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CANADA

DEPARTMENT OF TRADE AND COMMERCE

DOMINION BUREAU OF STATISTICS

+ + + *Census of Industry* + + +

MINING, METALLURGICAL & CHEMICAL STATISTICS

Report

on

THE MISCELLANEOUS

INDUSTRIAL OR NON-METALLIC MINERALS

IN CANADA, 1946

including

Barite
Corundum
Diamonds
Diatomite
Fluorspar
Garnet
Graphite
Grindstones
Lithium Minerals
Magnesitic Dolomite
Magnesium Sulphate
Natural Mineral Waters
Phosphate
Silica Brick
Sodium Carbonate
Sodium Sulphate
Strontium Minerals
Sulphur (Pyrites)
Volcanic Ash

OTTAWA
1948

Price 25 cents

Dominion Statistician: Herbert Marshall
Director - Division of Census of Industry and Merchandising: W. H. Losee
Chief - Mining, Metallurgical and Chemical Statistics: H. McLeod

MISCELLANEOUS INDUSTRIAL OR NON-METALLIC MINERALS IN CANADA, 1946

Canadian operators producing certain industrial minerals, and who are usually relatively few in number, have been segregated for statistical purposes into a single group designated as the Miscellaneous Industrial or Non-metallic Minerals Industry. Minerals or primary mineral products produced (or deposits developed) by this industry during 1946 included barite, brucite, diatomite, fluorspar, graphite, grindstones, magnesitic-dolomite (crude and refined), mineral waters, phosphate, silica brick, sodium carbonate and sodium sulphate. For convenience, the sulphur content of pyrites shipped and sulphur recovered from smelter gas are recorded with the various miscellaneous minerals listed above; the value of sulphur production, however, is not included in the total for the miscellaneous non-metallic or industrial minerals as the value of this element is credited to the copper-gold-silver mining and non-ferrous smelting industries.

During the year under review the production of this group of industries had a gross value of $4,248,107 compared with $4,415,718 in 1945. Salaries and wages paid to 911 employees amounted to $1,582,846. About $1,389,098 was spent for the purchase of fuel, electricity, process supplies and containers.

Table 1 - PRINCIPAL STATISTICS RELATING TO MISCELLANEOUS NON-METAL MINING INDUSTRIES IN CANADA, 1945 and 1946

		1945	1946
Number of plants		51	42
Number of employees - Administrative		119	102
Workmen		760	809
Total		879	911
Salaries and wages - Salaries	$	225,824	230,609
Wages	$	1,375,244	1,352,237
Total	$	1,601,068	1,582,846
Selling value of products (gross)	$	4,415,718	4,248,107
Cost of fuel and electricity	$	780,313	822,546
Cost of process supplies used	$	540,701	493,642
Cost of containers	$	54,923	35,863
Selling value of products (net)	$	3,059,781	2,859,009

Table 2 - PRODUCTION OF MISCELLANEOUS NON-METALLIC MINERALS IN CANADA, 1945 and 1946

Item	Unit of measure	1945 Quantity	1945 Value	1946 Quantity	1946 Value
			$		$
Barite	ton	139,589	1,211,403	120,419	1,006,475
Corundum	ton	1,317	133,762	742	102,340
Diatomite	ton	46	1,238	90	2,532
Fluorspar	ton	7,369	233,708	8,042	237,491
Garnets (schist)	ton	...	...	2	1,200
Graphite	ton	1,910	187,364	1,975	180,405
Grindstones	ton	225	10,870	295	17,450
Magnesite dolomite	...	...	1,278,596	...	1,225,595
Mineral waters	Imp.gal.	244,761	149,690	217,842	122,404
Phosphate	ton	299	4,356	57	869
Silica brick	M	4,208	517,263	2,902	197,804
Sodium carbonate	ton	286	3,146	...	...
Sodium sulphate	ton	93,068	884,322	105,919	1,117,683
TOTAL	...	...	4,415,718	...	4,212,244
Sulphur production (*)	ton	250,114	1,881,321	234,771	1,784,666

Note: Value of containers is excluded.

(*) Includes sulphur content of pyrites at its sales value and estimated figures for quantity and value of sulphur in smelter gases used for acid making or recovered as elemental sulphur, or in ammonium sulphate (direct). General statistics relating to production of sulphur included with those of the copper-gold mining and non-ferrous smelting industries.

This report was prepared by A. R. Deir, Mining Statistician.

Table 3 - WORKMEN, BY MONTHS, IN THE MISCELLANEOUS NON-METAL MINING INDUSTRIES IN CANADA, 1945-1946

Month	1945					1946				
	Mine			Mill		Mine			Mill	
	Surface		Underground			Surface		Underground		
	Male	Female		Male	Female	Male	Female		Male	Female
January	127	1	40	528	1	140	...	60	548	1
February	134	1	42	502	1	149	...	59	600	1
March	147	1	58	470	1	163	1	60	482	1
April	215	...	61	456	1	195	1	66	543	1
May	225	...	65	499	1	223	2	62	536	1
June	227	...	71	470	1	218	2	68	550	1
July	250	...	71	505	1	240	2	68	545	1
August	245	...	74	507	1	234	2	74	462	1
September	194	...	70	485	1	239	2	70	446	...
October	236	...	66	486	1	228	2	72	537	...
November	196	...	68	556	1	218	...	75	580	...
December	154	...	64	497	1	166	...	73	610	...
AVERAGE	199	1	63	496	1	201	1	68	538	1

Table 4 - FUEL AND ELECTRICITY USED IN THE MISCELLANEOUS NON-METAL MINING INDUSTRIES IN CANADA, 1945 and 1946

Kind	Unit of measure	1945		1946	
		Quantity	Cost	Quantity	Cost
			$		$
Bituminous coal--Canadian	ton	13,726	79,219	4,218	26,091
Imported	ton	19,663	187,344	19,545	186,100
Anthracite--From the United States	ton	17	286	45	806
Lignite coal	ton	17,338	54,970	18,065	59,329
Coke	ton	24	334	14	195
Gasoline	Imp.gal.	141,459	40,019	194,344	55,560
Kerosene or coal oil	Imp.gal.	1,422	270	2,399	463
Fuel oil and diesel oil	Imp.gal.	3,769,334	252,866	5,293,061	339,162
Wood (cords of 128 cubic feet)	cord	1,765	12,241	1,164	8,404
Gas--Manufactured	M cu.ft.	356,903	48,070	267,800	31,920
Electricity purchased	K.W.H.	11,969,783	104,694	12,356,251	114,516
TOTAL	...	...	780,313	...	822,546
Electricity generated for own use.	K.W.H.	6,274,845	...	4,933,590	...

BARITE

(Text from the Annual Review by the Bureau of Mines, Ottawa)

In Nova Scotia, the Canadian Industrial Minerals Limited, the only shipper of barite in Eastern Canada in 1946, continued to expand its important operation at Walton, Hants county. Production came entirely from open-cast mining, but preparations for underground operations were made by the sinking of a three-compartment shaft to a depth of 400 feet from which it is expected some ore will be raised in 1947. A large program of plant expansion was completed, including the erection of a new power house, headframe, ore bin building, roll crusher house, and of housing for employees. Bleaching and beneficiation tests by the Bureau of Mines, Ottawa, in 1946 on ore from Walton property, showed that material heavily stained by iron can be bleached at a 325-mesh grind to yield a good white colour.

In British Columbia, the Mountain Minerals Ltd. shipped part of its production from its property at Parson, 25 miles south of Golden, to Pulverized Products Ltd., Montreal, for grinding, and the remaining part to the plant of Summit Lime Works, Crow's Nest, where it was ground for use in western glass works and in drilling mud. There was no production from the company's property near Brisco, in the Windermere Valley section, about 25 miles south of Parson, from which most of the barite shipped for ballast purposes in 1945 was taken.

In Ontario, the Woodhall Mines Ltd. resumed development work on the old Premier Langmuir property on Nighthawk River, Langmuir township, Porcupine area, under lease from Canada Baryte Mines. Considerable stripping, trenching and test-pitting was reported to have been done on two veins and 1,200 tons of crude ore was stockpiled.

The average unit price of domestic barite sold by primary producers in 1946 was $6.40 to $7.30 per short ton, f.o.b. mine. Ground, off-colour barite exported for oil-well drilling was sold for $13.70 per ton f.o.b. Atlantic ports, and ground white for the pigment and filler trade averaged $33 per ton f.o.b. mill.

In the United States, Georgia crude was quoted at $8.50 to $9.00 per long ton f.o.b. mines, and Missouri crude at $8.25 to $8.50. Missouri prime white, water-ground, floated and bleached sold for $22.85 per ton, f.o.b. works.

In the American market, crude barite is usually sold on a penalty-premium basis, a content of 94 per cent $BaSO_4$ and less than 1 per cent iron (Fe_2O_3) being considered standard. A premium or penalty of 25 cents per ton is set for each per cent barium sulphate above or below 94 per cent and a similar premium or penalty for each 0.1 per cent of Fe_2O_3 below or above 1 per cent.

The United States imposes a duty of $4 per ton on crude barite, and $7.50 per ton on ground or otherwise manufactured material. Canadian imports are free of duty under the British preferential tariff, and there is no duty on barite used in drilling mud, or in the manufacture thereof. Otherwise, imports from countries other than the United Kingdom are subject to a duty of 25 per cent.

Table 5 - PRODUCTION OF BARITE IN CANADA, 1914-1946

Year	Short tons	$	Year	Short tons	$
1914	612	6,169	1928	127	2,847
1915	550	6,875	1929	105	2,341
1916	1,368	19,393	1930	66	1,484
1917	3,490	54,027	1931	16	363
1918	640	10,165	1932	...	...
1919	468	8,154	1933	20	60
1920	751	22,983	1939	323	3,639
1921	270	9,567	1940	338	4,819
1922	289	9,537	1941	6,890	74,416
1923	409	8,548	1942	19,667	188,144
1924	151	3,308	1943	24,474	279,253
1925	95	2,259	1944	118,719	1,023,696
1926	100	2,307	1945	139,589	1,211,403
1927	56	1,268	1946	120,419	1,006,475

Table 6 - IMPORTS OF BARITE INTO CANADA, 1940-1946

Year	Tons	$	Year	Tons	$
1940	2,622	64,922	1944	1,824	47,913
1941	3,431	81,620	1945	1,150	32,531
1942	2,536	68,196	1946	1,547	42 904
1943	1,686	43,239			

Table 7 - CONSUMPTION OF BARITE IN CANADA, 1941-1946

	1941	1942	1943	1944	1945	1946
			(Tons)			
(a) By Uses						
Paints	2,453	3,417	2,760	1,971	1,749	1,711
Rubber goods	830	557	351	288	478	461
Wall paper	13	18	15	20	22	...
Glass	367	286	290	294	879	266
Miscellaneous	180	161	123	226	200	400
TOTAL	3,843	4,439	3,649	2,799	3,328	2,838

Table 7 - CONSUMPTION OF BARITE IN CANADA, 1941-1946 (Concluded)

	1941	1942	1943	1944	1945	1946
			(Tons)			
(b) By Provinces						
Nova Scotia	109	67	38	41	33	34
Quebec	1,483	1,639	1,191	893	931	1,123
Ontario	1,902	2,325	1,983	1,388	1,916	1,179
Manitoba	113	155	162	183	210	276
Saskatchewan	5	10	11	8	4	4
Alberta	96	93	128	119	105	106
British Columbia	135	150	136	167	129	116
CANADA	3,843	4,439	3,649	2,799	3,328	2,838

Note: Above figures do not include amounts used in oil drilling.

CORUNDUM

(Text from the Annual Review by the Bureau of Mines, Ottawa)

With completion of the treatment of tailings at the Craigmont property, Renfrew county, Ontario, at the end of October, 1946, corundum operations in Canada have come to an end for an indefinite period and the machinery and equipment at the property have been sold. Treatment of the tailing was undertaken at the request of the United States Government as an emergency measure in October, 1944, arising from the difficulty of obtaining supplies of flour corundum from the Transvaal, South Africa. This type of corundum was then urgently needed for use in polishing high precision lenses for military optical instruments, and a 200-ton gravity mill was erected by Wartime Metals Corporation to treat the tailing. Shipments of concentrate were made to American Abrasive Company's plant at Westfield, Massachusetts, for grinding and for the preparation of fine powders. During the 25-month period of operation a total of 139,323 tons of tailings averaging 2.56 per cent corundum was treated, and 2,588 tons of concentrate containing 1,726 tons of corundum, having a nominal value of $234,820 was shipped to Westfield. Since November, 1945, the Craigmont operations have been handled by the Department of Reconstruction and Supply, Ottawa.

Some corundum is still available in the known deposits, but, except in an emergency, production costs would be excessive. The Canadian consumption of corundum is small and supplies are obtained from foreign sources without difficulty.

Corundum (Al_2O_3), the oxide of aluminium, usually occurs as bronze-coloured barrel-shaped crystals. It is fairly heavy, and has a hardness (Mohs' scale) of 9, being the hardest known mineral next to diamond (hardness 10).

Prior to the war corundum was used chiefly for the abrasive grit in grinding wheels required for special types of work, but during the war most of it was used as flour for the polishing of lenses, and the coarse grain, for snagging wheels. In the United States, which is by far the leading consumer, a start was made shortly after the end of the war to revert to the use of corundum for the manufacture of precision grinding wheels.

The price of Canadian concentrate was Government controlled at about $90 per ton. The prices of corundum and other ores imported into the United States were frozen as of August 20, 1943. South African 'crystal' corundum was $107 and 'boulder' was $74 per short ton delivered to the Westfield plant. U.S. prices of prepared grain and flour corundum vary considerably according to mesh size. These prices are $8\frac{3}{4}$ cents per pound for 6 to 60 mesh and $9\frac{3}{4}$ cents for 70 to 275 mesh. Flours range from 30 cents for 850 mesh to 70 cents for 2,600 mesh.

Production of corundum in 1946 amounted to 742 tons valued at $102,340.

DIAMONDS

Although diamonds are not produced in Canada, they play a very important role in the mineral industry. In 1946 the diamond drilling on Canadian mineral deposits exceeded 1,500 miles. During 1946 the imports of black diamonds and borts for borers were appraised at $4,002,457 compared with $1,985,299 in 1945. Imports of unset white diamonds in 1946 were valued at $6,103,856 compared with $3,299,415 in the preceding year.

Table 8 - WORLD PRODUCTION AND SALES OF DIAMONDS, 1937-1946

Year	Production Metric carats	Sales £ Sterling		£ Sterling
1937	9,164,024	9,151,205		
1938	11,619,971	3,673,934		
1939	12,500,553	5,865,000		
1940	13,012,525	6,144,314		
1941	9,104,978	7,414,420	(Industrials (Cuttables	2,000,000 5,550,000
1942	9,258,734	10,694,671	(Industrials (Cuttables	4,240,000 6,250,000
1943	8,347,239	20,500,000	(Industrials (Cuttables	5,000,000 15,500,000
1944	11,676,578	17,000,000 (estimate)	(Industrials (Cuttables	4,000,000 13,000,000
1945	14,257,157	24,500,000 (estimate)	(Industrials (Cuttables	4,900,000 19,600,000
1946	10,212,573	29,500,000 (estimate)	(Industrials (Cuttables	3,400,000 26,100,000

DIATOMITE

(Text from the Annual Review of the Bureau of Mines, Ottawa)

There are more than 400 known deposits of diatomite in Canada. They are in the swamps and in the lake bottoms of northern Nova Scotia; in southern New Brunswick; in the Muskoka district, Ontario; and in various parts of British Columbia. The Tertiary fresh water deposits near Quesnel in the Cariboo district, British Columbia, are by far the largest known in Canada. They extend for many miles along the Fraser River, are compact, and are up to 40 feet thick. At Digby Neck, Nova Scotia, is the largest known Recent fresh water (swamp) deposit in Canada.

All the Canadian production of diatomite since 1939 has come from the aforementioned areas. The present producers are G. Wightman, who operates the deposit at Digby Neck, L. T. Fairey of Vancouver, who has been obtaining his output from Lot 1122 on the west bank of the Fraser River, north of Quesnel, and Cariboo Diatomite Company, which produces small quantities from a deposit near Alexandria, a few miles south of Quesnel for use in fertilizer dusting.

The Nova Scotia Department of Mines in 1946 investigated some of the deposits of the province, particularly those along Digby Neck. The Resources Development Board, Fredericton, New Brunswick, examined a number of diatomite deposits in the vicinity of Saint John and intends to submit bulk samples to consumers. Tests were continued on the suitability of diatomite in the vicinity of Quesnel, British Columbia, for fertilizer use and for insulation.

Prior to 1944, from 70 to 80 per cent of the diatomite consumed in Canada was used in the form of filter aids, mainly in the refining of cane sugar. The ammonium nitrate fertilizers in which diatomite is used as a dusting agent are made in Canada by The Consolidated Mining and Smelting Company of Canada Limited in its plant in Trail, British Columbia, and in another in Calgary, and by North American Cyanamid, Limited, in its plant in Welland, Ontario. The diatomite thus used is highly porous and when added to the nitrate it absorbs moisture, which prevents the nitrate from caking and ensures even spreading. Specifications call for uncalcined material of 325 mesh and less than 5 per cent moisture. The remainder of the diatomite was used chiefly as a filler in the paint, chemical, paper, rubber, soap, and textile industries; also in silver polish bases, and as an admixture in concrete. A small amount of lime-diatomite insulation bricks is made by a company in Toronto, which uses diatomite from Nova Scotia. Diatomite is being used in pressure filters in industrial plants in place of sand filters for the removal of disease-producing organisms.

The price of diatomite used in Canada for insulation varies from $23 to $40 per ton; for filtration from $26 to $75 per ton; and for fertilizer grades, $28 to $42 per ton. For material suitable for polishes, the price for small lots ranged up to $200 a ton in 1946. Imported insulation bricks vary in price from $85 to $140 per 1,000, according to grade and density.

Table 9 - PRODUCTION OF DIATOMITE IN CANADA, 1932-1946

Year	Short tons	$	Year	Short tons	$
1932	1,496	29,509	1940	248	7,957
1933	1,789	36,648	1941	344	9,935
1934	1,372	54,910	1942	365	9,088
1935	823	33,140	1943	98	3,331
1936	615	13,650	1944	13	437
1937	643	18,606	1945	46	1,238
1938	398	13,842	1946	90	2,532
1939	301	10,388			

Table 10 - CONSUMPTION OF INFUSORIAL EARTH BY THE CANADIAN SUGAR REFINING INDUSTRY, 1932-1946

Year	Tons	Value	Year	Tons	Value
		$			$
1932	1,289	73,309	1940	2,492	112,369
1933	1,254	70,191	1941	2,672	138,973
1934	1,281	69,116	1942	1,504	75,295
1935	2,154	96,560	1943	1,726	89,075
1936	2,188	98,954	1944	2,188	115,053
1937	2,293	95,532	1945	1,992	102,961
1938	2,454	101,473	1946	2,196	104,794
1939	2,410	105,711			

Table 11 - CONSUMPTION OF DIATOMACEOUS EARTH IN THE MANUFACTURE OF FERTILIZERS, 1944-1946

Year	Tons	$
1944	9,690	297,987
1945	6,444	274,968
1946	8,185	308,446

FLUORSPAR

(Text from the Annual Review of the Bureau of Mines, Ottawa)

Fluorspar is used chiefly as a powerful fluxing agent in the steel industry, and is used in small amounts in numerous other metallurgical industries. The next largest market is in the manufacture of hydrofluoric acid, which is used mainly in making artificial cryolite and aluminium fluoride for the aluminium industry. The fluorspar imported from Newfoundland is used for this purpose at Arvida, Quebec. The ceramic industry is next, and uses fluorspar as a fluxing and opacifying ingredient in glass and enamels. Uranium hexafluoride is used for the gaseous diffusion separation of the uranium isotopes U235 and U238 in the development of atomic energy.

Of considerable interest are the possible uses of elemental fluorine in the development of new industrial products and processes. A field of use is envisaged for fluorine in the chemical industry comparable to that of its closely related element chlorine. Only recently available on a commercial scale, compressed fluorine gas is being offered in small half-pound steel cylinders by a company in Philadelphia. The fluorine is produced in a specially designed electrolytic cell, using an electrolyte of anhydrous hydrofluoric acid and fused potassium bifluoride. Fluorine gas is evolved at the anode and hydrogen at the cathode. The fluorine is purified from associated small amounts of HF either by absorption of the latter in sodium fluoride or by chilling. Among the new compounds expected to be made available by the use of fluorine are: a liquid fluorinated non-inflammable and non-toxic hydrocarbon which can be used in place of mercury in the present mercury vapour boiler; sulphur hexafluoride gas of high insulating value for high voltages used in X-ray and nuclear physics work; and an extremely stable synthetic lubricating oil capable of withstanding high pressures and friction. Other suggested fluorine compounds include: insecticides, fungicides, germicides, fumigants, anesthetics, fire extinguishers and for proofing media, resins, and plastics.

Canadian trade journal quotations for metallurgical gravel, 85 per cent grade, fluorspar in 1946 remained at $40 per ton, f.o.b. Toronto, and for ground, 97 per cent grade, $66 to $69.

In the United States, under an OPA ruling of August, 1943, the maximum price for metallurgical grade spar f.o.b. at consumer's plant was based on the effective CaF2 content, plus either (a) rail freight from shipping point to consumer's plant, or (b) rail freight from Rosiclare, Illinois, to such plant, whichever is the lower. The base price was set as follows: 70 per cent or more effective units, $33 per short ton; 65 to 70 per cent, $32; 60 to 65 per cent, $31; under 60 per cent, $30. "Effective units" are computed as the CaF2 content less 2½ times the percentage of contained silica. This price ruling remained in effect through 1946. Acid grade, 97.5 per cent CaF2 was quoted at $37 per ton, plus freight. United States fluorspar had an average unit value of $28 per ton and probably included a substantial proportion of acid and ceramic grades, neither of which is produced in Canada. Mexican material had an average unit value of $16 per ton and is assumed to have been all of metallurgical grade.

The duty on metallurgical grade fluorspar entering the United States is $5.625 a ton, and on acid and ceramic grades $3.75 a ton. Fluorspar enters Canada duty free.

Table 12 - PRINCIPAL STATISTICS OF THE FLUORSPAR MINING INDUSTRY IN CANADA, 1945 and 1946

		1945	1946
Active firms	No.	7	4
Employees - Administrative	No.	11	8
Workmen	No.	63	64
Total	No.	74	72
Salaries and wages - Salaries	$	17,035	15,594
Wages	$	82,610	76,080
Total	$	99,645	91,674
Gross value of production	$	233,708	237,491
Cost of fuel and electricity	$	14,003	16,648
Process supplies used	$	9,312	9,729
Net value of production	$	210,393	211,114

Table 13 - PRODUCTION OF FLUORSPAR IN CANADA, 1932-1946

Year	Short tons	$	Year	Short tons	$
1932	32	464	1940	4,454	59,317
1933	73	1,064	1941	5,534	97,767
1934	150	2,100	1942	6,199	146,039
1935	75	900	1943	11,210	318,424
1936	75	900	1944	6,924	217,701
1937	150	2,550	1945	7,369	233,708
1938	217	3,906	1946	8,042	237,491
1939	240	4,995			

Table 14 - IMPORTS OF FLUORSPAR INTO CANADA, 1932-1946

Year	Tons	$	Year	Tons	$
1932	1,009	22,965	1940	30,312	628,719
1933	2,219	21,165	1941	26,539	567,656
1934	7,220	56,628	1942	47,784	1,046,526
1935	11,591	92,775	1943	77,436	1,738,669
1936	11,194	95,268	1944	37,100	840,309
1937	11,444	158,082	1945	20,517	530,670
1938	15,057	212,151	1946	31,815	717,094
1939	16,322	258,796			

Table 15 - CONSUMPTION OF FLUORSPAR IN CANADA, 1941-1946

	1941	1942	1943	1944	1945	1946
			(tons)			
(a) By Uses						
Steel	17,054	20,133	20,790	20,024	19,462	15,805
Glass	185	231	275	376	502	145
Enamelling and glazing	300	434	216	243	200	220
Heavy chemicals	3,405	3,599	2,680	3,113	3,600	3,388
Non-ferrous smelters	10,194	22,493	39,396	33,643	12,830	10,972
Ferro-alloys	...	853	1,407	104	792	1,431
White metal alloys	15	13	23	30	20	34
Miscellaneous	62	13	137	99	100	...
TOTAL	31,215	47,769	64,922	57,632	37,304	29,995
(b) By Provinces						
Nova Scotia	7,886	8,898	7,916	9,112	7,390	6,612
Quebec	10,422	21,471	38,990	32,745	13,300	11,098
Ontario	12,532	15,565	17,309	15,371	16,266	12,058
Manitoba	175	212	210	165	170	205
Alberta	52	138	151	118	70	...
British Columbia	148	1,485	346	121	110	22
TOTAL	31,215	47,769	64,922	57,632	37,304	29,995

GARNET

(Text from the Annual Review of the Bureau of Mines, Ottawa)

The Niagara Garnet Company was the only garnet producer in Canada in 1946. About 60 tons of garnet ore was mined by the company from the deposit near River Valley in Dana township, Ontario, and was shipped 25 miles southeast to the mill at Sturgeon Falls. The garnet ore is crushed and concentrated to about 95 per cent garnet grain and is then finely pulverized into flour grades for use in the grinding of lenses and in the optical trade. About 1½ tons of flour grade was shipped to plants in the United States. About a ton of flour was on hand at the end of 1946 and nearly 100 tons of broken ore at mine and mill.

Over 85 per cent of the world output of garnet comes from North Creek, New York, and the product is regarded as the world standard garnet. Production in the United States in 1946 was about 7,700 tons compared with 6,306 tons in 1945. The largest producer in the United States uses the "Sink-float" process in preliminary stages to eliminate the coarse tails, and uses a heat treatment process to improve the grain in the final concentrate.

Garnet, crushed and suitably graded as to size, is used for making abrasive-coated papers and cloth, which in turn are used mainly in the wood working (hard woods), and to a lesser extent in the shoe leather industries. The specifications for garnet for this use are somewhat exacting. Few if any of the hundred or more garnet deposits so far examined in Canada fulfil all of the requirements. Garnet is used to a minor extent for sandblasting, and for surfacing plate glass. Garnet superfine (flour) grades are used as a partial substitute for corundum flour, which is used for polishing optical lenses. For this purpose, several hundred tons of garnet were probably used in the United States in 1946.

Prices of ungraded concentrate suitable for sandpaper range from $60 to $85 a ton, and flours from 6 cents a pound for 275 mesh to 65 cents a pound for 5 and 10 micron.

GRAPHITE

(Text from the Annual Review of the Bureau of Mines, Ottawa)

Flake graphite is found in many parts of the Canadian Shield, chiefly in gneisses and crystalline limestone. Occurrences of flake graphite are known also in Manitoba and British Columbia, but have attracted little interest. Bodies of amorphous graphite near Saint John, New Brunswick, were worked on a small scale many years ago. Otherwise, production has been confined to adjacent sections of western Quebec and eastern Ontario, in the general Ottawa region, where about 12 mines and mills were operated at various times in the early years of the industry.

Production from the Black Donald continued to come mainly from the re-treatment of old mill tailings recovered from the lake alongside the workings by pumping or power shovel, the remainder being mill feed provided by lump ore salvaged from old surface dumps. Preparations for renewal of underground mining from the old Ross shaft were started early in 1946 and a stoping drift was opened on the 290-foot level to develop an orebody discovered some years ago by drilling. This orebody is 150 feet long and 6 to 8 feet wide, and contains 25 to 30 per cent graphite. Mining and stock-piling of new ore was commenced in August, and by November about 1,500 tons had been raised. Proven ore reserves at the end of 1946 was reported as 7,500 tons, and possible reserves at 10,000 tons. Old tailings reserves, which henceforth will be drawn on only during the summer, are estimated at 10,000 tons. The mill runs three 8 hour shifts, 7 days a week, and has treated up to 50 tons per day of salvaged ore and tailings. The expected rate on newly mined ore is 35 tons per day. Recovery of finished products comprising natural flake, powdered flake, and amorphous in 1946 was about 5 tons per day. Total labour force employed was 22 men, 12 in mining, and 10 in the mill. The mill treated about 13,500 tons, with a recovery of 11.7 per cent carbon per ton.

Trade journal quotations for flake graphite in the United States in 1946 ranged from 16 cents per pound for best quality, down to 3 cents per pound for the lowest grade. Crude Ceylon lump, chip, and dust ranged from 12 cents to 5 cents per pound, according to carbon content. Madagascar crucible flake sold for 10 to 11 cents per pound, nominal. Mexican crude amorphous was quoted at $14 to $30 per ton, f.o.b. New York, according to grade.

The duty on graphite entering the United States under the general tariff is 5 per cent ad valorem on natural amorphous and artificial grades, and 15 per cent on crystalline lump, chip, and dust grades. The Canadian tariff is as follows: graphite, not ground or otherwise manufactured, British, free; intermediate (including the United States), 7½ per cent ad valorem; general, 10 per cent; on ground and manufactures of, including foundry facings, but not crucibles, British, 15 per cent; intermediate, 22½ per cent; general, 25 per cent. Graphite crucibles enter Canada free under the British Preferential Tariff, under other tariffs the duty is 15 per cent ad valorem.

Table 16 - MINE PRODUCTION (SALES) OF GRAPHITE IN CANADA, 1932-1946

Year	Short tons	$	Year	Short tons	$
1932	346	18,483	1940	1,382	94,038
1933	405	18,367	1941	1,644	132,924
1934	1,518	71,424	1942	1,192	117,904
1935	1,782	79,781	1943	1,903	197,431
1936	2,045	88,812	1944	1,582	179,457
1937	2,511	125,343	1945	1,910	187,564
1938	723	41,590	1946	1,975	180,405
1939	1,101	61,684			

GRINDSTONES, PULPSTONES AND SCYTHESTONES

(Text from the Annual Review of the Bureau of Mines, Ottawa)

Material suitable for these stones occurs in certain sandstone beds in Nova Scotia, New Brunswick, and on the coast of British Columbia. Many years ago the output was considerable, but most of the known beds have been depleted and the demand for natural stones has decreased.

No natural pulpstones or scythestones were produced in Canada in 1946, but a total 295 tons of grindstones valued at $17,450 were shipped from New Brunswick and Nova Scotia. Pulpstones were last produced in 1937 by J. A. and C. H. McDonald Company from Gabriola Island near Nanaimo and Vancouver Island. Good pulpstones are in demand, particularly for use in the large magazine grinders, but known Canadian deposits containing thick beds of sandstone of the proper quality appear to have been worked out. There

is also an increasing competition from Canadian-made artificial segmental pulpstones, mainly of silicon carbide grit, and about 645 of these stones are in use and in stock in the various Canadian pulp mills. The imported natural pulpstones come mainly from West Virginia.

Table 17 - PRODUCTION OF GRINDSTONES, PULPSTONES AND SCYTHESTONES IN CANADA, 1932-1946

Year	Tons	$	Year	Tons	$
1932	328	15,735	1940	341	14,543
1933	498	21,919	1941	188	11,500
1934	987	46,478	1942	216	10,000
1935	708	34,010	1943	164	6,225
1936	569	24,724	1944	225	12,000
1937	412	21,429	1945	225	10,870
1938	306	16,198	1946	295	17,450
1939	304	15,278			

Table 18 - PRODUCTION OF NATURAL ABRASIVE STONES, 1945 and 1946

	Grindstones	
	Tons	$
1945		
Nova Scotia	10	600
New Brunswick	215	10,270
CANADA	225	10,870
1946		
Nova Scotia	...	...
New Brunswick	295	17,450
CANADA	295	17,450

Table 19 - CONSUMPTION OF PULPSTONES BY THE CANADIAN PULP AND PAPER INDUSTRY, 1932-1946

Year	Number for 2 ft. wood	Value	Number for 2.5 ft. wood	Value	Number for 4 ft. wood	Value
		$		$		$
1932	210	65,450	139	46,436	222	249,373
1933	321	98,475	95	31,945	199	223,635
1934	378	103,811	84	29,680	268	292,359
1935	417	116,501	52	20,297	237	243,805
1936	463	120,227	61	19,478	253	281,265
1937	392	123,598	84	21,700	280	382,084
1938	306	92,822	37	13,351	186	238,488
1939	242	60,622	60	22,443	203	238,620
1940	311	96,957	110	49,899	163	257,628
1941	295	127,349	77	35,843	97	215,913
1942	237	100,466	53	23,898	94	208,986
1943	197	102,888	54	20,000	66	151,411
1944	187	89,133	57	34,865	76	193,396
1945	191	117,585	33	14,132	114	271,108
1946	233	121,705	41	16,868	139	349,866

LITHIUM MINERALS

Amblygonite, spodumene, and lepidolite are the chief lithium minerals of commerce; their ores contain, respectively, about 8, 6 and 4 per cent of lithium oxide. Spodumene is in greatest supply, and is the base raw material for the manufacture of many lithium salts, lithium metal, and alloys. Amblygonite has similar uses, but is scarcer and more expensive. Lepidolite, or lithia mica, is employed mainly in the natural state as a batch ingredient in glass. The occurrence of all three minerals is confined to pegmatite dykes of a definite type, which usually have a localized, regional distribution and often carry, also, important amounts of beryl and tantalite-columbite. In some cases, such dykes have been worked for the recovery of all of these minerals.

There has been no recorded production of lithium minerals in Canada since 1937, when 32 tons of amblygonite and spodumene valued at about $1,700 was shipped, and little if any lithium ore is known to be used or required for any purpose in the Dominion. Thus, an outside market would have to be found for any production. Considerable development work has been done in recent years, however, on deposits in the Pointe du Bois area in southeastern Manitoba; and in the three years ended 1944 increased interest was shown in the commercial possibilities of lithium deposits in other sections of that province, though activities have been confined to exploratory drilling. Some attention has been given, also, to lithium-bearing deposits in the Yellowknife-Beaulieu area in the Northwest Territories.

Lithium ores and compounds early became of strategic importance in the present war, and to conserve supply for defence needs the United States Government placed both under allocation control in 1942. Government assistance also was given to the establishment of two spodumene mills, one in North Carolina, and the other in South Dakota. These measures resulted in a considerable easing of the general supply situation in 1944.

Total production in Canada during the active period 1925-1937, inclusive, is estimated at about 250 tons, and comprised lepidolite, spodumene, and amblygonite. Most of the material was exported to the United States.

The United States and Southwest Africa have been the two leading producers of lithium ores in recent years, with the former probably supplying well over 50 per cent of the annual total, and possessing the largest reserves. Production consists mainly of spodumene and amblygonite, and in the United States has come chiefly from the Black Hills region in South Dakota. An additional important source of lithia in the United States is lithium-sodium phosphate, recovered from the brine of Searle's Lake, at Trona, California, which at present furnishes nearly 50 per cent of the total American lithia production. Shipments of lithium ores and compounds in the United States in 1944 reached an all-time high of 13,319 tons, a 63 per cent increase over the previous year.

There are no plants in Canada for the chemical treatment of lithium ores. Most of the world production marketed prior to the war was treated by a few large chemical firms specializing in the business, the principal plants being in the United States, Great Britian, Germany and France. Such firms usually purchased their requirements under individual contract, and there has thus been little in the way of an open market, price quotations given in trade journals being merely nominal. Some of the larger consumers own and operate their own mines.

MAGNESITE AND BRUCITE

(Text from the Annual Review of the Bureau of Mines, Ottawa)

Magnesitic dolomite, a rock composed of an intimate mixture of magnesite and dolomite, is quarried at Kilmar, Argenteuil county, Quebec, by Canadian Refractories Limited, and is processed for use as refractory products and to a minor extent as fertilizer material.

Brucitic limestone, a rock composed of granules of the mineral brucite (magnesium hydroxide) thickly distributed throughout a matrix of calcite, is quarried near Wakefield, Quebec, by Aluminum Company of Canada, Limited, and is processed for the recovery of magnesia and lime. The magnesia is used for making magnesium metal, basic refractories, and fertilizers.

The value of refractory products made from magnesitic dolomite and brucitic limestone reached a new peak in 1946. Canadian Refractories Limited, the principal producer of these materials, was carrying out an extensive program of enlargement and modernization of its production facilities at Kilmar. This includes the installation of a sink-float plant and a 245-foot rotary kiln. The latter will possibly be in operation in 1947.

Dolomite Refractories Limited, a subsidiary of Canadian Refractories Limited, began the operation of a large mixed-feed kiln at Dundas, Ontario, which produces dead-burned dolomite for use as refractory material in open-hearth furnaces at steel plants.

Magnesite deposits occur in British Columbia and in Yukon. The most important of these, at Marysville, British Columbia, between Cranbrook and Kimberley, is owned by The Consolidated Mining and Smelting Company of Canada, Limited. Considerable silica and alumina occur as impurities in this magnesite. The company, however, has devised a flotation method to remove the greater part of these impurities, but there has been no commercial production. Other magnesite deposits in British Columbia and Yukon are of limited extent or are too far from transportation to be of economic interest at present. Some deposits of earthy hydromagnesite near Atlin and Clinton in British Columbia have been worked at various times on a small scale, but there has been no production in recent years.

There are large deposits of brucite limestone at Bryson, Quebec, and at Rutherglen, Ontario, and there is a small deposit on West Redonda Island in British Columbia.

Table 20 - PRODUCTION OF MAGNESITIC DOLOMITE (CALCINED) IN CANADA, 1937-1946

Year	Value	Year	Value
	$		$
1937	677,207	1942	1,059,374(a)
1938	420,261(b)	1943	1,260,056
1939	474,418	1944	1,139,281
1940	897,016	1945	1,278,596
1941	831,041	1946	1,225,593

(a) 1942 and following years include the value of brucite shipped.
(b) Represents value of magnesite (dead-burned, etc.) only, whereas the values for years immediately preceding include the value of some end products containing imported material; for this reason the 1938 to 1946 values are not entirely comparable with those for preceding years.

Table 21 - MAGNESITE AND DOLOMITE USED IN THE CANADIAN PRIMARY IRON AND STEEL INDUSTRY, 1939-1946

Year	Calcined Dolomite		Dolomite, Crude		Magnesite	
	Short tons	Value	Short tons	Value	Short tons	Value
		$		$		$
1939	14,858	99,838	40,592	78,904	11,401	351,680
1940	21,949	136,360	59,284	123,429	13,673	506,032
1941	21,608	160,602	71,087	159,037	18,127	682,742
1942	22,550	179,427	79,091	225,393	20,665	786,321
1943	10,310	99,740	78,746	243,793	19,427	744,716
1944	8,516	125,990	134,907	296,631	18,665	740,450
1945	6,146	111,581	110,478	266,236	18,249	755,958
1946	3,788	66,473	87,217	230,384	13,049	546,396

Table 22 - CALCINED MAGNESITE USED BY THE ARTIFICIAL ABRASIVES AND ABRASIVE PRODUCTS INDUSTRY IN CANADA, 1937-1946

Year	Tons	Value	Year	Tons	Value
		$			$
1937	484	29,242	1942	398	58,648
1938	...	...	1943	150	12,164
1939	121	7,735	1944	771	103,591
1940	302	19,331	1945	840	96,780
1941	809	77,508	1946	1,676	187,250

MAGNESIUM SULPHATE

Natural hydrous magnesium sulphate (Epsom Salts or Epsomite) occurs in deposits in lake bottoms or in solution in brine lakes in British Columbia. In Saskatchewan, it is found associated with sodium sulphate. Attempts have been made to produce refined salts, and a number of years ago there was a considerable production from several of the "lakes" in British Columbia. Experimental shipments have been made also from one of the lakes in Saskatchewan.

Canada's output of magnesium sulphate has come chiefly from a deposit in Basque, British Columbia, production from which was discontinued in the autumn of 1942. The salt was refined at Ashcroft, 15 miles south of the deposit, and the grade of the product was high. The refinery, now owned by Ashcroft Salts Company, Limited, had a capacity of 10 tons of salt a day. There are a number of other occurrences in British Columbia, near Clinton, north of Kamloops, and in Kruger's Pass, south of Penticton.

In Saskatchewan, two lakes south of Wiseton contain brines high in magnesium sulphate, and Muskiki Lake, just north of Dana, contains brine high in magnesium and sodium sulphates, which at certain times of the year crystallizes into a bedded deposit with layers of both salts.

In the chemical industries, Epsom salt has many uses. It is employed for tanning and in dyeing, and for textile and medicinal use. Magnesium sulphate is used in the paper industry for weighting paper. In the sole leather industry it is used to obtain a clean shiny cut, and it also helps to retain moisture in the leather and increases its weight. Magnesium salt is used to a small extent in the dyeing industry. In some cases it is used in the treatment of leather to increase the fastness of the colour in washing. It is used extensively and in large quantities in medicine and for various purposes in the manufacture of textiles. In bleaching wool, magnesium sulphate is added to destroy the corrosive effect of sodium peroxide. It is also used for weighting textile fabric, especially silk. Mixed with gypsum and ammonium sulphate, it is used in the manufacture of non-inflammable fabrics.

Table 23 - PRODUCTION OF NATURAL MAGNESIUM SULPHATE IN CANADA(*), 1937-1946

Year	Tons	Value	Year	Tons	Value
		$			$
1937	727	14,456	1942	1,140	38,760
1938	470	9,400	1943	...	...
1939	550	9,900	1944	...	...
1940	...	...	1945	...	...
1941	265	7,343	1946	...	...

(*)Produced entirely in British Columbia.

Table 24 - IMPORTS OF MAGNESIUM SULPHATE INTO CANADA, 1939-1946

Year	Tons	Value	Year	Tons	Value
		$			$
1939	1,951	56,648	1943	3,379	137,372
1940	2,211	86,090	1944	2,684	108,795
1941	2,729	109,022	1945	2,545	101,695
1942	1,688	68,532	1946	3,463	132,542

Table 25 - AVAILABLE DATA ON CONSUMPTION OF MAGNESIUM SULPHATE IN CANADA, 1940-1946

Industry	1940	1941	1942	1943	1944	1945	1946
				(tons)			
Leather tanneries	823	752	891	935	932	1,013	1,019
Medicinals	462	968	539	577	562	828	645
Fertilizers	90	200	790	...	54	431	57
Textiles	155	303	55	330	350	44	28
Miscellaneous	Not available		46	60	119	...	...
TOTAL ACCOUNTED FOR ...	1,530	2,223	2,321	1,902	2,017	2,316	1,749

NATURAL MINERAL WATERS

Production of natural mineral waters in past years originated in Ontario and Quebec. Some of the more prominent Canadian mineral waters possessing special therapeutic or hygienic properties include the following: in Quebec, the Abenakis springs on the St. Francois river in Yamaska county, Potton Springs in Brome county and the Colombia spring at L'Epiphanie. In Ontario, saline, sulphur and gas springs occur at Caledonia Springs and at Carlsbad Springs, near Ottawa; the waters range from alkaline to strongly saline. St. Catharines, near Niagara, is one of the oldest Canadian mineral water resorts and sulphur waters are found at the Preston mineral springs in Waterloo county. The most famous of all Canadian springs is undoubtedly the group of hot sulphur springs at Banff, Alberta. In British Columbia, the Harrison Hot Springs in Fraser Valley and the Halcyon Hot Springs on Arrow Lake are noted for their curative properties.

There were 18 firms reporting production of natural mineral waters in the Dominion in 1945. Fifteen of these firms were in Quebec and 3 in Ontario.

Table 26 - SHIPMENTS OF NATURAL MINERAL WATERS FROM CANADIAN SPRINGS, 1937-1946

Year	Quebec		Ontario		CANADA	
	Imp.gal.	$	Imp.gal.	$	Imp.gal.	$
1937	198,319	19,697	26,700	889	225,019	20,586
1938	159,893	19,033	28,416	2,586	188,309	21,619
1939	104,629	17,503	19,140	1,602	123,769	19,105
1940	109,025	18,466	31,638	2,426	140,663	20,892
1941	144,441	58,062	36,623	14,469	181,064	72,531
1942	129,062	60,316	28,023	14,189	157,085	74,505
1943	125,605	61,793	14,006	5,748	139,611	67,541
1944	148,965	88,113	7,185	805	156,150	88,918
1945	236,476	148,714	8,285	976	244,761	149,690
1946	211,842	121,526	6,000	878	217,842	122,404

PHOSPHATE

(Text from the Annual Review of the Bureau of Mines, Ottawa)

All of the output in 1946 came from the province of Quebec. For many years Electric Reduction Company Buckingham, Quebec, has purchased most of the output for use in the production of elemental phosphorus and of various phosphorus compounds. The company obtains most of its requirements, however, from Florida. Over 98 per cent of the Canadian imports of rock phosphate come from Florida and Montana and the remainder from North Africa and from Curacao, Netherlands West Indies. The Curacao material is low in fluorine and is used in stock feeds.

In Canada, the apatite is frequently associated with the productive phlogopite mica deposits of the general Ottawa region in Ontario and Quebec. In certain areas of Precambrian pyroxenite, the host rock of the phlogopite, are substantial bodies of apatite that contain little or no mica. These, in the past, were mined for straight phosphate and have accounted for the greater part of the recorded production. In more recent years, the small tonnages of apatite sold have been by-product material taken out in the course of mica-mining operations. During the war, some renewed interest was taken in a few of the larger and richer apatite properties that were worked in the peak years (1878-1894) of the phosphate industry, and this accounted for the slight rise in production in the 1941-1943 period.

Rock phosphate of Permo-Triassic age occurs along the Rocky Mountain Divide, notably in the vicinity of Crow's Nest, British Columbia, where a few thousand tons was mined about 1930 by the Consolidated Mining and Smelting Company of Canada, Limited. The material proved to be too low-grade to be of present economic interest and rock for the company's fertilizer plant at Trail, British Columbia, is obtained from richer deposits in Montana.

Overall average f.o.b. price of the United States production in the first half of 1946 was $4.24 per long ton. The price paid in 1946 for Canadian apatite delivered at plant continued to be $16 per short ton for material of 80 per cent B.P.L. grade, with a penalty or premium of 20 cents per unit below or above that figure.

Table 27 - PRODUCTION OF PHOSPHATE IN CANADA, 1937-1946

Year	Short tons	$	Year	Short tons	$
1937	100	900	1942	1,264	17,431
1938	208	1,886	1943	1,451	18,385
1939	157	1,712	1944	482	6,716
1940	358	4,039	1945	299	4,356
1941	2,487	33,376	1946	57	869

Table 28 - IMPORTS OF PHOSPHATE ROCK INTO CANADA, 1937-1946

Year	Tons	Value	Year	Tons	Value
		$			$
1937	113,971	453,599	1942	271,373	1,053,229
1938	128,409	455,697	1943	260,846	1,085,080
1939	124,900	477,317	1944	388,247	1,710,378
1940	165,858	663,554	1945	317,695	1,450,580
1941	237,029	863,833	1946	373,677	2,164,841

Table 29 - CONSUMPTION OF PHOSPHATE ROCK IN CANADA, 1945 and 1946

	1945	1946
	(tons)	
(a) By Uses		
Fertilizers	365,195	372,914
Chemicals	26,804	17,861
Steel furnaces	1,895	1,989
Refractories	154	153
Miscellaneous	...	7,100
TOTAL	394,048	400,017
(b) By Provinces		
Quebec	93,751	85,871
Ontario	69,060	70,933
British Columbia	231,237	243,213
TOTAL	394,048	400,017

SILICA BRICK

The manufacture of silica brick for refractory use was confined to the plants of the Dominion Steel and Coal Company, Limited, Sydney, Nova Scotia, and the Algoma Steel Corporation Limited, Sault Ste. Marie, Ontario. The brick manufactured by both these firms are processed from crushed silica rock and are utilized in furnace construction and repairs.

Table 30 - PRODUCTION OF SILICA BRICK IN CANADA, 1937-1946

Year	M	$	Year	M	$
1937	3,744	181,126	1942	4,273	263,006
1938	1,788	100,403	1943	4,165	295,505
1939	2,493	124,807	1944	3,997	312,092
1940	3,438	182,786	1945	4,208	317,263
1941	4,111	238,433	1946	2,902	197,804

Note: Quantities are shown as 9" equivalent.

SODIUM CARBONATE (NATURAL)

Deposits of natural sodium carbonate in the form of "Natron" (sodium carbonate with 10 molecules of water) and of brine occur in a number of small "lakes" throughout the central part of British Columbia, chiefly in the Clinton Mining Division and in the neighborhood of Kamloops. As the deposits are far from the main eastern Canadian markets, production is restricted to the requirements of consumers within economical rail haul.

Sodium carbonate has many industrial uses, notably in the manufacture of glass and soap, in the purification of oils, in the production of aluminum, in the flotation of minerals, in the refining of metals, and in the production of caustic soda.

Table 31 - PRODUCTION OF SODIUM CARBONATE (NATURAL) IN CANADA, 1937-1946

Year	Tons	$	Year	Tons	$
1937	286	2,574	1942	256	2,048
1938	252	2,268	1943	468	5,148
1939	300	2,400	1944	44	484
1940	220	1,760	1945	286	3,146
1941	186	1,488	1946	...	...

SODIUM SULPHATE (NATURAL)

(Text from the Annual Review of the Bureau of Mines, Ottawa)

Sodium sulphate occurs as crystals or in the form of highly concentrated brines in many lakes and deposits throughout western Canada. From these, hydrated sodium sulphate, known as Glauber's salt, and anhydrous sodium sulphate, known to the trade as "salt cake", are produced in Canada.

Investigations of the sodium sulphate deposits in western Canada were made by the Mines Branch, predecessor organization of the Bureau of Mines, Ottawa, in 1921, and over 120,000,000 tons of hydrous salts were proved in the few deposits examined in detail. The material is in the form of the hydrous salt (mirabilite or Glauber's salt) which contains 55.9 per cent of water of crystallization that is removed before marketing. For the small amount of the hydrous product that is marketed as such, clean crystals are harvested and stock-piled, after which they are screened to various sizes, bagged and shipped.

Anhydrous sodium sulphate is also obtained as a by-product from the manufacture of hydrochloric acid and as a by-product from the viscose industry. The latter source of supply is likely to increase rapidly as the demand for the other products of the viscose industry expands. Thus, unless the anhydrous material from western Canada can be made of such a high degree of purity that consumers will be willing to pay a premium based on the sodium sulphate content, it will be unable to compete in the export market with the by-product material.

Glauber's salt is used widely in the chemical industries and the demand is increasing. Sodium sulphate is used chiefly in the sulphate process for the manufacture of kraft pulp, and large amounts are used at Copper Cliff in the smelter. It is used in the glass, dye and textile industries and to a smaller extent for medicinal purposes, and for tanning.

The price of natural sodium sulphate from the deposits in western Canada in 1946 was quoted at $10.00 per short ton in carload lots f.o.b. plant. The delivered price at pulp mills, which are mostly distant from producing centres, is considerably higher.

Table 32 - PRINCIPAL STATISTICS OF SODIUM SULPHATE MINING INDUSTRY, 1945 and 1946

		1945	1946
Active firms	No.	5	4
Producing plants	No.	5	4
Employees - Administrative	No.	25	13
Workmen	No.	131	154
Total Employees	No.	156	167
Salaries	$	31,072	32,259
Wages	$	231,297	219,628
Total Salaries and Wages	$	262,369	251,887
Gross value of production	$	884,322	1,118,783
Cost of fuel and electricity	$	226,109	254,450
Cost of process supplies and containers	$	27,473	66,423
Net Value of Production	$	630,740	797,910

Table 33 - PRODUCTION OF NATURAL SODIUM SULPHATE (*) IN CANADA, 1937-1946

Year	Short tons	$	Year	Short tons	$
1937	79,804	617,548	1942	131,258	1,079,692
1938	63,009	553,307	1943	107,121	1,025,151
1939	71,485	628,151	1944	102,421	987,842
1940	94,260	829,589	1945	93,068	884,322
1941	115,608	931,554	1946	105,919	1,117,683

(*) All produced in the province of Saskatchewan, with the following exceptions:
Includes production in Alberta - 1937 ..... 80 tons, value $480
1938 ..... 89 tons, value $1,127
1939 ..... 10 tons, value $186
1940 ..... 10 tons, value $50
1941 ..... 8 tons, value $52

Table 34 - PRODUCTION IN CANADA OF MANUFACTURED SODIUM SULPHATE, 1937-1946

Year	Salt Cake		Glauber's Salt	
	Tons	$	Tons	$
1937	3,746	53,244	3,203	52,658
1938	2,955	42,049	2,464	39,935
1939	2,661	40,219	3,189	52,331
1940	4,100	61,567	4,425	82,969
1941	5,191	83,991	3,372	64,203
1942	4,945	68,377	914	18,761
1943	4,256	57,526	...	...
1944	3,758	46,077	...	...
1945	2,850	35,226	...	...
1946	2,584	33,333	...	...

Table 35 - IMPORTS INTO CANADA OF SODIUM SULPHATE, 1937-1946

Year	Salt Cake		Glauber's Salt	
	Tons	$	Tons	$
1937	14,117	132,352	1,706	25,000
1938	5,786	61,122	2,266	20,288
1939	6,542	73,575	1,330	20,102
1940	8,295	94,674	543	12,450
1941	7,819	105,502	250	8,244
1942	7,070	85,479	75	4,664
1943	11,904	150,496	566	15,399
1944	20,460	195,105	777	21,960
1945	13,535	120,982	1,016	29,452
1946	20,881	244,617	1,258	33,136

Table 36 - AVAILABLE DATA ON CONSUMPTION OF SODIUM SULPHATE (SALT CAKE) IN CANADA, 1941-1946

	1941	1942	1943	1944	1945	1946
			(tons)			
Pulp and paper	61,679	70,078	67,292	70,954	67,654	81,161
Non-ferrous smelters ...	28,294	21,541	33,385	37,079	30,000	26,124
Heavy chemicals	10	58	120	934	125	67
Glass	556	643	892	770	621	2,660
Medicinals	11	14	38	29	30	42
Textiles	10	3				
Tanneries	21	3		Not		
Soaps	...	18		available		
Miscellaneous	10	4				
TOTAL	90,591	92,358	101,727	109,784	98,430	110,054

STRONTIUM MINERALS

There was no commercial production of strontium minerals in Canada during recent years. In 1941, 27 tons of celestite valued at $280 was shipped from old dumps located on lots 6 and 7, concession 10 of Bagot township, Renfrew county, Ontario.

The following, relating to strontium, is from a review prepared by the Bureau of Mines, Ottawa:

"Several occurrences of celestite (strontium sulphate) of possible economic interest are known in Canada, and in 1920-21 some ground material produced from a deposit in Bagot township, Ontario, was sold to the paint trade. The material from this deposit is coarsely-fibrous in character and is not very pure, containing about 18 per cent of barium sulphate. It is accordingly not favoured for chemical use, but is regarded as suitable for paints and general filler or loader use. The old pit was pumped out in 1941 and a few tons of ore were scaled down from a small drift. This, along with some stockpile material, was shipped to Montreal for grinding. The product was used in the paint trade as a substitute for barite, but is reported to have found little favour, and no further work was done. Celestite of similar character and analysis occurs at some of the old fluorspar mines of the Madoc area in Ontario, and part of it might be recoverable from the waste dumps.

"Celestite, analyzing 98 to 99 per cent strontium sulphate, occurs as a small vein of coarse platey crystals in Lansdowne township, Ontario and some of it was mined many years ago.

"World production of strontium minerals is estimated at 5,000 to 7,000 tons a year. England is the principal source of supply, with Germany next. The United States produced about 350 tons in 1940, exclusive of celestite used for oil-drilling. Important deposits are reported to occur in India and Newfoundland, but there has been no production from these sources as yet.

"Celestite is the principal source of strontium used in the manufacture of the various strontium salts, and strontianite a less common mineral, is used for the same purpose. The nitrate, carbonate, and hydrate are the most important of the strontium compounds used in industry and medicine. Strontium nitrate is employed mainly in pyrotechnics, for fireworks, railroad signal flares, and military flares and rockets to which it imparts the characteristic strong red flame colour of the element. Other strontium compounds are employed in tracer bullets and shells. The hydrate is used chiefly in the refining of beet sugar by the Scheibler process. In North America, however, sugar is refined mainly by the Steffens, or lime, process. The carbonate is reported to be used to some extent as a batch ingredient in the manufacture of certain kinds of glass, glazes, and enamels, and as a fluxing and desulphurizing and dephosphorizing agent in iron and steel. Strontium chloride powder finds limited use in refrigerators working on the solid absorption principle. Ground celestite is used in fairly large quantities for purifying caustic soda in the rayon industry, and some impure material has been ground and employed as a barite substitute for weighting oil-drilling muds. Interest has also been shown in the possibilities of the carbonate and the sulphate in glass and white wares.

"Strontium metal, made from either the natural sulphate of carbonate, is used in limited quantities in certain alloys, mainly of copper, tin, lead, zinc, and cadmium."

VOLCANIC DUST

(Text from the Annual Review by the Bureau of Mines, Ottawa)

Volcanic dust (pumicite or pumice dust) is a natural glass or silicate, atomized by volcanic explosions and thrown into the air in great clouds which ultimately settle, forming beds of varying thickness, often hundreds of miles from its source. In many instances the dust has been washed down from higher levels and redeposited by the agency of waters, in which case the beds are stratified and mixed with foreign substances. It consists of aluminum silicate (80 to 90 per cent), and of oxides and silicates of iron, sodium, magnesium, calcium, etc.

Deposits of volcanic dust occur in Saskatchewan, Alberta and British Columbia. There was no production in 1945 and 1946. In 1943 about 60 tons was shipped from Rock Glen, 125 miles southeast of Swift Current, Saskatchewan. A lease was taken out recently on the Duncairn deposit near Swift Current and samples of cleanser material were distributed.

The United States is the largest consumer of volcanic dust and pumice, and has an annual output of about 90,000 tons valued at over $700,000. The material is used mainly in scouring and cleansing compounds and as a concrete admixture and concrete aggregate. To a minor extent it is used for insulation; in glass bevelling; for polishing aluminum; in the manufacture of fire-proof walls; in Acoustic plaster; in building tiles; as a filler in paint and in asphalt; and in glazes in ceramics.

SULPHUR (Including Pyrites)

(Text from the Annual Review by the Bureau of Mines, Ottawa)

Pyrites is produced in Canada as a by-product in the treatment of copper-pyrites ores at Waite-Amulet and Noranda mines in Quebec and at Britannia mine in British Columbia. No lump pyrites has been produced in Canada for several years, and published statistics on recent pyrites production refer to by-product iron pyrites recovered in the concentrating of copper and copper-zinc ores.

Deposits of native sulphur of commercial grade have not been found in Canada, but sulphur occurs in combination with copper, lead, zinc, nickel, or iron in many base metal sulphide orebodies in various parts of the country. In smelting these ores sulphur dioxide gas is produced, and to 1925 this gas was a total waste as no facilities were available for the recovery from it of sulphur or of sulphur compounds. In practice this gas can be used directly for the manufacture of liquid sulphur dioxide or for the production of elemental sulphur. Sulphur used in the making of sulphuric acid is recovered in the form of sulphur dioxide from salvaged gas by The Consolidated Mining and Smelting Company of Canada, Limited at Trail, British Columbia, and by Canadian Industries Limited at Copper Cliff, Ontario. There has been no production of elemental sulphur in Canada since July 1943.

In Quebec, Noranda Mines Limited, Noranda, recovers the pyrites from the cyanide mill tailings and sells it to pulp and paper mills at Trois Rivieres and at Hull, Quebec, and to chemical plants in Canada and the United States. Waite Amulet Mines, Limited has been producing a pyrite concentrate since March 1944, which it ships mainly to the United States.

In British Columbia, most of the large output of pyrites from the Britannia mine of Britannia Mining and Smelting Company, Limited, at Britannia Beach, was sold to Nichols Chemical Company's acid plant at Barnet, British Columbia, and the remainder was exported to Compagnie des Boleo in Mexico. The pyrites averaged over 50 per cent in sulphur. A considerable tonnage from operations in previous years has accumulated for disposal when market conditions are more favourable. The property of Northern Pyrites, Limited at Ecstall River, about 60 miles south of Prince Rupert, remained idle. Reserves are estimated at 5,000,000 tons with a sulphur content of 45 per cent.

By July 1943, the demand for sulphuric acid for fertilizer manufacture had become so great that the production of elemental sulphur at Trail, which was commenced in 1936, was discontinued. The sulphuric acid is made in a plant using the contact process, that was erected by Consolidated Mining and Smelting Company in 1929. Canadian Industries Limited also uses the contact process in its acid plant at Copper Cliff, the production of sulphuric acid being from converter gas that is withdrawn from the flues by arrangement with The International Nickel Company of Canada, Limited.

Table 37 - PRODUCTION OF SULPHUR (*) IN CANADA, 1932-1946

Year	Tons	$	Year	Tons	$
1932	53,172	470,014	1940	170,630	1,298,018
1933	57,373	510,299	1941	260,023	1,702,786
1934	51,537	515,502	1942	303,714	1,994,891
1935	67,446	634,235	1943	257,515	1,753,425
1936	122,132	1,033,055	1944	248,088	1,755,739
1937	130,913	1,154,992	1945	250,114	1,881,321
1938	112,395	1,044,817	1946	234,771	1,784,666
1939	211,278	1,668,025			

(*) Includes sulphur recovered from smelter gas.

Table 38 - PRODUCTION IN CANADA OF PYRITES WITH SULPHUR CONTENT, INCLUDING SULPHUR CONTAINED IN SULPHURIC ACID, ETC., MADE FROM SMELTER GASES, 1944-1946

	Pyrites			Smelter Gas		Total Sulphur	
	Sales	Sulphur Content		Sulphur Content			
	Tons	Tons	Value	Tons	Value	Tons	Value
			$		$		$
1944							
Quebec	240,370	116,887	453,501	...	...	116,887	453,501
Ontario	...	...	...	17,876	178,760	17,876	178,760
British Columbia ..	9,701	4,886	39,088	108,439	1,084,390	113,325	1,123,478
CANADA	250,071	121,773	492,589	126,315	1,263,150	248,088	1,755,739
1945							
Quebec	218,628	105,613	445,534	...	...	105,613	445,534
Ontario	...	...	...	16,847	168,470	16,847	168,470
British Columbia ..	9,095	4,590	36,677	123,064	1,230,640	127,654	1,267,317
CANADA	227,723	110,203	482,211	139,911	1,399,110	250,114	1,881,321
1946							
Quebec	194,291	92,716	375,328	...	...	92,716	375,328
Ontario	...	...	...	15,433	154,330	15,433	154,330
British Columbia ..	7,644	3,822	27,006	122,800	1,228,002	126,622	1,255,008
CANADA	201,935	96,538	402,334	138,233	1,382,332	234,771	1,784,666

Table 39 - AVAILABLE DATA ON THE CONSUMPTION OF SULPHUR (BRIMSTONE) IN CANADA, 1943-1946

Industry	1943	1944	1945	1946
	(Tons of 2,000 pounds)			
Pulp and paper	206,785	195,203	203,522	226,296
Heavy chemicals	69,236	68,649	53,689	45,346
Rubber goods	1,412	1,259	1,496	1,446
Explosives	1,806	1,753	1,131	1,461
Insecticides	1,246	1,228	1,244	1,297
Adhesives	93	495	75	64
Starch	270	240	253	208
Fruit and vegetable preparations	215	156	123	119
Sugar refining	104	108	130	128
Petroleum refining	47	51	51	68
Matches	76	75	89	83
Miscellaneous	3,828	670	600	195
TOTAL ACCOUNTED FOR	285,118	269,887	262,403	276,711

Table 40 - IMPORTS OF SULPHUR (BRIMSTONE) INTO CANADA, 1937-1946

Year	Tons	$	Year	Tons	$
1937	225,684	3,669,082	1942	290,121	4,680,672
1938	93,647	1,471,741	1943	218,527	3,524,006
1939	152,216	2,453,836	1944	235,955	3,875,649
1940	215,597	3,628,348	1945	248,846	4,063,324
1941	235,271	3,920,184	1946	273,502	4,271,081

DIRECTORY OF FIRMS IN THE MISCELLANEOUS NON-METAL MINING INDUSTRIES IN CANADA, 1946

(x) Active but not producing.
(*) Recover sulphur from smelter gas.

Name of Operator	Head Office Address	Plant Location
Barite		
Nova Scotia -		
Canadian Industrial Minerals Ltd.	Walton	Walton
Ontario -		
Woodhall Mines Ltd.	347 Bay St., Toronto	Langmuir
British Columbia -		
Mountain Minerals Ltd.	Box 273, Lethbridge, Alberta	Golden M.D.
Brucite		
Quebec -		
Aluminum Company of Canada Ltd.	Sun Life Bldg., Montreal	Wakefield
Corundum		
Ontario -		
Craigmont Corundum Project	Dept. of Reconstruction, Ottawa	Raglan Tp.
Diatomite		
Nova Scotia -		
Wightman, Mrs. G. W.	Smith's Cove	Digby Co.
British Columbia -		
Fairey and Co.	661 Taylor St., Vancouver	Cariboo M.D., Vancouver
Fluorspar		
Ontario -		
Dominion Magnesium Ltd.	67 Yonge St., Toronto	Cobden
Gilman, R. T.	13 Government Road W., Kirkland Lake	Madoc Dist.
Millwood Fluorspar Mines Ltd.	Box 206, Madoc	Madoc Dist.
Reliance Fluorspar Mining Synd. Ltd.	Madoc	Huntingdon Tp.
Stocklosar, Chas. A.	Box 198, Madoc	Huntingdon Tp.
Tops Mining Synd. Ltd. (x)	c/o W. E. Clark, Harcourt	Cardiff Tp.
Garnet		
Ontario -		
Niagara Garnet Co.	c/o Wm. A. Yarwood, 8573 Krull Parkway, Niagara Falls, N.Y., U.S.A.	River Valley
Graphite		
Ontario -		
Frobisher Exploration Co. Ltd.	Black Donald Mines	Brougham Tp.
Grindstones		
New Brunswick -		
Read, H. C.	Bathurst	Stonehaven
Bay of Chaleur Grindstone Co.	Clifton	Clifton
Lithium Minerals		
Manitoba -		
Lithium Corp. of Canada Ltd. (x)	403 Avenue Bldg., Winnipeg	Bernic and Cat Lakes
Sherritt Gordon Mines Ltd. (x)	25 King St. W., Toronto, Ontario	Herb Lake

Directory of Firms in the Miscellaneous Non-metal Mining Industries in Canada, 1946 (Continued)

Name of Operator	Head Office Address	Plant Location
Magnesitic Dolomite		
Quebec -		
Canadian Refractories Ltd.	1050 Canada Cement Bldg., Montreal	Kilmar and Harrington
Mineral Waters		
Quebec -		
Cie d'eau Minerale, de St. Hyacinthe	632 Concord Ave., St. Hyacinthe	St. Hyacinthe
Eau Minerale Etoile	Ste. Génévieve de Batiscan	Batiscan
Dore Baird	Desbiens Lac St. Jean	Roberval
Gurd, Charles & Co. Ltd.	1016 Bleury St., Montreal	Varennes
Lemay, Lucien	St. François du Lac	Nicolet Tp.
Levesque, Ernest (x)	Riviére-du-Loup Station	St. Louis de Kamouraska
Gauthier, Charles	Louisville	St. Léon
Minard, Edward	Maskinonge	Maskinonge
Montclair-Richelieu Spring Water Co. Ltd.	Chambly Basin	Chambly
Pellerin, A., and Sons	St. Barnabe N.	St. Maurice
Sources Abenakis Springs Ltd.	366 rue Racine, Granby	St. François du Lac
Source Coulombia	L'Epiphanie	L'Epiphanie
Source d'eau Minerals Radnor	St. Maurice	St. Maurice
Usine d'Embouteillage Maski	St. Justin	St. Justin
Ontario -		
Carlsbad Springs, The	Carlsbad Springs	Gloucester Tp.
Deneault, J. F.	Bourget	Bourget
Gurd, Chas., & Co. Ltd. (x)	1016 Bleury St., Montreal, Quebec	Caledonia Springs
Renaud, Victor	Blackburn	Blackburn
Phosphate		
Quebec -		
Bigelow, Robert	Buckingham	Bowman Tp.
Blackburn Bros. Ltd.	85 Sparks St., Ottawa, Ontario	Perkins
High-Rock Phosphates Ltd.	41 Main St., Buckingham	Portland W. Tp.
Cross, Stanley	28 Warren Ave., Ottawa, Ontario	Hull Tp.
Ontario -		
Ontario Phosphate Industries Ltd. (x)	Room 1101, 62 Richmond St. W., Toronto	Bedford Tp.
Silica Brick		
Nova Scotia-		
Dominion Steel & Coal Corp. Ltd.	Sydney	Sydney
Ontario -		
Algoma Steel Corp. Ltd.	Sault Ste. Marie	Sault Ste. Marie
Sodium Carbonate		
British Columbia -		
Bishop, V. C. (Mrs.)	c/o Boyds Garage, Clinton	Clinton area
Sodium Sulphate		
Saskatchewan -		
Horseshoe Lake Mining Co. Ltd. (x)	Ormiston	Ormiston
Midwest Chemicals Ltd.	Palo	Whiteshore Lake
Natural Sodium Products Ltd.	Bishopric	Frederic Lake, Alsask
Sybouts Sodium Sulphate Co. Ltd.	Gladmar	Gladmar

Directory of Firms in the Miscellaneous Non-metal Mining Industries in Canada, 1946
(Continued)

Name of Operator	Head Office Address	Plant Location
	Sulphur (Pyrites)	
Quebec -		
Noranda Mines Ltd.	Royal Bank Bldg., Toronto, Ontario	Noranda
Waite-Amulet Mines Ltd.	Noranda	Duprat Tp.
Ontario -		
International Nickel Company of Canada Ltd. (*)	Copper Cliff	Copper Cliff
British Columbia -		
Consolidated Mining & Smelting Company of Canada Ltd. (*)	Trail	Trail
Britannia Mining & Smelting Co. Ltd.	Britannia Beach	Britannia Beach

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