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CANADA

DEPARTMENT OF TRADE AND COMMERCE

DOMINION BUREAU OF STATISTICS

CANCELLED
Date

Report

on

MISCELLANEOUS METALS IN CANADA, 1934

including

Aluminium	Mercury
Antimony	Molybdenite
Beryl	Radium - Uranium
Bismuth	Selenium
Cadmium	Tellurium
Chromite	Tin
Lithium	Titanium (ilmenite)
Magnesium	Tungsten
Manganese	Vanadium

Published by Authority of the HON. R. B. HANSON, K.C.,
Minister of Trade and Commerce.

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1935

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Minister of Trade and Commerce

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

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Chief - Mining, Metallurgical and Chemical Branch: W. H. Losee, B.Sc.

MISCELLANEOUS METALS, 1934.

Finally revised statistics on, and a review of, the production of aluminium, antimony ores, beryl, bismuth, cadmium, chromite, lithium, magnesium, manganese, mercury, molybdenite, radium-uranium, selenium, tellurium, tin, titanium (ilmenite), tungsten and vanadium during 1934, as reported by the Mining, Metallurgical and Chemical Branch of the Dominion Bureau of Statistics at Ottawa, follows:

ALUMINIUM - Aluminium ores (bauxite) are not mined in Canada. In 1934 new aluminium was produced in Canada only at the Arvida reduction plant of the Aluminum Company of Canada, Limited, and was reduced from alumina obtained from foreign ores. The company's slag ore plant at Arvida, Quebec, and its reduction works at Shawinigan Falls in the same province were both inactive throughout the year. Production of the company in 1934 comprised aluminium fabricated products made at Shawinigan Falls, Quebec, and aluminium ingot produced at Arvida. Both the Shawinigan fabricating plant and the Arvida reduction works were in continuous operation during the entire year. Owing to the fact that only one Canadian company produces primary aluminium, the statistics relating to smelting operations in this industry have been included with data supplied by smelters producing other non-ferrous metals.

"To-day the capacity of the various aluminium reduction works of the United States, Canada, Scotland, Norway, France, Switzerland, Italy, Austria, Germany, Russia and Spain could supply nearly 400,000 tons of virgin aluminium a year and yet half a century ago barely 50 tons of this metal had been produced at a cost of roughly 30s. a pound ..... the light alloy has become an essential material for many purposes and cannot be replaced for aeronautical uses. The subject of aluminium alloys deserves separate treatment as the whole future of the aluminium industry is dependent on these light alloys. They are already to aluminium what steel is to iron and some of them hold positions to others as special steels hold to normal steel. It is tolerably well known that almost every ounce of virgin aluminium is produced from bauxite. In fact the bauxite industry was established as a result of the demands of the aluminium industry, just as was the Greenland cryolite industry, which still remains almost entirely dependent on the aluminium industry. However, new supplies of bauxite, or its equivalent - aluminous laterite - are being discovered almost every year in various parts of the world. The best known occurrences are those of the United States and France, but in Europe valuable deposits occur in Hungary, Italy and in Jugoslavia. The aluminous laterites of Dutch and British Guiana are also now well known and those of India, West Africa and East Africa await development. Although the greater part of the world's production of bauxite is used in the aluminium industry, after refining to alumina, for reduction to aluminium, increasingly large quantities of bauxite are used for the preparation of aluminium

sulphate and alums; in the manufacture of high grade refractories and abrasives of the emery type; in the manufacture of aluminous cements; and for the decolourisation and deodourisation of kerosene, etc. Roughly 4 tons of bauxite are required for the recovery of one ton of aluminium ... actually continues the "Deutsche Bergwerks Zeit" a substitute material has been developed for tin plate, tin ware, and many other uses of tin, which technically and economically is superior. This material is made by a process in which steel or iron plate is given an aluminium coating in a molten bath of aluminium. This aluminium coating is very thin, but is highly resistant against acid attack, and, therefore, particularly suitable for making containers for preserved goods .... In another direction, the development of substitute material for tin is being carried out by a manufacturer of aluminium foil. This development is a method by which both sides of paper can be given a coating of aluminium foil, rendering it perfectly impervious to air and moisture and very suitable for enclosing preserved foods. The advantage of the material is a great saving in weight compared to the use of tinned containers." (The Mining Journal - London)

The United States Bureau of Mines reports that in the automobile industry aluminium is finding increased use in the construction of trailers and chiefly as a result of recent disasters at sea, the use of various metals, including aluminium, is receiving serious consideration for bulkheads and cabin construction. Cabin walls constructed of layers of aluminium sheet with cellular asbestos are claimed to be not only fireproof but to reduce materially the weight of walls.

"A huge aluminium works has started working in Dniepropertrovsk. This is the biggest enterprise of the aluminium industry ... it has an output capacity of 40,000 tons of aluminium per annum. The Dniepropetrovsk works was begun in 1931 and cost about 200 million rubles. It is now the largest aluminium producing works in the Union. Enormous reserves of the necessary raw material (bauxite) have been discovered on U.S.S.R. territory and as there was no known source of natural cyrolite in the Union, a works was built for the production of synthetic cryolite." (U.S.S.R. Chamber of Commerce - Moscow).

IMPORTS INTO CANADA AND EXPORTS OF ALUMINIUM, ALUMINA BAUXITE AND CRYOLITE, 1933 and 1934.

	1933		1934	
	Cwt.	$	Cwt.	$
IMPORTS -				
Alumina	753	8,461	1,052	12,235
Bauxite	1,050,641	1,750,230	1,639,070	2,170,878
Cryolite	47,327	204,357	3,345	27,718
Aluminium in pigs, ingots, blocks, notch bars, slabs, billets and blooms	1,091	26,882	796	18,907
Aluminium scrap	1,394	21,794	3,520	45,174
Aluminium in bars, rods and wire	452	14,570	2,480	78,155
Aluminium in plates, sheets and strips, including circles	7,993	239,395	12,198	336,469
Aluminium pipes and tubes	463	21,439	805	38,694
Aluminium leaf, less than .005 mm. thick(x)	...	...	...	2,023
Aluminium kitchen or household hollow-ware, n.o.p.	...	61,428	...	92,411
Aluminium, manufactures of, n.o.p.	...	405,103	...	433,797
Aluminium leaf, n.o.p., or foil less than .005 inch think, plain or embossed	...	40,579	...	53,470
Aluminium powder lb.	30,073	14,382	109,673	48,137
Other	...	4,768	...	4,360
TOTAL ALUMINIUM AND ITS PRODUCTS	...	2,813,388	...	3,362,428

(x) From April 15, 1934.

IMPORTS INTO CANADA AND EXPORTS OF ALUMINIUM, ALUMINA, BAUXITE AND CRYOLITE, 1933 and 1934 (concluded)

	1933		1934	
	Cwt.	$	Cwt.	$
EXPORTS -				
Aluminium scrap	14,988	176,269	27,969	354,617
Aluminium in bars, blocks, etc. -				
To - United Kingdom	228,607	4,035,786	264,946	4,566,765
United States	17,464	284,265	30,499	502,995
Argentina	3,031	60,251	284	6,517
Brazil	1,562	34,292	344	7,294
China	5,709	103,359	72	2,611
Australia	232	4,686	3,055	72,991
Japan	77,728	1,358,987	74,940	1,233,867
Netherlands	...	...	22,669	375,383
British India	954	22,719	17,808	375,356
Belgium	1,222	22,637	632	13,594
Mexico	987	21,195	474	10,711
Other countries	1,639	31,811	1,747	38,457
Total in bars, blocks, etc.	339,135	5,979,988	417,470	7,206,541
Aluminium kitchen utensils and hollow-ware	...	8,634	...	11,920
Aluminium, manufacture of, n.o.p.	...	137,083	...	434,564
TOTAL ALUMINIUM AND ITS PRODUCTS	...	6,301,974	...	8,007,642

WORLD'S PRODUCTION OF ALUMINIUM

(Taken from the 1934 Year Book of the American Bureau of Metal Statistics)

(In metric tons)

Country	1929	1932	1933	1934
United States	102,100	47,600	38,600	33,646
Canada	42,000	18,000	16,200	15,500
Total North America	144,100	65,600	54,800	49,146
France	29,083	14,200	14,300	16,000
Switzerland (a)	20,700	8,500	7,500	8,100
Germany (a)	32,700	19,000	18,932	37,158
Austria (a)	4,000	2,100	2,000	2,100
Great Britain (a)	13,900	10,300	11,000	12,500
Norway	29,142	17,787	15,384	15,500
Italy	7,373	13,413	12,072	12,800
Spain	1,000	1,154	1,154	1,200
Russia	...	1,000	4,400	14,400
Sweden	...	...	...	200
Total Europe	137,898	87,454	86,742	119,958
Total World (b)	281,998	153,054	141,542	169,104
Average price in cents per pound - New York (x)	23.90	23.30	23.30	21.58

(a) Metallgesellschaft. (b) Omitted from this table are possibly small products in Belgium and Japan, as to which information is uncertain.

The Alliance Aluminum Co. (the European Cartel) produced in 1933 at the rate of 50% of capacity. Its stock of metal at the end of 1933 was reported as 135,000 metric tons, vs. 153,000 at end of 1932 and 218,000 at end of 1931. Figures for the end of 1934 are unavailable, but the statement has been made that "owing to the general increase in sales of aluminium in 1934 the large stocks of the metal were reduced materially." There was also reduction of the large stock of ingot aluminium in the United States.

(x) These quotations especially in recent years are in excess of prices actually realized on large-scale business.

ANTIMONY - Minerals containing antimony occur in Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba and British Columbia, also in the Yukon. No sales or shipments of antimony ores have been reported in Canada since 1917 and no by-product production of the metal since 1926 in which year it was recorded as a metal content of silver-lead-bismuth bullion obtained in the treatment of ores from the Cobalt district. The greater part of the Canadian output of refined antimony was produced at Trail, British Columbia, in the years 1907, 1909, 1915 and 1916 by the Consolidated Mining and Smelting Company of Canada, Limited; the metal was recovered as a by-product in the treatment of silver-lead ores.

Antimony is employed largely as an alloying element in bearing metals. Its power in reducing the shrinkage of crystallization in lead has favoured its utilization in type metal alloys; the metal in the liquid state also possesses practically the same volume as when solid.

The average price for antimony on the New York market in 1934 was 8.901 cents per pound as compared with a price of 6.528 cents in 1933 and 5.592 cents in 1932.

IMPORTS OF ANTIMONY AND ANTIMONY PRODUCTS INTO CANADA, 1933 and 1934.

	1933		1934	
	Pounds	$	Pounds	$
Antimony or regulus of, not ground, pulverized or otherwise treated	626,854	32,796	625,432	45,124
Antimony oxide and titanium oxide (x)	...	...	983,539	131,005
Antimony salts - tartar emetic, etc.	28,861	4,371	41,926	5,297
Antimony salts for dyeing	57,138	2,288	112	43

(x) From April 1, 1934.

WORLD'S PRODUCTION OF ANTIMONY ORE

(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	1931	1932	1933
BRITISH EMPIRE			
Canada (ore)	22	...	...
Australia	42	60	47
FOREIGN COUNTRIES			
Czechoslovakia	556	588	1,341
France	811	630	(a)
Greece	268	325	(a)
Italy	331	372	364
Yugoslavia	358	...	...
Algeria	100	261	(a)
Morocco (Spanish)	70	100	40
Mexico	5,357	1,317	1,919
United States	...	374	524
Argentina	...	...	12
Bolivia (exports)	1,327	1,446	1,866
Peru	...	31	39
China	13,108	12,191	12,600
Japan (ore)	28	66	(a)
Korea (ore)	...	7	21
Turkey	21	...	44

(a) Information not available.

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. No beryl mining operations in Canada were reported in 1934.

"The use of beryllium increased approximately fourfold during 1933. Beryllium-copper alloys continued to provide the principal commercial outlet for the metal, and approximately 90 per cent of the domestic consumption was used for this purpose. Another growing application is the utilization of beryllium oxide as a refractory. A considerable part of the beryl supply in the United States was drawn from the Black Hills of South Dakota, but additional quantities were obtained from scattered pegmatites in other states. Arrangements were perfected for obtaining additional quantities of beryl from British India, and deposits in other foreign countries were investigated as potential sources. The raw material situation does not indicate that beryllium is likely to become a cheap metal soon, but possibilities are that its use will continue to grow at an accelerated pace, and resulting savings in cost will be shared by consumers ... The discovery of large deposits of beryl in the Ghedem Mountains in Eritrea was reported; reports from Germany indicate that investigations in the laboratories of Heraeus-Vacuum Smelze A/G., of Hanau have resulted in the successful reduction of beryllium directly from its oxide to copper or nickel alloys ... A tract on the west side of the Cordon de la Bolsain the Sierra de la Madera Montezuma municipality in the State of Sonora, Mexico, was declared by the ministry to be part of the national mineral reserves for the exploitation of beryllium. The consumption of beryl in the United States increased to approximately 35 tons monthly at the end of 1933." (1)

The tensile strength of annealed copper is about 33,000 pounds per square inch and it is stated that by adding 1.5 to 2.5 per cent beryllium and by heat treatment the tensile strength can be raised to 200,000 pounds per square inch.

"To a notable extent beryllium possesses the capacity for hardening most of the common metals even when present in small proportions and although its present cost is somewhat prohibitive (at a figure approximating to 30s. per pound) that is a factory of development which will change favourably as time and use bring it into greater demand following upon a widening recognition of its valuable properties. As has been the case with other metals in the "rare" list, those who have had its development in hand have hedged themselves around with protective patents or other devices, whilst the process of production has been and is specialised and difficult owing to its affinity for oxygen. Whilst this feature has made it an effective deoxydizer of other metals, it has created many difficulties in the attempt to reduce it to metallic form. Beryllium bronzes would appear to have a bright future - Much more will be heard both of beryl and beryllium." (2)

It is interesting to note that the value of beryl crystals produced in the Union of South Africa during 1934 totalled £10,608 as compared with a value of £4,220 in 1933.

Metal and Mineral Markets, New York, September, 1935 quotations for beryllium ore were - per ton carload lots, minimum 10 per cent BeO $30; minimum 12 per cent, $35, f.o.b. mines. Beryllium-copper-master alloy, 3.5 per cent beryllium, remainder copper, in lots of 250 lb. or more beryllium $25 per pound of contained beryllium.

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(1) Excerpts from United States Bureau of Mines 1934 Minerals Year Book.
(2) Excerpts from "The Mining Journal" London.

BISMUTH - Production of new bismuth in Canada in 1934 totalled 253,644 pounds valued at $301,215 as compared with 78,303 pounds worth $81,526 in 1933 and 16,855 pounds at $7,340 in 1932. The production in each of the three years consisted of the metal contained in silver-lead-bismuth bullion exported by the Deloro Smelting and Refining Company, Limited, Deloro, Ontario, and metallic bismuth produced at Trail, British Columbia, by the Consolidated Mining and Smelting Company of Canada, Limited. Output of the metal during the first six months of 1935 amounted to only 4,244 pounds valued at $3,109 as against 79,525 pounds worth $110,541 during the corresponding period of 1934.

Bismuth is utilized in the manufacture of various low melting alloys including some solders, and in the production of astringents and various chemical products.

Imports into Canada in 1934 of bismuth metal totalled 4,046 pounds valued at $4,864 as compared with 180 pounds worth $198 in 1933. Bismuth salts imported during 1934 were valued at $22,010 as against a value of $25,255 in 1933.

"Metal and Mineral Markets" quoted metallic bismuth, September, 1935, New York, at 90 cents per pound ton lots. London, 3s. 6d.

WORLD'S PRODUCTION OF BISMUTH

(Taken from the Imperial Institute's publication "The Mineral Industry of the British Empire and Foreign Countries")

(x) Production of Bismuth Ore, etc.

(Cwt.)

Producing country and description	1931	1932	1933
BRITISH EMPIRE			
Canada - Metal and content of bullion	1,055	150	699
India - Ore	42 lb.	27 lb.	80 lb.
Australia - Ore, etc.	792	405	50
FOREIGN COUNTRIES			
Germany (Saxony) - Bismuth-cobalt-nickel ore	1,299	2,154	(a)
Spain - Ore	2,244	650	1,516
Metal	531	669	512
Mexico - Ore (Bi content)	....	343	923
Bolivia (exports) - Ore, etc. (Bi content)	523	46	37
Peru - Metal	60	1,568	5,756
China - Ore (Bi content)	1,200	400	400
Japan - Metal	1,115	938	1,124

(x) Bismuth is also recovered as a by-product in the United States and the United Kingdom.

(a) Information not available.

CADMIUM - Cadmium production in Canada during 1934 was valued at $95,665 as compared with $78,733 in 1933 and $26,824 in 1932. The entire Canadian output of this metal is obtained at Trail, British Columbia, in the treatment of zinc bearing ores by the Consolidated Mining and Smelting Company of Canada, Ltd. Both the cadmium and bismuth plants of this company are by-product works and are only operated as occasion demands. Cadmium precipitate is obtained in the electrolytic zinc refining operations of the Hudson Bay Mining and Smelting Company, Limited, at Flin Flon, Manitoba; the amount of this precipitate on hand at the end of 1934 totalled 5,495 tons containing 3.63 per cent cadmium, 6.76 per cent copper, and 55.0 per cent zinc.

One of the principal industrial uses at present for cadmium is as a plating metal in automobile and aeroplane manufacture; it is also utilized in the preparation of pigments. Excellent results have been claimed for cadmium base alloys; new cadmium alloys reported in the United States include a cadmium-silver-copper bearing, for which greater efficiency is claimed compared with babbit metal and a cadmium-nickel bearing which utilizes cadmium for a base and contains about 1.3 per cent of nickel; this latter alloy is now being tested in the automobile industry. The metal is also used in low melting alloys.

The United States Bureau of Mines reports the production of metallic cadmium in the United States during 1934 at 2,777,384 pounds, an increase of 22 per cent over 1933. In addition to metallic cadmium, United States manufacturers reported production of the following cadmium compounds: cadmium sulphide, cadmium oxide, cadmium lithopone, cadmium selenide (cadmium red), cadmium hydrate, cadmium sulphate, and cadmium carbonate - the cadmium content of which was 566,700 pounds in 1934 compared with 401,400 pounds of cadmium in compounds in 1933, an increase of 41 per cent. Imports for consumption of cadmium metal into the United States in 1934 amounted to 125,955 pounds, of which 76,889 pounds were from Norway, 29,153 pounds from Germany, 11,094 pounds from Belgium and 8,819 pounds from Netherlands.

It was announced in February, 1935, by the U.S.S.R. Chamber of Commerce, Moscow, that the experimental electrolytic works of the Ridder combinate had developed a process of producing cadmium by electrolysis.

"Metal and Mineral Markets" - New York, reported cadmium - New York - at 85 cents per pound, September 20th, 1935. London, 4s. nominal.

WORLD'S PRODUCTION OF CADMIUM
(Lb. avdp.)

Producing Country	1931	1932	1933
BRITISH EMPIRE			
Canada	323,139	122,822	246,041(c)
Australia	445,158	354,620	357,313
FOREIGN COUNTRIES			
Belgium (exports)	6,400	51,400	183,400
France	181,167	274,451	355,000
Italy	17,600	13,752	15,700
United States -			
Metal	1,050,529	799,501	2,276,933
Compounds (metal content)	337,200	259,800	401,400
Mexico (b)	70,175	189,981	2,848,079

Cadmium is also produced in Germany, U.S.S.R. (Russia), Norway, Poland, Sweden, and South West Africa, but statistics are not available.

(b) Including cadmium content of flue dust, etc., exported for treatment.
(c) Excluding cadmium sponge produced at Flin Flon.

CHROMITE - The output of chromite in Canada in 1934 amounted to 111 tons valued at $1,578 as compared with 30 tons worth $343 in 1933. The production in 1934 came entirely from the Eastern Townships of Quebec and from the Obonga Lake area, Thunder Bay district, Ontario.

The Ontario Department of Mines reported development, to the end of 1934, on the Obonga Lake property of Chromium Mining and Smelting Corporation, Ltd., included one two compartment shaft, 350 feet deep, and about 600 feet of lateral work on the 100 foot level; a second shaft, 25 feet deep; about 3,000 feet of surface trenching; and 33 diamond drill holes, with a total footage of 6,150 feet. Shipments of ore were made in 1934 and the first half of 1935 to a smelter located at Niagara Falls, New York, and in August, 1935, it was announced that the Chromium Mining and Smelting Corporation, Ltd., had commenced smelting operations at Sault Ste. Marie, Ontario, where ferro-chromium will be produced.

The three principal uses for chromite are: (1) for the production of ferro-chromium; (2) for the production of bichromates and other chemical compounds of chromium, and recently the chemicals used in electroplating with chromium; and (3) as a refractory.

Chromium is a very important constituent of the so-called stainless steel alloys and the familiar heating element "nichrome" is an alloy containing approximately 20 per cent chromium. There is also a demand for chromium bronzes and chromium aluminium, both of which are characterized by high tensile strength. Chromite is utilized in the manufacture of emerald green glass and chrome oxide is extensively employed in the ceramic industry for black, green and brown glazes. Bichromate of soda is used in the tanning of light leathers and, as an oxidizing agent, is utilized in the manufacture of dyes and other synthetic chemicals.

IMPORTS OF CHROMIUM AND CHROMIUM PRODUCTS INTO CANADA, 1933 and 1934.

		1933		1934	
		Quantity	$	Quantity	$
Chromium metal and tungsten metal, in lumps, etc., when imported by manufacturers for alloying purposes	lb.	17,755	8,801	26,222	16,461
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.	50,841	46,210	48,413	45,114
Chrome fire brick	xx	...	38,431	...	39,184
Bichromate of potash - crude	lb.	113,607	9,013	139,865	11,684
Bichromate of soda	lb.	1,858,424	87,558	2,374,311	138,313

"Metal and Mineral Markets", New York, September quotations, 1935, were as follows:- Chromium, per pound, 97 per cent grade, spot, 88 cents; contract, 83 cents per pound contained chromium, maximum 1 or 2 per cent iron (usually sold as ferro-chrome).

Chrome Ore - per long ton, c.i.f. Atlantic ports, $15.50 to $16.50 for 45 to 47 per cent Cr_2O_3 ore, and $18.50 to $19.50 for 48 to 50 per cent ore. Ferrochrome, per pound of contained chromium, 4 to 6 per cent carbon, 66 to 70 per cent chromium, 10 cents, delivered on contracts.

WORLD PRODUCTION OF CHROME ORE AND CHROMIUM

(Taken from the Imperial Institute's publication "The Mineral Industry of the British Empire and Foreign Countries")

(Long tons)

Producing Country	1931	1932	1933
BRITISH EMPIRE			
Southern Rhodesia	80,334	15,445	34,493
Union of South Africa	22,966	19,065	33,541
Cyprus (c)	200	1,000	...
Canada	...	70	27
India	19,913	17,865	15,526
Australia	26	97	891
TOTAL	123,000	54,000	85,000
FOREIGN COUNTRIES			
Greece	5,545	1,530	(a)
Norway	...	403	321
Yugoslavia	57,462	38,523	25,062
Cuba	11,882	500	21,837
United States	762	200	966
French Indo-China	2,736	...	...
Japan	9,573	12,295	19,681
Turkey	29,059	54,344	74,188
New Caledonia	72,979	68,332	49,100
Roumania	...	...	29
TOTAL (b)	190,000	176,000	193,000
WORLD'S TOTAL (b)	313,000	230,000	278,000

(a) Information not available.
(b) Excluding U.S.S.R. (Russia) - figures for which are not available.
(c) Estimated.

LITHIUM - Lithium-bearing minerals occurring in the Pointe du Bois region of southeastern Manitoba have been investigated as to their economic value. A few years ago trial shipments of lepidolite and spodumene were made from the Silver Leaf mine located on the south side of Winnipeg river and considerable development work was conducted on the Buck property, Bernic lake. Some activity was reported at Bernic lake during July and August of 1934 by the Lithium Corporation of Canada, Ltd., however, no later developments were reported by this company up to the end of June, 1935. It was stated that the company plans the erection of a plant in Manitoba for the production of lithium salts and metal from ores of the Bernic lake deposits.

One of the chief consumers of lepidolite is the glass industry which employs the mineral in the production of heat-resistant products. Referring to lithium, "The Mining Journal", London, comments as follows:- "The therapeutic uses of certain lithium salts are very old, but the production today of other salts of this metal is already large, with promise of further expansion. Research work of an international character has resulted in a steady output of the metal (lightest of all metals) itself which is finding extensive employment, yet in quite minute proportions (a mere fraction of a per cent of the whole) in a bearing alloy, whilst a similar alloy has possibilities for employment as sheathing for cables. In short, the use of lithium is being steadily expanded in many directions, particularly in alloy form (calcium-lithium

for instance) and the ground gained is not likely to be lost again. There would appear to be a wonderful future for this metal."

"Metallic lithium is now produced very efficiently by the electrolysis of fused lithium chloride, the product being 99.5 per cent pure. Lithium alloys are also capable of being deposited, lithium-calcium alloys being commercial materials. These lithium-calcium alloys find industrial application in giving graphite refinement and increased strength for cast iron, whilst lithium itself improves the machinability of stainless steel, and is usefully employed as a de-oxidiser for producing oxygen - free copper and as a hardener for lead alloys and aluminium-zinc alloys ... lithium hydride (LiH) is a product for which there is commercial possibilities. It reacts with water, evolving hydrogen, and as the gross weight of the hydride is much less than that of a steel cylinder housing an equal volume of gas, this particular product should become of importance as a portable source of hydrogen." (The Chemical Age, London).

No imports into Canada of lithium, lithium alloys or compounds, described as such, were recorded in 1934.

"Metal and Mineral Markets - New York" quotations, September, 1935, for metallic lithium per pound, 98 to 99 per cent, 100 pound lots, $15. Lepidolite - per ton, $20 to $25 for ordinary grades. Amblygonite - per ton, f.o.b. mines, 8 to 9 per cent Li_2O, $34 to $35.

MAGNESIUM - Metallic magnesium is not produced in Canada. "Magnesium has only a short history as an industrial metal. Its present production is estimated at 30,000 to 35,000 tons yearly, but is expected to increase. Possible raw material for its production is exceedingly abundant; it includes magnesium chloride (natural brines) and the natural carbonates, magnesite and dolomite. Magnesium is obtained by several processes, but in all these on the principle of reducing the chloride or oxide electrolytically from a bath containing these materials in a suitable molten flux, which is generally a fusible halogen salt. Unalloyed magnesium metal, as such, has little industrial importance, but in the form of its alloys in which it is the basic metal, it is an exceedingly useful material, combining reasonable strength and good working properties with small weight. The best known alloys are the series under the general name "Elektron" which have numerous uses, including the manufacture of pistons for internal combustion motors and motor bodies. If its price can be lowered this will be a serious competitor with aluminium in different employment spheres; although somewhat inferior in strength, its considerable smaller weight favours its use in aircraft construction. Besides alloys in which magnesium is the basic metal, there are others in which it is used in small percentage to great advantage. These alloys include some of aluminium in which the magnesium plays an important part, although present in small quantities. The best known examples of these are duralumin and magnalium." (The Mining Journal, London).

The United States Bureau of Mines report that in 1934 the quantity of magnesium ingot sold or used in the United States was 4,249,838 pounds, an increase of 196 per cent over 1933 and the entire domestic output of primary magnesium was obtained from magnesium chloride recovered as a joint product of the salt wells of the Dow Chemical Company near Midland, Michigan.

The same prices were quoted by trade journals on ingot (4 x 16 inches) throughout 1934 as in 1933 and 1932 - 30 cents a pound in carloads, and 32 cents a pound in 100 pound lots or more, L.C.L.

MANGANESE - No Canadian manganese ores have been commercially shipped or sold in Canada since 1931. The Department of Mines, Ottawa, reports that the manganese ores mined in Eastern 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 obtained mainly from New Ross in Lunenburg county, Loch Lomand, Cape Breton, and Aylesford, King's county, all in Nova Scotia; in New Brunswick at Dawson Settlement and Turtle Creek, Albert county, and from Markhamville, King's county. Manganiferous ores have also been mined in British Columbia.

In 1934 some development work was reported on a bog manganese deposit located at North Renous, New Brunswick, and a trial shipment of the material may be made in 1935. Considerable work was also done on manganese bearing veins occurring near the village of Elgin, Albert county.

Manganese is utilized largely in the manufacture of various steels and the consumption fluctuates with the world's steel output; minor quantities are used in the non-ferrous alloys, chemical and electrical products industries.

Imports of manganese oxide into Canada during 1934 totalled 619,069 cwt. valued at $234,236 as compared with 686,842 cwt. worth $293,910 in 1933; the greater part of the imports in both years came from the Gold Coast while lesser quantities were obtained from the United States, British South Africa, and the United Kingdom. Imports of ferro-manganese and silico-manganese, containing more than 30 per cent by weight of manganese totalled 6,903 cwt. valued at $61,017 in 1934 as compared with 4,835 cwt. worth $31,611 in 1933. (To April 18th, 1934).

"Metal and Mineral Markets" quotations, September, 1935, were: manganese ore, per long ton unit of Mn., c.i.f. North Atlantic ports, cargo lots, exclusive of duty: Brazilian, 46 to 48 per cent Mn. 24 cents; Chilean, 47 per cent minimum, 25 cents; Indian, 48 to 50 per cent, 25 cents; Caucasian, 52 to 55 per cent, 26 cents; South African, 49 to 51 per cent, 26 cents.

WORLD'S PRODUCTION OF MANGANESE

(Long tons)

Producing country	1931	1932	1933
BRITISH EMPIRE			
Gold Coast (exports)	247,191	50,689	265,140
Northern Rhodesia	1,467	...	5,367
Union of South Africa	100,290	...	20,894
Canada	104	...	...
India	537,844	212,604	218,307
Unfederated Malay States	8,848	9,278	13,194
Australia	13	106	129
TOTAL	900,000	270,000	520,000
FOREIGN COUNTRIES			
Austria (b)	(a)	(a)	(a)
Czechoslovakia	82,558	32,951	16,799
France	325	...	(a)
Germany	...	12	(a)
Greece	301	733	(a)
Hungary	1,114	1,473	6,134
Italy	6,320	372	4,453
Portugal	266	...	25

WORLD'S PRODUCTION OF MANGANESE (concluded)

(Long tons)

Producing country	1931	1932	1933
FOREIGN COUNTRIES (concluded)			
Roumania	18,490	4,971	2,337
Spain	17,633	2,550	2,789
Sweden	8,232	4,653	6,124
U.S.S.R. (Russia)	862,000	813,000	982,000
Yugoslavia	2,415	156	521
Egypt	100,174	322	184
Morocco (French zone)	10,659	4,000	4,752
Cuba	6,491	2,113	89,224
Porto Rico (exports)	2,374	2,302	1,638
Mexico	719	301	(a)
United States (c)	39,242	17,777	18,558
Argentine	218	248	404
Brazil	142,731	20,555	24,500
Chile	377	441	450
China	30,700	21,200	9,600
Japan	12,646	25,828	42,847
"Manchoukuo"	640	59	740
Netherlands East Indies	14,311	8,156	10,298
Turkey	1,000	2,800	7,600
TOTAL	1,360,000	970,000	1,230,000
WORLD'S TOTAL	2,260,000	1,240,000	1,750,000

(a) Information not available.
(b) Manganese content of manganese ore and manganiferous iron ore.
(c) Shipments. Excluding ore containing 10 to under 35 per cent. Mn, which is included with iron ore, as follows:-

1931	64,062 long tons
1932	15,635 long tons
1933	12,779 long tons

MERCURY - There has been no Canadian production of new mercury reported since 1897. Previous to this a small output of quicksilver was recorded as having been produced in British Columbia from a property situated on the north shore of Kamloops lake. The principal mercury producing countries are Italy, Spain, United States, Mexico, and Czechoslovakia.

The 1934 Minerals Year Book of the United States Bureau of Mines refers to the following new uses for mercury: A new type of mercury lamp using a small quantity of rubidium, and closely approximating sunlight has been developed; Dupont Lignason is an organic mercurial used to prevent fungus growth on freshly cut lumber in storage.

In the United States, during 1928, drugs and chemicals accounted for about 39 per cent of the mercury consumed and fulminate used in detonators and ammunition for 19 per cent. Next in importance was the use of mercury for scientific instruments and electrical apparatus followed in turn by vermilion, felt, and caustic soda and glacial acetic acid. This order of importance has probably remained substantially the same since that year, if the large amount of mercury used in 1932 for mercury-boiler plants is not consid red, although the proportionate use for electrical

apparatus may have increased somewhat. In Canada a considerable amount of mercury is utilized in the amalgamating of gold in ores.

It was reported in the Japanese Press early in 1935 that an extensive deposit of mercury ore had been discovered in Hokkaido, on the Teshio river. The deposits are estimated to contain about three million tons of mercury metal.

Imports of mercury into Canada in 1934 totalled 246,892 pounds valued at $183,366 as compared with 49,066 pounds worth $35,057 in 1933. Of the 1934 imports 146,879 pounds came from Italy and 83,809 pounds from the United States. Imports of mercury salts in 1934 were appraised at $3,010 as against $1,676 in 1933.

Quicksilver was quoted, September, 1935, New York, $69.50 to $71.50 per flask of 76 pounds; London, £11 6s. to £11 7s. 6d. for spot.

WORLD'S PRODUCTION OF QUICKSILVER

(Taken from the Imperial Institute's publication "The Mineral Industry of the British Empire and Foreign Countries")

Producing country	1931	1932	1933
BRITISH EMPIRE			
Australia	817	1,989	46
New Zealand	34,200	1,500	7,500
FOREIGN COUNTRIES			
Austria	998	2,200	440
Czechoslovakia	168,927	99,329	14,872
Italy	2,861,679	2,240,518	1,348,306
Roumania	551	168	600
Spain	1,503,843	1,797,978	1,491,601
Algeria	82,000	90,041	(a)
Mexico	554,183	557,176	340,372
United States	1,895,972	959,272	714,552
Bolivia (exports)	77,645	38,380	(a)
Peru (exports)	157	...	...
China	49,000	44,000	33,000
Japan	7,725	5,256	17,807
Korea	3,085	2,050	(a)
Turkey	17,925	...	1,748
(b) WORLD'S TOTAL	7,300,000	5,800,000	(a)

(a) Information not available.
(b) Excluding U.S.S.R. (Russia).

MOLYBDENITE - No commercial mine shipments of molybdenite ore or concentrates have been made in Canada since 1931 in which year 1,222 pounds of molybdenite concentrates were shipped from a property in Ontario. The mineral occurs in Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba and British Columbia, and deposits in Ontario and Quebec have yielded a considerable output during past years. The mine of the Phoenix Molybdenite Corporation, Ltd., located in Bagot township, Renfrew county, Ontario, was operated from April to October, 1934; the mill of the company went into operation on August 15 and treated about 200 tons of surface ore, with a recovery of 3,300 pounds of concentrates.

It was reported in 1934 that an adit had been commenced on the Stella molybdenite property located some 5 miles southwest of Endako in the Omineca division, British Columbia. Molybdenite occurs here in fine scales, remarkably free from other sulphides, in quartz veins up to 2 feet wide in granodiorite and also as disseminations in the rock adjacent to the veins. No report of ore shipments from this property was received in 1934.

In 1933, 700 pounds of hand picked molybdenum ore was shipped from a molybdenite prospect at Pigeon Lake, Gloucester county, New Brunswick. This was for experimental purposes.

In Preissac township, Abitibi county, Quebec, the Height of Land Company during 1934 dewatered two old shafts and the underground workings of its molybdenite property; the company also conducted some prospecting and completed a small amount of diamond drilling. No shipments of ore were made.

The United States is by far the world's greatest producer of molybdenite ores and in 1934, as in other recent years, the Climax Molybdenum Company at Climax, Lake County, Colorado, and the Molybdenum Corporation of America near Questa, Taos county, New Mexico, were the principal producers and shippers.

The world production of molybdenum in 1934 was estimated by the Mining Journal, London at 10,175,000 pounds of which 700,000 pounds came from Green Cananea (Mexico), 300,000 pounds from Norway (Knaben mine), 150,000 pounds from Morocco and the balance from the United States. The Journal states that "there has been a very large development in Germany in the use of molybdenum salts for catalysers for hydrogenation work. There are other uses in connection with the oil industry now being developed which may also largely increase the demand for molybdenum. Experience in the United States indicates that molybdenum is substantially replacing tungsten in modern alloy steel. One of the advantages of molybdenite alloys is that molybdenum steel can be made much thinner for equal strength with consequent marked saving in weight; this is particularly important in the case of aeroplanes and the new streamline trains. Large quantities of bearing metal are now being made containing percentages of molybdenum. Molybdenum has a wide range of use in connection with various types of stainless steel, and in the development of cast iron alloys" In the incandescent lamp and radio tube industries the metal is used in the form of wire and sheet; it is also employed in the manufacture of high temperature electric furnaces.

Imports of calcium molybdate into Canada, when imported by manufacturers of steel for use exclusively in the manufacture of steel, in their own factories, totalled 35,187 pounds valued at $15,586 in 1934 as compared with 7,082 pounds worth $3,414 in 1933.

"Metal and Mineral Markets", New York, September, 1935, quotations were: Molybdenum, per pound, in 10 to 49 pound lots, C.P. powder, $9.50; 97 per cent, $4.10. Molybdenum ore, per pound of contained MoS_2, nominally 42 cents for 75 to 85 per cent concentrate. London, per long ton unit, nominal at 33s. for 80 to 85 per cent concentrate.

WORLD'S PRODUCTION OF MOLYBDENUM

(Taken from the Imperial Institute's publication "The Mineral Industry of the British Empire and Foreign Countries")

(Cwt.)

Producing Country	1931	1932	1933
BRITISH EMPIRE			
Canada (MoS_2 content)	11	...	...
Australia	11	102	130
FOREIGN COUNTRIES			
Norway (MoS_2 content)	3,380	5,181	8,149
French Morocco (ore)	...	...	2,362
Mexico	112	103	1,303
United States (MoS_2 content)	46,616	36,176	84,554
Korea	433	879	2,070
Peru	...	130	127

RADIUM-URANIUM (Pitchblende-Silver) - The commercial production of primary radium and uranium products in Canada comes entirely from the refinery of Eldorado Gold Mines, Ltd.; this plant, located at Port Hope, Ontario, was in continuous operation throughout 1934. Ores and concentrates treated at Port Hope are shipped from the company's pitchblende-silver mine situated at Echo Bay, Great Bear Lake, North West Territories. In summer months, roughly from July to October, transportation is by water route from the railhead at Waterways, Northern Alberta, via Athabaska river, Lake Athabaska, Great Slave River, Great Slave Lake, Mackenzie River, and Great Bear River to Great Bear Lake, a total distance of 1,400 miles. In both summer and winter regular airplane service is maintained between Edmonton and Waterways, Alberta, and Great Bear Lake.

During 1934 the Port Hope plant received from the mine 77 tons of pitchblende and silver ore and seven tons of silver concentrates. Twenty-six tons of ore were treated with the recovery of radium, uranium, silver and lead; the value of these products was reported, by the press, at $210,000.

The eighth annual report of the Company gives, for the first time, an estimate of ore reserves. It is stated that, assuming the ore is continuous from the surface to the 125 foot level, the two orebodies indicated in drifting contain ore to the value of $2,400,000. This estimate was based on the prevailing market prices for radium, uranium products and silver. No allowance is made for ore below the 125 foot level.

The Consolidated Mining and Smelting Company of Canada, Ltd., report that underground development was continued on its Echo Bay property, with somewhat favourable results. Altogether 524 feet of drifting and crosscutting was accomplished. The main crosscut intersected a vein not previously located on the surface but parallel in strike to number two vein, which carried fair values in silver for 85 feet, with some sections of high grade composed of leaves, wires and plates of silver. No pitchblende ore was encountered and no shipments of silver ore made.

Both surface and underground operations were carried on during 1934 by Bear Exploration and Radium Ltd.; the property of this company is located at Cameron Bay, Great Bear Lake, and a test shipment of three tons of silver ore was made in 1934 to the Trail smelter, British Columbia. Other operations in the area included those of Great Bear Lake Mines Ltd.; this company conducted shaft sinking, cross-

cutting and drifting, but reported no shipments of ore.

In Ontario the Canada Radium Mines, Ltd., maintained steady surface and underground development work at its radium bearing deposit located at Cheddar, Haliburton county. The shaft has been sunk to a depth of 375 feet with levels at 125, 250 and 365 feet. Approximately 700 feet of lateral work has been completed. No ore shipments were reported by this company.

In order to permit sale the National Research Council, Ottawa, recently conducted tests for the standardization and certification of the radium products of the Eldorado Gold Mines, Ltd. Tests demonstrated the value of the material, no significant impurities were discovered and needles of radium were tested and certified. Work is also being conducted by the Council to determine the life of radium luminous compounds as used in watches, clocks and aircraft instruments.

The U.S.S.R. Chamber of Commerce, Moscow, reports that an expedition party of the Moscow Institute of Rare Metals, which has been working at Cheleken Island, has worked out a process for obtaining radium salts from bore hole waters. Work has been started in connection with the construction of a test plant for obtaining radium concentrate from water.

The last annual report of the Union Miniere du Haut-Katanga states that the radium market was improved and the quantity of its sales was very satisfactory in 1934.

The greater part of the world's radium supply is utilized for therapeutic purposes whereas uranium, in the form of salts, is used largely for coloring glazes in the ceramic industry.

Imports of radium into Canada in 1934 were valued at $211,140 as compared with $8,374 in 1933.

"Metal and Mineral Markets" quotations, September, 1935, for radium was $50 per Mg. radium content. New York quotation, September, for uranium oxide, kegs, was $1.50 per pound up.

WORLD'S PRODUCTION OF URANIUM MINERALS

(Taken from the Imperial Institute's publication "The Mineral Industry of the British Empire and Foreign Countries")

(Cwt.)

Producing Country	1931	1932	1933
BRITISH EMPIRE			
Canada	...	(b)	(b)
FOREIGN COUNTRIES			
Czechoslovakia (U_3O_8)	309	376	236
Portugal	...	645	1,233
Belgian Congo	8,149	(i)	(i)
Madagascar	8	...	(a)
United States (U_3O_8)	11	34	18

Uranium minerals are also produced in Russia. The production recorded in 1927 was about 50 tons; later information is not available.

(a) Information not available.

(b) 58 tons of pitchblende were treated in Canada in 1933 and produced 3,021 mgrms. of radium of 98 per cent average concentration and 34,940 lb. of uranium salts.

(i) The output of uranium minerals is not available for these years but it is reported that the radium produced from these ores amounted to 40; 6; and 6.7 grams in 1931, 1932 and 1933, respectively. This production of uranium represents the greater part of the world's supplies.

SELENIUM - Production of selenium in Canada in 1934 totalled 104,924 pounds valued at $171,311 as compared with 48,221 pounds worth $70,345 in 1933. The production of the metal in Canada represents a by-product in the refining of blister or anode copper in electrolytic copper refineries located at Montreal East, Quebec, and Copper Cliff, Ontario. Selenium was produced commercially for the first time in Canada in 1931, the metal being recovered at Copper Cliff by the Ontario Refining Company, Ltd. Selenium produced in Canada is credited to the provinces from whose ores the blister copper, electrolytically refined, was obtained.

Selenium has found its best use as a decolorizer and as a base for various colours in the manufacture of glass. It is used in the rubber industry for compounding to increase tensile strength, resistance to abrasion and to shorten the cure. The metal is also employed in the manufacture of photo-electric cells and stainless steels. It has also been used effectively as an insecticide for the elimination of the red spider in fruit orchards.

"Metal and Mineral Markets" September, 1935, quotation for selenium was - per pound, $2 for black powdered, 99.5 per cent pure.

TELLURIUM - The first commercial production of tellurium in Canada occurred in 1934, the metal being recovered at the electrolytic copper refinery of the Ontario Copper Refining Company, Ltd. The output totalled 5,130 pounds valued at $25,599.

Tellurium is used as a hardening and strengthening agent in lead and its alloys. Tellurium lead, with 0.02 to 0.1 per cent tellurium is reported to be remarkably strong and corrosion resisting as compared with pure lead. The metal is also employed in the manufacture of rubber products, its function being to increase tensile strength and resistance to abrasion.

It was recently reported that a successful method of plating rhenium had been evolved; the coating is very hard and possesses a high resistance to hydrochloric acid. The metal occurs in certain copper refinery slimes.

In May, 1935, it was reported that tellurium was being produced in Russia as a by-product in the treatment of the copper ores from Kyschtym.

New York quotation for tellurium, September, 1935, was $2 per pound.

TIN - Tin ores are not mined in Canada. The metal 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.

The Mining Journal, London, states that most of the tin available for smelting at the present time is alluvial, comprising nearly all the production of Malaya, Netherlands Indies, Nigeria, Siam, the Congo, and considerable proportions of the output from Burma, Indo China, and some of that from South and East Africa and Australia. The rapid development of the tin deposits of the Congo is bringing tin smelting in Belgium and the Congo into prominence.

IMPORTS OF TIN INTO CANADA, 1933 and 1934.

	1933		1934	
	Pounds	$	Pounds	$
Tin in blocks, pigs or bars	2,834,100	1,149,378	3,999,900	2,053,773
Tinfoil	8,271	4,076	35,158	18,990
Collapsible tubes	...	81,258	...	38,597
Tin bichloride and tin crystals	826,632	149,880	333,311	88,327
Oxide of tin and copper	144,657	50,743	207,769	86,376
Phosphor tin and phosphor bronze in blocks, bars, plates, etc.	506,464	135,997	826,611	232,483
Tin plate food containers	...	138,887	...	186,175
Tin plate containers, n.o.p.	...	165,509	...	239,497

The Engineering and Mining Journal report the average price of straits tin, New York, at 52.191 cents in 1934; London, 230.273 pounds sterling per long ton, standard tin.

WORLD'S PRODUCTION OF TIN ORE

(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 and Description	1931	1932	1933
BRITISH EMPIRE			
United Kingdom	598	1,337	1,542
Nigeria	7,056	4,320	3,755
Southern Rhodesia	7	4	11
South West Africa	82	65	144
Swaziland	54	59	71
Tanganyika Territory	14	50	49
Uganda	108	261	272
Union of South Africa	408	540	539
India	2,979	3,168	3,472
Federated Malay States (shipments)	53,457	28,363	23,925
Unfederated Malay States	1,436	1,341	923
Straits Settlements	16	38	57
Australia	1,750	2,138	2,810
TOTAL	68,000	41,700	37,600
FOREIGN COUNTRIES			
Czechoslovakia	7	...	...
Portugal (estimated)	390	400	500
Spain	143	78	70
Belgian Congo	195	689	1,896
Mexico	761	740	123
United States	4	(8 cwt.)	2
Bolivia	(b) 31,138	21,100	17,000
China	8,433	7,572	7,961
French Indo-China	874	1,000	1,038
Japan	1,577	1,557	1,538
Netherlands East Indies	27,374	16,789	12,608
Siam	12,495	9,276	10,300
Argentina	...	...	68
TOTAL	83,000	59,000	53,000
WORLD'S TOTAL	151,000	101,000	91,000

NOTE - The metal content of the ores has been calculated on the following percentages - South-West Africa 70, Swaziland 70, Uganda 70, India 70, Belgian Congo 70, Japan 70, Siam, 72.

(b) Exports.

TITANIUM ORE - Important deposits of ilmenite, some of which contain rutile, occur near Baie St. Paul, Quebec, and titaniferous ores have been exported from this area for some years. Shipments of these ores in Canada during 1934 totalled 2,023 tons valued at $14,161, the entire output coming from properties in the province of Quebec. Shipments during the first six months of 1935 amounted to 2,419 tons worth $16,933.

"Like molybdenum, titanium has also found its way into cast iron and stainless alloys, although on a much more modest scale. It is added to cast iron to make strong alloy compositions more easily to machine, to close the pores and reduce the size of the graphite flakes. Added to stainless steel in a ratio of 5 to 7 times the carbon content, it serves to inhibit intergranular corrosion. It also prevents air-hardening and imparts ductility and softness to the steel. Otherwise, the most important metallurgical use of titanium is as a scavenger to remove oxygen and nitrogen from iron and steel. Alloyed with copper, titanium imparts age-hardening properties; the carbide is also being used in cutting steels. The output of titanium oxide, an excellent white pigment (possessing high hiding powers) is, however, much more important than that of the metal." (Engineering and Mining Journal).

The United States Bureau of Mines defines the standard titanium-calcium pigment as containing 30 per cent titanium dioxide precipitated upon and coalesced with calcium sulphate, and the titanium-barium pigment as containing 25 per cent titanium dioxide precipitated upon a blanc fixe base. A leading brand of titanated lithopone contains 15 per cent titanium dioxide.

Imports into Canada of antimony oxide and titanium white from April 1st to December 31st, 1934, totalled 983,539 pounds valued at $131,005.

September, 1935, quotations - New York - titanium metal, 96 to 98 per cent, $6 to $7 per pound; titanium ore - 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.

CONSUMPTION OF TITANIUM WHITE IN CANADIAN PAINT INDUSTRY, 1931 - 1934.

	Pounds	Cost at Works
		$
1931	745,207	89,761
1932	691,304	96,759
1933	1,061,249	128,969
1934	1,710,188	186,678

WORLD'S PRODUCTION OF TITANIUM MINERALS

(Taken from the Imperial Institute's publication "The Mineral Industry of the British Empire and Foreign Countries")

(Long tons)

Producing Country and Description	1931	1932	1933
BRITISH EMPIRE			
Sierra Leone - Ilmenite	10	...	...
Canada (shipments) - Titaniferous iron ore	1,347	...	...
India - Ilmenite	36,166	50,053	43,384
Australia - Ilmenite	...	...	550
FOREIGN COUNTRIES			
Norway - Ilmenite	5,000	13,268	22,846
Rutile	21	30	55
Portugal - Ilmenite	150	...	...
Egypt	...	479	...
Senegal - Ilmenite	1,058	...	369
Argentina - Titaniferous iron ore	...	...	2,559
Brazil (exports) - Ilmenite	...	34	95

NOTE - Titanium minerals are also produced in the United States, but figures are not available for publication.

TUNGSTEN - Tungsten minerals have been found in widely separated districts in Canada. Deposits in Nova Scotia and New Brunswick appear to possess the greatest economic possibilities. Comparatively small shipments of tungsten ores were made in Canada in 1912 and 1917; no commercial production has been reported since the latter year.

At Indian Path, Lunenburg county, Nova Scotia, the Indian Path Mines, Ltd. carried on work during the winter months of 1934. No. 2 shaft was deepened 80 feet and at 70 feet a level was driven east a distance of 40 feet along No. 1 vein which consists of quartz containing small segregations of scheelite, also crystals of galena, arsenopyrite and pyrites. At the east end of the level a crosscut was driven to connect with No. 3 shaft. This cross cut intersected two scheelite bearing quartz veins. No ore shipments were reported from the property.

The British Columbia Department of Mines reported that for the first time in many years, interest was evinced in tungsten properties, at one of which, the Hardscrabble mine near Barkerville, preliminary investigation was commenced.

Tungsten has a number of industrial uses being employed in the manufacture of high temperature electric furnaces, vacuum tube filaments, incandescent lamp filaments, electric contact surfaces and laboratory equipment. It is an important alloying element in such high speed tool alloys as stellite and is a constituent in certain resistance welding electrodes and hard cemented carbides.

"Broadly speaking, it may be taken that for normal consumption with trade in a reasonable state of activity, the world's requirements must be some 12,000 to 14,000 tons of mineral concentrates, equivalent to half this quantity of metal. The chief producers in 1913 were India and Burma, United States and Portugal. Today the chief output available is from China which has shipped, and probably under normal conditions, can produce comfortably 6,000 tons a year. Chinese government manipulation of the market, and some improvement in demand, have caused prices to remain high for some time, and, in consequence, numerous sources of supply outside China have been developed on a larger scale. The countries producing the bulk of the world's requirements today, are: China, Burma, Malaya, Bolivia, United States and Portugal, while Australia, Argentine, Cornwall and several other countries have contributed substantial quantities." (The Mining Journal, London).

Imports of metallic elements and tungstic acid into Canada, for use only in the manufacture of metal filaments for electric lamps, were valued at $57,919 in 1934 as compared with $46,734 in 1933. Imports of chromium metal and tungsten metal, in lumps, etc., and alloy scrap for alloying purposes, totalled 26,222 pounds valued at $16,461 in 1934 as against 17,755 pounds at $8,801 in 1933.

September, 1935, New York quotation for tungsten, 98 per cent powdered was $1.75 to $1.90 per pound; tungsten ore - per unit WO_3, N.Y. Chinese wolframite, $15, duty paid. Bolivian scheelite, nominal. Domestic scheelite, good analysis, carload lots or more, $15.

VANADIUM - No vanadium ores are produced in Canada. Relatively small quantities of the metal are known to occur in some of the magnetites of the Rainy River district in Ontario and some research has been conducted as to a method for its commercial recovery.

By far the greater amount of vanadium is consumed as a toughening element in the prdduction of alloy steels and recently the metal is being used in cast irons.

Early production of vanadium came largely from Peru where certain bituminous coal deposits carry a relatively high percentage of vanadium pentoxide. Increased production in recent years has developed in South West Africa and Northern Rhodesia where the metal occurs with lead-zinc-copper ores. In the United States vanadium has been obtained chiefly from the carnotite ores of the Southwestern States. It was reported in the technical press, early in 1935, that vanadium stocks have been excessive and ore production slowed down.

Vanadium ore prices - September, 1935 - per pound V_2O_5 contained was 27½ cents, f.o.b. shipping point. Ferrovadium, per pound of vanadium contained, delivered, $2.70 to $2.90.

WORLD'S PRODUCTION OF VANADIUM

(Taken from the Imperial Institute's publication "The Mineral Industry of the British Empire and Foreign Countries")

(Long tons)

Producing Country	1931	1932	1933
BRITISH EMPIRE			
Northern Rhodesia -			
Oxide	268	363	70
Concentrates	705	1,204	...
South West Africa	4,602	2,973	177
FOREIGN COUNTRIES			
France	84	53	(a)
United States (V_2O_5)	(a)	103	3

(a) Information not available.

OTHER METALS - "Among the most striking properties of tantalum is its high resistance to chemical attack. It is also one of the best valve metals known and is used extensively in electrolytic rectifiers. It is making good headway in the chemical process industries, for heaters, linings for vessels, thermometer wells, heating coils, spinnerettes and laboratory equipment and apparatus. The closely related metal columbium has recently been found efficient in keeping stainless steel soft and workable both hot and cold. Zirconium is generally used as a scavenger for removing oxygen, nitrogen, and sulphur from steel, it is also used in ammunition primers, smokeless flashlight powders and photograph lamps, electric blasting caps, pyrotechnics, and getters for vacuum lamps. Metallic calcium is also found to be an effective scavenger in melting copper, nickel, lead, and steel; it has a hardening effect on lead and is used for debismuthizing lead. Barium metal is also gradually finding outlets; it has found some application as an efficient getter in vacuum tubes. A nickel-copper-barium alloy is used as a spark terminal, while a barium-coated electrode is employed in the new sodium and mercury lighting units to lower starting potential." (Engineering and Mining Journal, New York).

Most of the high grade tantalite has been obtained from the Pibarra field in Western Australia.

It was reported recently that American interests are developing columbite-bearing ground in the extreme south of Zaria province, West Africa. These deposits had primarily been worked for tin.

None of the metals referred to under this sub-heading are produced in Canada at the present time.

PRINCIPAL STATISTICS OF THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1933 and 1934(x)

		1933	1934
Number of firms		5	7
Capital employed	$	563,500	1,548,205
Number of employees - On salary		5	5
On wages		19	39
Total		24	44
Salaries and Wages - Salaries	$	3,312	6,345
Wages	$	10,963	25,928
Total	$	14,275	32,273
Cost of fuel and electricity	$	1,178	2,383

AVERAGE NUMBER OF WAGE-EARNERS EMPLOYED, BY MONTHS, 1934.

Month	Number
January	13
February	36
March	34
April	17
May	25
June	41
July	42
August	44
September	62
October	60
November	45
December	37

POWER EQUIPMENT INSTALLED, 1934.

Description	Number	Horse power
Steam engines	1	25
Diesel engines	2	80
Gasoline and other gas engines	4	53
Electric motors	2	12
Boilers	4	140

(x) Does not include data relating to smelters and refineries or to mining in the North West Territories.

DIRECTORY OF FIRMS IN THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1934.

Name of Firm and Product	Head Office Address	Location of Mine or Plant
Aluminum Company of Canada, Ltd. Product - Aluminium.	Canada Life Bldg., Toronto, Ont.	Shawinigan Falls and Arvida, P.Q.
Canadian Copper Refiners Ltd. Products - Selenium and Tellurium.	Royal Bank Bldg., Toronto, Ont.	Montreal East, P.Q.
Ontario Refining Co. Ltd. Products - Selenium and Tellurium.	Copper Cliff, Ont.	Copper Cliff, Ont.
Consolidated Mining and Smelting Co. of Canada, Ltd. Products - Bismuth, Cadmium and Pitchblende Ore.	Montreal, P.Q.	Trail, B.C.
Hudson Bay Mining & Smelting Co. Ltd. Product - Cadmium Precipitate.	Woodstock, Ont.	Flin Flon, Man.
Deloro Smelting & Refining Co.Ltd. Product - Bismuth (unrefined).	Deloro, Ont.	Deloro, Ont.
Hardscrabble Mine(x) Product - Molybdenite.	Barkerville, B.C.	Barkerville, B.C.
Indian Path Mines, Ltd.(x) Product - Tungsten Ore.	605 Dennis Bldg.,Halifax, N.S.	Lunenburg Co.,N.S.
Atlantic Manganese Corp. Ltd.(x) Product - Manganese Ore.	Roy Bldg., Halifax, N.S.	New Ross, N.S.
Langley, A. (x) Product - Molybdenite.	Endako, B.C.	Endako, B.C.
The Phoenix Molybdenite Corp.Ltd.(x) Product - Molybdenite.	36 Toronto St., Toronto, Ont.	Renfrew Co., Ont.
Height of Land Co.(x) Product - Molybdenite.	4327 Old Orchard Ave., Montreal, P.Q.	Abitibi Co., P.Q.
Asbestos Corp. Ltd. Product - Chromite.	Canada Cement Bldg.,Montreal,P.Q.	Thetford Mines,P.Q.
Camire, Lucien Product - Chromite.	Thetford Mines, P.Q.	Eastern Townships, P.Q.
Chromium Mining & Smelting Corp.Ltd. Product - Chromite and ferrochrome.	Bank of Commerce Bldg., Hamilton, Ont.	Collins, Ont.

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DIRECTORY OF FIRMS IN THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1934 (concluded)

Name of Firm and Product	Head Office Address	Location of Mine or Plant
Bear Exploration and Radium Ltd. Product - Pitchblende-Silver Ore.	85 Richmond St.W., Toronto, Ont.	Great Bear Lake, N.W.T.
Eldorado Gold Mines, Ltd. Products - Radium and Uranium Salts, Oxides, etc.	40 King St. W., Toronto, Ont.	Great Bear Lake, N.W.T. and Port Hope, Ont.
Great Bear Lake Mines, Ltd.(x) Product - Pitchblende-Silver ore.	244 Bay St., Toronto, Ont.	Great Bear Lake, N.W.T.
Canada Radium Mines, Ltd.(x) Product - Pitchblende.	224 Bay St., Toronto, Ont.	Haliburton Co., Ont.
Baie St. Paul Titanic Ore Co. Product - Titanium ore.	Baie St. Paul, P.Q.	St. Urbain, P.Q.

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(x) Active but no production reported in 1934.