116,645	241,932	321,912
Chemical	44,430	48,950	46,275
Refractory	6,021	7,295	1,814
Abrasive	...	...	2,596

PRODUCTION (EXPORTS) OF CRYOLITE IN GREENLAND -

Year	Long tons
1936	17,135
1937	50,822
1938	49,463

ANTIMONY -

Canadian production of virgin antimony during 1939 totalled 1,225,585 pounds valued at $151,469. Of this the major part represents antimony metal recovered in the metallurgical plants of the Consolidated Mining and Smelting Company of Canada Limited, located at Trail, British Columbia. In addition there were relatively small quantities contained in ores exported from Nova Scotia and British Columbia. 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. Statistics of production relating to antimony output in British Columbia in 1939 include the metal contained in stibnite ore shipped from the "Snowbird group" located at Stuart Lake near Fort St. James. This ore was exported to a smelter at Laredo, Texas, U. S. A. Antimony production in Nova Scotia in 1939 represents the metal contained in auriferous ore exported from old dumps accumulated at a West Gore property. An antimony reduction plant was built by the Consolidated Mining and Smelting Company of Canada Limited at Trail, British Columbia, to work up an accumulation of antimony arsenic flue dust.

At the close of 1939 antimony metal was quoted - New York - 14 cents per pound. Antimony ore, per unit of antimony contained, 50 to 55 per cent, $1.50 to $1.60; 58 to 60 per cent, $1.60 to $1.70; 60 to 65 per cent, $1.80 to $1.90; London, 60 to 65 per cent, 10s. 6d. per long ton unit, nominal.

Table 4 - ANTIMONY USED IN SPECIFIED CANADIAN INDUSTRIES, 1937 and 1938.

Industry	1937 Pounds	1937 $	1938 Pounds	1938 $
White metal alloys	573,575(x)	79,936	514,027(x)	68,962
Electrical apparatus and supplies	186,275	25,996	76,149	10,997

(x) Regulus. In addition the industry reported the consumption of 263,462 pounds of antimony ore valued at $12,496 in 1937 and 145,440 pounds at $7,575 in 1938.
NOTE - Corresponding data for 1939 not yet available.

Table 5 - IMPORTS OF ANTIMONY and ANTIMONY PRODUCTS INTO CANADA, 1938 and 1939.

	1938 Pounds	1938 $	1939 Pounds	1939 $
Antimony or regulus of, not ground, pulverized or otherwise treated	856,986	85,461	238,909	27,092
Antimony oxide and titanium oxide (x)	5,710,481	512,219	9,003,693	803,198
Antimony salts - tartar emetic, etc.	62,016	9,376	27,755	7,283
Antimony salts for dyeing	25	23	537	97
Type metal in blocks, bars, plates and sheets	540,959	20,746	647	5,027

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

Imports of antimony or regulus of into Canada during 1917 totalled 332,137 pounds valued at $61,732 compared with 1,962,194 pounds at $344,918 in 1915; 667,050 pounds at $49,408 in 1913 and 683,803 pounds at $111,664 in 1918.

Table 6 - WORLD'S PRODUCTION OF ANTIMONY ORE, 1936, 1937 and 1938. (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	1936	1937	1938
BRITISH EMPIRE			
Southern Rhodesia	84	78	77
Union of South Africa	17	...	12
Canada	...	...	11
Burma (estimated)	100	30	90
India	...	(c)	13
Sarawak	30	5	...
Australia	150	567	(a)
FOREIGN COUNTRIES			
Austria	123	248	(a)
Czecho-Slovakia	1,020	1,226	(a)
Greece	196	...	(a)
Italy	485	600	910
Portugal	23	61	161
Yugoslavia	1,600	1,780	3,370
Algeria	1,375	958	1,010

Table 6 - WORLD'S PRODUCTION OF ANTIMONY ORE, 1936, 1937 and 1938. (Concluded) (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	1936	1937	1938
Morocco (French)	35	26	155
do. (Spanish)	15	206	80
Mexico	7,188	10,471	7,907
United States (b)	674	1,130	580
Argentina	...	10	(a)
Bolivia (exports)	6,421	7,014	9,287
Honduras	1	(a)	(a)
Peru	1,224	1,396	662
China	17,000	15,000	8,000
French Indo-China	46	6	102
Japan (estimated)	150	(a)	(a)
Korea	17	10	(a)
Turkey	562	659	490

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

1936 ..... 8,800 long tons
1937 .....11,018 " "
1938 ..... 7,580 " "

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 metal can be prepared by heating barium oxide (BaO) and peroxide (BaO_2) to 1350°C. in an electric furnace, with a metal having a high heat of oxidation, aluminium being suitable for this purpose. Barium is an extremely active deoxidizer, combines with many gases and in the radio industry is inserted, in the form of copper-clad wire, into valves (tubes) to remove the last traces of gas."

Barium has been produced in the United States, Germany, France and Great Britain, but not yet commercially in Canada. "Mineral Industry" reported in 1936 that the price of barium has been continuously reduced and it is probably now available at $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, however, in 1938, Canadian Beryllium Mines and Alloys Limited, conducted development work on beryl-feldspar deposits located in Renfrew County, Ontario. It was reported that the company had some 206 tons of beryllium ore available for treatment at the close of 1939. No commercial production of beryllium ore in Canada was reported in 1939. The metal beryllium is used chiefly in the manufacture of copper-beryllium alloys. During recent years the production of beryllium in the United States came from plants operated by the Beryllium Corporation of Pennsylvania, Temple, Pennsylvania, and the Brush Beryllium Corporation, 3714 Chester Avenue, Cleveland, Ohio. In 1938 it was reported that about one ton of beryllium worth 3,000 francs per kilogram (about $40 a pound) was being produced annually in France by electrolysis in a fluoride bath from

beryl obtained near Limages and Autun, supplemented by supplies from Madagascar; Italy, Japan and possibly other countries are credited with small or occasional outputs, but Germany and the United States produce the bulk of the world's beryllium in the form of alloys. United States output of Beryl has been mainly as a by-product of feldspar, lithium or rare metal mining. An interesting new development is the use of beryllium-copper in cast-setting diamond core bits and reaming shells.

Engineering and Mining Journal - New York - at the close of 1939 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 1939. It may, however, enter in the form of special alloys.

BISMUTH -

Bismuth production in Canada during recent years represented the metal recovered from silver-lead ores smelted at Trail, British Columbia, and the metal contained in silver-lead-bismuth bullion produced in the treatment of silver-cobalt ores at Deloro, Ontario. Production in 1939 came entirely from the treatment of silver-lead ores in the Trail smelter and totalled 409,449 pounds valued at $466,362. The total output of bismuth in the Dominion to the close of 1939 amounted to 1,531,752 pounds worth $1,775,768. The largest previous annual production occurred in 1936 in which year 364,165 pounds valued at $360,523 were recovered.

Imports of metallic bismuth into Canada in 1939 totalled 10,252 pounds valued at $10,835 compared with 297 pounds at $303 in 1938; these imports came entirely from the United States. Imports of bismuth salts into Canada in 1939 were appraised at $8,671 compared with $16,756 in the preceding year.

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, September, 1939 - per pound, in ton lots $1.10; London 4s.6d.

Table 7 - PRODUCTION + 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	360,523
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

+ First commercial production in 1924.
/ High record output.

Table 8 - BISMUTH USED IN THE MANUFACTURE OF CANADIAN MEDICINAL AND PHARMACEUTICAL PREPARATIONS, 1937 and 1938.

	1937		1938	
Item	Pounds	$	Pounds	$
Bismuth metal	27,089	24,231	26,643	23,951
Bismuth salts	12,306	19,702	12,779	19,107

Table 9 - WORLD'S PRODUCTION OF BISMUTH ORE, ETC. (x), 1936, 1937 and 1938. (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
BRITISH EMPIRE			
Uganda - Ore	...	...	8
Union of South Africa - Ore (Bi content)	...	368	52
Canada - Metal and content of bullion	3,251	51	85
Burma - Ore	1	2	...
Australia - Ore, etc.	361	174	132
FOREIGN COUNTRIES			
France - Mispickel (Bi content)	78	(a)	(a)
Metal	80	(a)	(a)
Norway - Copper ore (Bi content)	11	7	(a)
Roumania - Bismuth-Molybdenum ore	880	530	3,228
Mexico - Ore (Bi content)	3,259	2,789	3,657
Argentina - Ore (Bi Content)	310	160	(a)
Bolivia (exports) - Ore, etc. (Bi content)	1,257	607	338
Peru - Lead-silver bullion, etc. (Bi content)	166	362	(b) 248
Metal	7,341	1,318	(b) 4,059
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.

The output of cadmium in the Dominion in 1939 totalled 939,691 pounds valued at $662,209 compared with 699,138 pounds at $561,799 in 1938; the quantity of the 1939 production was an all-time high record in Canadian production of the metal; of the 1939 production, 799,253 pounds valued at $563,241 were credited to British Columbia, 73,830 pounds at $52,029 to Manitoba, and 66,608 pounds at $46,939 to Saskatchewan. The proportioning between Manitoba and Saskatchewan of the cadmium recovered by the Hudson Bay Mining & Smelting Company results from the interprovincial boundary intersecting the orebody of the Flin Flon mine.

German cadmium production in 1939 was probably well over 400 tons according to the "Mining Journal", London. Italian production should have been of the order of 100 tons in 1939.

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, December 1939, per pound, commercial sticks, wholesale quantities, 75 cents; London 5s.6d.

Table 10 - CADMIUM PRODUCTION IN CANADA, 1928 - 1939.

Year	BRITISH COLUMBIA		MANITOBA		SASKATCHEWAN	
	Pounds	$	Pounds	$	Pounds	$
1928 +	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	436,431	715,747	164,223	269,326	144,553	237,067
1938	510,342	410,090	115,166	92,543	73,630	59,166
1939	799,253	563,241	73,830	52,029	66,608	46,939

+ First Production.

In 1937 there were 65,796 pounds of cadmium valued at $84,993 used in the Canadian white metal alloys industry; the consumption of the metal in the same industry during 1938 was 46,305 pounds, worth $38,333.

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 11 - WORLD'S PRODUCTION OF CADMIUM, 1936, 1937 and 1938. (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)
(Lb. avdp.)

Producing Country	1936	1937	1938
BRITISH EMPIRE			
United Kingdom	49,956	273,688	275,354
South West Africa (c)	218,000	305,000	255,000
Canada	785,916	745,207	699,138
Australia	555,180	464,311	439,436
FOREIGN COUNTRIES			
Belgium	452,000	598,000	400,000
France	185,000	218,000	256,000
Germany	668,000	783,000	957,000
Italy	120,441	200,000	152,000
Norway	224,598	339,935	458,000
Poland	310,000	274,000	538,000
U.S.S.R.	250,000	(a)	(a)
United States - Metal	3,633,495	3,995,739	3,753,323
Compounds (metal content)	626,800	828,000	431,000
Mexico (b)	1,172,894	1,366,407	1,680,800

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 following information relating to the metal is supplied by "The Mining Journal", London:- "Calcium metal alloys with aluminium, magnesium, beryllium, barium, copper, iron and lead, and the alloys are used both for general and special purposes. The metal is very useful as a reducing agent in the preparation of different metallic products and effects a great improvement in the properties of certain alloys. It also acts as a reducing agent in the preparation

of metal powders of chromium, thorium and uranium. In the form of calcium silicide it is a good de-oxidizer in iron castings and alloyed with lead it is used in battery grides and plates, for machinery and other bearings, and as a sheathing for telephone, cable and electric lines. During the war of 1914-18, when antimony and antimonial lead were difficult to obtain in the United States, the so-called "Frary" metals were developed containing, besides lead, two per cent barium and one per cent calcium. These alloys found considerable favour for bearings, and in some respects, such as tensile strength, hardness and resistance to fatigue were considered superior to the one per cent atimony lead, when used for cable sheathing. These alloys can be satisfactorily cast, rolled, welded, machined and turned. From the results of experience available, it would seem that amongst the most valuable functions of calcium metal is that of the great scavenging effect in freeing other metallic products from impurities which might be highly detrimental to their employment.

"Calcium metal, either as such, or in alloy form, has uses outside the metallurgical field. It is used to dehydrate commercial alcohol to obtain 100 per cent spirit and also for the dehydration of certain solvents and organic liquids; also for de-sulphurizing petroleum fractions; it is also a very effective absorbing agent for producing high vacua.

"Calcium metal is produced by the electrolysis of fused calcium chloride, at an expenditure of electric energy of 15 to 25 kilowatt hours per pound of metal produced. The pure metal is silver-white, but when exposed to mositure-containing air, a film of bluish oxide forms on its surface, which film is protective against further atmospheric action. The metal has a specific gravity of 1.542 and thus is lighter than beryllium, magnesium and aluminium, being only exceeded in lightness by the alkali metals. Incidentally, this property of lightness is not of great importance, because calcium metal as such is not likely to be used extensively for constructional purposes, but only in small quantities alloyed with other metals. The metal is ductile and malleable and can be machined, turned, etc., but cannot be cast by ordinary foundry methods --- Calcium is rapidly becoming an important metallurgical raw material which suggests that its production will continue to increase with the usual result of lowering the market price".

Calcium metal was quoted in the United States, September, 1939 - per pound 98 to 99 per cent - 75 cents - ton lots, lump. Data relating to possible Canadian imports of calcium metal are not published.

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 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. No commercial shipments of ore were made from the Obongo Lake property during 1939 and it was reported that the company, in the future, would smelt only imported chromite ore. In 1939 development work was conducted on a chromite prospect located in Coleraine Township, Megantic County, Province of Quebec; some fifteen tons of ore were extracted during the year, but no shipments were recorded.

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 with the exception of some surveying completed in 1937 by the Consolidated Mining and Smelting Company of Canada, Limited, at chromite claims located near Ashcroft.

"Metal and Mineral Markets", New York, quoted chrome ore September, 1939, as follows:- Per long ton C.I.F. Atlantic ports: 43 to 45 per cent Cr_2O_3, $20.00 to $22.00; 48 to 50 per cent, $25.00 to $26.00. Prices nominal. Corresponding prices May, 1940, were:- Turkish, 48 per cent Cr_2O_3 concentrate, $29.00 to $30.00; Indian, 48 per cent, $25.00 to $26.00; 43 to 45 per cent refractory, $21.00 to $22.00.

The production of chromite in the Eastern townships of the Province of Quebec was greatly stimulated during the world war of 1914-1918 by the demand created for the mineral as a refractory and in the manufacture of ferro-chrome. From 1910 to 1914 inclusive, the Canadian industry had been dormant, but in 1915 shipments of 12,341 tons averaging less than 35 per cent Cr_2O_3 were made. This was increased in 1916 to 15,249 tons valued at $310,902 (final shipments of ore and custom concentrates) having an

average content of 38.3 per cent Cr_2O_3 and an average value of $20.39 per ton. In 1917 the final shipments of ores and concentrates were 23,712 tons valued at $581,796 containing an average of about 35.7 per cent Cr_2O_3. The 1917 shipments included 20,154 tons of ore that would vary from 30 per cent to 40 per cent Cr_2O_3, but would probably average close to 32 per cent; and 3,558 tons of concentrates that would average about 50 per cent Cr_2O_3.

Of the total shipments in 1917 about 965 tons were marketed for consumption in Canada. Prices for 40 per cent chromite ore varied during 1917 from 85 cents per unit, per short ton in January to a maximum of $1.25 per unit in December. Exports of chromite from Canada in 1918 were 15,831 tons valued at $353,616; the imports of bichromate of soda into Canada in 1918 were 1,046,490 pounds valued at $208,669; data relating to imports of ferro-chrome into Canada in 1918 are not available.

Table 12 - PRODUCTION OF CHROMITE IN CANADA, 1928 - 1939.

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

(a) Quantity not published.
Production in 1918 was 21,994 tons valued at $867,122; of this output 670 tons valued at $36,395 came from Cascade in the Rossland district, British Columbia, and the balance from Quebec province.

Table 13 - IMPORTS OF CHROMIUM AND CHROMIUM PRODUCTS INTO CANADA, 1938 and 1939.

	1938		1939	
	Quantity	$	Quantity	$
Chromium metal and tungsten metal, in lumps, etc., when imported by manufacturers for alloying purposes ....lb.	43,527	30,328	55,428	50,769
Nickel chromium in bars or rods not more than 0.75 inches diam. containing 60% nickel and 10% chromium for use as electric resistance wire, etc. ...lb.	43,472	41,805	48,597	48,616
Chrome fire brick	...	47,885	...	88,367
Bichromate of potash - crude ....lb.	121,531	10,435	188,479	16,819
Bichromate of soda ....lb.	1,776,372	106,150	3,246,413	211,173
Chrome ore and ores of metals N.O.P.+ ....lb.	19,137,700	378,496	...	...
Chrome ore (a) ....lb.	18,206,600	142,399	33,168,400	232,851

+ To March 31 - 1938.
(a) From April 1st, 1938; 16,464,000 pounds at $123,100 from British South Africa in 1938 and 26,626,100 pounds in 1939.

Table 14 - CONSUMPTION OF CERTAIN CHROMIUM PRODUCTS AND CHROME ORE IN SPECIFIED CANADIAN INDUSTRIES, 1937 and 1938.

		1937		1938	
Industry	Item	Pounds	$	Pounds	$
Ingots and Castings	Chrome ore	1,158,000	20,602	504,000	8,440
Ingots and Castings	Ferrochrome	1,734,000	167,531	1,478,000	116,639
Paints, Pigments and Varnishes ..	Chrome colours ...	1,470,347	219,078	1,425,687	215,524
Paints, Pigments and Varnishes ..	Sodium bichromate.	573,267	46,157	490,607	34,837
Leather Tanning	Sodium bichromate.	1,822,343	139,212	1,482,653	115,227
Glass Manufacture	Chromite	52,000	996	68,000	1,461

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 15 - WORLD PRODUCTION OF CHROME ORE, 1936-1938. (Supplied by Imperial Institute)
(Long tons)

Producing Country	1936	1937	1938	Estimated Cr_2O_3 content+ 1936	1937	1938
BRITISH EMPIRE						
United Kingdom	...	300	466	...	75	117
Sierra Leone (shipments)	...	729	497	...	328	224
Southern Rhodesia	180,499	271,265	183,083	88,400	132,900	89,700
Union of South Africa	172,895	165,958	173,773	75,746	74,349	78,181
Cyprus	500	1,615	5,577	250	800	2,800
Canada	824	3,814	...	200	800	...
India	49,485	62,307	44,129	25,000	31,000	22,000
Australia	415	459	952	(a)	(a)	(a)
TOTAL	405,000	506,000	408,000			
FOREIGN COUNTRIES						
Bulgaria	266	2,313	1,717	120	1,064	687
Greece (b)	46,599	51,789	35,098	18,109	21,000	14,000
Italy (Rhode Is.)	79	(a)	(a)	27	(a)	(a)
Norway	...	173	(a)	...	78	(a)
U.S.S.R. (c)	216,000	(a)	(a)	(a)	(a)	(a)
Yugoslavia	53,190	58,918	49,401	18,400	28,000	23,800
Cuba	69,257	79,420	36,739	19,000	22,000	10,000
Guatemala	...	...	483	...	...	(a)
United States	269	2,321	812	100	1,000	350
Brazil (exports)	3,829	837	920	(a)	(a)	(a)
Japan	37,868	(a)	(a)	15,100	(a)	(a)
Philippine Islands	2,873	75,209	38,271	1,300	34,000	18,000
Turkey	161,292	189,468	210,256	81,000	90,000	105,000
New Caledonia	47,084	47,264	51,391	24,000	24,000	26,000
TOTAL	640,000	(a)	(a)			
WORLD'S TOTAL	1,040,000	(a)	(a)			

+ 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.

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.

In the Province of Quebec exploration of iron ore deposits, located near the Labrador border, was conducted by McKay Exploration Limited during the period June 4 to September 13, 1939.

More iron ore has been produced in Ontario than in any other province; in northwestern Ontario, about 1899, a deposit of hematite, that later developed into the Helen mine, was found. This property was the main source of Ontario's iron ore output for a number of years. The province has a large supply

of low-grade iron ore, but beneficiation processes must be applied to make these ores suitable for commercial use.

During 1937 the Algoma Ore Properties Limited, commenced rebuilding the surface equipment at the New Helen iron mine in Michipicoten; work was suspended in May, 1938, and resumed in December; development operations were continued in 1939 and commercial shipments of beneficiated ore were commenced in July. These totalled 123,598 short tons valued at $341,594 in 1939. The Dwight-Lloyd process for the elimination of CO_2 and sulphur is employed in the treatment of the Helen mine ore. A new discovery of hematite iron ore at Steep Rock Lake near Atikokan, Ontario, the first of bessemer grade ever found in Ontario, was reported in March of 1938. This deposit, which might prove of extreme importance to the industrial life of the province and to Canada generally, has been outlined by diamond-drilling on behalf of the Sterola Exploration Company. Early drilling indicated a mass of ore at least 700 feet long and 150 wide. This grade of hematite ore requires no beneficiation prior to smelting. Exploration and development of the deposit were continued in 1939.

Legislation passed by the Ontario Legislature has provided that a bounty of two cents per unit of iron will be paid to possible producers of iron ores for a period of ten years, commencing January 1, 1939.

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.

Imports of iron ore into Canada during 1939 totalled 1,764,844 tons valued at $4,179,353 compared with 1,302,430 tons at $2,830,482 in 1938; of the 1939 imports 1,205,261 tons valued at $3,080,641 came from the United States; 524,849 tons at $938,954 from Newfoundland and 20,404 tons at $73,061 from Brazil.

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. April, 1940, quotation 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.

The Foreign Minerals Quarterly of the United States Department of the Interior shows a total of 21,927,539 metric tons of iron ore imported into Germany in 1938 of which 755,454 came from Algeria; 1,718,049 from Belgium - Luxemburg; 5,056,121 from France; 1,121,515 from Newfoundland; 1,082,551 from Spain; 724,549 from Spanish Morocco; 8,992,331 from Sweden and 2,476,969 from other countries.

Table 16 - ORES USED IN CANADIAN STEEL FURNACES, 1937 and 1938.

	1937		1938+	
Ore	Long tons	$	Long tons	$
Crude iron ore, imported	86,169	434,120	74,137	462,773
Calcined roasted, or treated ore, imported	85	837	81	774
Manganiferous ore, imported	332	4,949	104	1,300
Chrome ore, imported	579	20,602	252	8,440

In addition to the consumption of ores listed in Table 16, there were 1,604,073 long tons of foreign ore valued at $5,372,263 used during 1937 in blast furnaces for the production of pig iron. Corresponding consumption in 1938 totalled 1,234,433 long tons worth $4,368,325.

+ Complete data for 1939 not yet available.

Table 17 - WORLD'S PRODUCTION OF IRON ORE, 1934, 1937 and 1938. (Taken from the Minerals Yearbook of the United States Bureau of Mines)

(Metric tons)

Country (1)	1934	1937	1938
NORTH AMERICA:			
Cuba (shipments)	181,121	496,258	154,540
Guatemala	...	101	(2)
Mexico	105,799	136,018	118,251
Newfoundland	514,747	1,635,554	1,707,180
United States	24,982,047	73,250,649	28,903,861

Table 17 - WORLD'S PRODUCTION OF IRON ORE, 1934, 1937 and 1938. (concluded) (Taken from the Minerals Yearbook of the United States Bureau of Mines)

(Metric tons)

Country (1)	1934	1937	1938
SOUTH AMERICA:			
Brazil (exports)	7,138	209,715	359,115
Chile (3)	969,285	1,489,637	1,608,399
EUROPE:			
Belgium	115,890	265,540	(2)
Bulgaria	...	11,920	16,771
Czechoslovakia	538,742	1,836,495	(2)
France	32,015,150	37,839,000	33,137,000
Germany (4)	4,213,869	9,575,234	10,938,650
Austria	466,835	1,884,694	2,647,000
Greece	147,408	300,498	(2)
Hungary	68,870	289,520	370,000
Italy	484,583	997,805	(2)
Luxemburg	3,833,847	7,766,254	5,048,965
Norway	567,414	1,008,225	1,400,000
Poland	247,365	780,152	872,591
Portugal	2,895	7,700	(2)
Roumania	83,590	129,005	(2)
Spain	2,094,001	990,000	2,513,000
Sweden	5,253,058	14,952,549	(2)
Switzerland (exports)	18,961	148,578	133,998
U.S.S.R. (6)	21,508,800	26,000,000	(7) 27,000,000
United Kingdom: Great Britain (8)	10,756,765	14,443,146	12,049,540
Yugoslavia	179,841	629,172	606,884
ASIA:			
Burma	24,314	25,834	(2)
China (9)	2,544,613	(5)	(2)
Chosen	176,008	207,500	(2)
India, British	1,923,370	2,916,909	2,885,357
Indochina	1,500	33,285	(2)
Japan	431,681	(5)	(2)
Malay States:			
Federated Malay States	...	1,165	938
Unfederated Malay States	1,153,876	1,686,990	(2)
Philippine Islands (exports)	7,239	601,190	910,952
U.S.S.R.	(6)	(6)	(6)
AFRICA:			
Algeria	1,326,437	2,427,230	3,105,037
Egypt	203	...	(2)
Morocco:			
French	...	66,864	266,100
Spanish	824,812	1,420,000	1,341,658
Northern Rhodesia	...	528	208
Sierra Leone	233,148	644,160	(2)
South-West Africa	...	14,280	(2)
Tunisia	546,500	943,763	821,630
Union of South Africa	233,175	461,796	505,314
OCEANIA:			
Australia:			
New South Wales	...	...	(2)
Queensland	3,282	4,551	5,207
South Australia	1,264,205	1,896,370	2,281,404
Tasmania	...	62	(2)
New Zealand	2,851	580	1,238
	120,100,000	213,700,000	(2)

Footnotes to Table 17 - preceding page -

(1) In addition to the countries listed Finland, Madagascar, and Turkey report production of iron ore, but complete data are not available.
(2) Data not yet available.
(3) Production of Tofo mines.
(4) Exclusive of manganiferoue iron ore carrying 12 to 30 per cent manganese.
(5) Estimate included in total.
(6) Russia in Asia included with Russia in Europe.
(7) Includes manganiferous iron ore.
(8) Exclusive of bog ore, which is used mainly for the purification of gas.
(9) Including Manchuria.

Corresponding data for 1939 not yet available.

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 1939. It has been stated that the lepidolite from the "Silver Leaf" deposits in Manitoba contains substantial quantities of caesium and rubidium. 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 during 1940.

"Metal and Mineral Markets", New York, quoted lithium metal, May, 1940, per pound, 98 to 99 per cent 100 pound lots $15. Amblygonite was quoted, April, 1940, 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, 1936 - 1938. (Imperial Institute London)

Table 18 - (Long tons)

Country	1936	1937	1938
South West Africa	852	1,030	...
Canada	...	(£342)	...
France	400	(a)	(a)
Portugal	...	109	...
United States (lithium minerals)	1,108	1,212	796
Argentina	60	181	(a)

(a) Information not available.

MAGNESIUM -

No magnesium metal has been 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.

The United States Bureau of Mines in its "Minerals Yearbook" for 1939 states:- "Increased interest in aircraft in the present national-defence program of the United States has again emphasized the growing importance of magnesium and other light alloys. Production (sales) of primary magnesium in the United States in 1938 was greater than ever before. Outside of the United States production of magnesium increased at an even more rapid rate. World output totalled possibly 22,000 metric tons, an increase of 22 per cent over that indicated in 1937. Germany continued as the outstanding producer, with an estimated output of 12,000 tons. The rapid growth in the use of magnesium abroad is due to the armament and self-sufficiency programs of totalitarian and democratic countries, as well as to development of new uses based upon its lightness and strength. Sales of primary magnesium in the United States in 1938 totalled 2,410 short tons. The 1938 estimate of magnesium production by countries is as follows:- Greater Germany, 12,000; United Kingdom, 2,200; United States (sales) 2,185; Japan 2,000; France 1,800; Switzerland 800; U.S.S.R. 600; and Italy 400. The magnesium chloride electrolytic process continued to supply the greater part of the output. The principal raw materials used were potash final liquor, carnallite, magnesite and brine. It is expected that a larger part of the output will be furnished by the thermal reduction process in 1939 when new plants in the United Kingdom, Japan and Italy are scheduled to begin production. These new plants will use magnesite and dolomite as raw material."

Sales of new magnesium ingot in the United Stetes during 1939 totalled 10,650,121 pounds, an increase of 121 per cent over 1938. Magnesium was used in 1939 in the construction of many more parts of airplanes. It was report in March, 1940, that the Dow Chemical Company had commenced construction of a $5,000,000 plant at Freeport Texas for the production of magnesium from sea water.

Data relating to any Canadian imports of magnesium metal are not published separately. Imports of magnesium alloys from June 3, 1939, to December 31, 1939, were appraised at $575.

"Metal and Mineral Markets" - New York - Prices September 21, 1939, and May, 1940, were:- per pound ingots (4 x 16 in.) 99.8 per cent; carload lots, 27 cents; extruded sticks, carload lots, 34 cents.

MANGANESE ORE -

Commercial shipments of manganese ore from Canadian mines during 1939 totalled 396 short tons valued at $3,688; of these shipments 4 tons valued at $88 were made from the East Mountain deposits, Col-Chester County, Nova Scotia, and 392 tons worth $3,600 from Turtle Creek in Albert County, New Brunswick.

The manganese deposits of New Brunswick fall into two main classes, "Bog ore" and "Hard ore". According to the Department of Mines, New Brunswick, the bog ores are extensive but the market very limited, the chief demand being for hard ores containing more than 30 per cent manganese. In 1939, the New Brunswick government sampled a deposit of manganiferous iron ore located in Carleton County averaging iron 26.26 per cent; manganese 12.97 per cent; sulphur 0.09 per cent and phosphorous 0.9 per cent.

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 process for the production of manganese had been practically completed in 1939 by the Consolidated Mining and Smelting Company of Canada, Limited.

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 May, 1940, were: Brazilian, 46 to 48 per cent manganese, 47 cents; Chilian, 48 per cent manganese, 49 cents; Indian, 48 to 50 per cent manganese, 49 cents; South African, 50 to 52 per cent manganese, 50 cents; Cuban, 45 to 47 per cent manganese, not dutiable, 51½ cents; 50 to 52 per cent, 62 cents. Prices nominal.

Imports into Canada of manganese oxide during 1939 totalled 59,573,600 pounds valued at $621,931 compared with 42,100,000 pounds at $463,673 in 1938. of the 1939 imports, 45,074,300 pounds were imported direct from the United States and 14,471,800 from British South Africa. In 1938 imports from the Gold Coast amounted to 37,914,000 pounds valued at $371,564.

Table 19 - PRODUCTION OF MANGANESE ORE IN CANADA FOR YEARS SPECIFIED

Year	Tons	Value	Year	Tons	Value
		$			$
1915	201	9,360	1931	117	2,893
1916	957	89,544	1932-1934	...	...
1917	158	14,836	1935	100	800
1918	440	6,230	1936	221	1,596
1924	584	4,088	1937	85	817
1925-1929	...	...	1938	...	...
1930	273	1,356	1939	396	3,688

The total production of manganese ore in Canada since 1886 totalled 16,377 short tons valued at $458,698. The largest annual tonnage in those years was 1,801 in 1888 and the greatest annual value was $89,544 for 957 tons produced in 1916.

Table 20 - CONSUMPTION OF MANGANIFEROUS ORE and MANGANESE COMPOUNDS IN SPECIFIED CANADIAN INDUSTRIES, 1937 and 1938.

Industry	Item	1937 Quantity	1937 Value	1938 Quantity	1938 Value
			$		$
Electrical Apparatus and Supplies	- Manganese dioxide .... pound	4,207,634	75,970	4,187,176	84,368
Paints, Pigments and Varnishes ..	- Manganese salts ..... pound	55,423	6,322	46,396	5,427
Steel Ingots and Castings	- Ore, manganiferous (foreign) ..... pound	664,000	4,949	227,296	1,300
	Spiegeleisen ..... long ton	2,682	88,650	2,518	86,833
	Ferromanganese ..... long ton	13,392	629,865	11,710	614,317

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.

German imports of manganese ore in 1938, according to the United States Department of Interior, totalled 425,785 metric tons of which 47,769 came from Brazil; 17,226 from British India; 268,044 from British South Africa; 60,925 from Russia and 31,821 from other countries.

Table 21 - WORLD PRODUCTION OF MANGANESE ORE, 1937 and 1938. (Supplied by Imperial Institute)
(Long tons)

Producing Country	1937	1938
BRITISH EMPIRE		
Gold Coast (shipments)	527,036	324,207
Northern Rhodesia	2,341	2,735
Union of South Africa	621,229	543,028
Canada	76	...
India	1,051,594	987,929
Unfederated Malay States	32,793	31,970
Australia	1,142	594
New Zealand	5	90
TOTAL	2,240,000	1,870,000

Table 21 - WORLD PRODUCTION OF MANGANESE ORE, 1937 and 1938. (concluded) (Supplied by Imperial Institute)
(Long tons)

Producing Country	1937	1938
FOREIGN COUNTRIES		
Bulgaria	3,000	1,857
Czecho-Slovakia	104,664	(a)
Germany	177	(a)
Greece	6,842	(a)
Hungary	24,691	21,870
Italy	33,002	47,529
Portugal	312	548
Roumania	49,947	59,222
Sweden	6,031	5,983
U.S.S.R. (estimated)	2,770,000	2,900,000
Yugoslavia	4,369	3,699
Belgian Congo	30,498	7,603
Egypt	183,377	150,694
Morocco (French)	75,257	85,230
Morocco (Spanish)	650	150
Costa Rica (exports)	129	299
Cuba	113,840	(b) 110,523
Mexico	17	116
Porto Rico (exports)	2,343	1,023
United States (c)	40,241	25,321
Argentina	596	(a)
Brazil	256,054	218,455
Chile	12,809	(a)
French Indo China	5,207	2,179
Japan	(a)	(a)
Netherlands East Indies	10,908	9,534
Philippine Islands	5,600	40,240
Portuguese India	4,013	9,478
Turkey	522	2,151
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 " "

MERCURY -

Production of virgin mercury in Canada during 1939 totalled 436 pounds valued at $1,226 compared with 760 pounds at $760 in 1938. The output in both years originated at the Property of the Empire Mercury Mines Limited, located at Mud Creek, Bridge River area, British Columbia. During 1939 the Consolidated Mining and Smelting Company of Canada, Limited, conducted exploration work, both surface and underground, on a mercury bearing deposit situated at Pinchi Lake in the Omineca district of British Columbia. The company announced that an 85 per cent interest in the property had been optioned and several more claims staked; as the property appeared to be promising, plans were rushed for bringing it into production as early as possible. This plant should be in operation before midsummer 1940. Concurrent development of the property has been very favourable and in all probability will call for doubling the plant as soon as the 50 ton plant is in successful operation.

"World events in 1939 had a marked influence on the mercury industry in the United States and, combined with conditions within the industry itself, caused sharp fluctuations in the price, according to the Bureau of Mines, United States Department of the Interior. In January the monthly price was $77.44 a flask. There was an upward movement in the early months of the year due to political tension abroad and to the speculation over what would be the selling policy for Italian and Spanish mercury should Franco win the Spanish civil war. Prices eased following Franco's victory and the resumption of combined selling by Mercurio Europeo, signalling attempts to market large quantities of metal rather than to run up the price. Upon the outbreak of the war between Great Britain and France and Germany in September apparently some consuming countries were found to be under-supplied. The United States, for example, had substantially lessened her importation of mercury since late in 1937 and had not increased domestic production to offset the decline in imports. Consumers' stocks in the United States must have been drawn on in 1938 and up to the opening of war in September 1939. Prices in the United States jumped in September and averaged $140.00 for the month; they rose to $145.60 for October; declined to $134.98 in November and were $141.20 in December. During this period the foreign price lagged greatly behind the domestic one. Whereas, the price differential in favor of selling in the United States was $6 to $11 a flask for the first 8 months of the year as against the tariff of $19, in September it skyrocketed to $49. The jump in the September differential was due largely to the decline in the exchange rate for the pound. Late in the year production in the Unites States began to respond to increased prices and imports increased. Conditions of obtaining supplies abroad became more acute, however, and the foreign price rose precipitously, leaving the domestic price protected by tariff far behind. In February 1940 the Cartel price rose to $205 c.i.f. New York, duty unpaid, and that for domestic metal was quoted as $178 to $182 a flask.

"Domestic production amounted to 18,633 flasks, the highest recorded since 1931, but only 10 per cent above the average for the 5-year period, 1934-38." - United States Bureau of Mines.

Table 22 - IMPORTS OF MERCURY INTO CANADA FOR YEARS SPECIFIED.

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

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

Table 23 - MERCURY CONSUMED IN SPECIFIED CANADIAN INDUSTRIES, 1937 and 1938.+

Industry	1937		1938	
	Pounds	Value	Pounds	Value
		$		$
Boiler Compounds	300	304	...	...
Medicinal and Pharmaceutical Preparations	44,574	41,399	12,666	10,249
Other chemicals	55,994	47,552	22,305	19,767

+ Data not yet complete for 1939.

NOTE - In addition to the consumption specified, there is a considerable quantity of quicksilver employed by the mining industry in the recovery of both placer and lode gold.

Table 24 - WORLD'S PRODUCTION OF QUICKSILVER, 1936, 1937 and 1938. (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)
(Lb.)

Producing Country	1936	1937	1938
BRITISH EMPIRE			
Canada	...	...	760
Australia	5,911	710	...
New Zealand	...	1,344	760

Table 24 - WORLD'S PRODUCTION OF QUICKSILVER, 1936, 1937 and 1938. (concluded) (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)
(Lb.)

Producing Country	1936	1937	1938
FOREIGN COUNTRIES			
Austria	220	10,192	(a)
Czecho-Slovakia	142,546	208,988	220,000
Italy	3,247,620	4,868,000	5,073,000
Roumania	179	293	(a)
Spain (b)	3,220,000	3,200,000	3,200,000
Algeria	8,823	9,429	15,252
Tunis	5,470	1,911	20,536
Mexico	403,355	375,132	647,460
United States	1,259,244	1,254,608	1,367,316
Bolivia (exports)	16,885	1,217	(a)
China (exports)	186,928	131,925	4,941
Japan	32,571	(c) 44,000	(c) 45,000
Korea	157	...	...
Turkey	63,504	37,269	45,408
WORLD'S TOTAL	8,600,000	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 1939 totalled 2,722 pounds valued at $816 compared with 14,000 pounds worth $4,500 in the preceding year. Of the 1939 output, 2,240 pounds valued at $600 were produced in the Malartic area of Abitibi County, Quebec, by the Molybdenite Corporation of Canada Limited, while the balance of Canadian production represents concentrates shipped by Regnery Metals from its property located near Hawk Junction, Algoma District, Ontario.

A renewed interest in Canadian molybdenite deposits was apparent throughout 1939, especially after the declaration of war against Germany. In the Province of Quebec reports of work conducted during 1939 were officially received from Cheabella Mine Company (Montbeillard), Maniwaki Molybdenum Mines Limited, (Maniwaki), La Reine Holdings (Abitibi County), Quyon Molybdenite Company Limited (Quyon), Kindale Mines Limited (Gatineau County), Molybdenite Corporation of Canada Limited (Abitibi County) and Alloys Limited (Quyon district). In Ontario work was officially reported by Regnery Metals (Algoma), North American Molybdenum Corporation Limited (Renfrew County), Kenopo Mining and Milling Company Limited (Kenora district), and Puritan Mines Limited (Renfrew County). Operations during 1939 at molybdenite properties located in British Columbia were reported by Powell River Molly claims (Nanaimo district) and A. Langly (Stella Group, Omineca district). No shipments were reported from these properties and development chiefly represented assessment work. A discovery of molybdenite near Cranberry Portage, Manitoba, was recently reported.

The United States Bureau of Mines in an advance summary review states:- "The domestic production of molybdenum in 1939 amounted to 32,347 short tons of concentrates containing 30,324,000 pounds of metallic molybdenum, as compared with 36,157 tons of concentrates containing 33,297,000 pounds of metallic molybdenum in 1938.

"About 72 per cent of the domestic output of molybdenum came from the operation of the Climax Molybdenum Co. of Lake County, Colo. Production of molybdenum concentrates was also reported from Arizona, California, New Mexico, Utah, Washington, and Wisconsin.

"Concentrates shipped from mines in 1939 were 32,415,000 pounds of molybdenum with an estimated value of $22,157,000, as compared with 25,727,000 pounds with an estimated value of $17,977,000 in 1938.

"Exports of molybdenum concentrates in 1939 were 21,777 short tons, of which 9,071 tons went to the U.S.S.R., 4,681 tons to Japan, 3,778 tons to the United Kingdom, 1,480 tons to France, 1,367 tons to the Netherlands, 502 tons to Italy, and 898 tons to other countries. These were valued at $14,066,441."

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 U.S. 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 1938 by manufacturers of steel for use exclusively in the manufacture of steel in their own factories totalled 181,377 pounds valued at $63,131 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 2,252,100 pounds valued at $461,596 in 1939; some of these may have contained molybdenum.

"Metal and Mineral Markets" - New York - quoted molybdenum ore December, 1939, - per pound of contained MoS_2, 90 per cent concentrate, 45 cents F.O.B. mines; London - per long ton unit, nominal at 50s for 85 to 90 per cent concentrate. Molybdenum per pound in 10 to 49 pound lots C.P. powder $9.50; 99 per cent $2.60 to $3.00. Ferromolybdenum per pound of Mo, F.O.B. shipping point, 55 to 65 Mo, 95 cents. Molybdate, per pound of contained Mo, 80 cents.

Table 25 - 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 26 - WORLD PRODUCTION OF MOLYBDENUM ORES, 1937 and 1938. (Taken from the Mineral Industry - Imperial Institute).

(Cwt.)

Producing Country	1937	1938
BRITISH EMPIRE		
Canada	147	140
Burma	14	...
Australia	1,400	1,163
FOREIGN COUNTRIES		
Italy (MoS_2 content)	15	4
Roumania (Bi-Mo Ore)	530	3,230
Norway (MoS_2 content)	11,279	(a)
French Morocco (MoS_2 content)	3,200	3,350
Mexico (MoS_2 content)	20,655	15,861
United States (MoS_2 content)	437,783	495,492
Peru (MoS_2 content)	1,629	3,006
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.

World production of molybdenum in 1939 was estimated at 32,635,000 pounds, of which about 30,135,000 pounds were produced in the United States. Production by the Climax Molybdenum Company in 1939 was 21,785,000 pounds.

RADIUM-URANIUM -

Commercial production of radium-uranium bearing ores in Canada is confined, at the present time, entirely to the Great Bear Lake district in the Northwest Territories. Eldorado Gold Mines Ltd. operates a mine and mill at Echo Bay, Great Bear Lake, Northwest Territories, and Bear Exploration and Radium Limited conducted mining and milling operations in 1939 at Contact Lake in the same district. Pitchblende concentrates produced by the Eldorado Company are treated for the recovery of radium and uranium at a refinery owned and operated by the company at Port Hope, Ontario. 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.

The property of Bear Exploration and Radium Limited was active until July 31 and 6,658 tons of ore were milled; shipments of silver-bearing concentrates were made by this company to the Trail smelter of Consolidated Mining and Smelting Company of Canada Limited and to the Deloro Smelting and Refining Company, Deloro, Ontario.

"The St. Joachimsthal mines, formerly part of Czechoslovakia, were incorporated in the German Reich in October 1938. These deposits are estimated to contain more than 300 grams of radium still unmined and at the time of their incorporation into Germany were producing about 180 to 190 metric tons of pitchblende ore yielding about 5 grams of radium a year. Operations were under control of the Czech Government; and the output, ranging from 2 to 10 grams annually in recent years, has been purchased principally in England. In March 1939 the Auergesellschaft, A. G., Berlin, Germany's leading manufacturer of radioactive metals (one of its products being mesothorium from gas-mantle residues) obtained a concession from the German Government to operate the Joachimsthal mines under lease and extract the radium at its works in Berlin." - U.S. Bureau of Mines.

Eldorado Gold Mines, Limited, reported that in 1939 there were 522 tons of pitchblende concentrates received from the mine at its Port Hope refinery. Ore reserves at the mine were maintained throughout the year and are now ample for the operation of the present mill for the next four years; the refining was operated for approximately eleven and a half months. The advent of war in September, 1939, created many new problems in the marketing of products, particularly as more than 90 per cent are exported. However as a partial compensation for this, there has been a gradual increase in the demand for products from the United States and the Far East. Products of the company include: radium bromide and sulphate; uranium

(yellow, orange, black and nitrate); polonium, silver-copper concentrate; silver sulphide and cobalt-copper-nickel concentrate.

For statistical purposes, the data relating to the mining and milling and the refining of pitchblende-silver ores in Canada are combined, respectively, with those of silver-lead-zinc mining and non-ferrous smelting industries. Figures pertaining to the value of production of radium and uranium in Canada were not published prior to 1939.

The Union Minière du Haut Katanga is the world's other large producer of radium but little information is available regarding the mining of radium ores by this organization in the Belgian Congo or to the refining operations conducted at Oolen, Belgium.

Imports of radium into Canada during 1938 were valued at $22,559 compared with $15,929 in 1939. Data relating to Canadian exports of radium and imports and exports of uranium are not shown in Canadian Government Publications.

"Metal and Mineral Markets", New York, quoted radium September, 1939, - per mg. radium content $25 to $30, as to quantity. September, 1939, New York quotations for uranium were - black oxide kgs. $2.65 - per pound; yellow kgs. $1.75 - per pound.

Table 27 - WORLD'S PRODUCTION OF URANIUM MINERALS, 1937 and 1938. (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)

(Cwt.)

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

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

(c) The content of radium in salts was 2,900 mgrams.

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 in Canada during 1939 totalled 150,771 pounds valued at $266,714 compared with 358,929 pounds worth $622,742 in 1938. Of the output in 1939, there were 23,841 pounds recovered from copper-gold ores mined and smelted in Quebec and 126,930 pounds in Ontario from nickel-copper ores. Selenium is also contained in the copper-gold ores of the Flin Flon mine in Manitoba and Saskatchewan but its commercial recovery (sales) from such ores was not reported in 1939.

The International Nickel Company of Canada, Ltd., reported that the demand for selenium was stronger in 1939 and that the company's sales were greater than in 1938.

One of the principal uses for selenium is as a decolorizer in the manufacture of glass. It is used with cadmium sulphide as a pigment and with sulphur as a secondary vulcanizing agent in the rubber industry. Selenium is used in copper alloys and stainless steel to increase machinability. Selenium is marketed chiefly as a black to steel-gray amorphous powder, also in cakes and sticks.

According to the U.S. Bureau of Mines more and more selenium is being recovered from copper refining, and as the use of selenium in glass no longer seems to be increasing, the search for new uses has been resumed; rubber-making continues to be the second largest use of the element next to glass making.

"Metal and Mineral Markets" - New York - quoted selenium December, 1939, per pound $1.75 for black, powdered 99.5 per cent pure.

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. Figures pertaining to Canadian imports and exports of selenium were not published separately prior to 1939. Exports of selenium and salts of, from Canada in 1939, totalled 238,925 pounds valued at $374,700; of these 128,293 pounds went to the United Kingdom and 109,411 pounds to the United States.

Table 28 - 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.

In 1937 the Canadian glass industry consumed 4,116 pounds of selenium valued at $7,565. Consumption in the same industry in 1938 totalled 3,186 pounds worth $5,711. Complete date on world production of selenium and tellurium are not available.

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.

Production of tellurium in Canada during 1939 totalled 2,940 pounds valued at $4,769; this output was credited entirely to the province of Quebec. No commercial production was reported in Ontario, Manitoba or Saskatchewan in 1939.

Tellurium is used in rubber hose and cable coverings and greatly increases the toughness and abrasion resistance of rubber. Tellurium is usually marketed as slabs and sticks of 99 per cent purity, but for use in compounding rubber it is furnished in the form of a steel gray powder. The metal is also used to harden toughen and increase the corrosion resistance of lead. Both tellurium and selenium impart free-cutting properties to alloy and plain carbon steels.

The annual report of the International Tin Research and Development Council for 1938 states that the investigation of the mechanical properties of tin-rich tellurium tin alloys is now completed. The most notable results are the remarkable work-hardening properties and the high ratio of creep strength to tensile strength. While the absolute values are low compared with certain other tin alloys, these properties indicate that tellurium may be a valuable addition to other tin alloys.

The International Nickel Company of Canada, Limited, reported that the industrial demand for tellurium continues to be small, although it is interesting to record that a leading fabricator of copper products is offering "free-machining" copper and copper alloys containing small amounts of tellurium.

Data relating to Canadian imports and exports of tellurium are not shown separately in the trade reports of the Dominion. "Metal and Mineral Markets" - New York, quoted tellurium at $1.75 per pound, September 7th, 1939, and May, 1940.

Table 29 - PRODUCTION OF TELLURIUM IN CANADA, 1934 - 1939.

Year	Pounds	$	Year	Pounds	$
1934 (+)	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

(+) First commercial production in Canada.

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. The Nova Scotia Department of Public Works and Mines reported that some prospecting was performed in 1938 by Mr. George Mitchell on an occurence of molybdenum and tin in the New Ross area, Lunenburg County. No official reports of any primary tin production in Canada were received in 1939 and no development of any Canadian tin bearing deposits was reported.

"As considerable tin enters world trade in the form of ore, geographical data on world smelter output differs materially from those of mine output. For example, all ore from Bolivia and Nigeria is smelted in Europe. An appreciable part of the tin ore from Netherland India is smelted in the Netherlands and the product of Siam and Indo-China is smelted in British Malaya. The only commercial tin ore smelter in the Western Hemisphere is in Argentina, and its output has increased somewhat in recent years. Germany (including Austria) produces little tin; and despite major efforts to provide substitutes, apparent consumption increased from 9,164 tons in 1936 to 13,474 in 1938. The acquisition of Czechoslovakia increased Germany's dependence on imported tin, as consumption there has averaged over 1,600 tons annually from 1936 to 1938, with little or no local production." (U.S. Bureau of Mines)

"Metal and Minerak Markets" - New York - reported that effective March 25, 1940, United States buyers of tin, rubber, jute and various other British Empire products will have to effect all such purchaees in dollars or in "official" pounds. This news was contained in an order issued by the British Exchange Control on March 9. The action will prevent buyers of those British Empire Products from using the cheaper "Free" pound in making settlements. The exchange restrictions caused tin prices to rise, Straits tin advancing to 49 cents, New York, on March 9.

Table 30 - IMPORTS OF TIN AND TIN PRODUCTS INTO CANADA, 1938 and 1939.

Item	1938 Pounds	1938 $	1938 Pounds	1938 $
Tin in blocks, pigs or bars + ...	5,275,200	2,205,449	5,825,700	2,833,089
Tinfoil	19,092	6,593	38,520	12,133
Collapsible tubes	...	45,484	...	64,523
Tin bichloride and tin crystals	129,053	28,467	84,942	22,889
Oxide of tin and copper	165,006	54,030	172,460	61,186
Phosphor tin and phosphor bronze in blocks, bars plates, etc.	595,098	158,137	740,691	235,420
Tin plate food containers	...	282,200	...	382,905
Tin plate containers, n.o.p.	...	346,671	...	427,231
Sheets, plate, hoop, etc., tin coated	155,976,500	8,814,992	173,812,900	9,239,372
Manufactures of tin plate painted, etc., manufactures of tin, n.o.p.	...	505,838	...	516,105
Kitchen or dairy holloware of iron or steel coated with tin	...	38,313	...	54,881
Arseniate, binarseniate and stannate of soda	11,200	2,843	32,054	6,739

+ Of the 1938 imports 3,378,400 pounds valued at $1,400,871 came from the Straits Settlements and 1,730,000 pounds at $730,772 from United Kingdom. Corresponding imports in 1939 were 3,384,400 pounds at $1,623,55: and 1,816,400 pounds worth $901,143.

Exports of tinware from Canada in 1938 were appraised at $13,481; in 1939, corresponding exports were appraised at $23,190.

The average price (New York) for Straits tin was 48.721 cents August, 1939; the corresponding price May, 1940, was 53.000 cents.

Table 31 - IMPORTS OF TIN IN BLOCKS, PIGS AND BARS INTO CANADA FOR YEARS SPECIFIED.

Year	Pounds	$	Year	Pounds	$
1910	3,231,100	1,058,778	1915	2,912,600	1,009,597
1912	4,894,700	2,134,221	1916	3,457,500	1,372,200
1913	5,085,700	2,252,324	1917	3,685,200	1,786,212
1914	3,382,700	1,191,466	1918	3,474,500	2,492,257

Importation of tin plates and sheets in 1918 totalled 145,687,800 pounds valued at $11,403,887 compared with 115,084,900 at $5,221,163 in 1916; in 1913, 116,062,000 pounds of tin plate valued at $3,954,615 were imported.

Table 32 - AVAILABLE STATISTICS ON THE CONSUMPTION OF TIN IN SPECIFIED CANADIAN MANUFACTURING INDUSTRIES, 1936-1938.

Industry	Item (used)	1936	1937	1938
		Pounds	Pounds	Pounds
Brass and Copper Products	(Ingots	276,414	384,685	269,050
	(Scrap	12,290	7,540	11,736
	(Other	3,533	2,774	13,225
White Metal Alloys	Pig	2,940,320	3,207,124	2,756,326
Iron and Steel and Their Products +	Tin	1,144,865	1,324,562	1,400,000

+ Includes castings and forgings; boilers, tanks and engines; farm implements; machinery; hardware and tools; sheet metal products; wire; railway rolling stock; heating and cooking apparatus; automobile parts, etc., partly estimated.

Data for 1939 not yet complete.

Table 33 - WORLD PRODUCTION OF TIN, 1937 and 1938. (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
BRITISH EMPIRE		
United Kingdom	1,987	1,999
Nigeria	10,782	7,305
Northern Rhodesia	5	3
Southern Rhodesia	139	267
South West Africa	169	164
Swaziland	108	122
Tanganyika Territory	243	241
Uganda (exports)	361	399
Union of South Africa	538	558
Burma	4,636	4,412
Federated Malay States	75,117	41,206
Unfederated Malay States	2,075	2,041
Straits Settlements	72	114
Australia	3,256	3,329
TOTAL	99,000	62,000

Table 33 - WORLD PRODUCTION OF TIN, 1937 and 1938. (concluded) (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
FOREIGN COUNTRIES		
Germany	(a)	(a)
Italy	60	5
Portugal	1,095	1,036
Belgian Congo	8,133	9,025
Cameroon (French)	258	242
Morocco (French)	14	...
Mozambique	6	(a)
Mexico	373	249
United States	168	109
Argentina	1,423	(a)
Bolivia (exports)	25,128	25,484
Peru	173	103
China (smelter)	11,100	11,600
French Indo-China	1,577	1,599
Japan	2,300	2,300
Netherlands East Indies	39,165	27,299
Siam	15,786	14,704
TOTAL	107,000	95,000
WORLD'S TOTAL	206,000	157,000

NOTE - In the case of countries for which assay figures are not published the metal content of the ores has been estimated on the following percentages - South West Africa 70, Swaziland 70, Uganda 70, Burma 70, Belgian Congo 70, Japan 70, Siam 72.
(a) Information not available.

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-tantalite 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.

Nigeria has been the principal producer of columbite and Australia of tantalite. Columbo-tantalit is also produced in the Black Hills, South Dakota, U.S.A. The U.S. Bureau of Mines Minerals Year Book, 1938, refers to the recovery of columbo-tantalite at Manono, Katanga, Belgian Congo, as a by-product of the tin-mining operations of Geomines and its smelting in Brussels to an iron-tantalum-columbium alloy. The United States has taken most of the output of Nigeria and Australia. Imports of columbium ore into the United States in 1937 aggregated 461 short tons valued at $306,086, all from Nigeria except 540 pounds valued at $245 from Brazil. Tantalum ore imports in the United States in 1937 were 20,897 pounds valued at $40,742, all from Australia. In 1938 the imports of tantalite into the United States rose to 41,706 pounds valued at $80,092; the imports of columbite declined to 645,141 pounds valued at $228,078. The Fansteel Metallurgical Corporation, North Chicago, Illinois, treat columbium and tantalum ores in the United States. Data relating to possible Canadian imports of columbium and tantalum ore or alloys are not published.

"Metal and Mineral Markets", New York, quoted tantalum ore August 17, 1939, - per pound Ta_2O_5, $1.50 to $2.50 per 60 per cent concentrate, the price depending on source of supply. Columbium metal per kilo. base prices: rod $560; sheet $500. Tantalum metal per kilo, base price, $160.60 for C.P. rod, sheet $143; discounts on volume business. These same prices were quoted May, 1940.

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 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.

Paul M. Tyler of the U. S. Bureau of Mines refers to the current uses of titanium as follows:- "Although pigments continue to represent the chief outlet for ilminite, other fields of use are not being neglected. In metallurgy titanium is not only an effective deoxidizer and cleansing agent, but an alloying element as well. By addition of titanium, chrome-nickel steels are made more resistant to corrosion and chrome-molybdenum steels become easier to weld. In aluminium and sundry non-ferrous alloys, titanium refines the grain and otherwise contributes to better structure. A variety of low carbon as well as high and medium carbon alloys are now available, in addition to the older alloys that first found extensive application only for treating sheet steel and rails. To avoid employing expensive alloys W. Mathesius has patented (British) a process for introducing titanium into molten steel by carbon reduction from a cover slag. In welding-rod coatings, the principal function of rutile is to stabilize the ore, though it also tends to prevent the inclusion of oxides and nitride needles in the deposited metal."

Because of their great whitening and obliterating power, titanium pigments continue to be employed widely in paint, rubber, linoleum, leather, plastics, soap, printing inks, paper, textiles and ceramics.

Imports into Canada of antimony oxide, titanium oxide and white pigments containing not less than 14 per cent by weight of titanium totalled 4,710,481 pounds valued at $512,219 in 1938 compared with 9,003,693 pounds at $803,198 in 1939. Of the 1939 imports 1,689,329 pounds came from the United Kingdom and 7,302,923 pounds from the United States. No imports into Canada of titanium ore or rutile were recorded in 1939.

The bulk of the ilmenite used in the United States is imported from British India and is consumed in the manufacture of titanium pigments. Imports of rutile into the United States in 1939 was almost twice as large as in 1938; Australia is the leading foreign source with Brazil second.

United States quotations for titanium ore January, 1939, were:- Per gross ton, ilmenite, 45 to 52 per cent TiO_2, F.O.B. Atlantic seaboard $10 to $12, according to grade and impurities. Rutile, per pound, guaranteed minimum 94 per cent concentrate, 10 cents, nominal; 88 to 90 per cent, $55 per ton, C.I.F. New York ferrocarbontitanium per ton $142.50 F.O.B. producer's plant. Quotations April, 1940, were:- titanium ore, per gross ton ilmenite, 50 to 60 per cent TiO_2, F.O.B. Atlantic seaboard $16 to $18 according to grade and impurities. Titanium, per pound 96 to 98 per cent, $5.00 to $5.50. Ferrocarbontitanium per ton $142.50 F.O.B. producer's plant.

Table 34 - 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.

Table 35 - CONSUMPTION OF TITANIUM PIGMENTS IN CANADIAN PAINT INDUSTRY, 1931 - 1938

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

(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 and in 1938, 1,341,359 pounds at $200,552.

Data for 1939 not yet complete.

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

In 1938 there were 76 tons of ferrotitanium valued at $14,547 consumed in the manufacture of steel in Canada.

Table 36 - WORLD'S PRODUCTION OF TITANIUM MINERALS, 1937 and 1938. (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
BRITISH EMPIRE		
South West Africa - Rutile	16	...
Canada (shipments) - Titaniferous iron ore	3,776	185
Federated Malay States (exports) - Ilmenite	6,252	6,462
India - Ilmenite	181,047	252,220
Australia - Ilmenite	670	(a)
Rutile	1,123	(a)
Rutile-ilmenite	72	(a)
FOREIGN COUNTRIES		
Norway - Ilmenite	66,270	(a)
Rutile	184	(a)
Portugal - Ilmenite	1,433	559
Cameroon (French) - Rutile	101	116
Egypt	315	89
Senegal - Ilmenite	3,026	8,303
Brazil (exports) - Ilmenite	230	312
Rutile	644	211

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.

The only important production of tungsten ore in Canada reported previous to 1918 is that of 1912, being 14 tons of concentrates produced by the Scheelite Mines Limited, of Moose River, Nova Scotia. In 1915 the British Government commandeered all supplies of tungsten concentrates within the Empire at a fixed price of 55 shillings ($13.50) per unit (22.4) pounds of contained tungstic acid.

In 1917 a small test shipment of a few hundred pounds was made from Halifax County, Nova Scotia, and another from Dublin Gulch, Mayo District, Y.T., amounting in all to 580 pounds running 69.41 per cent WO_3 and netting $234. The production in 1918 amounted to 13½ tons valued at $11,700 and with a small metallic content of 19,915 pounds of WO_3. This production consisted of 11 tons of concentrates shipped to New York by the Acadia Tungsten Mines Limited, operating at Burnt Hill, New Brunswick, with also a few small consignements to the Mines Branch Testing Plant, Ottawa, from Nova Scotia, Manitoba and the Mayo district, Yukon. A concentrating mill was erected in 1912 by the Scheelite Mines Limited, operating the Moose River Properties in Nova Scotia and in 1916 a concentrating mill was erected at Burnt Hill, N.B., by the Acadia Tungsten Mines Company. The Burnt Hill mines were inspected in 1917 for the Munitions Resources Commission, Ottawa, and it was then reported that there was some tonnage of wolframite ore, but that the operators could not afford to produce concentrates at the official British price of 55 shillings per unit.

Scheelite was discovered near Falcon Lake, Eastern Manitoba, in March, 1918, and operations were carried on in the district during the year by a new company, the War Metals Production Company Limited. In 1918 it was also reported that the Cariboo Chisholm Creek Mining Company Limited, Van Winkle, B.C., had been operating the old deposit on Hardscrabble Creek in the Cariboo District.

The price of scheelite on the New York market was around $26 per unit during January and February, 1918; with the signing of the armistice, business came to a complete stop and there were no quotations for November and December, 1918.

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. 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. In December, 1939, two shafts at North Waverley, Nova Scotia, were cleaned out to investigate scheelite occurrences explored there at the close of 1918. During the year under review both surface and underground work were carried out at the Lake Charlotte tungsten mines, Halifax County, Nova Scotia. These operations were conducted by Guysborough Mines Limited and extended from July 15 to the end of the year. In the province of Quebec a tungsten bearing deposit near Guigues was prospected by the Syndicate Minier de Gaboury.

It is also interesting to note that tungsten is reported to occur with gold in the veins of the Slave Lake Gold Mines Limited property, Outpost Island, Slave Lake, Northwest Territories; it is stated that recent sampling of the mine revealed encouraging tungsten values.

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.

China has been the principal world producer of tungsten ores and the production in that country has been adversely affected by the Sino-Japanese War. Exports in 1938 were 13,387 metric tons (60 per cent WO_3 basis) compared with 17,895 tons in 1937 according to the U.S. Bureau of Mines. It was reported early in 1939 that the Chinese Government had granted to the Peiping Syndicate, Limited, exclusive selling rights for Chinese tungsten ore, including the stocks in Hong Kong.

Output in Burma comes principally from the Herminggi and Mawchi mines. The ore reserves of the Mawchi mine are said to contain 3.24 per cent tin and tungsten; exports from Burma in 1938 were 10,598 metric tons.

Table 37 - TUNGSTEN ORE AND CONCENTRATES IMPORTED FOR CONSUMPTION IN THE UNITED STATES, 1938 and 1939.+
By Countries

	1938			1939		
	Gross weight (pounds)	Tungsten content (pounds)	Value	Gross weight (pounds)	Tungsten content (pounds)	Value
			$			$
Argentina	...	...	...	141,872	76,524	50,324
Australia	...	...	...	102,216	56,639	42,196
Bolivia	2,286	705	961	180,019	96,164	77,342
British Malaya	108,765	67,460	58,346	200,843	123,682	113,063
Burma	...	...	...	24,576	12,878	8,683
China	138,380	69,986	42,350	1,656,307	899,806	587,489
Ecuador	...	...	...	37,440	21,326	7,500
French Indo China	...	...	...	5,630	2,876	2,832
Mexico	27,585	1,360	1,051	306,907	146,637	89,352
Peru	...	...	...	87,662	48,625	19,190
Union of South Africa	45,069	23,233	35,985	...	...	...
TOTAL	322,085	162,744	138,693	2,743,472	1,485,157	997,971

+ According to the Bureau of Foreign and Domestic Commerce, Washington, D. C.

In addition, 589,828 pounds of tungsten in concentretes were imported in bond for smelting, refining and export compared with 828,660 pounds in 1938.

Imports into the United States of tungsten metal and tungsten carbide in 1939 were 39,498 pounds (metallic content) compared with 22,814 pounds in 1938. About 99 per cent of the 1939 total came from the United Kingdom. Imports of tungstic acid and other compounds of tungsten were 700 pounds (metallic content) in 1939 compared with 241 pounds in 1938, Germany and Hungary supplying the entire 1939 total.

Exports from the United States of tungsten metal, wire, shapes, and alloys other than ferrotungsten (for which export data are not available) decreased to 194,926 pounds in 1939 from 256,185 pounds in 1938.

"Metal and Mineral Markets", New York, quoted tungsten ore, January, 1939, - per unit of WO_3 N. Y.: Chinese wolframite $19.50, duty paid. Domestic scheelite, known good analysis, carload lots or more $6.00 to $19.00. Ferrotungsten per pound of tungsten contained 75 to 80 per cent tungsten $1.60 to $1.70. September 1939: tungsten ore - per unit of WO_3, N. Y.: Chinese wolframite nominal at $23.75 duty paid. Domestic scheelite, carload lots $25.00. Tungsten metal - per pound - 98 per cent, powdered $1.85; 99.5 per cent $2.50 to $2.75; 99.9 per cent $5 nominal. Chinese tungsten ore was quoted May, 1940, per short ton unit of WO_3 - duty paid - New York $23.00.

Table 38 - IMPORTS INTO CANADA OF SPECIFIED TUNGSTEN PRODUCTS, 1938 - 1939.

	1938		1939	
	Quantity	$	Quantity	$
Tungsten carbide +	...	720	...	246
Chromium metal and tungsten metal (a) lb.	43,527	30,328	55,428	50,769
Metallic elements and tungstic acid for lamps	...	71,730	...	157,369

+ From November 12, 1938.
(a) In lumps, powder, scrap alloy, etc. for alloying purposes.

Table 39 - TUNGSTEN WIRE USED IN THE MANUFACTURE OF CANADIAN ELECTRICAL APPARATUS AND SUPPLIES, 1931-1938.

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

In 1938 there were 30 tons of ferrotungsten valued at $69,806 consumed in Canada in the manufacture of steel.

Table 40 - WORLD'S PRODUCTION OF TUNGSTEN ORE AND CONCENTRATES, 1937 and 1938. (Taken from the Imperial Institute's publication - The Mineral Industry of the British Empire and Foreign Countries)
(Long tons)

Producing Country	1937	1938	Estimated WO_3 content. 1937	1938
BRITISH EMPIRE				
United Kingdom - Concentrates	127	218	83	152
Nigeria - Concentrates	8	48	5	31
South West Africa - Wolfram	28	36	19	25
Scheelite	9	8	5	5
Southern Rhodesia - Concentrates	246	299	160	194
Tanganyika Territory - Wolfram	2	3	1	2
Uganda - Wolfram	1	1	1	1
Union of South Africa - Tungsten ore	34	110	25	75
Burma - Concentrates	4,998	5,343	3,249	3,473
Federated Malay States - Wolfram	27	29	19	20
Scheelite	836	573	602	412
India - Concentrates	13	10	8	6
Unfederated Malay States - Wolfram	242	289	157	187
Australia - Wolfram	726	979	472	636
Scheelite	12	40	8	26
New Zealand - Concentrates	24	46	16	30
FOREIGN COUNTRIES				
France - Tungsten ore	1	21	...	13
Italy - Tungsten ore	5	7	2	3
Norway - Wolfram	3	(a)	2	(a)
Portugal - Concentrates	1,776	2,381	1,190	1,603
Tin-tungsten ores	90	138	33	57
Sweden - Tungsten Ore	136	195	75	108
Egypt - Tungsten ore	176	(a)	(a)	(a)
Morocco (French) - Tungsten ore	...	6	...	4
Mexico	30	69	20	45
United States - Concentrates	3,125	2,718	1,875	1,631
Argentina - Concentrates	752	(a)	520	(a)
Bolivia (exports) - Concentrates	1,774	2,490	1,064	1,494
Brazil (exports) - Tungsten ore	7	2	4	1
Chile - Concentrates	4	(a)	3	(a)
Peru - Concentrates	70	(b) 157	17	(b) 100
China (exports) - Ore	16,257	12,163	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	...	...	...	...
Siam - Concentrates	89	227	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.

Data relating to possible imports of vanadium ores or vanadium compounds or alloys are not shown separately in Canadain trade reports. In 1938 these were 11 tons of ferrovanadium valued at $25,324 consumed in Canada in the manufacture of steel.

It was recently reported that vanadium may be recovered at German ferrous smelters from the treatment of pig iron made from vanadium bearing iron ores. Plant for the recovery of vanadium was completed in 1938 in Japan by the Japan Iron Sand Industrial Company.

"Metal and Mineral Markets", New York, quoted vanadium ore, January 12, 1939, - per pound V_2O_5 contained, 27½ cents F.O.B. shipping point. Ferrovanadium, per pound of vanadium contained, delivered $2.70 to $2.90. These same prices were quoted May, 1940.

Table 41 - WORLD PRODUCTION OF VANADIUM IN ORES AND CONCENTRATES, 1937-38, IN METRIC TONS. (United States Bureau of Mines)

Country	1937	1938
Mexico	45	180
Northern Rhodesia	235	374
Peru	583	102
South West Africa	591	557
United States	493	732

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.

"Mineral Industry" states - "Zirconium wire is used in radio tubes and sheet metal in spinneret cups for rayon manufacture. Zirconium-silicon and zirconium-ferrosilicon are finding a growing use in steel making and zirconium powder is used in flashlight mixtures and in ammunition primers; from a tonnage standpoint, however, the main uses of zirconium compounds are in enamels and for electrodes or welding-rod coatings, as a scavenger for oxides and nitrides in steel, and as a refractory."

According to Industrial and Engineering Chemistry, zirconium is used successfully in the form of zircon and sodium zirconium silicate in enamel and glaze frits, to produce opacity; as zirconium oxide it is used as a smelt in the frit and more recently as a mill addition opacifier.

Imports into Canada of zirconium silicate in 1939 were appraised at $5,589 while those of zirconium oxide in the same period were valued at $40,096 compared with $24,983 in 1938. Data relating to possible imports of zirconium alloys are not published.

Zirconium alloy was quoted by "Metal and Mineral Markets", January, 1939, - 12 to 15 per cent zirconium, 39 to 43 per cent silica, $97.50 to $102.50 per gross ton; 35 to 40 per cent zirconium, 47 to 52 per cent silica, 14 to 16 cents per pound. Zircon ore per ton, 55 per cent ZrO_2, F.O.B. Atlantic seaboard, carload lots, $55; 5 ton lots, $60. Crude granular zircon, $70, F.O.B. Suspension Bridge, New York; milled $90. The same prices were quoted May, 1940.

Table 42 - PRINCIPAL STATISTICS(x) OF THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1938 and 1939.

		1938	1939
Number of firms		19	31
Capital employed (a)	$	1,380,035	3,074,999
Number of employees - On salary		39	40
On wages		90	291
Total		129	331
Salaries and wages - Salaries	$	37,216	62,477
Wages	$	108,335	392,801
Total	$	145,551	455,278
Value of production (gross)	$	8,909	524,977
Cost of fuel and electricity	$	10,749	92,405
Process supplies used	$	6,131	81,991
Smelter charges	$	...	...
Freight	$	26	1,177
Value of production (net)	$	-7,997	349,404

(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 - 1939.

	1938	1938		
		Surface	Underground	Mill
January	56	108	29	7
February	59	123	16	4
March	66	149	13	4
April	83	159	26	5
May	50	206	16	4
June	91	258	25	6
July	82	244	29	37
August	77	296	36	45
September	87	284	42	50
October	133	292	43	59
November	150	310	53	62
December	141	296	59	60

Table 44 - FUEL AND ELECTRICITY CONSUMED, 1939.

Kind		Quantity	Cost
			$
Bituminous coal - Canadian	short ton	...	...
Imported	short ton	37	296
Coke	short ton	7,096	29,695
Gasoline	Imp. gal.	4,696	1,377
Kerosene	Imp. gal.	311	81
Fuel oil and diesel oil	Imp. gal.	209,197	25,747
Wood	cord	1,500	4,977
Other fuel			22
Electricity purchased	K. W. H.	3,574,442	30,210
TOTAL	$		92,405

Table 45 - POWER EQUIPMENT INSTALLED, 1939.

Description	Number	Horse Power
Steam engines	1	65
Electric motors	135	3,911
Diesel engines	11	697
Gasoline engines	13	239
Boilers	9	140

DIRECTORY OF FIRMS IN THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1939.

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.
Baie St. Paul Titanic Iron Ore Co. Product - Titanium ore	Baie St. Paul, P. Q.	St. Urbain, P. Q.
Berggren, Chester Product - Antimony ore	R. R. 2, Bedford, N. S.	West Gore, N. S.
Calgary Chrome Ore Synd. (x) Product - Chrome ore	214 Southam Block, Calgary, Alberta	Ashcroft, B. C.
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.
Columbia Tungstens Co. Ltd. Product - Tungsten ore	61 Broadway, New York City, U. S. A.	Wells, B. C.
Consolidated Mining & Smelting Co. of Canada, Limited Products - Bismuth, Cadmium, Antimony, lead, zinc, silver, mercury (x), and gold.	C. P. R. Bldg., Montreal, P. Q.	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.
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	728 W. Hastings St., Vancouver, B. C.	Mud Creek, B. C.
Fenton, I. G. O. Product - Manganese ore	60 Queen St., St. John, N. B.	Turtle Creek, N. B.
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.	Woodstock, Ont.	Flin Flon, Man.

DIRECTORY OF FIRMS IN THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1939. (Concluded)

Name of Firm and Product	Head Office Address	Location of Mine or Plant
International Nickel Co. of Canada, Ltd. Products - Selenium, Tellurium, Copper, gold, silver, nickel salts.	Copper Cliff, Ont.	Copper Cliff, Ont.
Kenopo Mining & Milling Co. Ltd. (x) Product - Molybdenite	Box 910, Kenora, Ont.	Ewart Tp., Ont.
Kindale Mines Ltd. (x) Product - Molybdenite	231 St. James St., Montreal, P. Q.	Masham Tp., P. Q.
Kirkpatrick Tungsten Synd. Product - Tungsten ore	Goff, N. S.	Goff, N. S.
Lamarche, J. H. (x) Product - Molybdenite	Mont Laurier, P. Q.	Mont Laurier, P. Q.
Langly, Alfred (Stella) (x) Product - Molybdenite	Fraser Lake, B. C.	Endako, B. C.
La Reine Holdings 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.
Maniwaki Molybdenum Mines Ltd. (x) Product - Molybdenite	774 Notre Dame W., Montreal, P. Q.	Maniwaki, P. Q.
McKay (Quebec) Exploration Ltd. (x) Product - Iron ore	Room 401, Canadian Pacific Express Bldg., Montreal, P. Q.	Ungava, P. Q.
Molybdenite Corp. of Canada, Ltd. Product - Molybdenite	445 St. Francois-Xavier St., Montreal, P.Q.	Abitibi Dist., P. Q.
Munro & MacLennan Product - Manganese ore	Bank of Nova Scotia Bldg., Truro, N. S.	East Mountain, N. S.
North American Molybdenum Corp. Ltd.(x) Product - Molybdenite	Room 602, 112 Yonge St., Toronto, Ont.	Renfrew Co., Ont.
Powell River Molly Claims (x) Product - Molybdenite	Box 786, Powell River, B. C.	Powell River, B. C.
Quyon Molybdenite Co. Ltd. Product - Molybdenite	Quyon, P. Q.	Quyon, P. Q.
Regnery Metals Product - Molybdenite	Hawk Junction, Ont.	Algoma Dist., Ont.
St. James Antimony Co. Product - Antimony ore	3760 West 29th Ave., Vancouver, B. C.	Fort St. James, B. C.
Siscoe Gold Mines Ltd. (x) Product - Tungsten ore	907 Dominion Square Bldg., Montreal, P. Q.	Lunenburg, N. S.
Steep Rock Iron Mines Ltd. (x) Product - Iron ore	25 King St. W., Toronto, Ont.	Atikokan, Ont.
Syndicate Minier de Gaboury (x) Product - Tungsten ore	Guigues, P. Q.	Gaboury, P. Q.
Thetford Ferro-Chrome reg. (x) Product - Chromite	Thetford Mines, P. Q.	Coleraine Tp., P. Q.

(x) Active but not shipping.