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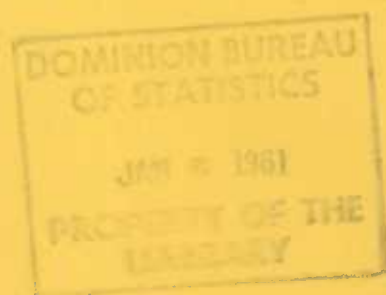
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CANADA

THE MISCELLANEOUS NON-METAL
MINING INDUSTRY

1959



DOMINION BUREAU OF STATISTICS

Industry and Merchandising Division

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THE MISCELLANEOUS NON-METAL
MINING INDUSTRY
1959

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SYMBOLS

The interpretation of the symbols used in the tables throughout this publication is as follows:

- .. figures not available.
- ... figures not appropriate or not applicable.
- nil or zero.

THE MISCELLANEOUS NON-METAL MINING INDUSTRY

1959

Canadian operators which produce certain industrial or non-metallic minerals, and which are usually too few in number to permit the publication separately of complete details of operations, have been classified for statistical purposes to a group which has been designated as the Miscellaneous Non-metal Mining Industry. Minerals or primary mineral products recovered (or deposits developed) by this industry during 1959 included barite, brucite, diatomite, fluorspar, graphite, grindstones, magnesitic dolomite, lithia, mineral waters, potash, phosphate rock, silica brick, sodium carbonate and sodium sulphate. The general statistics also include some data on development work done on pyrite deposits.

During 1959 there were 28 firms which made shipments of materials which are grouped as miscellaneous non-metallics. Gross value of the producer's shipments amounted to \$13,854,287 in 1959

compared with \$11,942,125 in the preceding year. The value of containers was included in these figures. The industry employed an average of 1,409 persons to whom \$5,711,543 were paid as salaries and wages. Fuel cost \$1,126,081 and 71,711,836 kwh. of electricity were purchased for \$732,323. Process supplies cost of \$1,415,408 and the containers used were valued at \$145,132. Freight paid amounted to \$68,130.

The report also includes data for arsenious oxide, titanium dioxide, pyrite, pyrrhotite and sulphur in smelter gases; these are by-products of the metal mining and smelting industries, thus output, employment, etc., are credited to the producing industries. Also, for convenience, the statistics for the mica mining industry and for the iron oxides mining industry are published in this report, although they are not included in the figures for the Miscellaneous Non-metal Mining Industry.

**TABLE 1. Principal Statistics of the Miscellaneous Non-metal Mining Industry,
Significant Years,¹ 1921-59**

Year	Establishments	Employees	Salaries and wages	Cost of fuel and electricity	Cost of process supplies and containers	Gross value of production	Net value of production ²
	number		dollars				
1921 .....	..	..	..	..	..	..	..
1929	38	506	545,216	79,463	..	1,502,574	..
1931	34	275	297,394	205,149	..	1,247,697	..
1933	36	297	241,999	176,512	..	913,380	..
1937	53	530	658,723	321,919	228,953	1,687,317	1,136,445
1939	47	465	539,143	260,652	133,705	1,358,922	964,565
1941	62	683	878,700	482,043	315,521	2,442,748	1,645,184
1944	52	865	1,500,250	706,929	462,999	3,986,579	2,797,719
1946	43	911	1,582,846	822,546	493,642	4,248,107	2,859,009
1949	37	1,160	2,632,808	1,011,021	576,919	6,236,811	4,461,930
1951	39	1,359	3,699,789	1,471,290	1,063,878	8,914,360	6,209,886
1954	47	1,343	4,839,822	1,419,441	1,202,247	10,421,552	7,716,472
1955	73	1,650	5,340,186	1,597,371	1,665,679	10,987,755	7,561,714
1956	60	1,773	6,069,934	2,078,573	1,936,327	15,813,812	11,692,288
1957	50	1,571	5,673,243	1,909,893	1,597,660	14,035,393	10,723,739
1958	40	1,223	4,806,084	1,681,441	1,087,514	11,942,125	9,110,412
1959	38	1,409	5,711,543	1,858,404	1,560,540	13,854,287	10,367,213

¹ During the years under review there have been changes in the methods of compilation. Some commodities have been added to this group and some commodities have been removed to form a separate classification.

² Gross value of production, less the value of fuel, electricity, process supplies, containers and freight.

TABLE 2. Producers' Shipments of Miscellaneous Non-metallic Minerals, 1958 and 1959

Item		1958		1959	
		Quantity	Value	Quantity	Value
Barite	ton	195,719	\$ 2,196,384	238,967	\$ 2,254,582
Diatomite	"	27	540	5	100
Fluorspar .....		...	1,542,589	...	1,850,497
Graphite .....		...	...	...	...
Grindstones .....		...	...	60	9,000
Magnesitic dolomite, brucite .....		...	2,529,161	...	3,050,779
Lithia	lb.	3,853,322	2,047,880	2,756,280	1,422,153
Mineral waters	Imp. gal.	316,727	172,568	369,113	202,969
Potash, K ₂ O .....		...	...	...	1,408,462
Silica brick	M	2,815	472,346	1,926	354,295
Sodium sulphate	ton	173,217	2,862,915	179,535	2,881,861
Totals .....		...	11,824,383	...	13,434,698
Pyrite, pyrrhotite ¹	ton	1,191,731	4,248,668	1,099,564	3,433,095
Sulphur ² in smelter gases	"	241,055	2,361,252	277,030	2,716,416
Sulphur, elemental ³	"	94,377	1,872,832	145,656	2,620,787
Arsenious oxide ¹	"	1,162	94,542	789	63,786
Titanium dioxide, etc. ¹ .....		...	6,583,921	...	8,507,149
Iron oxides	ton	1,632	113,390	1,235	108,286
Mica	"	752	89,651	407	63,004

¹ General statistics relating to pyrite arsenious oxide and titanium dioxide are included with the smelting industry.

² Data for 1957 and 1958 include sulphur in smelter gases in the form of acid or sulphur dioxide. General statistics relating to production of sulphur are included with those of the metal mining and non-ferrous smelting industries.

³ Produced from sour natural gas; includes sulphur recovered in processing nickel-copper matte.

Note: Value of containers is excluded.

TABLE 3. Consumption of Non-metallic Minerals, 1959

	Used during 1959
	tons of 2,000 lbs.
Arsenic trioxide (refined)	173
Barite - Lump	11
Ground - Natural	9,238
Bleached	112
Blanc fixe (precipitated barium sulphate)	461
Bentonite - Swelling (also called sodium or Wyoming bentonite)	44,342
Non-swelling (also called calcium or Southern decolorizing bentonite)	6,757
China clay (Kaolin)	127,520
Diatomite (diatomaceous earth, Kieselguhr, Celite, etc.):	
Ground or powdered - Natural	14,717
Calcined	1,785
Other	499
Feldspar	4,329
Fluorspar - Metallurgical grade (lump)	89,890
Ceramic	553
Acid	5,709
Graphite - For manufacture of foundry facings	7,314
For manufacture graphite shapes, i.e. brushes, pistons, rings, etc.	422
Other - Flake	1,135
Amorphous	500
Mica - Muscovite - Sheet, splittings	156
Wet ground	880
Other ground	679
Nepheline Syenite	30,451
Phosphate rock	800,189
Potash (muriate of potash)	123,520
Silica - Lump (quartz, quartzite, sandstone)	282,036
Sand (including foundry sand but excluding concrete sand)	684,695
Flour or pulverized	37,868
Sodium sulphate - Lump crude	168
Salt cake	151,660
Glauber's salts	732
Sulphur - Elemental	450,168
Liquid sulphur dioxide	73,395
Talc, Soapstone, Pyrophyllite - Ground	39,068
Other	20,492
Whiting or whiting substitute:	
Ground chalk, whiting, calcium carbonate, precipitated chalk	65,596
Whiting substitute, ground limestone and ground marble	140,103

TABLE 4. Employees and their Earnings in the Miscellaneous Non-metal Mining Industry, 1955 -59

	Employees					Man-hours worked (all employees)	Earnings		
	Office and administrative		Workmen		Total		Office and adminis- trative	Workmen	Total
	Male	Female	Male	Female					
	number						dollars		
1955	179	19	1,447	5	1,650	3,205,343	734,172	4,606,014	5,340,186
1956	186	21	1,562	4	1,773	3,769,255	947,470	5,122,464	6,069,934
1957	176	20	1,372	3	1,571	3,180,501	914,396	4,758,847	5,673,243
1958	191	21	1,011	—	1,223	2,580,335	1,052,289	3,753,795	4,806,084
1959	195	20	1,191	3	1,409	2,909,058	1,253,931	4,457,612	5,711,543

TABLE 5. Workmen, by Months, in the Miscellaneous Non-metal Mining Industry, 1958 and 1959

Month	1958				1959				
	Mine		Mill	Total	Mine			Mill	Total
	Surface	Under-ground			Surface		Under-ground		
	Male		Male		Male	Female		Male	
	number				number				
January	354	323	381	1,058	319	2	309	410	1,040
February.....	310	336	404	1,050	338	3	306	414	1,061
March	288	314	404	1,006	336	3	334	423	1,096
April	288	283	393	964	365	3	340	479	1,187
May	331	268	310	909	420	3	366	449	1,238
June	355	250	324	929	481	3	392	468	1,344
July	364	253	374	991	466	3	354	464	1,287
August	326	270	416	1,012	508	3	384	482	1,377
September.....	341	266	417	1,024	479	3	385	463	1,330
October	429	271	427	1,127	447	3	387	469	1,306
November	361	222	393	976	383	3	289	378	1,053
December	411	258	379	1,048	354	2	254	331	941
Average	347	277	387	1,011	411	3	342	438	1,194
Total man-hours worked.....	2,141,295				2,437,253				

TABLE 6. Fuel and Electricity Used in the Miscellaneous Non-metal Mining Industry, 1959

Kind	Quantity	Cost at plant
		\$
Bituminous coal (a) From Canadian mines	short ton	
(b) Imported	—	18,120
Sub-bituminous coal (from Alberta mines only)	—	—
Anthracite coal	short ton	13
Lignite coal	—	175,939
Coke (for fuel only)	—	—
Gasoline (includes gasoline used in cars and trucks)	Imp. gal.	64,564
Kerosene or coal oil	—	5,982
Fuel oil	—	587,978
Wood (cords of 128 cubic feet of piled wood)	cord	214
Gas (a) Liquefied petroleum gases (propane, etc.)	Imp. gal.	1,109
(b) Other manufactured gas	M cu. ft.	28,445
(c) Natural gas	—	243,717
Other fuel	—	—
Electricity purchased for power and lighting	kwh.	732,323
Electricity purchased for other purposes	—	—
Total (cost only) .....	...	1,858,404
Electricity generated (a) For own use	kwh.	...
(b) For sale	—	1,150

ARSENIOUS OXIDE

During 1959 the producers of arsenious oxide (arsenic trioxide) shipped 1,578,307 pounds valued at \$63,786. Included in the output was some arsenic which was recovered from foreign ores. The Canadian and foreign ores are mixed for treatment and separate data are not available.

Production in Ontario was at the smelter of Deloro Smelting and Refining Company Limited which treats the cobalt-silver concentrates from Cobalt and Gowganda and imported cobalt ores.

Compounds of arsenic such as lead arsenate and calcium arsenate are used in insecticides,

rodenticides and other pesticides. Other uses are: as a decolourizer in glass, as preservatives and depilatories in the tanning of hides, in the chemical debarking of trees; in pyrotechnics; and in paint pigments.

The auriferous quartz ores exported to the United States from British Columbia mines contain considerable amounts of arsenic, but no data are available on the possible recovery of this arsenic and since the Canadian gold mines receive no payment for the arsenic content, it is not credited as commercial production.

TABLE 7. Production, Imports and Exports of Arsenic, 1958 and 1959

	1958		1959	
	Quantity	Value	Quantity	Value
	lb.	\$	lb.	\$
Production:				
White arsenic (crude and refined) ¹	2, 323, 320	94, 542	1, 578, 307	63, 786
Imports:				
Arsenic acid	507, 657	16, 011	595, 674	20, 081
Arsenious oxide and arsenic sulphide .....	...	...	...	...
Sodium arsenate and sodium biarsenate	121, 921	31, 406	207, 134	40, 919
Arsenate of lead	130, 400	25, 854	84, 448	18, 430
Arsenate of lime	85, 500	6, 142	87, 526	3, 347
Exports:				
Arsenic	1, 703, 200	67, 731	1, 130, 400	46, 460

¹ Includes some arsenic recovered from foreign ores.

TABLE 8. Production, Imports and Exports of White Arsenic, 1950-59

Year	Production, crude and refined, but no duplication	Imports ¹	Exports	
			Refined	Crude
			pounds	
1950	794, 091	16, 290	361, 400	—
1951	2, 353, 367	35, 231	1, 508, 200	334, 000
1952	1, 708, 351	19, 249	294, 800	—
1953	1, 403, 740	32, 233	934, 000	—
1954	1, 180, 350	—	1, 422, 600	—
1955	1, 571, 787	—	940, 600	—
1956	1, 790, 381	16, 320	1, 168, 100	—
1957	3, 697, 317	1, 559	3, 229, 800	—
1958	2, 323, 320	—	1, 703, 200	—
1959	1, 578, 307	—	1, 130, 400	—

¹ Arsenious oxide and arsenic sulphide.

TABLE 9. Consumption of Refined White Arsenic, 1954-58

Industry	1954	1955	1956	1957	1958
	pounds				
Glass	337,071	356,211	381,547	337,331	269,344
Insecticides ¹	²	²	²	²	²
White metals	59,385	65,899	81,144	73,668	68,120
Miscellaneous chemicals	13,389	11,163	43,135	49,563	60,927
Total accounted for	409,845	433,273	433,992	460,562	398,391

¹ Does not include arsenic acid (As₂O₅) imported for use in making insecticides, as follows: 1954, 1,397,596 pounds; 1955, 847,413 pounds; 1956, 408,840 pounds; 1957, 519,631 pounds; 1958, 507,657 pounds.

² Included with miscellaneous chemicals total.

TABLE 10. World Production of White Arsenic, by Countries, 1954-58
(Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1954	1955	1956	1957	1958
	short tons ²				
North America:					
Canada	590	786	895	1,849	1,125
Mexico	2,675	3,255	2,913	5,075	3,411
United States	13,167	10,780	12,201	10,493	11,508
South America:					
Brazil	1,273	1,077	819	99	110 ³
Peru	105	—	28	22	22 ³
Europe:					
Belgium (exports)	1,979	2,281	3,056	2,280	440 ³
France	812	6,369	6,608	5,622	6,200 ³
Germany:					
West (exports)	239	635	334	216	205
Greece	—	42	45	11	11 ³
Italy	1,243	1,166	1,173	1,087	1,100 ³
Portugal	1,196	1,973	1,109	898	880 ³
Spain	22	—	—	—	—
Sweden	10,762	13,803	13,437	11,130	11,000 ³
Asia:					
Iran ⁴	—	—	—	—	—
Japan	1,584	1,910	1,833	1,521	1,540 ³
Africa:					
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia	459	508	1,084	883	683
Union of South Africa	—	—	—	—	—
Oceania:					
Australia	—	—	—	—	—
New Zealand	—	—	—	—	—
World totals (estimate)^{1,2}	38,000	46,000	47,000	43,000	40,000

¹ Arsenic is also produced in Argentina, Austria and East Germany and estimates are included in the total. There is too little information to estimate production in China, Czechoslovakia, Finland, Hungary, U.S.S.R. and United Kingdom.

² This table incorporates revisions of data published in previous white arsenic chapters.

³ Estimate.

⁴ Year ended March 20, of year following that stated.

BARITE

The producers of barite in Canada shipped 238,967 tons valued at \$2,254,582 in 1959 compared with 195,719 tons worth \$2,196,384 in the preceding year. Nova Scotia produced most of the nation's barite. The open pit operation is located near Walton at the head of the Bay of Fundy. Shipments are made by boat from Walton. In British Columbia barite was quarried at Brisco in the East Kootinay district, then shipped to a grinding plant at Lethbridge Alberta. Shipments were made from the Giant Mascot mine, Spillamacheen and from Sheep Creek mines, to a grinding plant at Onoway, Alberta.

The principal use of barite is in oil-well drilling muds with bentonite and minor conditioning agents. Barite is used also as a pigment and filler in paints, rubber, linoleum, and papers; in the manu-

facture of barium chemicals; as an additive to glass batches; as an aggregate in concrete where additional weight is required (such as coatings for under water pipes), or where shielding is required against radiation such as in X-ray rooms or atomic energy plants.

Barium compounds are used widely in industry. Barium carbonate is used to reduce "dry house" scum on bricks; in pharmaceuticals; as a flux in the enamelling and ceramic trades; and in heat-treatment compounds. The chloride is used as a pigment in lithographic inks; in the purification of salt brine and in water treatment; as a mordant in dyeing textiles; and in many other applications. Other compounds include the hydrate, phosphate, oxide, sulphide, stearate and chlorate.

TABLE 11. Production of Barite, 1950 - 59

Year	Short tons	Value \$	Year	Short tons	Value \$
1950.....	77,177	750,378	1955.....	253,736	2,277,166
1951.....	98,113	1,131,917	1956.....	320,835	3,031,034
1952.....	136,002	1,521,162	1957.....	228,048	2,992,913
1953.....	247,227	2,220,292	1958.....	195,719	2,196,384
1954.....	221,472	2,003,796	1959.....	238,967	2,254,582

TABLE 12. Imports of Barite, 1950 - 59

Year	Tons	Value \$	Year	Tons	Value \$
1950.....	2,089	70,095	1955.....	1,449	46,017
1951.....	1,068	37,471	1956.....	1,475	50,828
1952.....	1,445	44,488	1957.....	1,831	58,009
1953.....	1,207	40,143	1958.....	1,382	56,644
1954.....	1,236	39,264	1959.....	1,662	64,468

TABLE 13. Exports of Barite, 1955 - 59

Year	Tons	Value \$
1955.....	244,070	2,274,526
1956.....	312,275	2,973,234
1957.....	199,785	2,417,297
1958.....	172,942	1,741,640
1959.....	221,721	2,248,199

TABLE 14. Consumption of Barite, 1954 - 58

	1954	1955	1956	1957	1958
	tons				
By uses:					
Paints.....	1,842	963	869	962	805
Rubber goods.....	422	537	492	525	387
Glass.....	237	287	331	301	215
Oil-well drilling, estimate ¹	2,639	...	...	1,147	16,747
Miscellaneous.....	...	...	...	...	...
Asbestos products.....	41	39	64	...	30
Miscellaneous chemicals.....	134	96	93	...	12
Miscellaneous non-metallics.....	558	...	...	...	...
Total accounted for.....	5,873	...	...	...	...

¹ Reported data unreliable, consumption may be as high as 10,000 tons annually.

TABLE 15. World Production of Barite, by Countries,¹ 1954-58
 (Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1954	1955	1956	1957	1958
	short tons ²				
North America:					
Canada	221,472	253,736	320,835	228,048	201,329
Cuba (exports)	—	—	—	37,482	9,407
Mexico (exports)	56,871	117,654	235,792	429,537	211,000 ³
United States	926,036	1,114,117	1,351,913	1,304,542	486,287
Totals	1,204,379	1,485,507	1,908,540	1,999,969	908,023
South America:					
Argentina	25,329	22,481	19,152	18,679	18,700 ³
Brazil	13,402	3,950	16,197	55,349	62,655
Chile	3,546	3,466	476	1,100	1,100 ³
Colombia	9,921	6,614	8,378	6,963	14,330
Peru	12,348	9,410	11,601	95,388	117,802
Totals	64,546	45,921	55,804	177,500³	214,600³
Europe:					
Austria	4,802	4,365	3,413	3,902	4,709
France	52,361	70,507	60,627	71,650	72,000 ³
East Germany ³	27,600	27,600	27,600	27,600	27,600
West Germany	422,589	456,710	453,836	448,144	409,105
Greece	24,249	21,451	26,843	143,549	165,347
Ireland	3,080	6,232	7,729	8,624	11,283
Italy	81,931	114,635	103,075	113,083	102,729
Poland	—	11,574	12,346	12,400	12,400 ³
Portugal	385	357	346	853	770 ³
Spain	11,740	9,833	8,505	20,287	29,586
Sweden	108	137	—	—	—
U.S.S.R. ³	110,000	110,000	110,000	110,000	110,000
United Kingdom ³	81,967	92,906	84,670	87,280	70,825
Yugoslavia	114,640	109,129	71,000 ³	103,969	151,016
Totals^{1,3}	940,000	1,040,000	980,000	1,160,000	1,190,000
Asia:					
India	21,048	8,537	7,072	14,462	15,481
Japan	20,815	20,374	20,578	27,513	16,403
Korea, Republic of	336	933	744	8	—
Philippines, Republic of	—	—	5,045	6,367	5,500 ³
Turkey	—	—	—	2,111	6,035
Totals^{1,3}	53,000	52,000	61,000	84,000	76,000
Africa:					
Algeria	21,341	33,720	32,843	37,724	47,415
Egypt	35	67	88	294	300 ³
French Morocco	10,246	27,170	32,622	16,276	47,060
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia	—	—	—	—	34
Swaziland	362	449	516	351	480
Tunisia	—	—	—	—	—
Union of South Africa	2,342	1,892	2,713	3,369	2,721
Totals	34,326	63,298	68,782	58,014	98,010
Oceania:					
Australia	7,696	7,016	6,750	10,951	8,201
World totals (estimate)^{1,2}	2,300,000	2,700,000	3,100,000	3,500,000	2,500,000

¹ In addition to countries listed, barite is produced in China, Czechoslovakia and North Korea, but production data are not available.

² This table incorporates a number of revisions of data published in previous barite chapters.

³ Estimate.

⁴ Data not available, no estimate included in the total.

⁵ Includes witherite.

CORUNDUM

No corundum has been produced in Canada since October, 1946, when treatment of the old tailings at the Craigmont property, Renfrew county, Ontario, for the recovery of corundum was completed. This operation was undertaken during the war at the request of the United States Government. During the two years of operation about 2,600 tons of concentrate were shipped from the Craigmont property to American abrasive Company, Westfield, Massachusetts, the only handler of corundum on the continent.

The main and only zone from which production has been obtained is in a belt 100 miles long and

6 miles wide, in Haliburton, Hastings and Renfrew counties in Ontario. Several of the numerous deposits examined in 1951 contain fair amounts of corundum, the most promising being an extensive deposit in Monteagle township on the east side of the York River, about 10 miles northeast of Bancroft. (For a description of corundum-bearing nepheline syenite belts of south and eastern Ontario, see report No. 820 "The Corundum Mineral Industry in 1945", page 53, issued by the Bureau of Mines, Ottawa.) It is doubtful, however, if the production of corundum alone would be economic and consequently marketable by-products would be necessary.

TABLE 16. World Production of Corundum, by Countries,¹ 1954-58
(Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1954	1955	1956	1957	1958
	short tons ²				
Argentina	26	—	—	—	—
Australia	—	10	—	—	—
India	527	149	395	477	370
Malaya, Federation of	—	2 ³	100 ³	..	..
Mozambique	1	9	—	—	—
Rhodesia and Nyasaland, Federation of:					
Nyasaland	17	20	—	—	—
Southern Rhodesia	2,840	1,168	4,448	4,506	4,594
South West Africa	—	—	—	—	—
Union of South Africa	1,443	834	2,068	1,539	2,164
World totals (estimate)³	10,000	8,000	11,000	10,000	11,000

¹ In addition to countries listed, corundum is produced in U.S.S.R., but data on production are not available and estimate is included in the total.

² This table incorporates a number of revisions of data published in previous annual reviews of corundum.

³ Exports.

DIATOMITE

In 1959 the producers shipped 5 tons of diatomite which was valued at \$100. In the preceding year the production was 27 tons valued at \$540. All the diatomite recovered in the past three years came from deposits in British Columbia. The calcining plant in Nova Scotia was dismantled.

Diatomite, also known as diatomaceous earth and keiselguhr, consists of microscopically small, opaline silica, skeletal remains of organisms known as diatoms. The purest varieties of diatomite are chalklike in appearance, free from grit, porous, and friable and an apparent specific gravity under one when dry.

It is the physical properties of porosity and chemical inertness that account for most of the uses of diatomite. The principal uses are as a filtering medium filler, and as an insulator against heat, cold and sound. Diatomite is important in many industries, such as sugar refining, liquor distilling, dry cleaning and water purification. For filtration the important considerations are size and shape of principal diatoms present, purity, and density of the consolidated material.

Diatomite is used as a filler in rubber, paper, asphalt products, plastics, explosives, insecticides, paints, and many other products. It is used as a concrete admixture and as the mild abrasive in metal polishes and dentrifices. Important properties of diatomite to be considered for such uses include:

color, freedom from grit, low density, inertness, and particle size. Diatomite imparts bulk with little increase in weight, along with certain desirable physical properties to the end products.

It is being used successfully as insulation in a wide variety of applications, some of these being: boilers, kilns, furnaces, retorts, anens, fire-resistant safes, chill rooms, ice cellars, cold storage, and building walls. The important properties when used as insulation are porosity and structure and freedom from solid impurities.

Acceptance of diatomite by consumers depends mainly upon the physical properties of the mineral in relation to its intended use. Microscopic examination can determine, in a general way, to what uses any particular material may be put.

The major Canadian use is in the manufacture of fertilizer, where it is used to coat pellets to prevent caking and sticking. The diatomite should be uncalcined, 95 per cent minus 325-mesh, with less than 5 per cent moisture content. The next major use is in filtration in sugar and brewing industries.

TABLE 17. Production of Diatomite, 1950-59

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1950	49	1,665	1955	16	352
1951	92	3,148	1956	2	40
1952	28	1,074	1957	120	2,400
1953	103	12,150	1958	27	540
1954	4	192	1959	5	100

TABLE 18. Consumption of Infusorial Earth in the Sugar Refining Industry, 1950-58

Year	Tons	Value	Year	Tons	Value
		\$			\$
1950	2,989	205,856	1955	2,094	158,960
1951	2,322	169,743	1956	2,196	165,026
1952	2,020	132,796	1957	2,260	174,677
1953	1,944	128,658	1958	1,965	164,382
1954	1,871	126,414			

TABLE 19. Consumption of Diatomaceous Earth in the Manufacture of Fertilizers, 1953-58

Year	Tons	Value
		\$
1953	8,643	427,881
1954	9,384	448,533
1955	9,166	429,149
1956	8,648	427,684
1957	6,068	314,425
1958	11,313	623,650

TABLE 20. Imports of Diatomaceous Earth, 1950 - 59

Year	Tons	Value	Year	Tons	Value
		\$			\$
1950	18,247	599,216	1955	22,158	788,503
1951	21,069	709,433	1956	21,078	888,090
1952	15,888	563,950	1957	25,288	1,077,657
1953	19,350	670,610	1958	27,258	1,184,427
1954	19,373	664,016	1959	27,260	1,157,976

TABLE 21. World Production of Diatomite, by Countries,¹ 1954 - 58
 (Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1954	1955	1956	1957	1958
	short tons ²				
North America:					
Canada	4	16	2	120	6
Costa Rica	595	3,000	6,737	1,800 ³	1,800 ³
Guatemala	12,900 ³	16,500 ³	16,600 ³	20,600	21,190
United States	368,426 ⁴	368,426 ⁴	368,426 ⁴	368,426 ⁴	368,426 ⁴
South America:					
Argentina	2,868	6,988	2,682	4,084	3,900 ³
Chile	31	550	—	—	—
Peru	2	1	34	39	—
Europe:					
Austria	3,532	4,445	5,490	3,823	4,086
Denmark:					
Diatomite	30,337	39,103	31,331	22,238 ⁵	22,238 ⁵
Moler ⁶	42,990	39,442	40,080	41,074	40,800 ³
Finland	1,367	2,059	2,535	1,874	2,315
France ⁷	68,092	70,025	69,546	86,240	86,000 ³
Germany, West ⁷	53,666	62,575	72,890	76,561	112,700 ³
Italy	11,160	10,635	9,651	29,707	29,800 ³
Portugal ⁷	2,011	2,499	1,985	1,613	1,650 ³
Spain ⁷	10,002	15,927	13,048	12,315	13,000 ³
Sweden	1,013	1,625	1,243	1,317	1,300 ³
United Kingdom, Great Britain	10,778	24,656	19,361	18,706	18,700 ³
Northern Ireland	4,675	7,293	6,577	6,842	6,600 ³
Yugoslavia	4,439	4,490	4,400 ³	4,400 ³	4,400 ³
Asia:					
Korea, Republic of	1,377	3,393	3,912	1,472	518
Africa:					
Algeria	38,581	30,384	26,360	10,360	29,762
Egypt	173	545	320	678	660 ³
Kenya	3,649	3,304	5,418	4,737	3,777
Union of South Africa	1,047	850	635	606	359
Oceania:					
Australia	6,091	5,647	6,484	6,968	4,400 ³
New Zealand	188	623	152	3,537	3,500 ³
World totals (estimate) ^{1,2}	725,000	765,000	760,000	770,000	825,000

¹ Diatomaceous earth is believed to be produced also in Brazil, Hungary, Japan, Mozambique, Rumania and U.S.S.R., but complete data are not available: estimates included in total.

² This table incorporates a number of revisions of data published in previous diatomite chapters. Data do not add to totals shown due to rounding where estimated figures are included in the detail.

³ Estimate.

⁴ Average annual production 1954-56.

⁵ Average annual production 1947-55.

⁶ A clay-contaminated diatomite used principally for light weight building brick.

⁷ Includes tripoli.

FLUORSPAR

Producers' shipments of fluorspar were valued at \$1,350,497 in 1959 compared with \$1,542,589 in the preceding year. St. Lawrence Corporation of Newfoundland Ltd. resumed operations after a lengthy shut-down at St. Lawrence, Newfoundland. Newfoundland Fluorspar Ltd. operated a mine at St. Lawrence and Huntingdon Fluorspar Mines Ltd. shipped from their property at Madoc, Ontario.

In Canada fluorspar is consumed chiefly by the aluminum industry. The fluorspar is used to make hydrofluoric acid, which in turn is used to make a flux (artificial cryolite). The flux, together with a small amount of fluorspar, dissolves alumina, and from this solution aluminum is recovered electrolytically. Fluorspar finds its other major use as a flux in the steel industry. In smaller but increasing amounts, fluorspar is used in the heavy-chemical, glass, enamelling, glazing, white-metal alloy and metal-refining industries.

In the United States the largest consumer is the steel industry, which is followed by the hydrofluoric acid manufacturers. Hydrofluoric acid is used

in large amounts by the aluminum, fluorine, chemical and uranium industries. It is worth noting that despite the steel-production increase of recent years, the rate of fluorspar consumption is growing faster in the manufacture of hydrofluoric acid than in the use of fluorspar as a flux in steel plants.

Standard fluxing gravel or lump grade for metallurgical purposes is usually sold on a specification of a minimum of 85 per cent CaF_2 and a maximum of 5 per cent SiO_2 (silica) and 0.3 per cent sulphur. Fines should not exceed 15 per cent.

Ceramic or glass and enamel grades call for not less than 94 per cent CaF_2 with a maximum 3.5 per cent CaCO_3 (calcium carbonate), 3 per cent SiO_2 and 0.1 per cent Fe_2O_3 (ferric oxide). The material must be in mesh sizes ranging from coarse to extra fine.

Acid grade has the most rigid specifications. It must be over 97 per cent CaF_2 and not over 1 per cent SiO_2 . Like ceramic grade, it is used in powdered form.

TABLE 22. Production of Fluorspar, 1950 - 59

Year	Short tons	Selling value f.o.b. works	Year	Short tons	Selling value f.o.b. works
		\$			\$
1950	64,213	1,553,004	1955	128,114	2,708,437
1951	74,211	2,189,875	1956	140,071	3,407,582
1952	82,187	2,523,408	1957 .....	...	1,756,841
1953	88,569	2,670,585	1958 .....	...	1,542,589
1954	118,969	2,987,026	1959 .....	...	1,850,497

TABLE 23. Imports of Fluorspar, 1950 - 59

Year	Tons	Value	Year	Tons	Value
		\$			\$
1950	1,572	66,823	1955	21,774	518,002
1951	8,188	239,120	1956	28,148	690,779
1952	22,714	684,968	1957	14,547	377,706
1953	20,161	546,915	1958	30,408	763,438
1954	16,240	382,935	1959	26,588	718,774

TABLE 24. Consumption of Fluorspar, 1954 - 58

	1954	1955	1956	1957	1958
By uses:			tons		
Steel	16,002	18,610	18,979	16,935	14,539
Glass	757	592	669	628	455
Enamelling and glazing	85	97	—	—	...
Heavy chemicals	63,751	68,592	76,452	53,198	74,939
White metal alloys	15	36	26	—	...
Total accounted for	80,610	87,927	96,126	70,761	89,933
By provinces:					
Nova Scotia	7,765	7,808	6,268	6,734	5,430
Quebec	61,338	65,888	74,086	52,074	73,737
Ontario	11,082	13,721	15,241	11,455	10,462
Manitoba	255	317	295	181	172
Alberta	103	123	191	292	108
British Columbia	67	70	45	25	24
Total accounted for	80,610	87,927	96,126	70,761	89,933

TABLE 25. World Production of Fluorspar, by Countries,¹ 1954 - 58
(Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1954	1955	1956	1957	1958
North America:			short tons ²		
Canada	118,969	128,114	140,071	66,245	62,000 ³
Mexico (exports)	146,198	200,220	360,117	389,807	244,982 ⁴
United States (shipments)	245,628	279,540	329,719	328,872	319,513
Totals	510,795	607,874	829,907	784,924	626,495³
South America:					
Argentina	14,308	16,031	12,983	8,544	8,800 ³
Bolivia (exports)	213	569	300	—	—
Brazil	487 ⁵	—	—	—	—
Totals	15,008	16,600	13,283	8,544	8,800³
Europe:					
France	81,788	94,863	93,412	103,066	99,000 ³
Germany, East ³	90,000	90,000	90,000	68,000	72,000
West	190,916	170,816	160,937	148,812	129,966
Italy	85,041	110,694	136,675	158,915	154,297
Norway	488	317	198	331	—
Spain	81,032	73,653	81,281	97,439	113,500 ³
Sweden (sales)	4,140	1,459	976	2,966	3,188
United Kingdom	92,607	96,235	102,536	104,467	86,695
Totals³	630,000	645,000	670,000	690,000	665,000
Asia:					
China ⁶	6	100,000	145,000	165,000	165,000 ⁷
Japan	6,771	5,738	8,911	8,542	5,826
Korea, Republic of	9,360	11,105	3,431	5,644	1,786
Turkey	—	23	—	—	88
U.S.S.R. ⁴	110,000	110,000	165,000	165,000	180,000
Total^{1,3}	170,000	240,000	335,000	400,000	410,000
Africa:					
Morocco Southern Zone	1,188	44	137	—	—
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia	120	480	942	97	6
South West Africa	3,063	675	—	24	4
Tunisia	—	—	—	—	—
Union of South Africa	21,996	32,839	35,065	35,106	48,251
Totals	26,367	34,038	36,144	35,227	48,261
Oceania: Australia	21	316	834	784	31
World totals (estimate)^{1,3}	1,350,000	1,545,000	1,860,000	1,920,000	1,760,000

¹ In addition to countries listed, fluorspar is produced in China and North Korea. Estimates are included in the total.

² This table incorporates a number of revisions of data in previous fluorspar chapters.

³ Estimate.

⁴ United States imports.

⁵ Exports.

⁶ Data not available; estimates included in total.

⁷ Data represents 1957 production, however, 1958 production was probably much greater.

⁸ U.S.S.R. in Europe included in U.S.S.R. in Asia as deposits are predominantly in Asiatic Russia.

GARNET

No production of garnet was reported in 1959 in Canada. There was intermittent production during 1940-1950 from a deposit near River Valley in Dana township, Ontario. The ore was crushed and concentrated at the firm's mill located at Sturgeon Falls.

The garnet group of minerals are aluminum silicates containing variable amounts of iron, magnesium, manganese calcium and chromium. They

are common constituents of many rocks, particularly metamorphic types, and some beach sands.

Garnet is used for making abrasive-coated papers and cloth, which in turn are used mainly in the wood-working and shoe-leather industries. Garnet flour of superfine grade is used as a partial substitute for corundum flour for polishing optical lenses.

GRAPHITE

During 1959 there was no production of natural graphite. There has been no production since the Black Donald Mine in Renfrew county, Ontario closed in 1954. In recent years there was some development work done on properties in eastern Ontario and in Quebec.

Graphite has many uses, but is employed principally in foundry facings, lubricants, crucibles, retorts and stoppers, packings, pencils and crayons, paints and stove polish. Important quantities, mostly amorphous or artificial, are used in dry batteries, electrodes and commutator brushes. Flake from the Black Donald deposit is too small for crucible use

and finished products consist mainly of amorphous foundry grades, but include high-grade fine flake and dust sold for use in lubricants, packings and polishes. Prepared facings for the domestic foundry trade also are made.

In Canada, graphite is used chiefly in the foundry, dry battery, packings, lubricants and paint trades. Foundry needs are met in part by domestic production, and in part by plumbago from Ceylon. The battery trade uses mainly Mexican amorphous, and paint requirements are filled largely by low-grade amorphous flake. American imports of Canadian graphite are used chiefly in foundry facings, lubricants and pencils.

TABLE 26. Producers' Shipments of Graphite, 1946-59

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1946	1,975	180,405	1951	1,569	231,167
1947	2,398	207,364	1952	2,040	255,732
1948	2,539	239,931	1953	3,466	366,528
1949	2,147	212,496	1954	2,463	254,534
1950	3,586	390,815	1955-59	—	—

TABLE 27. Imports and Exports of Graphite,¹ 1957-59

	1957	1958	1959
	dollars		
Imports:			
Plumbago, not ground	74,089	53,219	64,014
Crucibles, plumbago, and covers	237,333	166,056	224,204
Plumbago, ground, and manufactures of	748,732	909,226	976,250
Exports:			
Graphite, crude and refined	160	—	—
Carbon and graphite electrodes	3,666,570	3,409,139	340,357

¹ Includes artificial graphite.

TABLE 28. Available Data on the Consumption of Graphite, 1954 - 58

	1954	1955	1956	1957	1958
	pounds				
By industries:					
Polishes and dressings	22,164	22,536	19,810	11,588	100
Paints	104,703	109,994	173,520	117,926	96,332
Brass and copper products	48,096	39,846	45,385	69,632	67,370
Electrical apparatus	711,235	1,369,345	616,828	583,488	404,213
Heavy chemicals	496,753	687,303	754,042	637,888	1,211,095
Boilers and platework	7,021	8,185	16,780	12,064	13,707
Steel ingots and castings	1,074,000	1,616,000	2,216,000	2,516,000	1,742,000
Farm implements	2,700	10,739	—	...	...
Railway rolling stock	419,598	77,800	256,041	39,292	47,575
Machinery	118,212	178,246	77,095	166,774	185,404
Iron castings	506,081	803,313	1,014,378	2,200,805	660,948
Cooking and heating equipment	38,036	29,353	7,229	7,738	7,638
Ferro-alloys	6,100,000	...	...	...	...
Asbestos products	14,439	28,714	34,678	...	28,968
Explosives	42,188	2,822	3,165	...	...
Miscellaneous non-metallics	192,952	419,951	487,382	388,140	561
Miscellaneous iron and steel	168,827	53,103	178,630	192,906	258,104
Miscellaneous non-ferrous	538	725	...	...	...
Petroleum refining	77,090	62,800	...	...	...
Machine tools	6,900	5,500	5,000	4,500	4,500
Clay products .....	...	200,000	250,000	...	...
Miscellaneous chemicals .....	...	...	784	...	...
Total for above industries	10,151,533	5,726,275	6,156,747	6,948,741	4,728,515
By provinces:					
Newfoundland	5,372	3,628	4,560	16,649	45,196
Nova Scotia					
New Brunswick	5,151	996	1,893	1,189	655
Quebec	1,166,692	1,226,110	1,177,615	1,312,534	1,130,153
Ontario	8,704,037	3,563,490	4,567,547	5,324,995	2,619,717
Manitoba	118,835	216,659	150,293	82,820	157,314
Saskatchewan	400	2,195	2,080	1,300	1,000
Alberta	17,650	565,516	161,391	142,520	181,756
British Columbia	133,396	147,681	91,368	66,734	592,724
Total accounted for	10,151,533	5,726,275	6,156,747	6,948,741	4,728,515

TABLE 29. World Production of Natural Graphite, by Countries, 1955-59

(Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1955	1956	1957	1958	1959
	short tons ²				
North America:					
Canada	—	—	—	—	—
Mexico	32,342	32,655	25,938	21,564	30,684
United States	—	—	—	—	—
South America:					
Argentina	96	572	451	525	550 ⁴
Brazil	855	579	890	1,323	1,300 ⁴
Europe:					
Austria	19,637	20,597	20,857	23,318	68,440
Germany, West	11,556	12,878	12,554	12,021	12,000 ⁴
Italy	2,595	3,191	3,649	4,420	3,412
Norway	5,970	5,562	6,266	4,905	5,401
Spain	349	331	304	557	550 ⁴
Sweden	309	441	822	593	700 ⁴
U.S.S.R.	—	—	50,000 ⁴	50,000 ⁴	50,000 ⁴
Yugoslavia	1,033	—	1,102	992	1,102
Asia:					
Ceylon (exports)	11,064	10,261	9,223	6,342	8,817
China	—	—	—	35,000 ⁴	45,000 ⁴
Hong Kong	1,722	2,734	3,703	3,680	3,676
India	1,807	—	—	—	—
Japan	3,441	3,757	5,272	3,817	4,000 ⁴
Korea, North	4,288	20,635	34,969	45,000 ⁴	55,000 ⁴
Republic of	99,228	67,367	162,703	103,806	91,045
Taiwan (Formosa)	—	2,285	2,756	915	1,100 ⁵
Africa:					
Kenya	241	619	1,056	739	635
Madagascar	17,443	17,451	16,989	11,861	11,023
Morocco:					
Northern Zone	129	137	—	—	132
Southern Zone	—	—	—	—	—
Mozambique	—	—	—	—	—
South West Africa	1,011	—	—	—	—
Tanganyika	—	26	—	—	—
Union of South Africa	1,829	1,862	1,750	875	617
Oceania:					
Australia	24	11	—	—	—
World totals (estimate)^{1,2}	290,000	285,000	410,000	350,000	410,000

¹ In addition to countries listed, graphite has been produced in China, North Korea but production data are not available; estimates included in total.² This table incorporates a number of revisions of data published in previous graphite chapters.³ Production included in total; Bureau of Mines not at liberty to publish separately.⁴ Estimate.⁵ Data not available; estimates included in total.**GRINDSTONES, PULPSTONES AND SCYTHESTONES**

Sandstone beds in Nova Scotia, New Brunswick and British Columbia contain material suitable for grindstones. The output is only from the New Brunswick coast where the stones are removed along the

shore area of the Bay of Chaleur. There were 60 tons of grindstones valued at \$9,000 in 1959. Prior to 1959 there had been no shipments of grindstones since 1955.

TABLE 30. Production of Grindstones, Pulpstones and Scythestones, 1949-59

Year	Tons	Value	Year	Tons	Value
		\$			\$
1949	195	12,450	1954	—	—
1950	100	10,000	1955	10	1,500
1951	60	6,000	1956	—	—
1952	42	5,720	1957 and 1958	—	—
1953	15	900	1959	60	9,000

TABLE 31. Purchases of Pulpstones by the Canadian Pulp and Paper Industry, 1950-58

Year	Number for 2 ft. wood	Value	Number for 2.5 ft. wood	Value	Number for 4 ft. wood	Value
		\$		\$		\$
1950	136	101,029	12	8,773	124	378,050
1951	107	111,295	25	34,251	155	511,676
1952	82	104,718	11	21,057	179	605,840
1953	100	107,291	16	33,503	160	588,329
1954	78	120,549	18	41,158	201	703,596
1955	83	130,247	15	35,464	168	665,581
1956	109	152,475	15	37,517	200	841,206
1957	67	157,892	9	23,330	150	660,991
1958	37	83,991	9	23,168	108	477,795

IRON OXIDES

Iron oxide pigments are used also as colouring agents and fillers in the manufacture of imitation leather, shade cloth, shingle stain, paper and cardboard. Siennas and umbers are used in wood stains and wood fillers. The natural ochre is used as a pigment for linoleum and oilcloth; as a pigment in wood stains and wood fillers; and in colouring cement, stuccos and mortar.

A portion of iron oxide mined in Quebec was used for the purification of illuminating gas.

Canadian producers of ochreous iron oxides shipped 1,235 tons valued at \$108,286 in 1959 compared with 1,632 tons worth \$113,390 in 1958. In 1958 the major portion of the shipments was a higher grade milled calcined material.

The ochreous iron oxide used in the manufacture of paints is largely in the calcined form. However, a small quantity of natural iron oxides associated with clay-like materials in the form of umbers and siennas is also used as pigments in paints, both in the raw and calcinated state.

TABLE 32. Principal Statistics of the Natural Iron Oxides Industry, Significant Years, 1921-59

Year	Estab- lish- ments	Em- ployees	Salaries and wages	Cost of fuel and electricity	Cost of process supplies and containers	Gross value of products	Net value of production ¹
		number			dollars		
1921	4	32	42,693	10,858	..	93,610	..
1929	4	48	47,324	13,564	..	115,932	..
1931	4	30	29,194	8,560	..	49,205	..
1933	4	22	15,631	5,755	..	53,450	..
1937	6	50	35,368	13,368	510	83,640	69,762
1939	7	38	26,916	8,094	100	88,418	80,224
1941	4	44	42,152	15,697	5,697	142,069	120,675
1944	6	55	49,876	19,115	6,700	150,250	112,765
1946	5	60	77,727	16,656	4,200	152,268	116,251
1949	8	44	73,111	20,692	4,424	207,887	167,481
1951	5	43	87,283	22,896	3,651	262,277	219,852
1954	3	31	67,564	21,822	3,904	186,856	150,871
1955	4	33	71,781	21,931	3,931	165,928	121,772
1956	3	29	49,669	6,055	545	191,145	152,400
1957	3	26	64,011	22,402	450	192,388	141,288
1958	3	17	31,916	14,718	275	116,343	98,397
1959	1	16	45,275	18,400	3,527	111,388	89,461

¹ Gross value of production, less the value of fuel, electricity, process supplies, containers and freight.

TABLE 33. Production of Natural Iron Oxides, 1950-59

Year	Quantity	Value	Year	Quantity	Value
	short tons	\$		short tons	\$
1950	13,696	262,632	1955	7,702	162,512
1951	13,342	262,277	1956	8,803	186,225
1952	11,487	194,922	1957	7,518	187,211
1953	10,308	195,801	1958	1,632	113,390
1954	5,798	183,507	1959	1,235	108,286

TABLE 34. Imports and Exports of Ochres and Colours, 1958 and 1959

	1958		1959	
	Quantity	Value	Quantity	Value
	tons	\$	tons	\$
Imports:				
Ochres, ochrey earths, siennas and umbers	680	57,544	833	78,981
Oxides, fireproofs, rough stuff, fillers and colours, dry, n.o.p.	4,923	3,375,490	6,103	4,283,306
Exports:				
Iron oxides	2,401	371,287	2,624	400,700

TABLE 35. Consumption of Iron Oxides in Specified Canadian Industries, 1954-58

Year	Coke and gas		Paints and varnishes			
			Iron oxide pigments		Ochres, siennas and umbers	
	Quantity	Value	Quantity	Value	Quantity	Value
	tons ¹	\$	tons	\$	tons	\$
1954	9,167	100,240	2,190	389,588	212	52,691
1955	6,835	70,675	2,298	407,762	221	55,745
1956	8,745	89,107	2,166	430,797	220	52,053
1957	5,999	64,854	1,895	427,289	263	88,103
1958	237	2,446	1,826	471,356	158	46,511

¹ Oxide and purifying materials.

TABLE 36. Employees and their Earnings in the Natural Iron Oxides Industry, 1955-59

	Employees					Man-hours worked (all employees)	Earnings		
	Office and administrative		Workmen		Total		Office and adminis- trative	Workmen	Total
	Male	Female	Male	Female					
	number									dollars
1955	1	1	31	—	33	55,934	7,473	64,308	71,781
1956	1	1	27	—	29	44,056	7,473	42,196	49,669
1957	1	1	16	—	18	56,185	8,460	55,551	64,011
1958	2	1	13	1	17	23,744	8,740	23,176	31,916
1959	2	—	14	—	16	37,807	8,740	36,535	45,275

LITHIA

During 1959 the producers of lithia shipped 2,756,280 pounds valued at \$1,422,153 compared with 3,853,322 pounds worth \$2,047,880 in 1958. These figures on quantities are the lithia or lithium oxide content of spodumene concentrates exported for processing.

Lithium compounds find their most important applications in the ceramic industry and in the manufacture of lubricating greases. Practically all lithium concentrates are converted chemically to lithium carbonate or hydroxide, the usual basic compounds used in industry. For chemical processing, the only specification available is for the spodumene that Quebec Lithium Corporation is exporting. Four and a half per cent lithia is required as a minimum in the concentrate. However, practically all producers of lithium compounds either own or have a share in mining properties from which they obtain concentrates; standard specifications have, therefore, not been established and grades are a matter of individual negotiation.

Lithium greases, first evolved in 1943, came to play an important role in lubrication wherever operational extremes of temperature were experienced, as they maintain their lubricating qualities between -60°F and +320°F and, moreover, have excellent water-insolubility characteristics. In wartime, lithium greases were invaluable for aircraft engines. Since the war their industrial use has grown rapidly, as their unique properties make possible the production of multi-purpose greases, simplifying both manufacture and application.

In ceramics, lithia serves primarily as a flux, permitting the development of low-temperature ceramic bodies with the attendant benefits of refractoriness, fuel economies and wider colour use. It also makes possible the production of glass transparent to ultraviolet light for use in germicidal lamps. Lithium compounds reduce the maturing

temperature and increase the fluidity and gloss of glass, glazes and enamels, facilitate production of certain glasses of high electrical resistance and have many other desirable effects that render them of great benefit in the field of ceramics.

Lithium as a metal has so far had limited application. Its principal use appears to be as a scavenger of impurities in refining non-ferrous metals and as a grain-refining agent. Only very small amounts are added for these purposes. Lithium alloys of magnesium, aluminum, copper, lead and zinc are under development and have promise. The Aluminum Company of America announced during the year the development of a lithium-aluminum alloy which will maintain high strength up to 400°F.

The use of lithium in nuclear-energy production and as a source of fuel for rockets and guided missiles has received much publicity, and speculation as to its exact function has been widespread. Little information is available in either case, but from scientific publications it has become generally known that tritium, a reported constituent of the hydrogen bomb, is obtained by bombarding the lithium-6 isotope with neutrons. The association of lithium with solid fuels is in the form of lithium hydride. The chemical compound furnishes a readily available source of hydrogen, which is a high-energy fuel.

Other common applications include the use of lithium hydroxide as a constituent of the electrolyte in alkaline storage batteries; of lithium chloride and bromide in air-conditioning units, and in refrigeration systems; of lithium fluoride as a flux in the welding and brazing of aluminum; and of compounds in the production of single-crystal optical units, in the control of reactions leading to the formation of alkyd resins for use in paints and in the manufacture of dry-cell batteries which will function at extremely low temperatures where normal cells are inoperative.

TABLE 39. Producers' Shipments of Lithia, 1954 - 59

Year	Pounds	Value	Year	Pounds	Value
		\$			\$
1954	17,052	6,300	1957	5,140,257	2,827,143
1955	114,376	61,752	1958	3,853,322	2,047,880
1956	4,789,380	2,643,950	1959	2,756,280	1,422,153

MAGNESITE AND BRUCITE

Magnesitic dolomite is mined at Kilmar, Argen-teuil county, Quebec, by Canadian Refractories Limited, and is processed there into basic refractory products. These include dead burned grain material, bricks and shapes (burned and unburned), and finely-ground refractory cements.

Brucitic limestone, a rock composed of granules of the mineral brucite (magnesium hydroxide) thickly distributed throughout a matrix of calcite, is quarried from large deposits near Wakefield, Quebec,

by Aluminum Company of Canada, Limited, and is processed there for the recovery of magnesia and lime. The magnesia was used in part by the company for making magnesium metal at Arvida, Quebec, but the major part of the output is sold for the manufacture of basic refractories and for use as soil conditioner. Hydrated lime, the co-product, is produced in the process of recovering the magnesia and is sold for the various purposes for which lime is used.

TABLE 40. Production of Magnesitic Dolomite, 1950-59

Year	Value	Year	Value
	\$		\$
1950	1,717,879	1955	2,151,820
1951	2,148,940	1956	2,783,181
1952	2,161,472	1957	3,046,298
1953	2,016,640	1958	2,529,161
1954	1,909,163	1959	3,050,779

Note: Above figures include the value of brucite shipped, dead burned magnesitic dolomite and serpentine used or sold.

TABLE 41. Magnesite and Dolomite Used in the Canadian Primary Iron and Steel, 1954-58

Year	Calcined domolite		Dolomite, crude		Magnesite	
	Short tons	Value	Short tons	Value	Short tons	Value
		\$		\$		\$
1954	48,266	1,165,247	355,505	673,437	9,940	546,026
1955	86,420	2,118,600	388,535	711,310	10,353	619,131
1956	95,703	2,407,384	422,888	803,730	10,784	676,943
1957	99,402	2,560,630	399,156	796,434	9,062	607,987
1958	75,192	1,980,254	301,960	785,226	6,186	414,789

TABLE 42. World Production of Magnesite, by Countries,¹ 1954-58

(Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1954	1955	1956	1957	1958
	short tons ²				
North America:					
United States	284,015	486,088	686,569	678,489	492,982
Totals ^{1,3}	760,000	720,000	990,000	970,000	740,000
South America:					
Brazil ³	11,000	11,000	11,000	11,000	3,000
Totals ^{1,3}	11,000	11,000	11,000	11,000	3,000
Europe:					
Austria	925,007	1,093,173	1,194,502	1,292,567	1,346,133
Bulgaria	92,704	124,561	155,536	154,300 ³	165,350 ³
Czechoslovakia	4	4	4	4	4
Greece	114,410	66,980	68,350	52,392	77,162
Italy	3,348	4,527	5,448	8,512	6,500
Norway	915	874	1,124	880 ³	880 ³
Poland	35,825	21,639	18,673	18,850	18,750 ³
Spain	32,399	29,973	26,891	40,445	62,828
Yugoslavia	153,572	129,114	214,260	233,983	246,032
Totals ^{1,3}	3,200,000	3,300,000	3,600,000	3,700,000	3,800,000
Asia:					
India	78,968	64,470	102,717	99,552	110,880
Turkey	1,174	—	937	1,439	717
Totals ^{1,3}	420,000	530,000	730,000	780,000	1,240,000
Africa:					
Kenya	—	—	—	117	551
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia	7,792	11,610	8,611	2,910	—
Tanganyika (exports)	87	367	272	284	337
Union of South Africa	26,874	19,753	33,485	35,414	80,200
Totals	34,753	31,730	42,368	38,725	81,088
Oceania:					
Australia	48,331	64,595	72,447	93,490	75,706
New Zealand	807	434	818	675	660 ³
Totals	49,138	65,029	73,265	94,165	76,366
World totals (estimate) ^{1,2}	4,500,000	4,700,000	5,450,000	5,600,000	5,900,000

¹ Unless otherwise stated, quantities in this table represent crude magnesite mined. In addition to countries listed, magnesite is also produced in Canada, China, Mexico, North Korea and U.S.S.R., but data on tonnage output are not available; estimates.

² This table incorporates a number of revisions of data published in previous Magnesium Compounds chapters.

³ Estimate.

⁴ Data not available; estimates included in total.

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 salts 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 43. Production of Natural Magnesium Sulphate,¹ 1941-59

Year	Tons	Value
		\$
1941	265	7,343
1942	1,140	38,760
1943-59	—	—

¹ Produced entirely in British Columbia.

TABLE 44. Imports of Magnesium Sulphate, 1950-59

Year	Tons	Value	Year	Tons	Value
		\$			\$
1950	2,793	100,644	1955	2,376	69,009
1951	3,065	95,005	1956	2,614	69,517
1952	2,186	76,419	1957	2,558	71,295
1953	2,761	80,885	1958	2,453	71,209
1954	2,365	70,374	1959	2,721	70,697

TABLE 45. Available Data on Consumption of Magnesium Sulphate, 1954-58

Industry	1954	1955	1956	1957	1958
	tons				
Leather tanneries	515	534	533	474	464
Medicinals	488	505	568	630	658
Fertilizers	21	30	43	49	100
Textiles	9	1	7	2	—
Total accounted for	1,033	1,070	1,194	1,155	1,222

MICA

Amber mica or phlogopite is mined in Quebec and Ontario. The major portion of the output is derived from Quebec mines. Muscovite production

is from Ontario mines. The mica obtained from the schist rock in British Columbia is included for statistical purposes in the muscovite class.

TABLE 46. Principal Statistics of the Mica Mining Industry, Significant Years, 1921-59

	Estab- lish- ments	Em- ployees	Salaries and wages	Cost of fuel and electricity	Cost of process supplies and containers	Gross value of production	Net value added ¹
	number			dollars			
1921	20	104	74,432	4,404	..	70,063	..
1929	14	83	47,362	355	..	118,549	..
1931	11	28	22,556	444	..	54,066	..
1933	15	41	25,007	80	..	49,284	..
1937	34	199	97,547	3,768	13,778	133,731	116,185
1939	61	224	112,653	7,570	11,444	147,321	128,307
1941	81	246	181,800	17,705	21,824	335,288	295,759
1944	70	178	359,797	23,586	33,038	841,026	784,402
1946	27	129	153,616	20,308	17,778	199,039	160,953
1949	34	96	115,667	14,490	6,026	108,458	87,942
1951	31	138	182,033	14,580	18,148	447,650	414,922
1954	32	44	59,194	7,778	6,154	85,139	71,207
1955	33	31	42,495	6,491	5,157	78,375	66,727
1956	23	23	37,673	4,796	4,045	97,049	88,208
1957	25	47	66,283	5,585	7,411	113,458	100,462
1958	25	28	44,848	5,039	4,483	90,643	81,121
1959	14	16	37,106	3,810	4,090	64,029	56,129

¹ Gross value of production, less the value of fuel, electricity, process supplies, containers and freight.

TABLE 47. Mica Production (Primary Sales), by Classes, 1958 and 1959

Grade	1958		1959	
	Pounds	Total value f.o.b. shipping point	Pounds	Total value f.o.b. shipping point
		\$		\$
Rough, mine-run or rifted	4,608	573	8,641	601
Mica sold for mechanical splitting	54,717	14,413	23,250	6,495
Splittings	—	—	—	—
Ground or powdered	1,380,530	44,298	591,356	29,953
Scrap, mine or shop waste and mica mined and sold for grinding	35,244	375	174,251	4,548
Trimmed mica	29,834	29,992	16,336	21,407
Unspecified	—	—	—	—
Totals, mica shipments	1,504,933	89,651	813,834	63,004
Varieties:				
Phlogopite mica (amber) and biotite	1,061,972	85,781	813,509	62,576
Muscovite mica (white) and schist	442,961	3,870	325	428

TABLE 48. Production of Mica, by Provinces and by Varieties, 1959

Province	Phlogopite and biotite		Muscovite and schist		Total	
	Pounds	Value	Pounds	Value	Pounds	Value
		\$		\$		\$
Quebec	778,076	62,045	—	—	778,076	62,045
Ontario	35,433	531	325	428	35,758	959
Totals, Canada	813,509	62,576	325	428	813,834	63,004

TABLE 49. Production of Mica, 1950-59

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1950	1,940	252,611	1955	820	77,541
1951	2,481	447,650	1956	922	95,666
1952	1,007	194,106	1957	641	111,583
1953	1,133	161,128	1958	752	89,651
1954	853	85,139	1959	407	63,004

TABLE 50. Imports and Exports of Mica, 1957-59

	1957		1958		1959	
	Pounds	Value	Pounds	Value	Pounds	Value
		\$		\$		\$
Imports:						
Mica, unmanufactured	501,900	234,004	1,047,700	217,436	1,340,400	161,309
Mica, manufactures of, n.o.p. ....	...	438,782	...	384,496	...	428,088
Exports:						
Mica, scrap and waste	184,700	6,403	170,200	11,243	246,500	13,062
Mica splittings	—	—	—	—	—	—
Mica manufactures .....	...	11,400	...	—	...	8,570
Mica, rough, untrimmed	87,500	28,666	—	—	107,100	5,993
Mica, trimmed	66,000	79,266	51,900	51,335	24,200	23,154
Mica, ground	24,000	1,455	78,000	4,253	46,000	2,760
Totals, mica exports reported .....	...	127,190	...	66,831	...	53,539

TABLE 51. Consumption of Mica, in Specified Industries, as Reported to the Annual Census of Industry, 1954-58

	1954	1955	1956	1957	1958
	pounds				
By industries:					
Paints	1,802,747	1,721,152	1,652,031	2,196,612	1,912,073
Electrical apparatus	473,352	492,589	515,960	642,608	355,928
Rubber goods	322,247	484,985	543,940	574,706	634,021
Roofing	674,000	480,000	1,220,000	518,000	512,000
Paper goods	56,000	38,000	494,000	18,000	...
Asbestos .....	...	26,157	16,800	...	11,868
Non-metallic mineral products	85,000	101,219	79,719	79,000	121,506
Concrete products .....	...	4,700	...	...	...
Miscellaneous	16,502	8,102	2,360	...	...
Total accounted for	3,429,848	3,356,904	4,524,810	4,028,926	3,547,396
By provinces:					
Quebec and Nova Scotia	1,772,025	1,701,766	1,662,528	1,946,033	1,685,410
Ontario	1,214,578	1,361,430	1,779,940	1,545,913	1,324,552
Manitoba	8,455	13,392	14,556	27,085	191,782
Alberta	—	—	762,000	420,000	294,000
British Columbia	434,790	280,316	305,786	89,895	51,652
Canada	3,429,848	3,356,904	4,524,810	4,028,926	3,547,396

TABLE 52. World Production of Mica by Countries,¹ 1954 - 58
 (Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1954	1955	1956	1957	1958
	thousands of pounds ²				
North America:					
Canada (sales): Block	71	57	79	108	1,073
Splittings	2	—	2	15	
Ground	937	944	1,493	910	
Scrap	699	639	269	247	
United States (sold or used): Sheet	668	642	888	690	660
Scrap	162,146	190,884	172,618	184,876	186,694
South America:					
Argentina: Sheet	529	342	322	212	110 ³
Scrap	—	2	2	2	
Brazil	3,962	3,051	2,926	3,265	3,100 ³
Uruguay	—	—	—	—	—
Europe:					
Austria	—	—	—	—	—
Norway, including scrap	3,968	3,086	3,748	4,630	4,409
Spain	18	20	26	24	20
Sweden: Block	4	—	—	—	—
Ground	331	368	392	414	421
Asia:					
Ceylon	—	4	—	—	—
India (exports): Block	3,609	4,802	6,065	4,392	7,485
Splittings	10,855	16,479	14,663	16,643	14,314
Scrap	23,031	25,699	27,282	27,915	22,835
Taiwan (Formosa): Sheet	44	—	29	11	1
Scrap	—	—	—	—	—
Africa:					
Angola: Sheet	24	33	53	46	46
Scrap and splittings	362	518	968	844	716
Kenya	—	2	—	—	15
Madagascar (phlogopite): Block	101	62	77	139	223
Splittings	1,056	534	1,109	2,011	2,004
Morocco, Southern Zone: Sheet	11	—	—	—	—
Scrap	18	—	—	—	—
Mozambique, including scrap	2	29	26	66	4
Rhodesia and Nyasaland, Federation of:					
Northern Rhodesia: Sheet	7	4	3	1	2
Southern Rhodesia: Block	183	141	123	71	108
Scrap	—	—	—	—	—
South West Africa: Scrap	—	—	—	—	—
Tanganyika (exports): Block	174	146	128	148	108
Ground	—	—	—	—	—
Scrap	62	613	280	—	24
Uganda	4	—	—	—	—
Union of South Africa: Sheet	4	11	1	2	1
Scrap	4,107	7,818	5,038	4,226	4,225
Oceania:					
Australia: Block	84	57	29	37	31
Scrap	82	20	—	40	82
Damourite	1,151	977	1,058	1,455	1,100 ³
World totals (estimate)^{1,2}	285,000	320,000	305,000	320,000	320,000

¹ In addition to countries listed, mica is also produced in China, Rumania and U.S.S.R., but data on production are not available; estimates are included in total.

² This table incorporates a number of revisions of data published in previous mica chapters.

³ Estimate.

⁴ Less than 0.5 ton.

TABLE 53. Employees and their Earnings in the Mica Mining Industry, 1955-59

Year	Employees					Man-hours worked (all employees)	Earnings		
	Office and administrative		Workmen		Total		Office and adminis- trative	Workmen	Total
	Male	Female	Male	Female					
	number					dollars			
1955	1	—	28	3	32	44,117	3,600	38,895	42,495
1956	1	—	22	—	23	39,322	3,600	34,073	37,673
1957	2	—	32	13	47	78,251	4,500	61,783	66,283
1958	1	—	27	—	28	42,821	4,800	40,048	44,848
1959	1	—	15	—	16	37,106	4,800	32,306	37,106

TABLE 54. Workmen in the Mica Mining Industry, by Months, 1958 and 1959

Month	1958			1959			
	Male			Male			
	Mine	Mill or shop	Total	Mine		Mill or shop	Total
				Sur- face	Under- ground		
	number						
January	11	4	15	3	7	4	14
February	11	4	15	3	7	4	14
March	11	4	15	3	7	5	15
April	14	4	18	—	10	5	15
May	23	3	26	3	7	8	18
June	23	3	26	3	7	9	19
July	23	4	27	3	7	6	16
August	25	4	29	6	6	6	18
September	21	4	25	4	5	6	15
October	17	7	24	8	—	2	10
November	15	4	19	6	5	3	14
December	15	4	19	3	6	2	11
Average	21	6	27	4	6	5	15
Total man-hours worked	41,071			33,349			

TABLE 55. Fuel and Electricity Used in the Mica Mining Industry, 1959

Kind	Quantity	Cost at plant
		\$
Bituminous coal (a) From Canadian mines short ton	58	1,024
(b) Imported	—	—
Sub-bituminous coal (from Alberta mines only)	—	—
Anthracite coal	—	—
Lignite coal	—	—
Coke (for fuel only)	—	—
Gasoline, (includes gasoline used in cars and trucks) Imp. gal.	1,809	775
Kerosene or coal oil	—	—
Fuel oil	—	—
Wood (cords of 128 cubic feet of piled wood) cord	1	20
Gas (a) Liquefied petroleum gases (propane, etc.)	—	—
(b) Other manufactured gas	—	—
(c) Natural gas	—	—
Other fuel	—	—
Electricity purchased for power and lighting kwh.	84,940	1,991
Electricity purchased for other purposes	—	—
Totals (cost only) .....	...	3,810
Electricity generated (a) For own use	—	—
(b) For sale	—	—

NATURAL MINERAL WATERS

Most of the bottled natural mineral waters are obtained from springs in Quebec. Among the larger producers are Orange Crush Limited at Varennes, Sources Abenakis Ltée at St-François du Lac, Eau Minérale Naturelle St-Léon at St-Léon and Usine d'Embouteillage Maski Enrg. at St-Justin.

The directory at the end of this bulletin gives the location of other springs of natural mineral waters.

There were 9 firms reporting production of natural mineral waters in Canada in 1959. Eight of these firms were in Quebec and 1 in Ontario.

TABLE 56. Shipments of Natural Mineral Waters from Canadian Springs, 1950-59

Year	Quebec		Ontario		Canada	
	Imp. gal.	Value	Imp. gal.	Value	Imp. gal.	Value
		\$		\$		\$
1950	316,654	158,457	2,175	440	318,829	158,897
1951	322,800	146,521	2,500	450	325,300	146,971
1952	309,125	165,593	2,370	440	311,495	166,033
1953	309,285	165,334	300	150	309,585	165,484
1954	282,078	147,307	2,000	750	284,078	148,057
1955	303,110	158,495	3,573	2,015	306,683	160,510
1956	290,526	148,167	2,000	1,700	292,526	149,867
1957	346,210	183,155	2,500	2,012	348,710	185,167
1958	314,294	170,622	2,433	1,946	316,737	172,568
1959	366,088	201,033	3,025	1,936	369,113	202,969

PERLITE

Perlite is a volcanic glass characterized by a concentric "onion skin" fracture and usually a 2 to 5 per cent water content. When heated rapidly in a furnace it expands into a frothy material of low density.

Commercially-expanded perlite is granular material and is generally white. Because of its cellular nature it is light in weight and has good insulating and sound-proofing qualities. Expanded perlite is used chiefly in lightweight concrete aggregates, insulating and sound-proofing pre-cast wallboard, and in lightweight plaster. A sack of

expanded perlite containing 3 cubic feet weighs approximately 30 to 36 pounds.

Development work has been done on deposits of perlite at Francois Lake, British Columbia, about eighteen miles by road from Burns Lake on the C.N.R. Other deposits have been found in British Columbia at Empire Valley northwest of Clinton.

Shipments of 1,112 tons of perlite valued at \$11,120 were made from the British Columbia deposits to the expanding plant of Western Gypsum Products Ltd., Calgary, Alberta, during 1953. There was no production reported since.

PHOSPHATE

Phosphate in the form of apatite was mined in Canada on a fairly substantial scale up to 1895, but since then the production has been small and spasmodic. In 1951, about 6 tons were shipped but there were no shipments in subsequent years.

For many years, the Electric Reduction Company Limited, Buckingham, Quebec, has purchased most of the small output for use in the production of

elemental phosphorus and various phosphorus compounds. This company, however, obtains most of its phosphate rock requirements from Florida. That state and Montana supply the great bulk of the phosphate rock which Canada imports for the manufacture of fertilizer, occasional shipments being obtained also from North Africa. Rock low in fluorine is obtained from Curacao, Netherlands, West Indies, for use in stock feeds.

TABLE 57. Production of Phosphate Rock, 1947-59

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1947	—	—	1952	—	—
1948	—	—	1953	—	—
1949	20	291	1954	—	—
1950	129	1,070	1955	—	—
1951	6	94	1956-59	—	—

TABLE 58. Imports of Phosphate Rock, 1950-59

Year	Short tons	Value	Year	Short tons	Value
		\$			\$
1950	491,026	3,296,341	1955	588,209	4,512,833
1951	499,711	3,178,899	1956	627,648	5,185,597
1952	470,913	3,130,306	1957	723,220	5,897,784
1953	576,500	3,951,318	1958	744,164	6,854,243
1954	644,860	4,577,633	1959	747,068	7,468,368

TABLE 59. Consumption of Phosphate Rock, 1954-58

	1954	1955	1956	1957	1958
	tons				
By uses:					
Fertilizers	506,241	465,129	417,910	584,216	583,584
Chemicals	100,642	97,716	109,524	114,265	115,556
Steel and iron	1,081	128	276	...	...
Stock and poultry feeds	19,582	21,919	24,596	24,234	29,766
Miscellaneous	515	434	340	...	...
Totals	628,061	585,326	552,646	722,715	728,906
By provinces:					
Prince Edward Island	476	319	278	293	358
Nova Scotia					
New Brunswick	509	455	631	800	808
Quebec	148,254	140,602	160,536	175,260	170,272
Ontario	105,507	106,579	97,484	88,129	84,607
Manitoba	1,031	765	802	815	1,218
Saskatchewan	208	311	240	333	664
Alberta	697	655	6,604	99,692	107,508
British Columbia	371,379	335,640	286,071	357,393	363,471
Canada	628,061	585,326	552,646	722,715	728,906

TABLE 60. World Production of Phosphate Rock, by Countries,¹ 1955-59

(Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1955	1956	1957	1958	1959
thousand long tons ²					
North America:					
United States	12,265	15,747	13,976	14,879	15,869
West Indies:					
Jamaica: Guano	3	3	3	3	3
Netherlands Antilles (exports)	109	104	105	85	97
Totals	12,374	15,851	14,081	14,964	15,966
South America:					
Brazil	49	44	82	144	246
Chile: Apatite	52	62	32	18	20
Guano	41	24	34	31	21
Peru	285	331	280	164	98 ⁴
Venezuela	—	30	30	—	—
Totals	427	491	458	357	385
Europe:					
Belgium	19	13	16	18	13
France	101	89	74	76	74 ⁴
Spain	23	8	1	3	1 ⁴
Sweden: Apatite	—	—	—	—	—
U.S.S.R.: Apatite ⁴	3,445	3,690	3,940	3,940	3,940
Sedimentary rock ⁴	1,425	1,575	1,720	1,970	1,970
Totals ¹	5,260	5,600	6,000	6,250	6,240
Asia:					
British Borneo: Guano	3	3	3	3	1
China ⁴	100	150	200	300	500
Christmas Island (exports) (Indian Ocean)	390	341	336	374	375 ⁴
India: Apatite	6	9	9	15	14
Indonesia	6	3	4	2	2 ⁴
Israel	84	118	150	206	201
Jordan	161	205	258	289	234
Philippines: Guano	3	8	4	8	3
Vietnam, North: Phosphate rock	4	32	22	32	34 ⁴
Apatite	4	23	65	137	138 ⁴
Totals	800	910	1,080	1,390	1,520
Africa:					
Algeria	740	596	596	556	523
Egypt	636	605	576	549	475
French West Africa: ⁵ Aluminum phosphate	112	75	91	104	95
Madagascar	2	3	3	5	7
Morocco Southern Zone	5,245	5,435	5,480	6,235	7,050
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia	—	—	—	—	2
Seychelles Islands (exports)	1	4	6	17	6
South West Africa: Guano	2	—	3	—	1
Tunisia	2,166	2,044	2,035	2,243	2,150
Uganda	—	3	3	—	1
Union of South Africa	134	154	166	213	228
Totals	9,041	8,919	8,959	9,924	10,540
Oceania:					
Angaur Island (exports)	137	—	—	—	—
Australia	6	7	11	7	8
Makatea Island (French Oceania) (exports)	222	255	303	315	363
Nauru Island (exports)	1,401	1,333	1,105	1,234	1,211 ⁴
Ocean Island (Exports)	309	297	292	324	295 ⁴
Totals	2,075	1,892	1,711	1,880	1,877
World total (estimate) ^{1,2}	29,980	33,680	32,290	34,770	36,530

¹ In addition to countries listed a negligible amount is produced in Angola, British Somaliland, Japan and Tanganyika. Estimate for Austria, Ireland, North Korea and Poland are included in the total.

² This table incorporates a number of revisions of data published in previous chapters.

³ Less than 500 tons.

⁴ Estimate.

⁵ Includes calcium phosphate, production of which is reported in thousand long tons as follows: 1954, 5; 1955, 5; 1956, 5; 1957, 2; 1958, 1; 1959, 1.

POTASH

Shipments of potash made during 1959 were valued at \$1,408,462. After a tune up period late in 1958 the Potash Company of America Ltd. began shipping potassium chloride from the mine near Saskatoon, Saskatchewan. Although the products may be potassium chloride, the market quotations and other calculations are usually based on the K_2O equivalent. In recent years many millions of dollars have been expended in developing the

extensive potash deposits in Saskatchewan. Core drilling has indicated that these beds of sylvite and carnallite extend westward from the Manitoba border through the Saskatoon area to Unity, a distance of nearly 400 miles. Firms which are experienced potash producers were sinking shafts to mine these deposits which lie at depths of from 2,550 to 3,500 feet.

TABLE 61. World Production of Potash (Marketable, Unless Otherwise Stated) in Equivalent K_2O , by Countries,¹ 1955-59

(Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1955	1956	1957	1958	1959
	short tons ²				
North America:					
Canada.....	—	—	—	—	—
United States	2,066,706	2,171,584	2,266,481	2,147,670	2,383,259
Crude (including Brines) ³	2,326,946	2,479,463	2,615,808	2,478,725	..
South America:					
Chile	11,000	12,000	11,000 ⁴	11,000 ⁴	11,000 ⁴
Europe:					
France.....	1,310,961	1,463,006	1,545,267	1,630,436	1,653,000 ⁴
Crude ³	1,490,764	1,653,465	1,736,800	1,835,033	1,828,732
Germany: East ⁴	1,582,000	1,598,000	1,653,000	1,700,000	1,764,000
Crude ^{3,4}	1,820,000	1,840,000	1,900,000	1,960,000	2,028,000
West	1,870,848	1,823,221	1,862,000	1,886,052	2,026,046
Crude ³	2,226,666	2,166,039	2,190,000	2,225,564	2,364,455
Spain	242,539	263,468	251,460	262,672	274,500 ⁴
U.S.S.R. ⁴	870,500	983,600	1,040,000	1,100,000	1,160,000
Asia:					
Israel	12,000 ⁴	31,000 ⁴	50,000 ⁴	80,000 ⁴	80,000 ⁴
Japan	461	475	1,650 ⁴	1,900 ⁴	1,900 ⁴
Africa:					
Eritrea	—	—	—	450	—
Oceania:					
Australia	—	—	—	—	—
World totals (marketable estimate)¹	8,000,000	8,300,000	8,700,000	8,800,000	9,400,000

¹ In addition to countries listed, Ethiopia, Italy and Poland are reported to produce potash salts, but statistics of production are not available; estimates included in totals.

² This table incorporates a number of revisions of data published in previous potassium salts chapters. Data do not add to totals shown due to rounding where estimated figures are included in the detail.

³ To avoid duplication of figures, data on crude potash are not included in the total.

⁴ Estimate.

PYRITE, PYRRHOTITE

Pyrite and pyrrhotite are by-products which are produced from the processing of the metal sulphide ores of Noranda, Quemont, Waite Amulet, Normetal, West MacDonald, and Weedon Pyrite Mines in Quebec and Britannia mine in British Columbia. At Kimberley the waste iron sulphides are used to produce acid for the fertilizer plant. Shipments of pyrite were made to pulp and paper mills and chemical plants in Canada and abroad.

At Cutler, Ontario the pyrite and pyrrhotite concentrates from Noranda Mines are treated to produce sulphuric acid which is sold to the uranium mines in the Elliot Lake area. At Copper Cliff, a plant of the International Nickel Co. of Canada Ltd. treats pyrrhotite, containing some nickel, to produce iron oxide pellets and nickel carbonate. It is expected that the sulphur content of the pyrrhotite will be recovered.

TABLE 62. Producers' Shipments Pyrite and Pyrrhotite, 1950-59

Year	Gross weight	Sulphur ¹ content	Value	Year	Gross weight	Sulphur ¹ content	Value
	tons		\$		tons		\$
1950	312,614	150,487	682,810	1955	878,452	403,986	3,740,383
1951	444,948	215,363	1,556,510	1956	1,046,740	473,605	4,538,785
1952	553,987	263,241	2,245,713	1957	1,166,416	515,096	4,808,228
1953	408,257	186,650	1,450,698	1958	1,191,731	512,427	4,248,668
1954	687,928	311,159	2,663,499	1959	1,099,564	465,611	3,433,095

¹ Data for 1952-55 include sulphur content of acid made from roasting zinc sulphide concentrates at Arvida.

TABLE 63. World Production of Pyrites (Including Cupreous Pyrites), by Countries,¹ 1955-58

(Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1955		1956		1957		1958	
	Gross weight	Sulphur content	Gross weight	Sulphur content	Gross weight	Sulphur content	Gross weight	Sulphur content
	thousand long tons ²							
North America:								
Canada	784	361	935	423	1,041	460	1,664	800
Cuba	130	63	65	32	36	17	25	12
United States	1,007	410	1,070	432	1,067	436	974	403
South America:								
Venezuela	—	—	59	14	15	4	14	4
Europe:								
Austria	—	—	—	—	—	—	—	—
Finland	294	125	289	128	292	126 ³	251	105
France	301	133	299	126	319	124	370	163 ³
Germany: East	141	48 ³	152 ³	53 ³	148 ³	49 ³	148 ³	50 ³
West	580	206	634	253	596	237	557	224
Greece	229	100 ³	237	104	231	102	148	65
Italy	1,296	592	1,349	634	1,445	679 ³	1,490	676
Norway	730	362	840	363	830	360	775	335
Poland	139	56	152	61	207	76	207 ³	76 ³
Portugal	725	297	659	297	656	302	589	271
Rumania	179	72	178	71	174	70	174 ³	70 ³
Spain	2,290	1,110	2,259	1,084	2,182	1,047	1,738	283
Sweden	388	191	486	239	494	245	329	162
United Kingdom	6	2	4	2	4	1	4 ³	1 ³
Yugoslavia	223	116	252	131	308	123	326	130
Asia:								
Cyprus	1,318	633 ³	1,603	770 ³	1,080	524	1,006	485
Japan	2,693	1,131	3,049	1,296	3,324	1,404	3,143	1,329
Philippines	30	14	—	—	18	8	19	8
Taiwan (Formosa)	29	11	29	11	33	12	32	12
Turkey	16	8 ³	19	9 ³	48	23	80	39
Africa:								
Algeria	21	10	6	3	19	8	24	11
Morocco: Southern Zone	1	1	2	4	6	2	18	6
Rhodesia and Nyasaland Federation of:								
Southern Rhodesia	21	10	19	8	20	8	58	24
Union of South Africa	352	138	430	163 ³	388	160	493	205
Oceania:								
Australia	223	106	187	88	227	108	229	109
Totals (estimate) ¹	16,500	6,900	17,700	7,400	17,800	7,500	17,650	7,400

¹ In addition to countries listed, Brazil, China, Czechoslovakia, Kenya, Korea, Rumania, Tunisia and U.S.S.R. produce or have produced pyrites, but production data are not available; estimates are included in total.

² This table incorporates a number of revisions of data published in previous Sulphur and Pyrites chapters. Data do not add to totals shown due to rounding where estimated figures are included in the detail.

³ Estimate.

⁴ Less than 500 tons.

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 64. Producers' Shipments of Silica Brick, 1950 - 59

Year	M	Value	Year	M	Value
		\$			\$
1950	3,126	408,813	1955	4,763	602,625
1951	3,510	465,229	1956	5,799	736,817
1952	3,544	606,394	1957	4,308	655,903
1953	3,720	712,271	1958	2,815	472,346
1954	3,578	465,157	1959	1,926	354,295

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 neighbourhood 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 65. Production of Sodium Carbonate (Natural), 1945 - 59

Year	Tons	Value	Year	Tons	Value
		\$			\$
1945	286	3,146	1950	—	—
1946	—	—	1951	—	—
1947	163	1,793	1952	—	—
1948	—	—	1953	—	—
1949	47	513	1954 - 59	—	—

SODIUM SULPHATE (NATURAL)

All the natural sodium sulphate produced in Canada was obtained from the brine lakes in Saskatchewan. Producers shipped 179,535 tons valued at \$2,881,861 in 1959 compared with 173,217 tons valued at \$2,862,915 in the preceding year.

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.

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. It is used in the glass, dye and textile industries, and to a smaller extent for medicinal purposes and for tanning.

TABLE 66. Principal Statistics of the Sodium Sulphate Mining Industry, Significant Years, 1921 - 59

Year	Estab- lish- ments	Em- ployees	Salaries and wages	Cost of fuel and electricity	Cost of process supplies and containers	Gross value of production	Net value of production ¹
	number			dollars			
1921	2	..	..	..	..	18,850	..
1929	3	29	46,637	32,038	..	64,112	..
1931	5	83	101,026	144,512	..	267,863	..
1933	7	116	92,065	135,546	..	485,416	..
1937	6	122	153,181	159,673	26,459	618,028	431,896
1939	7	102	136,416	146,692	32,917	628,151	448,542
1941	7	125	193,298	231,964	50,128	931,554	649,462
1944	6	158	264,004	253,043	39,722	987,842	695,077
1946	4	167	251,887	254,450	66,423	1,118,783	797,910
1949	5	212	492,277	399,355	58,891	1,616,631	1,158,385
1951	5	225	671,878	662,601	113,806	2,391,813	1,615,406
1954	4	173	553,911	449,207	78,819	2,394,473	1,866,447
1955	5	235	824,393	577,842	124,552	2,805,507	2,093,113
1956	5	207	721,432	600,182	175,828	2,841,816	2,065,806
1957	5	180	628,876	469,756	84,663	2,574,152	2,014,309
1958	5	146	589,759	458,363	75,290	2,869,760	2,329,262
1959	5	148	609,869	493,215	107,825	2,885,286	2,284,246

¹ Gross value of production, less the value of fuel, electricity, process supplies, containers and freight.

TABLE 67. Production of Natural Sodium Sulphate, 1950 - 59

Year	Short tons	Selling value f.o.b. shipping point	Year	Short tons	Selling value f.o.b. shipping point
		\$			\$
1950	130,730	1,615,867	1955	178,888	2,799,715
1951	192,371	2,388,770	1956	181,053	2,838,186
1952	122,590	1,708,807	1957	157,800	2,568,728
1953	115,565	1,631,258	1958	173,217	2,862,915
1954	158,417	2,385,573	1959	179,535	2,881,861

TABLE 68. Production of Manufactured Sodium Sulphate,¹ 1946 - 59

Year	Salt cake		Year	Salt Cake	
	Tons	Value		Tons	Value
		\$			\$
1946	2,584	33,333	1951	3,297	72,206
1947	3,175	51,047	1952	2,382	54,956
1948	3,198	69,876	1953	2,345	59,793
1949	3,738	83,996	1954 - 59 .....	..	..
1950	3,674	74,555			

¹ Salt cake produces as a by-product is not included.

TABLE 69. Imports of Sodium Sulphate, 1950-59

Year	Salt cake		Glauber's salt	
	Tons	Value	Tons	Value
		\$		\$
1950	15,705	201,260	2,256	62,996
1951	19,432	340,740	3,234	102,930
1952	19,576	313,739	4,577	122,294
1953	32,802	516,863	5,493	150,263
1954	30,235	482,652	5,134	144,979
1955	29,928	574,440	3,888	131,447
1956	30,319	558,656	2,768	91,330
1957	28,086	511,457	1,512	50,527
1958	25,812	478,215	1,217	38,798
1959	27,157	511,162	966	39,907

TABLE 70. Exports of Sodium Sulphate, 1950-59

Year	Long tons	Value	Year	Short tons	Value
		\$			\$
1950	25,335	302,329	1955 ¹	67,762	1,263,911
1951	56,416	735,902	1956 ¹	60,579	985,801
1952	24,236	382,274	1957 ¹	37,023	593,390
1953	17,975	298,374	1958 ¹	39,763	645,670
1954	58,972	1,039,284	1959 ¹	47,922	752,116

¹ Source: "Trade of Canada, Exports"—Quantity is shown in short tons.

Note: Exports from Canada were not recorded separately prior to 1955 in the official trade statistics of Canada, but the imports into the United States from Canada are shown as above in the "U.S. Imports for Consumption of Merchandise" by the U.S. Department of Commerce.

TABLE 71. Available Data on Consumption of Sodium Sulphate (Salt Cake) in Canada, by Industries, 1954-58

Industry	1954	1955	1956	1957	1958
	short tons				
Pulp and paper	134,533	137,575	156,698	160,042	164,556
Glass, including glass wool.....	2,276	2,722	2,922	2,111	2,357
Medicinals.....	17	37	54	67	52
Soaps	1,264	1,555	1,335	1,252	814
Stone products	185	166	264	271	288
Total accounted for	138,275	142,055	161,273	163,743	168,067

TABLE 72. Employees and their Earnings in the Sodium Sulphate Mining Industry, 1955-59

Year	Employees					Man-hours worked (all employees)	Earnings		
	Office and administrative		Workmen		Total		Office and adminis- trative	Workmen	Total
	Male	Female	Male	Female					
	number					dollars			
1955	18	2	214	1	235	544, 272	93, 012	731, 381	824, 393
1956	19	3	184	1	207	439, 105	100, 812	620, 620	721, 432
1957	19	2	159	—	180	353, 219	104, 569	524, 307	628, 876
1958	14	3	129	—	146	305, 494	97, 178	492, 581	589, 759
1959	16	3	129	—	148	307, 046	104, 332	505, 537	609, 869

SULPHUR

Native sulphur deposits of commercial grade have not been found in Canada, but large tonnages of metal sulphide ores are smelted. In smelting these ores sulphur dioxide gas is produced, some of which is recovered to make sulphuric acid or liquid sulphur dioxide. At Trail, British Columbia the sulphur dioxide generated by smelting lead-zinc sulphide ores is converted into sulphuric acid. At Copper Cliff, Ontario, the Canadian Industries Limited uses the smelter gases from the International Nickel plant to make sulphuric acid and sulphur dioxide. Zinc sulphide concentrates are shipped to Arvida where the concentrates are calcined to produce sulphur dioxide which is used to

make sulphuric acid. The roasted material is exported to smelters for the recovery of zinc and other metals.

Sour natural gas in Alberta contains varying percentages of hydrogen sulphide. Before the distribution of natural gas the hydrogen sulphide is removed and it is converted into elemental sulphur. Statistical data for these operations are included in the manufacturing industries under sub-group classification of absorption gasoline industry.

Elemental sulphur is also produced in the processing of nickel sulphides at the nickel refinery.

TABLE 73. Sulphur in Smelter Gases, 1950-59

Year	Quantity ¹	Value	Year	Quantity ¹	Value
	tons	\$		tons	\$
1950	150,685	1,506,850	1955	224,457	2,244,570
1951	156,427	—	1956 ²	236,088	2,323,590
1952	160,547	1,605,470	1957 ²	235,123	2,322,067
1953	172,200	1,722,000	1958 ²	241,055	2,361,252
1954	221,247	2,212,470	1959	277,030	2,716,416

¹ Does not include in 1952-55 sulphur in acid made from roasting zinc sulphide concentrates at Arvida.

² Includes sulphur in acid made from zinc sulphide at Arvida.

TABLE 74. Sulphur (Elemental)¹ Made from Natural Gas and Nickel Sulphide, 1952-59

Year	Output	Sales
	short tons	
1952	8,931	4,225
1953	18,298	16,072
1954	22,320	18,665
1955	29,093	25,976
1956	33,464	34,784
1957 ²	107,478	93,335
1958 ²	186,055	94,377
1959 ²	294,775	145,636

¹ Does not include sulphur made from imported crude petroleum.

² Includes sulphur produced at nickel refinery.

TABLE 75. Imports of Sulphur, 1950-59

Year	Tons	Value	Year	Tons	Value
		\$			\$
1950	390,333	7,730,126	1955	373,373	9,386,983
1951	395,928	8,959,677	1956	474,117	11,857,556
1952	415,185	8,376,824	1957	416,930	9,752,368
1953	359,205	8,526,804	1958	380,331	8,324,191
1954	310,127	7,816,301	1959	332,430	6,924,938

TABLE 76. Available Data on the Consumption of Sulphur (Brimstone), 1954-58

	1954	1955	1956	1957	1958
	tons of 2,000 pounds				
By industries:					
Pulp and paper	268,607	300,899	313,851	284,561	273,861
Heavy chemicals	80,871	82,947	108,300	189,911	229,170
Rubber goods	2,360	2,783	2,905	2,687	2,424
Medicinal	21	27	126	43	21
Adhesives	73	29	41	77	61
Starch	328	340	27	43	450
Fruit and vegetable preparations	5	6	7	6	3
Sugar refining	168	168	140	144	135
Petroleum refining	287	255	225	225	225
Steel and iron	50	65	86	83	58
Miscellaneous chemicals	6,155	5,591	5,473	3,161	8,634
Asbestos products	5	8	10	...	5
Miscellaneous non-metallics	23	24	...	...	...
Glass .....	...	6	11	...	...
Total accounted for	358,953	393,148	431,202	480,941	515,047
By provinces:					
Newfoundland	20,492	20,088	21,440	19,886	19,387
Nova Scotia	5,865	6,567	6,105	6,753	6,543
New Brunswick	41,459	42,671	41,304	38,933	38,290
Quebec	110,439	124,762	136,909	134,528	138,483
Ontario	125,597	129,836	145,309	174,633	197,682
Manitoba and Saskatchewan	2,618	6,099	15,753	18,699	24,998
Alberta	201	2,344	5,660	39,105	41,688
British Columbia and Northwest Territories	52,282	60,781	58,722	48,404	47,976
Canada	358,953	393,148	431,202	480,941	515,047

TABLE 77. Exports of Sulphur and Pyrite, 1955-59

Year	Pyrite	Sulphur	
	Value	Tons	Value
	\$		\$
1955	2,001,575	3,051	94,141
1956	2,852,753	12,364	293,042
1957	2,649,349	4,331	128,116
1958	1,879,251	7,608	170,966
1959	1,018,608	26,526	504,961

TABLE 78. World Production of Native Sulphur by Countries,¹ 1954 - 58
(Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1954	1955	1956	1957	1958
	long tons ²				
North America:					
Mexico	52,407	475,487	758,415	1,007,915	1,236,929
United States	5,578,973	5,799,880	6,484,285	5,578,525	4,645,577
South America:					
Argentina	17,000	17,651	27,298	28,788	30,000 ³
Bolivia (exports)	2,565	3,975	3,418	783	392
Chile	43,100	56,338	37,272	18,492	24,015
Colombia	5,118	5,413	4,921	5,000 ³	6,693
Ecuador	64	1,550	—	—	21,200
Peru	—	—	—	—	—
Europe:					
France (content of ore)	—	—	—	—	—
Greece (content of ore)	2,507	3,600	1,322	2,826	3,000
Italy (crude) ⁴	194,064	181,629	170,094	171,730	158,665
Spain ⁵	5,400	6,500	6,200	3,410	3,700
Asia:					
Japan	184,745	199,676	243,312	253,548	177,175
Philippines	761	3,700 ³	—	1,300 ³	1,300 ³
Taiwan (Formosa)	5,873	4,854	7,864	9,433	6,178
Turkey	9,862	11,318	13,681	12,893	12,622
Ryuku Islands	—	—	254	1,003	³
World totals, (estimate) ¹	6,300,000	7,000,000	8,000,000	7,300,000	6,500,000

¹ Native sulphur believed to be produced also in U.S.S.R., but complete data are not available; estimates are included in the total.

² This table incorporates a number of revisions of data published in previous sulphur chapters. Data do not add to totals shown due to rounding where estimated figures are included in the detail.

³ Estimate.

⁴ In addition the following tonnages of ground sulphur rock (30 per cent) were produced and used as insecticide: 1953, 16,940 tons; 1954, 22,803 tons; 1955, 21,560 tons; 1956, 22,219 tons; 1957, 19,904 tons; 1958, 18,656 tons.

⁵ Negligible.

STRONTIUM MINERALS

In Ontario, several occurrences of celestite are known in the general Ottawa region, but very little mining has been undertaken for the mineral, and production has been small and intermittent.

Between 1918 and 1920, about 250 tons of white, fibrous celestite were mined from a deposit in Bagot township, Renfrew county, and after grinding in a small mill erected on the property, were sold for use in paint. The material was not very pure and contained about 18 per cent of barium sulphate. The old pit was pumped out in 1941 and a few tons of ore were scaled down from a small drift. This,

together with some stockpile material from the earlier work, was shipped to Montreal for grinding and pigment use. The property has since been idle. The above comprises the only production of strontium minerals in Canada of which there is any official record.

In British Columbia, celestite occurs near Birch Island, North Thompson River, Kamloops mining division. The deposit is reported to contain a large tonnage of ore consisting of a fine-grained intergrowth of fluorspar, celestite, feldspar, quartz, mica and pyrite.

VERMICULITE

Vermiculite, a hydrated magnesian aluminum silicate, resembles mica closely but is softer and inelastic. Colours range from black through brown and dark green to almost colourless. Its principal characteristic is its ability to expand many times on heating, and in its expanded form it possesses low bulk density, low thermal conductivity, high heat resistance, chemical inertness and acoustic properties. Vermiculite is generally regarded as a product of alteration and is usually associated with metamorphosed ultra-basic rocks.

At Perth, Ontario the Northern Vermiculite Co. Ltd. was treating some test lots of vermiculite with the expectation of commercial production in the near future.

Known deposits of vermiculite in Canada are located at Stanleyville, near Perth, Ontario and

at Blue River, Kamloops mining division, British Columbia.

The principal uses for vermiculite are loose insulation in buildings; concrete and plaster aggregate; lightweight fire-resistant and acoustic tile and wallboard; rooting medium; and soil amendment. It is also used in lubricants, dry chemicals, (as a diluent), combination refractory and insulating brick, as a pigment and extender in paint and as decorative filler in wallpaper. Vermiculite has been used as fireproof deck covering and partitions on ships, as loose insulation in fire and sound-proof partitions in vehicles and aircraft, as filler for life jackets and in finely-powdered forms, for oilless bearings.

In 1959 there were 8 plants in Canada making insulation aggregates, etc., from imported vermiculite.

TABLE 79. World Production of Vermiculite, by Countries,¹ 1954-58
(Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1954	1955	1956	1957	1958
	short tons ²				
Argentina	—	551	614	287	330 ³
Australia	—	—	1	—	—
Egypt	—	—	—	33	—
India	3	138	1,038	1,100 ³	1,100 ³
Kenya	807	380	497	33	96
Morocco	—	—	—	147	—
Rhodesia and Nyasaland, Federation of:					
Southern Rhodesia	—	—	305	460	280
Tanganyika	—	—	—	—	91
Union of South Africa	45,633	57,482	58,717	62,619	54,314
United States (sold or used by producers)	195,538	204,040	192,628	183,987	181,700 ³
Total^{1,2}	241,981	262,591	253,800	248,666	237,911³

¹ In addition to countries listed, vermiculite is produced in Brazil and U.S.S.R., but data are not available, and no estimates are included in the total.

² This table incorporates a number of revisions of data published in previous vermiculite chapters.

³ Estimate.

VOLCANIC DUST

Volcanic dust (pumice 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.

During 1924 to 1933 the annual production varied from 30 to 485 tons. There has been no production in recent years. The last recorded shipments were 50 tons in 1943.

Volcanic dust deposits have been found in Alberta, Saskatchewan and British Columbia. Pumice dust is used for concrete aggregate, acoustic plaster, cleansing compounds, paint fillers absorbents, etc.

TABLE 80. World Production of Pumice, by Countries,¹ 1954-58
(Taken from the "Minerals Yearbook" published by the United States Bureau of Mines)

Country ¹	1954	1955	1956	1957	1958
	short tons ²				
Argentina ³	—	49,604	15,708	20,278	20,000 ⁴
Austria:					
Trass	51,601	53,050	37,511	38,875	29,784
Egypt	441	154	170 ⁴	170 ⁴	110 ⁴
France:					
Pumice.....	11,133	10,141	14,337	9,370	9,400 ⁴
Pozzolan	296,207	352,650	423,041	402,343	402,000 ⁴
Germany, West (marketable)	2,218,950	3,105,207	3,966,111	3,261,735	3,255,121
Greece:					
Pumice.....	34,409	33,069	77,162	61,242	99,208
Santorini earth	38,581	40,234	93,696	87,634	88,185
Iceland.....	12,125	14,600 ⁴	19,000 ⁴	15,102	15,000 ⁴
Italy:					
Pumice.....	166,915	181,892	211,959	221,990	3,100,000 ⁴
Pumicite	40,400	16,722	18,150	37,302	
Pozzolan	1,657,290	1,452,282	2,750,702	2,897,620	
Kenya	—	—	1,831	2,319	821
New Zealand.....	9,916	8,670	8,527	16,991	25,851
Spain (Canary Islands)	529	944	—	—	—
United States (sold or used by producers)	1,647,397 ⁵	1,804,488 ⁵	1,482,214 ⁵	1,826,978 ⁵	1,972,956 ⁵
World total (estimate)^{1,2}	6,200,000	7,200,000	9,200,000	9,000,000	9,100,000

¹ Pumice is also produced in Canada, Mexico, Japan, U.S.S.R. and a few other countries, but data on production are not available; estimates are included in total.

² This table incorporates a number of revisions of data published in previous pumice chapters.

³ Includes volcanic ash and cinders, and pozzolan.

⁴ Estimate.

⁵ Includes in 1954, 690,056 tons; 1955, 961,526 tons; 1956, 594,661 tons; in 1957, 772,384 tons and in 1958, 1,047,930 tons of volcanic cinder and scoria, used for railroad ballast or similar purposes.

Directory of Firms in the Miscellaneous Non-metal Mining Industry, 1959

Name of operator	Head office address	Plant or mine location
BARITE		
Nova Scotia:		
Fluor-Bar Mines Ltd. ¹	1980 Sherbrooke St. W., Montreal, Quebec	Lake Ainslie
Magnet Cove Barium Corp.	Walton	Pembroke
Quebec:		
Beach, Mahlon W. ¹	Box 9, Barrie, Ontario	Woodbridge Twp.
Roy, Phillippe ¹	62 L'Évêché, Rimouski	St-Fabien
British Columbia:		
Mountain Minerals Ltd.	Box 273, Lethbridge, Alberta	Brisco
Larrabee Mining Exploration Ltd. ²	221 - A - 8th Ave. W., Calgary, Alberta	Athalmer
Giant Mascot Mines Ltd.	908 Royal Bank Bldg., Vancouver	Spillimacheen
Baroid of Canada Ltd.	Box 250, Onoway, Alberta	Spillimacheen
Sheep Creek Mines Ltd.	490 Baker St., Nelson, B.C.	Invermere
BRUCITE		
Quebec:		
Aluminum Company of Canada Ltd.	Sun Life Bldg., Montreal	Wakefield
DIATOMITE		
Nova Scotia:		
Wightman, Mrs. G.W. ¹	Smith's Cove	Digby Co.
Ontario:		
P.B.S. Organic Minerals Ltd. ¹	153 Sheridan Ave., Toronto	McKee Twp.
British Columbia:		
Falvey and Co.	661 Taylor St., Vancouver	Quesnel
FLUORSPAR		
Newfoundland:		
Newfoundland Fluorspar Ltd.	327 Duckworth St., St. John's	St. Lawrence
St. Lawrence Corporation of Nfld., Ltd.	120 Broadway, New York, U.S.A.	St. Lawrence
Ontario:		
Huntingdon Fluorspar Mines Ltd.	Madoc	Huntingdon Twp.
Quebec:		
Yates Uranium Mines Inc. ¹	132 St. James St. W., Montreal	Huddersfield Twp.
Lake Otter Uranium Mines Ltd. ¹	132 St. James St. W., Montreal	Sandy Creek
White River Exploration Ltd. ¹	507 Place d'Armes, Montreal	St. Ubald
British Columbia:		
Pacific Silica Ltd. ²	Oliver	Oliver
GARNET		
Ontario:		
Niagara Garnet Co. ¹	c/o Wm. A. Yarwood, 8373 Krull Parkway Niagara Falls, New York, U.S.A.	River Valley
GRAPHITE		
Quebec:		
Holland, A.A. ¹	1705 North 12th Ave., Pensacola, Florida, U.S.A.	McGill Twp.
Quebec Graphite Corp. ¹	233 Notre Dame ouest, Montreal	Labelle
Italia Copper Ltd. ¹	2548 Pie IX, Montreal	Labelle
Ontario:		
Krefeld Graphite Gold Mines Ltd. ¹	R.R. No. 2, Malton	Vogt Twp.
GRINDSTONES		
New Brunswick:		
Read, H.C.	Sackville	Stonehaven
Bay of Chaleur Grindstone Co. ¹	1434 Ste-Catherine St. W., Montreal, Quebec	Gloucester Co.

¹ Holds dormant property.² Active but not producing.

Directory of Firms in the Miscellaneous Non-metal Mining Industry, 1959 - Continued

Name of operator	Head office address	Plant or mine location
IRON OXIDE		
Quebec:		
Gelinas, Bruno ¹	1521 Notre Dame, Trois-Rivières	Portneuf Co.
Girardin, Chas. D. ¹	Yamachiche	Shawinigan
The Sherwin-Williams Co. of Canada	2875 Centre St., Montreal	Red Mill, Champlain Co.
LITHIUM MINERALS		
Quebec:		
American Lithium Co. Ltd. ¹	200, ouest rue St-Jacques, Montreal	Lacorne
Consolidated Negus Mines Ltd. ¹	85 Richmond St. W., Toronto	Lamotte Twp.
Glenmar Lithium Mines Ltd. ¹	100 Adelaide St. W., Toronto, Ontario	Lamotte Twp.
International Lithium Mining Corp. ¹	25 Adelaide St. W., Toronto, Ontario	Lamotte Twp.
Iso Uranium Mines Ltd. ¹	100 Adelaide St. W., Toronto, Ontario	Lacorne
La Corne Lithium Mines Ltd. ¹	25 King St. W., Toronto, Ontario	Lamotte Twp.
Major Lithium Mines Ltd. ¹	67 Yonge St., Toronto, Ontario	Lacorne Twp.
Massberyl Lithium Co. Ltd. ¹	100 Adelaide St. W., Toronto, Ontario	Lacorne Twp.
Quebec Lithium Corp.	1403 Edifice Aldred, Montreal	Barraute
Société d'Exploration Minière Cossette-Martel ¹	Première av ouest, Amos	Lamotte Twp.
Tide Lake Lithium Mines Ltd. ¹	100 Adelaide St. W., Toronto, Ontario	Figuery Twp.
Vallee Lithium Mining Corp. ¹	80 Richmond St. W., Toronto, Ontario	Fredmont Twp.
Valor Lithium Mines Ltd. ¹	100 Adelaide St. W., Toronto, Ontario	Vauquetin Twp.
Ontario:		
Alba Exploration Ltd. ¹	119 Adelaide St. W., Toronto	Barbara Lake
Lun Echo Gold Mines Ltd. ¹	67 Yonge St., Toronto	Nipigon
Dunvegan Mines Ltd. ¹	357 Bay St., Toronto	Cosgrave Lake
Manitoba:		
Lithium Corp. of Canada Ltd. ¹	25 Adelaide St. W., Toronto, Ontario	Lac du Bonnet
Viola Mac Mines Ltd. ¹	25 Adelaide St. W., Toronto, Ontario	Cat Lake
Green Bay Mining & Exploration Ltd. ¹	100 Royal Trust Bldg., Edmonton	Herb Lake
Northwest Territories:		
Boreal Rare Metals ¹	414 St. James St. W., Montreal, Quebec	Hearn Channel
MAGNESITIC DOLOMITE		
Quebec:		
Canadian Refractories Ltd.	540 Canada Cement Bldg., Montreal	Kilmar
MINERAL WATERS		
Quebec:		
Brevages Lazure	1395 Choquette, St-Hyacinthe	St-Hyacinthe
Eau Minérale Etoile	Ste-Geneviève de Batiscan	Batiscan
Eau minérale naturelle, St. Léon	1, rue St-Laurent, Louisville	Maskinongé
King's Court Beverages Co. Ltd.	2901 Sherbrooke St. E., Montreal	Chambly
Crush International Ltd.	1590 O'Connor Drive, Toronto, Ontario	Varennes
Sources Abenakis Ltée	St-François-du-Lac	St-François-du-Lac
Radnor Beverages	St-Maurice	St-Maurice
Usine d'Embouteillage Maski Enrg.	400 rue Mailot, Trois-Rivières	St-Justin
Ontario:		
Carlsbad Springs, The	Carlsbad Springs	Gloucester Twp.
Excel Beverages Ltd.	Bourget	Bourget
MICA		
Quebec:		
Blackburn Bros. Ltd.	85 Sparks St., Ottawa, Ontario	Cantley
Brown, Arthur	Cantley	Cantley
Barrett, J.	Cantley	Cantley
Cross, W.C.	209 Bridge St., Hull	Hull
Caron & Fileon Mica Mine Enrg.	St. Michel de Wentworth	Wentworth

¹ Holds dormant property.² Active but not producing.

Directory of Firms in the Miscellaneous Non-metal Mining Industry, 1959 - Continued

Name of operator	Head office address	Plant or mine location
MICA - Concluded		
Quebec - Concluded:		
Gagne, C	St. Michel de Wentworth	Wentworth
Hogan, A	Cantley	Cantley
Joanisse, L.	31 Graham St., Hull	Gatineau
Lawler, Pat	St. Michel de Wentworth	Wentworth
Lavigne, E.	St-Pierre de Wakefield	Wakefield
Law & Co.	209 Eddy St., Hull	Hull, Twp.
Mica Co. of Canada Ltd.	2 Lois St., Hull	Hull
Poirier, C.	St-Pierre de Wakefield	Portland West
Sargent, Fred	RR. 3 Wakefield	Hull
Trudeau Victor H.	Wilsons Corners	Hull Twp.
Trudeau, Wm.	Old Chelsea	Hull Twp.
Ontario:		
Buchanan, Geo.	31 South St., Perth	Lanark
Duggan & Auld	Dunchurch	Hagerman
Green, W.E. and E.C.	Perth Road	North Burgess
Greer, R.	Parry Sound	Parry Island
Mid Bay Mica Syndicate	North Bay	Nipissing
Watts, R.W.	21 Isabella St., Perth	Lanark
British Columbia:		
Fairey & Co.	661 Taylor St., Vancouver	Vancouver
PERLITE		
British Columbia:		
Western Gypsum Products Ltd. ¹	Childs Building, Winnipeg, Manitoba	Francois Lake
Perlite Mining Corp. Ltd. ¹	44 King St. W., Toronto, Ontario	Uncha Lake
PHOSPHATE		
Quebec:		
Bigelow, Robert ¹	Buckingham	Bowman Twp.
Blackburn Bros. Ltd. ¹	85 Sparks St., Ottawa, Ontario	Perkins
Quebec Smelting & Refining Ltd. ¹	215 St. James St. W., Montreal	Notre Dame de la Salette
Industrial Phosphate Mines Ltd. ¹	18 Toronto St., Toronto, Ontario	Portland East Twp.
Ontario:		
Ontario Phosphate Industries Ltd. ¹	Room 1101 - 62 Richmond St. W., Toronto	Bedford Twp.
McGlade, W.A. ¹	8 Church St., Perth	Burgess Twp.
POTASH		
Saskatchewan:		
Continental Potash Corp. Ltd. ²	508 Credit Foncier Bldg., Vancouver	Unity
Duval Sulphur and Potash Co. ¹	Mellie Esperson Bldg., Huston Texas	Saskatoon
International Minerals & Chemical Corp. ²	77 Metcalfe St. Ottawa Ontario	Esterhazy
Southwest Potash Corp. ²	61 Broadway, New York 6	Saskatoon
United States Borax & Chemical Corp. ²	630 Shatto Place, Los Angeles, Calif.	Saskatoon
Potash Co. of America Ltd.	Box 509 Saskatoon	Patience Lake
S.A.M. Explorations Ltd. ²	1168 Albert St., Regina	Riddle-Tidewater
PYRITE, PYRRHOTITE		
Newfoundland:		
Buchans Mining Co. Ltd. ²	Water St., St. John's	Buchans
New Brunswick:		
Middle River Mining Co. Ltd. ¹	42 Princess St., Saint John	Gloucester
Texas Gulf Sulphur Co. ¹	75 East 45th St. New York 17	Gloucester
Quebec:		
East Sullivan Mines Ltd.	1604 Alfred Bldg., Montreal	Bourlamaque Twp.
Quemont Mining Corp. Ltd.	350 Bay St., Toronto, Ontario	Rouyn Twp.
Noranda Mines Ltd.	Royal Bank Bldg., Toronto, Ontario	Noranda
Normetal Mining Corp. Ltd.	44 King St. W., Toronto, Ontario	Normetal
Waite-Amulet Mines Ltd.	Noranda	Duprat Twp.
Weedon Pyrite & Copper Corp. Ltd.	507 Place d'Armes, Montreal	Weedon
West MacDonald Mines Ltd.	1434 Ste-Catherine St. W., Montreal	Dufresnoy
Sulgas Properties Ltd. ²	744 W. Hastings St., Vancouver, British Columbia	Ascot Twp.

¹ Holds dormant property.² Active but not producing.

Directory of Firms in the Miscellaneous Non-metal Mining Industry, 1959 — Concluded

Name of operator	Head office address	Plant or mine location
PYRITE, PYRRHOTITE — Concluded		
Ontario: International Nickel Company of Canada Ltd.	Copper Cliff	Copper Cliff
Saskatchewan: Lorado Uranium Mines Ltd. ²	80 Richmond St. W., Toronto, Ont.	Beaverlodge
British Columbia: Consolidated Mining & Smelting Company of Canada Ltd. Britannia Mining & Smelting Co. Ltd.	Trail Britannia Beach	Kimberley Britannia Beach
SILICA BRICK		
Nova Scotia: Dominion Steel & Coal Corp. Ltd.	Sydney	Sydney
Ontario: Algoma Steel Corp. Ltd.	Sault Ste. Marie	Sault Ste. Marie
SODIUM CARBONATE (Natural)		
British Columbia: Bishop, V.C. (Mrs.) ¹	c/o Boyd's Garage, Clinton	Clinton area
SODIUM SULPHATE (Natural)		
Saskatchewan: Ormiston Mining & Smelting Co. Ltd. Midwest Chemicals Ltd. Sybouts Sodium Sulphate Co. Ltd. Saskatchewan Minerals (Sodium Sulphate Div.)..	Ormiston Box 446, Edmonton, Alberta Gladmar Chaplin	Ormiston Palo Gladmar Chaplin, Bishoperic
SULPHUR (in smelter gas)		
Quebec: Aluminum Co. of Canada Ltd. ³	Sun Life Bldg., Montreal	Arvida
Ontario: Canadian Industries Ltd.	Box 10, Montreal, Quebec	Copper Cliff
British Columbia: Consolidated Mining & Smelting Company of Canada Ltd.	Trail	Trail

¹ Holds dormant property.² Active but not producing.³ Produces acid by calcining zinc sulphide concentrates.

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