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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, 1935

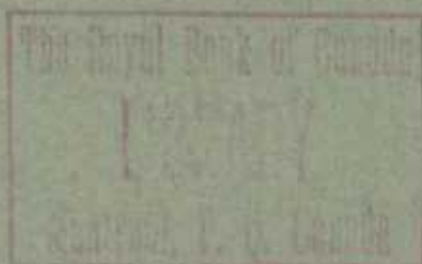
including

Aluminium
Antimony
Barium
Beryl
Bismuth
Cadmium
Caesium
Calcium
Chromite
Iron Ore
Lithium

Magnesium
Manganese
Mercury
Molybdenite
Radium - Uranium
Selenium
Tellurium
Tin
Titanium (ilmenite)
Tungsten
Vanadium
Zirconium

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

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MISCELLANEOUS METALS, 1935.

Metal-bearing minerals mined or treated in relatively small quantities by a comparatively few operators, have been grouped by the 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 1935 and classified as miscellaneous include bismuth, cadmium, chromite, manganese ore, radium and uranium products, selenium, tellurium 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, tungsten, calcium, aluminium, tin, iron ores, vanadium, mercury, molybdenite 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

Aluminium ores are not mined in Canada, however, the production of primary metallic aluminium in Quebec, from imported material, has constituted an important industry for several years. The Aluminum Company of Canada, Limited, the sole producer of new metal in the Dominion, operated its Shawinigan Falls fabricating plant continuously throughout 1935; the company's reduction works at Shawinigan Falls was inactive. The reduction plant of the company, located at Arvida, maintained steady production of aluminium ingot during the last calendar year. The slag ore works at Arvida was not operated in 1935.

The following information relating to recent developments at Arvida is taken from an article prepared by A. W. Whitaker, Jr., and which appeared in an early 1936 issue of "Canadian Chemistry and Metallurgy":

"The Aluminum Company of Canada, Ltd., subsidiary of Aluminum Limited, is making an important extension to its plant at Arvida, Quebec, for the extraction of alumina from bauxite by the "Bayer" process. The new process will tie in with the existing "Hall-Hoopes" process and utilize certain steps, buildings and equipment which have been associated with it. The extension involves the construction of new buildings and the installation of equipment to a value exceeding \$1,000,000."

A bulletin issued by the Imperial Institute, London, contains the following information:

"Silicates containing alumina as a major constituent occur widely distributed in nature, and a number of them, including kaolin, leucite, labradorite, nephelite, and various shales and clays, have been suggested as possible sources of alumina ... the possibility of producing aluminium from silicates has been studied in Germany for some time, and under the present regime research has been accelerated and small-scale experiments have been carried out which would enable a large-scale plant to be erected and worked, if occasion arose. At the present price of bauxite imported the clay processes cannot be economically operated, but if supplies were materially reduced or the price increased, they would be in a position to start production. The I. G. Farbenindustrie has an experimental plant at Bitterfeld equipped to produce aluminium from clay, using hydrochloric acid as a solvent. The solution obtained is saturated with hydrochloric acid gas, aluminium chloride free from iron is precipitated and ignited to yield alumina. The Vereingte Aluminiumwerke has developed an electro-thermal process and has purchased clay deposits at Bautzen which are stated to ensure raw material supplies for 100 years in case bauxite shipments fail ... Japan has no bauxite deposits, but efforts to establish an aluminium industry, using silicate as raw material, have been made since 1915, when the Nippon Aluminum Co. began producing aluminium from silicate, but as the metal produced could not be obtained purer than 94 per cent, the process was abandoned. The Nippon-Manchukuo Aluminum Co. are now erecting a plant for the treatment of Manchurian clay, using the Suzuki process. The aluminium works of the South Manchuria Railway Co. will employ the same process and raw materials. Suzuki's process is a development of Hall's dry process. The raw material is crushed and heated in an electric furnace with coke to reduce the ferric oxide and silica, which form a lower layer of ferro-silicon. The upper layer of alumina is removed, crushed, replaced in electric furnace, and heated to 500-600 deg., while a calculated amount of chlorine is passed through to convert the iron and silicon residue into chlorides which volatilize. The electrolysis of alumina is then carried out with cryolite as usual. ... There has been a rapid increase in the production of aluminium in the Soviet Republic in the last few years, and the extraction of the metal from domestic bauxite has developed to such an extent that it is claimed that the country is no longer dependent on foreign supplies. It has, however, been thought necessary to study the possibility of utilizing nephelite concentrates in a soda-lime fusion process and a mass production works is now under construction at Kandalaksha. The first section will have an output capacity of 40,000 tons of aluminium, the nephelite treated being a by-product in the working of apatite The possibility of utilizing Italian leucite as a source of alumina and potash has been realised, and a plant producing 4,000 to 5,000 metric tons of aluminium per year started operations near Civitavecchia in 1931, using the Blanc nitric acid extraction process All the aluminium produced in the United Kingdom is obtained from bauxite, most of which is imported from France."

IMPORTS INTO CANADA AND EXPORTS OF ALUMINIUM, ALUMINA BAUXITE AND CRYOLITE, 1934 and 1935.

	1934				1935			
	1	9	3	4	1	9	3	5
	Cwt.				Cwt.			
				\$				\$
IMPORTS								
Alumina	1,052			12,235	1,645			16,457
Bauxite ore	1,639,070			2,170,878	2,546,136			2,883,330
Cryolite	3,345			27,718	3,436			27,387
Aluminium in pigs, ingots, blocks, notch bars, slabs, billets and blooms	796			18,907	1,694			36,954
Aluminium scrap	3,520			45,174	5,361			70,045

IMPORTS INTO CANADA AND EXPORTS OF ALUMINIUM, ALUMINA BAUXITE AND CRYOLITE, 1934 and 1935. (concluded)

	1	9	3	4	1	9	3	5
	Cwt.		\$		Cwt.		\$	
IMPORTS -								
Aluminium in bars, rods and wire	2,480		78,155		1,947		60,331	
Aluminium in plates, sheets and strips, including circles	12,198		336,469		12,344		356,760	
Aluminium pipes and tubes	805		38,694		638		31,521	
Aluminium leaf, less than .005 mm. thick(x)	...		2,023		...		3,133	
Aluminium kitchen or household hollow- ware, n.o.p. ....	...		92,411		...		84,179	
Aluminium, manufactures of, n.o.p. ....	...		433,797		...		468,901	
Aluminium leaf, n.o.p., or foil less than .005 inch thick, plain or embossed ....	...		53,470		...		62,908	
Aluminium powder	109,673		48,137		67,419		30,025	
Other .....	...		4,360		...		7,597	
TOTAL ALUMINIUM AND ITS PRODUCTS .....	...	3,362,428			...	4,139,528		
(x) From April 18, 1934.								
EXPORTS -								
Aluminium scrap	27,969		354,617		26,130		348,623	
Aluminium in bars, blocks, etc. -								
To - United Kingdom	264,946		4,566,765		337,204		5,868,348	
United States	30,499		502,995		50,101		747,978	
Argentina	284		6,517		53		1,498	
Brazil	344		7,294		733		15,396	
China	72		2,611		7,801		131,687	
Australia	3,055		72,991		10,527		227,566	
Japan	74,940		1,233,867		121,656		1,922,774	
Netherlands	22,669		375,383		...		...
British India	17,808		375,356		3,234		63,041	
Belgium	632		13,594		5,845		38,527	
Mexico	474		10,711		1,096		24,605	
Switzerland .....	...		...		47,728		744,331	
Other countries	1,747		38,457		13,604		185,587	
Total in bars, blocks, etc...	417,470		7,206,541		599,582		10,021,338	
Aluminium kitchen utensils and hollow- ware .....	...		11,920		...		13,219	
Aluminium, manufactures of, n.o.p. ....	...		434,564		...		377,512	
TOTAL ALUMINIUM AND ITS PRODUCTS .....	...	8,007,642			...	10,760,692		

WORLD'S PRODUCTION OF ALUMINIUM, 1929, 1933, 1934 and 1935.

(From the Year Book of the American Bureau of Metal Statistics)
(in metric tons)

Country	1 9 2 9	1 9 3 3	1 9 3 4	1 9 3 5
United States	102,100	38,600	33,646	54,113
Canada	42,000	16,200	15,500	20,556
Total North America	144,100	54,800	49,146	74,669

WORLD'S PRODUCTION OF ALUMINIUM, 1929, 1933, 1934 and 1935 (concluded)
(From the Year Book of the American Bureau of Metal Statistics)
(in metric tons)

Country	1 9 2 9	1 9 3 3	1 9 3 4	1 9 3 5
France	29,083	14,300	16,000	21,800
Switzerland (a)	20,700	7,500	8,100	11,700
Germany (a)	32,700	18,932	37,158	70,700
Austria (a)	4,000	2,000	2,200	2,100
Great Britain (a)	13,900	11,000	13,000	15,100
Norway	29,142	15,384	15,346	16,000
Italy	7,373	12,072	12,846	14,000
Spain	1,000	1,154	1,230	1,200
Russia .....	...	4,434	14,391	24,500
Sweden .....	...	...	285	1,800
Total Europe	137,898	86,776	120,556	178,900
Japan .....	...	...	700	4,000
TOTAL WORLD(b)	281,998	141,576	170,402	257,569
Average price in cents per pound - New York .....(x) .	23.90	23.30	21.58	20.50

(a) Metallgesellschaft.

(b) Omitted from this table are possibly small productions in Belgium and Hungary, as to which information is uncertain.

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

ANTIMONY

No commercial production of metallic antimony has occurred in Canada since 1917 and no by-product output of the metal since 1926 in which year it was reported as being contained in silver-lead-bismuth bullion produced from the cobalt-silver ores of Northern Ontario. The greater part of the refined antimony made in Canada was produced at Trail, British Columbia, during the years 1907, 1909, 1915 and 1916 by the Consolidated Mining and Smelting Company of Canada, Limited, the metal being recovered in the treatment of silver-lead ores.

Minerals containing antimony occur in Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba and British Columbia, also in the Yukon Territory. No deposits of antimony ores, known as such, have been worked commercially in Canada for many years. China is the principal antimony producing country with approximately 95 per cent of the output coming from Hunan province. It was reported that the Hunan Antimony Syndicate was abolished in December, 1935, and the National Antimony Administration formed in January, 1936, with head office located in Shanghai. The purpose of this new organization is to improve the industry in Hunan, regulate production and collect taxes.

During recent years a large proportion of the world's antimony output has been absorbed in the manufacture of storage batteries and bearing metals; the metal is also employed in the manufacture of pigments, type metal, solder, rubber goods and various other products.

The average price of standard brands of antimony in the New York market was 13.616 cents per pound in 1935, an increase of 53 per cent over the average price for the previous year and the largest yearly average since 1926.

Antimony prices per pound, October, 1936, New York - domestic 12.25 cents; Chinese, (duty paid) 12.50 cents, spot.

ANTIMONY USED IN SPECIFIED CANADIAN INDUSTRIES, 1933-1934.

Industry	1 9 3 3		1 9 3 4	
	Pounds	\$	Pounds	\$
White metal alloys	482,571	29,362	385,052	32,212
Electrical apparatus and supplies	144,206	6,820	193,811	10,624

NOTE - Corresponding data for 1935 not yet available.

IMPORTS OF ANTIMONY AND ANTIMONY PRODUCTS INTO CANADA, 1934 and 1935.

	1 9 3 4				1 9 3 5			
	Pounds		\$		Pounds		\$	
Antimony or regulus of, not ground, pulverized or otherwise treated	625,432	45,124	926,959	113,072				
Antimony oxide and titanium oxide (x)	976,539	130,325	2,870,491	310,083				
Antimony salts - tartar emetic, etc.	41,926	5,297	48,516	7,907				
Antimony salts for dyeing	112	43	112	40				

(x) From April 1, 1934. (including white pigments containing not less than 14 per cent by weight of titanium).

WORLD'S PRODUCTION OF ANTIMONY ORE, 1932, 1933 and 1934.

(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	1 9 3 2	1 9 3 3	1 9 3 4
<u>BRITISH EMPIRE</u>			
Australia	60	47	9
<u>FOREIGN COUNTRIES</u>			
Czechoslovakia	588	1,341	1,142
France	627	300	261
Greece	325	168	(a)
Italy	372	358	346
Algeria	261	100	650
Morocco (Spanish)	100	40	(a)
Mexico	1,317	1,919	2,626
United States (c)	374	524	361
Argentina .....	...	12	(a)
Bolivia (exports)	1,446	1,866	1,182
Peru	14	18	73
China	12,191	12,600	16,466(b)
Japan (ore)	66	133	106
Korea (ore)	7	21	...
Turkey .....	...	44	(a)

(a) Information not available.

(b) Interport exports.

(c) Secondary metal was recovered as follows: 1932 - 5,800 long tons; 1933 - 6,600 long tons; 1934 - 6,700 long tons

BARIUM

The use of barium metal and particularly barium alloys is advancing steadily, according to "The Mineral Industry." It has been utilized in the vacuum tube industry because of its ability to remove the last traces of gases and to emit electrons easily; for the same purpose various barium alloys have been employed. Nickel-barium and nickel-copper-barium alloys are used for spark plugs owing to the production of a better and steadier spark due to their high thermionic electron emission.

BERYLLIUM

The principal ore of beryllium is the mineral beryl - $\text{Be}_3\text{Al}_2(\text{SiO}_3)_6$. 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 Canadian beryl mining operations were reported in either 1934 or 1935.

"Interest in the supply and uses of beryllium has increased materially in recent years, and in 1935 the output appears to have attained larger proportions than ever before. Research continues to disclose new uses for beryllium alloys, but unalloyed the metal has no commercial applications. In the United States beryllium-copper alloys have leading interest; in Germany, considerable progress has been made with nickel-base beryllium alloys. Close cooperation is maintained between the American producers of beryllium master alloys and leading German interests. Uncertainty as to the probable magnitude of raw-material supplies has tended to retard development of the beryllium industry. Offerings of beryl, however, continue to be encouraging, the supplies coming to a considerable extent from British India in 1935, although Brazil, Argentina, and South Africa also seem to be important, and United States contributions appear likely to be susceptible of large increase. Italian interests are said to be contemplating developing African ores as well as utilizing home supplies, which are probably meagre. Madagascar exported 132 metric tons during the first nine months of 1935 compared with 164 tons during the corresponding period of 1934. Statistics from other countries are not now available. Beryl was quoted at \$30 to \$35 per short ton, f.o.b. mine throughout 1935. The German price for minimum 98 per cent metal remained at 600 marks per kilo until September, when the quotation was reduced to 500 marks.

"Interesting new uses reported during the year include the application of cast beryllium copper to moulds for the manufacture of plastics. It is stated that under favourable conditions this innovation may provide a satisfactory and sometimes cheaper substitute for steel dies and that cast-beryllium copper containing 2.75 per cent beryllium also may be employed for metal-forming dies. Uses for beryllium in the field of light metal alloys and as a tarnish-resistant addition of silver alloys are still in the experimental stage." (Minerals Year Book, 1936 - United States Bureau of Mines).

"Metal and Mineral Markets" - New York - quotations (October, 1936) for beryllium ore - per ton, carload lots, minimum 10 per cent BeO , \$30; minimum 12 per cent, \$35, f.o.b. mines.

BISMUTH

Production of bismuth in Canada during 1935 totalled 13,797 pounds valued at \$13,245 as compared with 253,644 pounds at \$301,215 in 1934. Of the quantity produced in 1935, British Columbia contributed 6,718 pounds and Ontario the balance. Production of the metal increased greatly in 1936 when the output during the first

six months of the year totalled 146,170 pounds. Bismuth produced in the Dominion chiefly represents the metal made in the Trail (British Columbia) metallurgical plants of the Consolidated Mining and Smelting Company of Canada, Limited, together with minor quantities contained in silver-lead-bismuth bullion made and exported by the Deloro Smelting and Refining Co. Ltd., Deloro, Ontario.

For many years the metal was employed almost exclusively for medicinal and pharmaceutical purposes, recently, however, its use in industry has been increasing; it is now utilized in the manufacture of low melting alloys such as sprinkler nozzles, and the element in the form of bismuth perchlorate, in solution, is suitable for electrode position. The metal was quoted in October, 1936, at \$1 per pound, ton lots, New York; London 4s.

PRODUCTION OF BISMUTH IN CANADA, 1926 - 1935.

Year	Pounds	\$	Year	Pounds	\$
1926	6,440	6,440	1931	118,207	157,650
1927	2,072	1,033	1932	16,855	7,340
1928	14,002	5,067	1933	78,303	81,526
1929	194,329	307,114	1934	253,644	301,215
1930	12,732	6,366	1935	13,797	13,245

BISMUTH USED IN THE MANUFACTURE OF CANADIAN MEDICINAL AND PHARMACEUTICAL PREPARATIONS, 1933 and 1934.

Item	1933		1934	
	Pounds	\$	Pounds	\$
Bismuth metal	29,840	28,500	31,365	31,500
Bismuth salts	11,104	17,772	11,554	18,735

Imports of metallic bismuth into Canada during 1935 totalled 2,048 pounds valued at \$1,675 as compared with 4,046 pounds worth \$4,864 in 1934. The value of bismuth salts imported during 1935 totalled \$11,613 as against \$22,010 in the preceding year.

WORLD'S PRODUCTION OF BISMUTH, 1932, 1933 and 1934.

(Taken from the Imperial Institute's publication "The Mineral Industry of the British Empire and Foreign Countries.")
Production of Bismuth Ore, Etc.(x)
(Cwt.)

Producing Country and Description	1932	1933	1934
<u>BRITISH EMPIRE</u>			
Canada -			
Metal and content of bullion	150	699	2,265
India -			
Ore	27 lb.	80 lb.	...
Australia -			
Ore, etc.	405	53	300

WORLD'S PRODUCTION OF BISMUTH, 1932, 1933 and 1934 (concluded)

(Taken from the Imperial Institute's publication "The Mineral Industry of the British Empire and Foreign Countries")
Production of Bismuth Ore, Etc. (x)
(Cwt.)

Producing Country and Description	1 9 3 2	1 9 3 3	1 9 3 4
<u>FOREIGN COUNTRIES</u>			
Germany (Saxony) -			
Bismuth-cobalt-nickel ore	2,154	...	(a)
Spain -			
Ore	650	1,516	3,543
Metal	669	512	905
Mexico -			
Ore (Bi content)	343	923	2,033
Bolivia (exports) -			
Ore, etc. (Bi content)	46	37	993
Peru -			
Lead-silver bullion, etc. (Bi content)	1,192	1,607	2,358
Metal	376	4,149	3,010
China -			
Ore (Bi content)	400	400	400
Japan -			
Metal	938	1,124	991

(x) Bismuth is also recovered as a by-product in the United Kingdom, France, Sweden, U.S.S.R. (Russia) and the United States.

(a) Information not available.

CADMIUM

Cadmium production in Canada represents the recovery of the metal as a by-product in the electrolytic refining of zinc. Production up to 1936 came entirely from the treatment of zinc-bearing ores at Trail, British Columbia, by the Consolidated Mining and Smelting Company of Canada, Limited. The quantity of the metal produced in Canada during 1935 totalled 580,530 pounds valued at \$441,203 and represented recoveries solely from British Columbia ores. It is interesting, however, to note that the Hudson Bay Mining and Smelting Company commenced the commercial production of cadmium at Flin Flon, Manitoba, for the first time, during the early part of 1936.

The use of cadmium as a substitute for tin in bearing metals is now attracting considerable attention; cadmium-silver-copper, cadmium-silver and copper-lead-cadmium alloys are now being employed by the automobile industry. Previous to the adaption of cadmium as an alloy metal relatively large quantities were employed for the rustproofing of small automobile parts and it is reported that its use as a substitute for zinc, nickel or copper plating continues to develop. It is also stated that the use of cadmium-copper alloy for tramway and railway trolley wires is also increasing, and the use of the alloy is being extended for overhead telephone and telegraph lines, for flexible telephone cords and similar cables. A copper-cadmium alloy, containing from 0.8 per cent to 1.0 per cent cadmium, is being introduced for long span, high voltage, transmission lines. The metal also finds growing application in the form of sulphide or sulpho-selenide as a pigment for the enamel, ceramic, rubber and paint industries.

Cadmium quotations, October, 1936, New York, per pound to platers, patented shapes, \$1.05. On quantity business, commercial sticks, prompt and forward shipment, quotations range from 75 cents to \$1. London, 2s. 11d. to 3s.

PRODUCTION OF CADMIUM IN CANADA, 1928 - 1935.

Year	Pounds	\$	Year	Pounds	\$
1928	491,894	341,374	1932	(a)	26,824
1929	773,976	675,294	1933	(a)	78,733
1930	(a)	337,871	1934	(a)	95,665
1931	(a)	180,958	1935	580,530	441,205

(a) Quantities not published.

WORLD'S PRODUCTION OF CADMIUM, 1932, 1933 and 1934.

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

Producing Country	1932	1933	1934
<u>BRITISH EMPIRE</u>			
South West Africa (d)			140,000
Canada	122,822	246,041(c)	294,000(c)
Australia	354,620	357,313	380,493
<u>FOREIGN COUNTRIES</u>			
Belgium	274,451	355,000	498,245
France	108,000	88,000	...
Italy	13,752	15,287	17,600
U.S.S.R. (Russia)	(a)	(a)	5,700
United States -			
Metal	799,501	2,276,933	2,777,384
Compounds (metal content)	259,800	401,400	566,700
Mexico (b)	189,981	2,848,079	848,149

Cadmium is also produced in Germany, Norway, Poland, Sweden and Japan.

(a) Information not available.

(b) Including cadmium content of flue dust, etc., exported for treatment.

(c) Excluding cadmium sponge produced at Flin Flon.

(d) Cadmium content of shipments of dust from the smelters to Germany.

CAESIUM.

Caesium is not produced in Canada; the metal belongs to the alkali group, but differs from potassium and sodium in the properties of its complex salts, many of which are comparatively insoluble in water. In nature, caesium is relatively rare; it occurs in the mineral Pollux or Pollucite, which is a hydrated aluminium caesium sodium silicate containing from 30 to 36 per cent caesium oxide. This is found in Hebron, Maine (U.S.A.) and in Germany. Caesium is recovered from its mineral by treatment with hydrofluoric acid and then precipitated out of solution by the addition of antimony trichloride. Practically all of the caesium produced today is consumed in the production of photoelectric cells. The modern caesium cell has an average sensitivity of 60 microamperes per lumen. Caesium also occurs in some of the lepidolites and in some of the carnallites. (The Chemical Trade Journal and Chemical Engineer, London).

There is no record of any imports into Canada of caesium during recent years.

CALCIUM

Metallic calcium, produced by the electrolysis of the fused chloride, is gradually acquiring new commercial applications. Among the more important of these are the debismuthizing of lead (the Betterton process); the hardening of lead for various purposes, particularly bearing metals and cable coverings; as a deoxidizer for copper and its alloys, and for cast iron and steel; as a constituent of aluminium alloys for forging and casting; as a reducing agent for oxides of beryllium, chromium, thorium and uranium; as a desulphurizing agent in petroleum refining; and as an absorbent of residual gases in vacuum tubes.(x) The metal has not yet been produced in Canada.

(x) The Mineral Industry.

CHROMITE

Chromite production in Canada during 1935 was valued at \$14,947 as compared with \$1,578 in 1934. The output of the mineral during both years came from the Coleraine area in the Eastern Townships of Quebec and the Obonga Lake deposits of northwestern Ontario. The Chromium Mining and Smelting Corporation Ltd., conducting mining operations at Obonga Lake, commenced the production of ferrochrome at Sault Ste. Marie, Ontario, in August, 1935, utilizing chromite shipped from its Obonga Lake mine. Early in 1936 it was announced that the smelting plant was to be enlarged and a 100 ton concentrator built at the mine.

"The continued improvement in the international ferrous-metallurgical industries, coupled with armament activities by the military powers during 1935, increased the demand for chromite. World production in 1935 exceeded 1934 and probably was greater than in 1929, although complete figures are not available. Production in Turkey continued to expand in 1935 and reached a new high of 150,504 metric tons. The U.S.S.R. (Russia) was probably the leading producer; an output of 180,000 tons was planned for 1935. Southern Rhodesia ranked third in 1935 but was closely followed by the Union of South Africa, where output increased 47 per cent over 1934. The improvement in the consumption of chromite during the last year reflects the increased activity in the steel industry, the principal consumer. The automobile industry in the United States, one of the principal users of chromium-alloy steels and chromium plating, increased its output 43 per cent over 1934, making 3,946,934 cars in 1935. The building-construction industry uses stainless steel for decorative purposes and large quantities of chromium-plated plumbing fixtures. Chromium in varying quantities, either alone or combined with other alloying elements, enters into the manufacture of a wide variety of alloy steels designed for specific purposes. Perhaps the most widely known are the steels and irons of the chromium and chromium-nickel series, which are extensively used in the automobile, building, dairy, paper, petroleum and chemical industries, as well as in kitchen equipment for restaurants, hotels and hospitals. Chromium plating may be divided into two classes - decorative and wear-resisting. The former is encountered more commonly, being used extensively in automobile fittings and hardware, plumbing fixtures and miscellaneous hardware and cutlery; wear-resisting plate, while not as well known as decorative plate, has many important industrial applications, including use for dies, rolls, and engraving plates. The second largest use of chromite in the United States is in the manufacture of refractory materials, such as brick, cement, ground ore or crude lump ore; the ore used for this purpose is imported largely from Cuba, Greece and the Union of South Africa. Chrome refractories are neutral metallurgically and quite resistant to many types of slag." (Minerals Year Book, 1936 - United States Bureau of Mines).

Of the 73,971 metric tons of chromite exported from New Caledonia in 1935 the United States took 62,238 tons; Netherlands, 4,674 tons; Germany, 2,540 tons; Japan, 1,612 tons, and Australia, 1,547 tons.

"The Iron Age" - Philadelphia, reports that an English development, brush plating, with some American improvements is now on the market as a practical and commercial process. In simplest terms, this consists of attaching the negative wire of a low voltage direct current circuit to the work to be plated and the positive wire to the binding post of a brush which resembles that of a painter but which has in the centre of the bristles a metal anode. The brush is first dipped in a moist jelly-like solution of chromic acid and is then used very much as a painter would use it to coat the metal parts. This brush method can also be utilized for nickel plating.

"Metal and Mineral Markets" in October, 1936, quoted chrome ore - per long ton, C.I.F. Atlantic ports, \$16.50 to \$16.75 for 45 to 47 per cent Cr₂O₃ ore, and \$18.50 to \$19.50 for 48 to 50 per cent ore.

PRODUCTION OF CHROMITE IN CANADA, 1926 - 1935.

Year	short tons	\$	Year	short tons	\$
1926	1931 .....	...	...
1927	1932	78	1,113
1928	1933	30	343
1929	126	900	1934	111	1,578
1930	1935	(a)	14,947

(a) Quantity not published.

IMPORTS OF CHROMIUM AND CHROMIUM PRODUCTS INTO CANADA, 1934 and 1935.

		1934				1935			
		1	9	3	4	1	9	3	5
		Quantity				Quantity			
		\$				\$			
Chromium metal and tungsten metal, in lumps etc., when imported by manufacturers for alloying purposes	lb.	26,222	16,461	36,007	22,454				
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.	48,413	45,114	43,434	41,381				
Chrome fire brick	xx	...	39,184	...	46,882				
Bichromate of potash - crude	lb.	139,865	11,684	151,336	12,150				
Bichromate of soda	lb.	2,374,311	138,313	2,634,271	148,421				

CONSUMPTION OF CERTAIN CHROMIUM PRODUCTS IN SPECIFIED CANADIAN INDUSTRIES, 1933 and 1934.

Industry	Item	1933		1934	
		Pounds	\$	Pounds	\$
Paints, Pigments and Varnishes	Chrome colors	764,682	109,595	1,008,063	147,598
Paints, Pigments and Varnishes	Sodium bichromate	359,787	34,200	434,786	33,205
Chemicals	Sodium bichromate	20,592	1,412	23,266	1,783
Leather Tanning	Sodium bichromate	1,092,635	71,312	1,230,073	90,116

NOTE - In addition to the items listed above, a considerable quantity of ferrochrome is utilized in the manufacture of Canadian alloy steels.

WORLD'S PRODUCTION OF CHROME ORE AND CHROMIUM, 1932 - 1934.

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

Production of Chrome Ore
(Long tons)

Producing Country	1 9 3 2	1 9 3 3	1 9 3 4
<u>BRITISH EMPIRE</u>			
Southern Rhodesia	15,445	34,493	70,961
Union of South Africa	19,065	33,541	44,560
Cyprus	1,000(c)	...	966
Canada	70	27	99
India	17,865	15,526	21,576
Australia	97	891	1,716
TOTAL	54,000	84,000	140,000
<u>FOREIGN COUNTRIES</u>			
Greece	1,530	14,550	(a)
Norway	403	321	41
Roumania .....	...	29	...
U.S.S.R. (Russia)	64,200	110,900	(a)
Yugoslavia	38,524	25,062	46,540
Cuba	500	21,837	49,370(d)
Guatemala (d) .....	...	2,061	792
United States	200	966	341
Japan	12,295	19,681	26,792
Turkey	54,344	74,188	143,800
New Caledonia	68,332	49,100	54,300
TOTAL	240,000	319,000	(a)
WORLD'S TOTAL	294,000	403,000	(a)

(a) Information not available.

(c) Estimated.

(d) Imports into the United States from the country indicated.

COLUMBIUM

This element has not been recovered or produced commercially in Canada. The mineral columbite, however, has been reported as occurring in Renfrew county, Ontario. Columbium is now employed in the manufacture of special steels and the world's present source of columbite is Nigeria. According to "Mineral Industry" the ore is raised to 45 - 55 per cent Cb_2O_5 in Nigeria, and after importation into the United States is subjected to still further concentration and purification. The ferro-alloy produced runs 50 - 60 per cent Cb, and sells for \$3 per pound of contained columbium (1934). The main applications of columbium are as an addition to stainless steels for high temperature work, for the prevention of intergranular corrosion, and in the production of welding rods. "Metal and Mineral Markets" - New York, quotations for columbium, October, 1936, were - per kilo, base prices: rod, \$560; sheet, \$500.

No imports of the metal or its ores into Canada were recorded in 1935.

IRON ORE

No iron ores, known as such, are mined at present in Canada. 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 and operated 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.

In northwestern Ontario, about 1899, a deposit of hematite, that later developed into the Helen mine, was found. This proved the chief source of Ontario's iron output for a number of years. The high grade ore was exhausted and the mine is now idle; Ontario has a considerable supply of low grade iron ore that would require beneficiation for commercial use. Iron ores, chiefly low in grade, also occur in British Columbia, Ungava and other parts of the Dominion.

Imports of iron ore into Canada during 1935 totalled 1,509,933 tons valued at \$2,960,207 and of this tonnage 762,146 came from the United States, 693,375 from Newfoundland and 29,530 from Norway. Imports in 1934 totalled 977,341 tons worth \$1,827,308.

WORLD'S PRODUCTION OF IRON ORE(x), 1932, 1933 and 1934.

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

Producing Country	1 9 3 2	1 9 3 3	1 9 3 4
<u>BRITISH EMPIRE</u>			
United Kingdom (b)	7,328,190	7,461,720	10,586,846
Northern Rhodesia	711	...	...
Sierra Leone (exports) .....	...	24,550	210,645
Union of South Africa	31,196	67,496	229,494
Newfoundland	317,858	320,891	506,616
India	1,760,501	1,228,625	1,916,918
Unfederated Malay States	688,179	766,472	1,135,649
Australia	546,160	736,604	1,247,465
New Zealand .....	...	6,572	2,806
TOTAL	10,700,000	10,600,000	15,800,000
<u>FOREIGN COUNTRIES</u>			
Austria	301,951	262,814	459,462
Belgium	91,344	104,523	114,060
Czechoslovakia	592,704	422,000	530,233
France	27,163,427	29,728,996	31,695,690
Germany	1,318,600	2,550,513	4,274,092
Greece	45,295	83,875	(a)
Hungary	52,029	49,231	67,775
Italy	417,368	517,294	494,153
Luxemburg	3,161,879	3,309,312	3,771,328
Norway	368,002	466,379	558,452
Poland	75,901	270,161	243,458
Portugal .....	...	4,400	2,849
Roumania	7,924	13,613	82,270
Spain	1,732,667	1,786,811	2,060,929
Sweden	3,246,886	2,656,127	5,170,093
Switzerland (exports)	11,675	6,977	18,661

WORLD'S PRODUCTION OF IRON ORE(x), 1932, 1933 and 1934 (concluded)
(Taken from the Imperial Institute's publication "The Mineral Industry of the British
Empire and Foreign Countries")
(Long tons)

Producing Country	1932	1933	1934
<u>FOREIGN COUNTRIES (concluded)</u>			
U.S.S.R. (Russia).....	12,000,000	14,000,000	21,000,000
Yugoslavia	26,214	50,925	176,971
Algeria	459,560	749,426	1,305,488
Belgian Congo .....	...	69	(a)
Egypt	25	...	200
Morocco (Spanish)	168,479	507,692	811,785
Tunis	206,000	286,000	537,900
Cuba	185,248	275,197	(a)
Mexico	26,694	76,486	104,128
United States (d)	9,872,350	17,744,819	24,809,438
Brazil (estimated)	30,000	30,000	30,000
Chile	168,420	556,246	957,800
China	1,232,816	1,260,000	(a)
French Indo-China .....	...	405	1,512
Japan	223,141	315,605	424,865
Korea	149,022	254,188	173,223
"Manchoukuo"	1,025,163	1,158,060	(a)
TOTAL	64,000,000	79,000,000	101,000,000
WORLD'S TOTAL	75,000,000	90,000,000	117,000,000

(x) Including Manganiferous Iron Ore).

(a) Information not available.

(b) In addition bog ore and iron ore (not used for smelting) were produced as follows:-

1932	9,533 long tons
1933	8,256 " "
1934	9,709 " "

(c) Shipments from mines.

(d) Including shipments of manganiferous iron ore up to 35 per cent. Mn.

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 from around 8 to 9 per cent for amblygonite, 4 to 8 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; at Bernie Lake about 100 tons of spodumene and 50 tons of amblygonite were mined and stock piled in 1930; there has been only a minor amount of work done since that year and no shipments have been made to the end of 1935. Lithium minerals serve as the raw material for the manufacture of lithium chemicals and lithium metal and alloys." (Report 773 - Department of Mines, Ottawa).

"Lithium and its compounds are increasing rapidly in commercial importance. For a number of years there has been a steady output of lithium-hardened bearing metal

alloys, and due to the profound influence of rather minute amounts of this ultra-light metal in such alloys, its sponsors envisage rapid expansion in its metallurgical uses Lithium salts afford an extraordinarily efficient vehicle for dehumidifying air and thus making indoor atmospheres more comfortable in hot weather. "Lithiated" mineral waters consume a substantial quantity of lithium chloride and the nitrate and salicylate are employed as remedies for rheumatism and gout. Lithium hydroxide is employed in alkali storage batteries and in the ceramic industries artificial lithium compounds, as well as lepidolite, have been used to some extent, mostly as apacifiers for certain kinds of glass. Foreign trade statistics are not separately reported but it is known that there has been a substantial exportation of lithium minerals, principally South Dakota amblygonite, to Germany in recent years following a reduction in output from the Spanish Peninsula. On the other hand, trial shipments of South African lepidolite have been made with a view of creating a market for this material in the United States." (Minerals Year Book, 1936 - United States Bureau of Mines).

"Metal and Mineral Markets" New York, quote October, 1936, lithium metal per pound, 98 to 99 per cent, 100 pound lots, \$15. Amblygonite - August, 1936, per ton, f.o.b. mines, 8 to 9 per cent Li_2O , \$34 to \$35.

No imports into Canada of lithium, lithium alloys or compounds, described as such, were reported in 1935.

The following amounts of lithia mica were produced during 1932, 1933 and 1934:-

	<u>1 9 3 2</u>	<u>1 9 3 3</u> (long tons)	<u>1 9 3 4</u>
Germany	156	72	(a)
Portugal	2,014	870	294

(a) Information not available.

MAGNESIUM

"The rapid development of aviation, and the growing importance of the air arm for military purposes, has caused the question of magnesium production to be seriously regarded in all the more important countries.

"At present magnesium is produced in Germany, Great Britain, the United States, Russia and Japan. In Italy the Montecatini Concern obtained permission in August, 1935, from the Corporation Minister to erect works for magnesium production, and it has been planned to commence production of magnesium in Holland and Austria.

"The raw materials of most of the producers are magnesite or magnesium chloride. The Dow Chemical Company uses a brine rich in magnesium salts as the source of magnesium (U.S.A.) while the Nichiman Magnesium K.K. uses both magnesium oxide and the sulphate. Wintershall A. G. and the Russian's produce magnesium directly from carnallite. The Osterreichisch Amerikan ischen Magnesit A.G., at Rodenthein in Austria has developed a process by which magnesium metal is obtained from magnesite or from dolomite, by reduction with carbon It has been asserted that, on a corresponding scale, magnesium can be produced at less cost than aluminium." (The Mining Journal, London).

A plant is now operating on the inland shores of San Francisco Bay for the manufacture of magnesium compounds from sea water by a chemical precipitation process and it is reported that in operating practice approximately 100 gallons of Bay water is pumped to produce 1 pound of MgO .

The metal is not yet made in Canada and data relating to imports into Canada of magnesium are not published separately.

New York prices for the metal, October 8, 1936, per pound, ingots (4x16 in.) 99.8 per cent, 30 cents in carloads; 32 cents in 100 pound lots or more, l.c.l. 1/4, 3/8, 1/2, 1, and 2 pound sticks, 5 cents per pound over ingot price. New magnesium ingot and stick sold or used by the producer in the United States totalled 4,241,218 pounds in 1935.

MANGANESE

The only production of manganese ore in Canada since 1931 represented a shipment of 100 tons valued at \$800 in 1935. This was made from a deposit located at Turtle Creek, Albert county, New Brunswick, and was consigned to the steel industry. The Department of Mines, Ottawa, report 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.

In June, 1936, the technical press reported the development in the electro-metallurgical laboratory of the United States Bureau of Mines of a method for the production of metallic manganese from ore by leaching and electrolysis. The pure metal so produced, it is stated, is in the form of bright, coherent sheets, perfectly stable in air; according to report the process is simple and cheap and adaptable to commercial utilization. The electrolyte used is manganese sulphate ... with large manganese deposits located within reach of power from Boulder Dam and other federal projects, the power cost of producing high-purity manganese metal may be as low as \$10 a ton.

The National Association of Purchasing Agents, New York, states in its report A - 19, of October, 1936: "It is estimated that more than 90 per cent of the world's consumption of manganese ore is in the manufacture of iron and steel. Most of the manganese ore entering the ferrous metallurgical industry is used in making ferromanganese and spiegeleisen, the forms in which manganese is usually added to steel. Silico-ferromanganese and silicaspiegel are used in certain grades of steel and may replace ferromanganese and spiegeleisen. Considerable manganese ore is also added to the pig-iron blast furnace charge when the iron-ore burdens are deficient in manganese. Manganese steels are utilized in the manufacture of plates, shapes, structural bars, open-hearth rails, spring steels, car wheels, tires, axles and for many other purposes where toughness and resistance to abrasion is required. Manganese is also used in the formation of alloys of copper, zinc, aluminium and other metals. Probably the most extensive chemical use of manganese ore is in the manufacture of dry cells; another outlet taking advantage of the oxidizing power of manganese dioxide is in the glass and ceramic industry; fine glassware is almost entirely decolorized by the addition of manganese oxide. Manganese compounds are used extensively as driers in the preparation of varnish and paint, due to their catalytic properties; manganese ore required for this use must be of relatively high grade. The manufacture of manganates and the permangates for use as germicides and deodorizers is now an important branch of the chemical industry; the permangates are also used for bleaching in the textile industry.

Manganese ore quotations, October 22, 1936, New York, were: 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; Chilian, 47 per cent minimum, 25 cents; Indian, 48 to 50 per cent, 25 cents; Caucasian, 52 to 55 per cent, 27 cents; South African, 50 to 52 per cent, 27 cents; 44 to 48 per cent, 25 cents.

In 1935 Canada imported 73,560,900 pounds of manganese oxide valued at \$353,414 and of this quantity, 3,448,800 pounds came from the United States, 6,056,900 pounds from British South Africa, and 63,488,000 pounds from the Gold Coast. Total manganese oxide imports in 1934 amounted to 61,906,900 pounds worth \$234,236.

CONSUMPTION OF MANGANESE ORE OR MANGANESE COMPOUNDS IN SPECIFIED CANADIAN INDUSTRIES,
1933 and 1934.

Industry	Item	1	9	3	3	1	9	3	4
		Pounds		\$		Pounds		\$	
Electrical Apparatus and Supplies	Manganese oxide	993,852		16,805		2,646,545		37,275	
Paints, Pigments and Varnishes	Manganese salts	34,038		3,379		49,543		4,529	
Primary Iron and Steel	Ore manganiferous (foreign)	443,520		3,203		1,682,240		12,235	

WORLD'S PRODUCTION OF MANGANESE ORE, 1932, 1933 and 1934.

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

Producing Country	1	9	3	2	1	9	3	3	1	9	3	4
<u>BRITISH EMPIRE</u>												
Gold Coast				50,689(c)				265,140(c)				365,178
Northern Rhodesia								5,367				2,041
Union of South Africa								20,894				50,229
India				212,604				218,307				406,306
Unfederated Malay States				9,278				13,194				18,649
Australia				106				149				105
TOTAL				270,000				520,000				840,000

FOREIGN COUNTRIES

Austria	(a)	(a)	(a)
Czechoslovakia	32,951	16,799	58,433
Germany	12	554	507
Greece	733	1,578	(a)
Hungary	1,473	6,134	10
Italy	387	4,453	6,831
Portugal		25	290
Roumania	4,971	2,730	11,198
Spain	2,550	2,789	3,736
Sweden	4,653	6,124	6,212
U.S.S.R. (Russia)	813,000	982,000	1,792,000
Yugoslavia	157	521	1,086
Egypt	322	184	944
Morocco (French zone)	4,000	4,752	7,161
Portuguese India	3,517	1,600	(a)
Cuba	2,113	89,224	(a)
Porto Rico (exports)	2,302	1,638	1,711
Mexico	301	564	654
United States (d)	17,777	19,146	26,514
Argentina	248	404	(a)

WORLD'S PRODUCTION OF MANGANESE ORE, 1932, 1933 and 1934 (concluded)
(Taken from the Imperial Institute's publication "The Mineral Industry of the British
Empire and Foreign Countries")
(Long tons)

Producing Country	1 9 3 2	1 9 3 3	1 9 3 4
<u>FOREIGN COUNTRIES (concluded)</u>			
Brazil	36,152	24,500	2,300
Chile	441	450	(a)
China	21,200	9,300	(a)
Japan	25,828	42,847	56,262
"Manchoukuo"	59	740	(a)
Netherlands East Indies	8,156	10,238	11,451
Turkey	2,800	7,600	2,645
TOTAL	980,000	1,240,000	2,080,000
WORLD'S TOTAL	1,250,000	1,760,000	2,920,000

(a) Information not available.

(c) Exports.

(d) Shipments. Excluding ore containing 10 to under 35 per cent. Mn, which is included with iron ore, as follows:-

1932	15,635 long tons
1933	12,779 long tons
1934	23,231 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.

"As Italy and Spain are the largest mercury-producing countries in the world, the war between Italy and Ethiopia, economic sanctions against Italy, and internal disorders in Spain, raised the question of possible difficulty in obtaining supplies of mercury and increased demand for the metal in the last quarter of 1935. Sixty per cent of the total imports into the United States were entered in the last quarter of 1935. Italy's output of mercury in 1935 totalled 25,469 flasks, nearly double the production of 1934 but much below the level of years prior to 1933. Exports of mercury from Spain are reported to have doubled in 1935. Production in the United States in 1935 totalled 17,513 flasks, properties in Arkansas, California, Oregon and Texas accounting for 92 per cent of this output." (Metal and Mineral Markets, New York).

It is interesting to note that the General Electric Company reports that there is no other known method of generating power from a fuel so efficiently as that represented by the mercury and steam cycle; mercury approximating 750,000 pounds or 10,000 flasks is at present circulating in three boilers and turbines driving generators in the eastern United States.

The average quoted price for quicksilver in London was \$60.74 per flask in 1935 and in New York, \$71.99. (flask, 76 pounds).

Imports of quicksilver into Canada during 1935 totalled 121,471 pounds valued at \$98,871 as compared with 246,892 pounds worth \$183,366 in 1934; the metal was obtained during both years from the United Kingdom, United States, Italy and Spain.

MERCURY CONSUMED IN SPECIFIED CANADIAN INDUSTRIES, 1933 and 1934.

Industry	1933			1934		
	Pounds	\$		Pounds	\$	
Boiler Compounds	1,052	789		730	613	
Medicinal and Pharmaceutical Preparations .	19,081	10,494		21,452	16,112	
Other chemicals	36,894	48,724		42,998	52,903	

WORLD'S PRODUCTION OF QUICKSILVER, 1932, 1933 and 1934.

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

Producing Country	1932	1933	1934
<u>BRITISH EMPIRE</u>			
Australia (concentrates)	1,989	47	167
New Zealand	1,500	7,500	3,852
<u>FOREIGN COUNTRIES</u>			
Austria	2,200	440	...
Czechoslovakia	99,329	14,872	58,052
Italy	2,240,518	1,338,058	972,238
Roumania	168	600	(a)
Spain	1,797,978	1,491,601	2,416,729
Algeria	90,041	...	...
Mexico	557,176	340,372	348,161
United States	959,272	734,844	1,173,820
Bolivia (exports)	38,383	...	50,384
China	44,000	33,000	(a)
Japan	5,256	17,807	14,930
Korea	2,050	(a)	(a)
Turkey .....	...	1,748	3,192
WORLD'S TOTAL .....(b)	5,800,000	4,000,000	(a)

(a) Information not available.

(b) Excluding U.S.S.R. (Russia).

(c) Estimated.

MOLYBDENITE

The last commercial production of molybdenite ore or concentrates in Canada was in 1931 when 1,222 pounds of molybdenite concentrates were shipped from a property located in Ontario. The Department of Mines, Ottawa, in its report # 773 for 1935, states:- "The Phoenix Molybdenite Corporation, Toronto, carried out extensive prospecting on its property in Bagot township, 8 miles southwest of Renfrew, Ontario. The shaft was sunk to 100 feet, from which depth about 1,000 feet of drifting and crosscutting was undertaken. The main ore zone, previously worked by open cut methods, was found at depth and some rich pockets of molybdenite were discovered. About 1,000 tons of milling ore were hoisted and placed in storage. Prospecting was continued by A. V. Dukes on the molybdenite property near

Mace, Steele township, Cochrane district. Prospecting was conducted in Quebec on molybdenite properties located in Masham township and near Portneuf Station, 40 miles west of Quebec city.

In British Columbia exploration was recently conducted on molybdenite bearing veins occurring in the Usk area of the Northeastern Mineral Survey District (2); the mineral is found here in quartz veins in association with gold.

The United States Bureau of Mines reports that in 1935 the Climax Molybdenum Company, with its mine at Climax, Lake county, Colorado, maintained its lead as the largest producer of molybdenum in the world. During the year the company mined 1,267,459 tons, from which 9,526 tons of concentrates were produced; these concentrates yielded 10,168,635 pounds of the metal.

The correspondent of the Mining Journal, London, reported that the burning of the Knaben mill in 1934 accounted for the serious drop in molybdenite output, but in 1935 a new and enlarged mill was put in operation, with the resulting increase in the year's output. Norway possesses molybdenite deposits covering a considerable area, but at the present time only one mine is working; Knaben II in Fjotland.

Molybdenum steels are used largely in the automobile industry, oil refining equipment, high pressure boilers and turbines and various other machinery, while molybdenum cast irons are employed for camshafts, clutch plates, cylinder blocks and other machinery parts.

"Metal and Mineral Markets" - New York, quotations for molybdenum metal, October 1, 1936, per pound, in 10 to 49 lb. lots, C.P. Powder, \$9.50; 97 per cent, \$4.10. Molybdenum ore, per pound of contained MoS_2 , nominally 42 cents for 90 per cent concentrate. London, per long ton unit, nominal at 37 s. for 90 per cent concentrate.

Imports of calcium molybdate when imported into Canada by manufacturers of steel for use exclusively in the manufacture of steel in their own factories totalled 74,994 pounds valued at \$26,192 in 1935 as compared with 35,187 pounds worth \$15,586 in 1934. No imports of molybdenum metal were recorded.

WORLD'S PRODUCTION OF MOLYBDENUM ORE, 1932, 1933 and 1934.

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

(Gwt.)

Producing Country	1932	1933	1934
<u>BRITISH EMPIRE</u>			
Australia	102	130	89
<u>FOREIGN COUNTRIES</u>			
Norway (MoS_2 content)	5,181	8,149	4,793
French Morocco (MoS_2 content) .....	...	3,700	2,700
Mexico	103	1,303	15,315
United States (MoS_2 content)	36,176	84,554	139,315
Peru (MoS_2 content)	150	198	176
Korea	879	2,070	2,037
Japan .....	...	...	99

RADIUM- URANIUM

Commercial production of radium-uranium bearing ores in Canada comes at the present time entirely from the Great Bear Lake district in the North West Territories. Eldorado Gold Mines Ltd. is the principal operator in this field and during 1935 the mill of this company treated 14,402 tons of ore, of which 2,560 tons came from development headings. Pitchblende and silver concentrates totalled 296 tons valued at \$752,918. A carload of 34 tons of pitchblende concentrate was flown to railhead during the winter flying season. Underground development in 1935 was confined to the main vein (#2); the shaft was extended to the 500 level in 1936; in September, 1936, it was reported that underground development at the 465 foot level, deepest working horizon at the property, was disclosing particularly favourable conditions, with high grade silver and pitchblende present. It was reported that the recovery of radium, uranium, silver and lead during 1935 at the company refinery, located at Port Hope, Ontario, amounted to about \$490,000; a chemical process suitable for every type of ore, sorted or concentrated at the mine, was established at the plant in November, 1935. The uranium products of the company are principally orange and yellow sodium uranate and uranium oxide, silver sulphide and radium bromide.

It was reported that development work was conducted during 1935 on the pitchblende deposits occurring at Beaverlodge Lake some 100 miles south of the Eldorado property; these deposits are being explored by Hottah Lake Gold and Radium Mines, Ltd. In Ontario development work was continued by Canadian Radium Mines Ltd. at its property near Wilberforce where radio active minerals are reported to occur.

The Department of Mines, Ottawa, report that several small showings of pitchblende were discovered in 1935 on claims located near the new townsite of Goldfields, on the north shore of Lake Athabasca; the veins appear to be very narrow and hardly suggest the presence of commercial ore-bodies.

During 1935 the output of carnotite ores in the United States amounted to 1,145 short tons valued at \$56,223, containing 3,329 milligrams of radium, 22,009 pounds of uranium (25,946 pounds U_3O_8), and 50,776 pounds of vanadium (90,671 pounds V_2O_5). The ore ranged from 1 to 4 per cent in U_3O_8 content and from 3.5 to 12 per cent in V_2O_5 content. Most of the ore or concentrates was shipped to the Vitro Manufacturing Co. of Pittsburgh, Pa., and the Shattuck Chemical Company of Denver, Colorado.

The Union Miniere du Haut-Katanga, operating mines in the Belgian Congo is the world's largest producer of radium and the following statement has been taken from the company's annual report for 1935: "Our sales of radium remain stationary. Owing to some facilities granted by our Society to some public institutions, it has been possible to perfect some new methods of treatment by telecurietherapy which are likely to create in the near future a better demand for radium."

Although radium has found its greatest usefulness in the field of medicine, it has taken a front rank position during recent years in metal manufacturing where it is employed in the detection of flaws. The element with zinc sulphide is also employed in the manufacture of luminous paint.

Uranium in various forms is used chiefly as a colouring material in the ceramic, glass and textile industries while the metal itself is employed in the manufacture of photoelectric cells, ferro-uranium, flow-tube electrodes, and X-ray targets.

Uranium oxide was quoted - New York - October, 1936, \$1.50 per pound.
Radium - per mg. radium content, \$40.

Radium imports into Canada during 1935 were valued at \$150,643 of which \$142,603 came from the United Kingdom and \$8,040 from the United States. Total imports in 1934 were worth \$211,140. Statistics relating to imports and exports of uranium or uranium products are not published separately.

WORLD'S PRODUCTION OF URANIUM MINERALS, 1932, 1933 and 1934.

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

Producing Country	1932	1933	1934
<u>BRITISH EMPIRE</u>			
Canada	(b)	(b)	(b)
<u>FOREIGN COUNTRIES</u>			
Czechoslovakia (U ₃ O ₈)	376	236	236
Portugal	645	1,233	791
Belgian Congo	(c)	(c)	(c)
United States (U ₃ O ₈)	34	18	70

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

- (b) During 1933 and 1934 - 3,021 mgrms. and 3,000 mgrms. of radium of 98 per cent. average concentration and 34,940 lb. and 27,000 lb. of uranium salts were produced, respectively.
- (c) The output of uranium minerals is not available for these years but it is reported that the radium produced from these ores amounted to 6 and 6.7 grams in 1932 and 1933 respectively. This production of radium represents the greater part of the world's supplies.

SELENIUM

Selenium production in Canada represents a by-product in the electrolytic refining of blister copper made from Manitoba, Ontario and Quebec ores. It is recovered at Copper Cliff, Ontario, by the Ontario Refining Company, Ltd., and at Montreal East, Quebec, by the Canadian Copper Refiners, Ltd. Output in 1935 totalled 566,425 pounds valued at \$703,536 and of this total quantity, 206,421 pounds were credited to Quebec, 75,363 pounds to Ontario, 65,074 pounds to Manitoba, and 19,567 pounds to Saskatchewan.

In the United States, 232,831 pounds of selenium was sold by producers in 1935 while in Sweden the enlargement of a by-product plant at Boliden increased productive capacity for the element. In Japan a small quantity of selenium is obtained in refining copper.

Selenium is employed in the manufacture of alloys, glass, and rubber products, and the recent development in selenium rectifiers for converting alternating into direct currents is interesting. The United States Bureau of Mines describe the presence of selenium in water samples from the Colorado river as indicating a previously unsuspected source of selenium.

Selenium was quoted - New York - October, 1936, per pound, black, \$2; powdered, 99.5 per cent pure.

Statistics relating to Canadian imports and exports of selenium are not published separately.

TELLURIUM

Canadian production of tellurium totalled 16,425 pounds valued at \$32,850 in 1935 and, as in the case of selenium, the element was recovered as a by-product in the refining of blister copper by the Ontario Refining Company, Ltd., and the Canadian Copper Refiners, Ltd. Present consumption of the metal is chiefly in the making of lead alloys, rubber compounds, and in the Tainton electrolytic zinc process. "New Lead Alloys and their Application in the Construction of Plant" appearing in "The Chemical Age" London, states:- "The most important development in alloys of lead in recent years is based on the observations that so small a quantity as 0.05 to 0.065 per cent tellurium introduced into lead effects profound changes in the physical properties of the metal without sacrifice in corrosion resistance, whilst still preserving the essential properties of lead. Tellurium added to lead effects the following fundamental changes in the physical structure of the material: (1) grain is refined in a remarkable way, (2) the temperature at which recrystallisation occurs is raised very appreciably, (3) work-toughening properties are imparted, (4) tensile strength is practically doubled and more than doubled at 100° C. (5) resistance to fatigue is increased almost three times at ordinary temperature and four times at 100° C. when compared with ordinary lead used under the same conditions."

It was recently reported that tellurium was being recovered at Odessa, Russia, from the Cottrell dust of a superphosphate works, and also in Russia as a by-product from treatment of Kyshtym copper ores.

New York quotations, October, 1936, for tellurium metal - per pound, \$1.75 to \$2.

Statistics relating to Canadian exports or imports of tellurium are not published.

TIN

Tin is known to occur in the Snowflake and Sullivan mines in British Columbia and in certain pegmatites in southeastern Manitoba. It has also been reported at New Ross, Nova Scotia. No tin ore deposits have been worked or tin ore production recorded in Canada during recent years.

A review on tin in 1935 by the Mining Journal, London, refers to restriction as follows:- "As the ability of international restriction to produce, if desired, a complete famine in tin has been demonstrated during the year, the fundamental question, not merely for the moment but over a period of years, is whether, when the current agreement comes to an end, it will be succeeded by a new agreement, and if so, with what components and for what period. Although nothing authoritative, so far as the writer knows, has been published on this latter point, recent negotiations are believed to have in view a five years duration. Comparatively early in 1935 the Bolivians intimated that they did not wish to continue the Buffer Pool beyond the end of the year, and in the absence of any knowledge of the I.T.C. discussions it was inferred, in view of the terms of the existing agreement, that unless the agreement itself was renewed during 1935 any country might be free to withdraw. However, the committee was satisfied to stand on the letter of the agreement which said that renewal must be considered twelve months before it was due to expire, so this apprehension was allayed. None the less the main underlying preoccupation during the year was the question of the continuation of restriction in principle ... The average price for cash standard for the year was but little below the high

figure for 1934, coming out at £225 14s. 2d per ton against £230 7s 6d. The highest quoted figure for cash standard was £248 on October 14, the highest figure since January, 1928. The average price of straits in New York was 50.389 cents per pound as against 52.16 cents in the previous year while English refined was 50.067 cents against 52.04 cents."

IMPORTS OF TIN INTO CANADA, 1934 and 1935.

	1	9	3	4	1	9	3	5
	Pounds				Pounds			
Tin in blocks, pigs or bars	3,999,900		2,053,773		4,677,000		2,323,177	
Tinfoil	35,158		18,990		45,245		19,756	
Collapsible tubes .....	...		38,597		...		44,335	
Tin bichloride and tin crystals	333,311		88,327		628,399		167,922	
Oxide of tin and copper	207,769		86,376		222,388		92,822	
Phosphor tin and phosphor bronze in blocks, bars, plates, etc.	826,611		232,483		819,164		213,812	
Tin plate food containers .....	...		186,175		...		190,135	
Tin plate containers, n.o.p. ....	...		239,497		...		300,819	

AVAILABLE STATISTICS ON THE CONSUMPTION OF TIN IN SPECIFIED CANADIAN MANUFACTURING INDUSTRIES, 1933 and 1934.

Industries	Items (used)	1 9 3 3	1 9 3 4
		Pounds	Pounds
	(Ingots	125,526	261,354
Brass and copper products	(Scraps	3,568	91,939
	(Other	19,339	5,038
White metal alloys	Pig	2,086,320	2,455,847
Iron and steel	Tin	631,136	1,214,493
GRAND TOTAL		2,865,989	4,028,671

NOTE - Data for 1935 not yet complete.

WORLD'S PRODUCTION OF TIN ORE (in terms of metal), 1932, 1933 and 1934.

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

Producing Country	1 9 3 2	1 9 3 3	1 9 3 4
<u>BRITISH EMPIRE</u>			
United Kingdom	1,337	1,542	1,999
Nigeria	4,320	3,755	5,000
Southern Rhodesia	4	11	11
South West Africa	65	144	136
Swaziland	59	71	114
Tanganyika Territory	50	59	103
Uganda	261	272	334
Union of South Africa	540	539	570
India	3,168	3,472	4,061
Federated Malay States (shipments) ..	28,363	23,922	36,385

WORLD'S PRODUCTION OF TIN ORE (in terms of metal), 1932, 1933 and 1934 (concluded)
(Taken from the Imperial Institute's publication "The Mineral Industry of the British
Empire and Foreign Countries")
(Long tons)

Producing Country	1932	1933	1934
<u>BRITISH EMPIRE (concluded)</u>			
Unfederated Malay States	1,341	923	1,348
Straits Settlements	38	57	49
Australia	2,138	2,810	2,986
Total	41,700	37,600	53,100
<u>FOREIGN COUNTRIES</u>			
Argentina .....	...	45	254
Portugal (estimated)	400	500	530
Spain	78	70	102
Belgian Congo	689	1,950	4,356
Cameroon (French) .....	...	60	150
Morocco (French) .....	...	40	40
Mexico	740	123	16
United States	(8 cwt.)	3	8
Bolivia	21,100	17,000	22,638(b)
China	7,572	7,961	8,000
French Indo-China	1,000	1,038	1,134
Japan	1,557	1,538	1,821
Netherlands East Indies	16,789	12,609	19,433
Siam	9,276	10,300	10,157
Total	59,000	53,000	68,000
WORLD'S TOTAL	101,000	91,000	121,000

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.

(a) Information not available.

(b) Exports.

TANTALUM

Tantalum metal is not produced in Canada, however, it is interesting to note that the Department of Mines, Ottawa, reports that columbite-tantalite has been found in small quantities in a number of feldspar mines in the Dominion.

Tantalum is malleable, ductile, tough and has a high tensile strength; the metal is very resistant to chemical reagents.

The metal in the pure form finds employment in various shapes in the chemical and electrical industries while tantalum carbide is utilized for machine tools, drawing dies, etc.

Imports of tantalum and columbium ores unto the United States in 1935 aggregated 1,190,398 pounds valued at \$107,079, of which 6,083 pounds (tantalite) valued at \$9,342 came from Australia and 1,184,315 pounds (columbite) valued at \$97,737 came from Nigeria. In 1934 imports from Australia amounted to 24,630 pounds valued at \$35,441. No imports or exports of tantalum ores or metal were recorded in Canada during recent years.

New York quotations for tantalum, October, 1936, per kilo, base price, \$160.60 for C. P. rod; sheet, \$143. Discounts on volume business.

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. Shipments of Canadian titanium ore during 1935 came entirely from the St. Urbain deposits and totalled 2,288 tons valued at \$16,400. Canadian ilmenites are reported to carry from 18 to 25 per cent titanium.

Titanium pigments are being produced by three companies in the United States, two in England, one in Germany, one or two in Italy, and one or two in France. The United States Bureau of Mines reports that new plants are projected in Australia and Japan. The United States is by far the leading producer of titanium pigments, production representing 32,000 tons of dioxide in 1934, rising to 35,000 tons in 1935. The majority of the tonnage is in the titanium-calcium, titanium-barium, and other composite pigments; lead titanate, $PbTiO_3$, is the latest addition to the list of titanium pigments. Rutile, the natural dioxide, is also finding a rapidly growing market, largely in the field of welding-rod coatings.

In the metallurgical field it was stated a nickel-titanium alloy with commercial possibilities was introduced during 1935 in the United States; also an alloy containing manganese and titanium in aluminium was developed.

"Metal and Mineral Markets" - New York - quoted titanium ore, October, 1936, 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; titanium metal, 96 to 98 per cent, \$6 to \$7 per pound.

Imports into Canada of antimony oxide, titanium oxide and white pigments containing not less than 14 per cent by weight of titanium totalled 2,870,491 pounds valued at \$310,083 and of this quantity, 788,253 pounds came from the United Kingdom and 2,059,204 pounds from the United States.

PRODUCTION OF TITANIUM ORE IN CANADA(x), 1926 - 1935.

Year	short ton	\$	Year	short ton	\$
1926	200	600	1931	1,509	10,261
1927	2,029	8,980	1932 .....	...	...
1928	2,244	6,732	1933 .....	...	...
1929	2,748	7,359	1934	2,023	14,161
1930	412	1,239	1935	2,288	16,400

(x) all from Quebec.

CONSUMPTION OF TITANIUM PIGMENTS IN CANADIAN PAINT INDUSTRY, 1931 - 1935.

Years	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
1935	2,499,351	260,467

WORLD'S PRODUCTION OF TITANIUM MINERALS, 1932, 1933 and 1934.

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

Producing Country and Description	1932	1933	1934
<u>BRITISH EMPIRE</u>			
Canada (shipments) -			
Titaniferous iron ore .....	...	...	1,806
India -			
Ilmenite	50,053	43,384	75,644
Australia -			
Ilmenite .....	...	550	51
<u>FOREIGN COUNTRIES</u>			
Norway -			
Ilmenite	13,268	22,846	25,891
Rutile	30	55	243
Portugal -			
Ilmenite .....	...	...	434
Egypt	479	...	161
Senegal (exports) -			
Ilmenite .....	...	300	500
Argentina -			
Titaniferous iron ore .....	...	2,559	(a)
Brazil (exports) -			
Ilmenite	34	95	114

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 been in the order of 1,000 to 5,000 tons, and that of rutile has been several hundred tons.

(a) Information not available.

TUNGSTEN

Several occurrences of tungsten-bearing minerals are known to occur in Canada but only comparatively small shipments of tungsten ores have been made, the last being recorded in 1912 and 1917.

During 1935 the Indian Path Mines Ltd. conducted exploratory and development work at the Indian Path mine in Lunenburg county, Nova Scotia. The Nova Scotia Department of Public Works and Mines reported that scheelite was first encountered in the company's new shaft at a depth of about 30 feet, and at 35 feet segregations of it occur in several of the veins; the Department remarks that the magnitude of the orebody encountered and the occurrence of both scheelite and good values in gold makes this prospect a very interesting one.

The 1935 annual report of the British Columbia Department of Mines describes the occurrence of scheelite at the Ada mine, located in the North Point or Fraser river section of District No. 2, a 2 foot section of one quartz vein assayed gold trace; silver trace; tungsten 4.05 per cent. Scheelite has also been identified on the nearly "silver" group; the mineral also occurs in the Wells area on the Hardscrabble property.

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. According to the United States Bureau of Mines cemented tungsten carbide continued to grow in favour, and cemented-carbide consumption in the United States in 1935 was the largest for any year. Although tungsten carbide cemented with cobalt is still used more than all other types of cemented carbides combined, the year has witnessed new development of several special grades including combinations of tungsten carbide and tantalum carbide cemented 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.

Imports into Canada of chromium metal and tungsten metal by manufacturers for alloying purposes totalled 36,007 pounds valued at \$22,454 in 1935 as compared with 26,222 pounds worth \$16,461 in 1934. Imports of metallic elements and tungstic acid for use in the manufacture of metal filaments for electric lamps were valued at \$85,926 in 1935 as against \$57,919 in the preceding year.

Quotations for tungsten - New York - October, 1936, were: per pound, 98 per cent, powdered, \$1.80 to \$1.90; 99.9 per cent, \$9. Tungsten ore - per unit of WO_3 , New York: Chinese wolframite, \$15.25, duty paid. Domestic scheelite, known good analysis, carload lots or more, \$15.75 to \$16. Bolivian scheelite, nominal.

Consumption of tungsten wire, etc., in the Canadian electrical apparatus and supplies industry during 1934 was valued at \$48,996.

WORLD'S PRODUCTION OF TUNGSTEN ORE AND CONCENTRATES, 1932, 1933 and 1934.
(Taken from the Imperial Institute's publication "The Mineral Industry of the British Empire and Foreign Countries")
(Long tons)

Producing Country	1932	1933	1934
<u>BRITISH EMPIRE</u>			
United Kingdom -			
Concentrates	2	11	190
Nigeria -			
Concentrates .....	...	...	5
South West Africa -			
Tungsten ore .....	...	...	16
Southern Rhodesia -			
Concentrates	13	30	106
India -			
Concentrates	2,023	2,147	3,329
Federated Malay States -			
Wolfram .....	...	33	29
Scheelite	302	918	1,508
Unfederated Malay States -			
Wolfram	129	79	78
Australia -			
Wolfram	44	117	254
Scheelite	(12 cwt.)	...	6
New Zealand -			
Concentrates .....	...	...	39

WORLD'S PRODUCTION OF TUNGSTEN ORE AND CONCENTRATES, 1932, 1933 and 1934 (concluded)
(Taken from the Imperial Institute's publication "The Mineral Industry of the British
Empire and Foreign Countries")
(Long tons)

Producing Country	1932	1933	1934
<u>FOREIGN COUNTRIES</u>			
Portugal -			
Concentrates	257	298	579
Tin-tungsten ores	64	89	100
Spain -			
Concentrates	39	41	44
Mexico .....	...	...	73
United States -			
Concentrates	354	799	1,829
Argentina -			
Concentrates	6	...	(a)
Bolivia -			
Concentrates	671	230	782
Peru -			
Concentrates .....	...	...	11
China -			
Ore	2,146	5,400	4,700
French Indo-China -			
Tin-tungsten concentrates	218	208	272
Japan -			
Scheelite	20	29	64
Korea -			
Ore	56	150	363
Netherlands East Indies -			
Concentrates .....	...	...	2

(a) Information not available.

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 Colorado and Utah in the United States; Minasragra in Peru; Broken Hill in Northern Rhodesia; and Otavi in South West Africa. It is interesting to note that a successful process of manufacturing pure vanadium and high grade ferrovanadium pig from the titaniferous magnetite ores of the Urals has been recently reported.

Vanadium is consumed chiefly in the steel in the steel industry and more particularly in the manufacture of axles, springs, crankshafts and various automobile and locomotive parts. The addition of the metal to steel imparts tensile strength, elastic limit, yield point and impact strength. The salts are of considerable importance in chemical and other industries and the pentoxide has been employed as a catalyst.

The following information relating to the occurrence of vanadium in Russian coals is taken from Transactions of the All-Union (Russia) Scientific Research Institute of Economic Mineralogy (Bulletin 87 - 1936);- "The majority of coals, characterized by a high vanadium content, belong to the Clarain-vitrain type and frequently have a lignite structure. A study of their general chemical composition leads one to assume the presence of ash of infiltration origin. Thus the origin of vanadium is probably related to the local conditions, that is the processes of the decay of the basic rocks of the Ural range, in which occur numerous segregations of titaniferous magnetites, rich in vanadium ... Considerable accumulations of vanadium (up to 9 per cent V_2O_5 in ash) are observed in the coals of the Clarain-Vitrain type, as well as in lignites, confined exclusively to the Jurassic deposits of the region adjoining the Urals ... The wide distribution of coals in some regions, from where specimens of coals enriched in vanadium were obtained, raises the question as to the possibility of a practical utilization also of the ash of these coals."

New York quotation for vanadium ore, October, 1936, was - per pound, V_2O_5 contained, 27½ cents, f.o.b. shipping point.

Possible imports of vanadium or vanadium compounds or alloys are not shown separately in Canadian trade figures.

WORLD'S PRODUCTION OF VANADIUM ORES, 1932, 1933 and 1934.

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

(Long tons)

Producing Country	1932	1933	1934
<u>BRITISH EMPIRE</u>			
Northern Rhodesia (V content)	302	35	3
South West Africa	2,973	177	324
<u>FOREIGN COUNTRIES</u>			
United States (V_2O_5)	103	2	(a)

(a) Information not available.

ZIRCONIUM

The metal is not produced in Canada; zircon is the most common zirconium mineral and the Department of Mines, Ottawa, states that it, or cyrtolite, commonly occurs in greater or less amount in Canadian PreCambrian pegmatites, also in the pegmatiticapatite-phlogopite deposits of the Grenville areas in Ontario and Quebec. Brazil is the chief source of commercial zirconium ore, greatly overshadowing all other occurrences in available reserves and cheapness of exploitation. The ore in Brazil has been called brazilite, apparently a mixture of baddeleyite and zirkelite; the ore is said to occur in great masses weighing many tons and also as alluvial pebbles. British India and Australia have also produced considerable quantities of zircon during recent years.

Zirconium wire is used in radio tubes and sheet metal in spinneret cups for rayon manufacture. The United States Bureau of Mines states that 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. Zirconium ores imported into the United

States during 1935 totalled 5,756,726 pounds valued at \$76,923.

Imports of zirconium silicate into Canada during 1935 were appraised at \$2,307 while the value of zirconium oxide imported in the same year was \$13,824.

Commercially pure zirconium metal was quoted October, 1936 - New York - per pound - powdered \$7. Zircon ore - per ton, 55 per cent ZrO₂, f.o.b. Atlantic seaboard, carload lots, \$55; 5 ton lots, \$60. Crude granular, zircon, \$70, f.o.b. Suspension Bridge, N.Y. milled \$90.

PRINCIPAL STATISTICS(x) OF THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1933, 1934 and 1935.

	1933	1934	1935
Number of firms	5	7	12
Capital employed	563,500	1,548,205	733,497 (a)
Number of employees - on salary	5	5	9
On wages	19	39	73
Total	24	44	82
Salaries and Wages - Salaries	3,312	6,345	12,390
Wages	10,963	25,928	51,222
Total	14,275	32,273	63,612
Cost of fuel and electricity	1,178	2,383	4,051
Process supplies .....	...	...	5,249

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

AVERAGE NUMBER OF WAGE-EARNERS EMPLOYED, BY MONTHS, 1933 - 1935.

Month	1933	1934	1935
January	16	13	42
February	16	36	55
March	13	34	73
April	12	17	62
May	12	25	51
June	19	41	79
July	10	42	80
August	13	44	78
September	13	62	83
October	26	60	92
November	34	45	86
December	31	37	85

POWER EQUIPMENT INSTALLED, 1935.

Description	Number	Horse power
Steam engines	2	125
Electric motors	13	275
Boilers	2	125

DIRECTORY OF FIRMS IN THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1935.

<u>Name of Firm and Product</u>	<u>Head Office Address</u>	<u>Location of Mine or Plant</u>
Aluminum Company of Canada, Ltd. Product - Aluminium	340 University Ave., Toronto, Ont.	Arvida and Shawinigan Falls, P.Q.
Atlantic Manganese Corp. Ltd.(x) Product - Manganese ore.	286 Roy Bldg., Halifax, N.S.	New Ross, N.S.
Asbestos Corp. Ltd. Product - Chromite	Canada Cement Building Montreal, P.Q.	Thetford Mines, P.Q.
Bear Exploration and Radium Ltd.(x) Product - Pitchblende-silver ore.	85 Richmond St. W., Toronto, Ont.	Contact Lake, N.W. Territories.
Baie St. Paul Titanic Iron Ore Co. Product - Titanium ore.	Baie St. Paul, P.Q.	St. Urbain, P.Q.
Bain, J., Estate of (x) Product - Molybdenite	c-o Toronto General Trusts Corp., Ottawa, Ont.	Hull Co., P.Q.
Casey, Harry E. Product - Manganese ore.	173 Weldon St., Moncton, N.B.	Turtle Creek, N.B.
Chromium Mining & Smelting Corp.Ltd. Product - Chromite and ferrochrome.	Bank of Commerce Bldg., Hamilton, Ont.	Collins, Ont.
Canadian Pyrites Ltd. Product - Titanium ore.	c-o E. L. du Pont de Nemours & Co., Wilmington, Del., U.S.A.	St. Urbain, P.Q.
Canadian Radium Mines Ltd. (x) Product - Radium ore.	288 Bay St., Toronto, Ont.	Haliburton Co., Ont.
Consolidated Mining & Smelting Co. of Canada, Ltd. Products - Bismuth, Cadmium.	C. P. R. Bldg., Montreal, P.Q.	Trail, B.C.
Canadian Copper Refiners Ltd. Products - Selenium, Tellurium.	Royal Bank Bldg., Toronto, Ont.	Montreal East, P.Q.
Deloro Smelting & Refining Co. Ltd. Product - Bismuth.	Deloro, Ont.	Deloro, Ont.
Dukes, A. V. (x) Product - Molybdenite.	Mace, Ont.	Steel Tp., Ont.
Eldorado Gold Mines, Ltd. Products - Radium-uranium salts and oxides, silver.	Star Bldg., Toronto, Ont.	Great Bear Lake, N.W.T. and Port Hope, Ont.
El-Bonanza Mining Corp. Ltd. Product - Silver ore	Star Bldg., Toronto, Ont.	Great Bear Lake, N.W.T.

DIRECTORY OF FIRMS IN THE MISCELLANEOUS METAL MINING INDUSTRY IN CANADA, 1935 (concluded)

<u>Name of Firm and Product</u>	<u>Head Office Address</u>	<u>Location of Mine or Plant</u>
Hottah Lake Gold & Radium Mines, Ltd.(x) Product - Pitchblende.	1116 Federal Bldg., Toronto, Ont.	North West Territories.
Hudson Bay Mining & Smelting Co.Ltd. Product - Cadmium.	Woodstock, Ont.	Flin Flon, Man.
Indian Path Mines, Ltd.(x) Product - Tungsten ore.	711 Dennis Bldg., Halifax, N.S.	Lunenburg Co.,N.S.
Lithium Corp. of Canada, Ltd.(x) Product - Lithium ores.	403 Avenue Bldg., Winnipeg, Man.	Bernie Lake, Man.
Madore and Germain(x) Product - Molybdenite.	4321 A. Brebueuf St., Montreal, P.Q.	Portneuf, P.Q.
Ontario Refining Co. Ltd. Products - Selenium, Tellurium.	Copper Cliff, Ont.	Copper Cliff, Ont.
Phoenix Molybdenite Corp. Ltd.(x) Product - Molybdenite.	710 Excelsior Life Bldg., Toronto, Ont.	Renfrew Co., Ont.
Plante, P., & Bro. (x) Product - Chromite.	Ste. Angele de Merici, P.Q.	Arvantgish Tp.
Renfrew Minerals Ltd. Product - Beryl(x) Feldspar.	901 Royal Bank Bldg., Toronto, Ont.	Quadeville, Ont.

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(x) Active but not producing.

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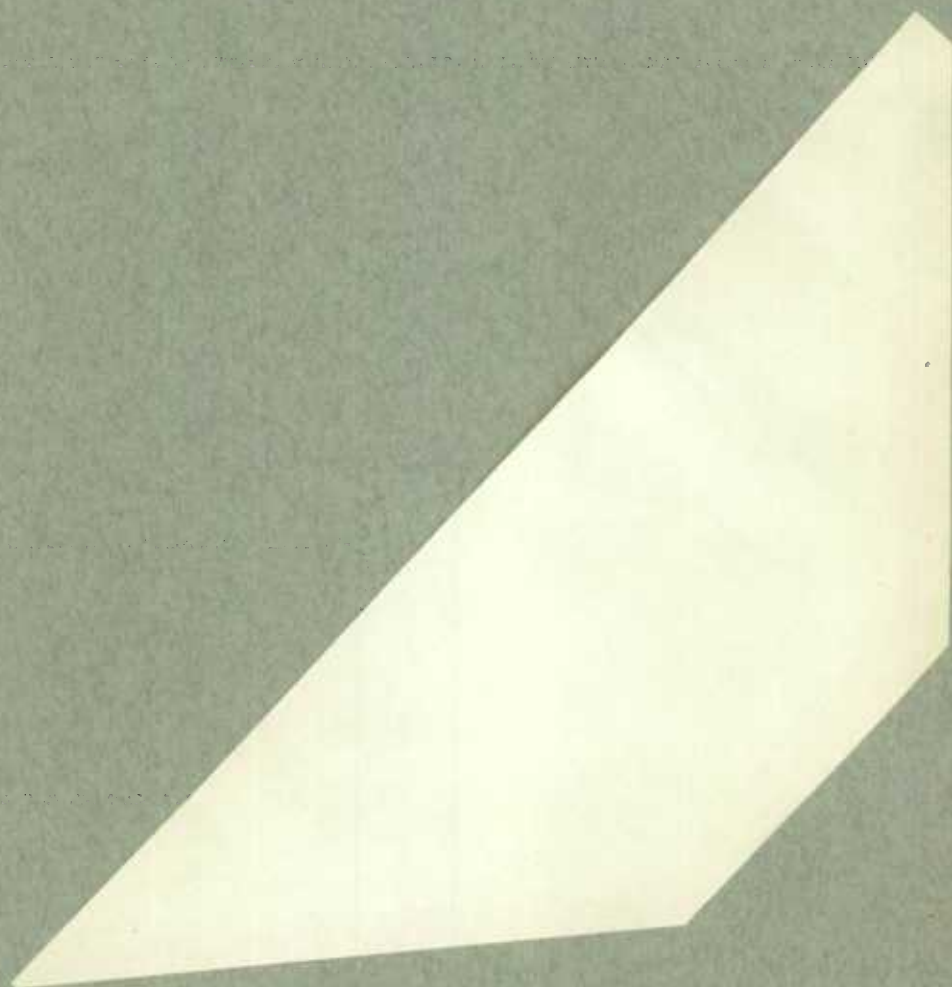
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