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1964

Formerly The Miscellaneous Metal Mining Industry

DOMINION BUREAU OF STATISTICS

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MISCELLANEOUS METAL MINES

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SUMMARY

Aluminum
Antimony
Barium
Beryllium
Bismuth
Cadmium
Calcium
Cerium
Columbium
Chromium
Indium
Magnesium
Manganese
Mercury
Molybdenum
Selenium
Tantalum
Tellurium
Thallium
Thorium
Tin
Titanium (ilmenite)
Tungsten
Uranium
Vanadium
Zirconium

Principal statistics presented in this report under the heading of Miscellaneous Metal Mines (Tables 1-8) reflect a combination of two industries as defined in the Standard Industrial Classification Manual Catalogue No. 12-501, namely, industry 057 – Uranium Mines and industry 059 – Other Metal Mines. For statistical purposes, the industry Uranium Mines is defined as including establishments primarily engaged in mining uranium or radium ores and in dressing and beneficiating such ores. The industry Other Metal Mines is defined as including establishments primarily engaged in mining metal ores not elsewhere classified and in dressing and beneficiating such ores. The following types of mines are included in this industry: chromite, manganese, mercury, molybdenite, tungsten, titanium, etc. – for a more complete listing of the metals covered in this report see above.

The production of these metals in some instances is confined to a few operators and the annual extraction of certain types of ores often fluctuates in an erratic manner according to demand and supply. Included in this report, with the statistics relating to the Canadian production of these ores or metals, are notes and statistical data pertaining to various rare or semi-rare metals of metalliferous ores produced in other countries. In addition to particulars relating to these metals or minerals, the bulletin contains notes of summary nature on aluminum, beryllium, vanadium and a few of the rarer metals.

It should be noted that some of the metals listed above as Canadian products, and including bismuth, cadmium, selenium and tellurium represent by-products recovered in the refining of lead, zinc or copper and, for this reason, the statistics of employment, etc., relating to their production in Canada are included with those of either the silver-lead-zinc mining industry, the copper-gold-silver mining industry or the smelting and refining industry.

Data presented in this report under the heading of Miscellaneous Metal Mines (Tables 1-8) reflect the full implementation of the revised Standard Industrial Classification (S.I.C.) and the New Establishment Concept including an extension of the latter to cover total activities of mining establishments (see Explanatory Notes section of this report). Commodity statistics reflecting total production from all sources, world figures on production, trade data, etc. are presented along the same general lines as in the earlier issues of this report.

The combination of improvements in internal procedures with the introduction of the final stage of the establishment concept in the annual Census of Mining produced changes which, for some industries, required major adjustments in industry statistical data – see Explanatory Notes. In the case of the industry under review in this report, the changes primarily affected the items relating to number of establishments and cost of materials and supplies, as evidenced in the comparative series of statistics presented in Tables 1 and 2. The reduction in the number of establishments indicated is the result of the exclusion of non-producers. These latter are no longer being included as establishments under the new definition. The higher cost of materials reflects the broadening of the coverage of materials used under the new definition – see Explanatory Notes.

SYMBOLS

The following standard symbols are used in Dominion Bureau of Statistics publications:

.. figures not available.

... figures not appropriate or not applicable.

— nil or zero.

-- amount too small to be expressed.

p preliminary figures.

r revised figures.

TABLE 1. Principal Statistics, Miscellaneous Metal Mines, 1957-63

Basic: Revised Standard Industrial Classification

Year	Establishments	Employees	Salaries and wages	Cost of fuel and electricity	Cost of materials and supplies	Value of production	Value added[1]
	number		dollars				
1957	139	8,705	42,386,402	6,539,935	20,949,018	144,689,661	115,788,076
1958	91	14,375	78,320,507	9,293,152	50,827,573	284,367,777	223,484,942
1959	84	13,645	76,604,136	9,023,750	57,982,723	333,770,291	265,835,151
1960	68	9,380	54,453,208	7,570,803	40,059,514	273,409,628	224,482,268
1961	43	5,919	34,332,063	5,856,827	22,992,059	201,214,250	170,664,295
1962	29	5,120	30,354,642	4,989,168	22,129,854	164,135,270	135,816,670
1963	35	4,468	27,924,566	4,755,070	19,752,181	144,412,912	118,642,123

[1] Value of production, less the value of fuel, electricity, process supplies, freight and treatment charges. See footnote Table 2.

TABLE 2. Principal Statistics, Miscellaneous Metal Mines,[1] 1961-64

Basic: Revised Standard Industrial Classification and New Establishment Concept

Year	Establishments	Mining activity							Total activity				
		Production and related workers			Cost of fuel and electricity	Cost of materials and supplies	Value of production	Value added	Working owners and partners		Employees		Value added
		Number	Man-hours paid	Wages					Number	Withdrawals	Number	Salaries and wages	
	No.		$'000	$'000						$'000		$'000	
1961	15	4,774	9,624	27,426	5,274	26,345	205,598	173,979	—	—	5,816	33,914	174,878
1962	13	4,143	8,333	24,204	4,720	24,489	160,752	131,543	—	—	5,048	29,915	132,309
1963	14	3,564	7,670	21,889	4,638	21,324	142,177	116,215	—	—	4,410	27,718	117,031
1964	15	2,872	6,144	17,418	3,824	18,563	86,359	63,972	—	—	3,696	22,620	65,831

[1] Refer to Explanatory Notes for description of concepts and definitions and an explanation of differences in Tables 1 and 2. See also text page 3.

TABLE 3. Employment and Payroll, Miscellaneous Metal Mines, 1961-63

Basis: Revised Standard Industrial Classification

Year	Employees										Salaries and wages				
	Production and related workers				Administrative and office		Sales and distribution		Total		Production and related workers		Administrative and office	Sales and distribution	Total
	Mining		Other												
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Mining	Other			
	number										$'000				
1961	4,925	15	—	—	877	102	—	—	5,802	117	28,365	—	5,967	—	34,332
1962	4,287	5	—	—	737	91	—	—	5,024	96	25,113	—	5,242	—	30,355
1963	3,658	2	—	—	731	77	—	—	4,389	79	22,424	—	5,500	—	27,924

See footnote Table 2.

TABLE 4. Employment and Payroll, Miscellaneous Metal Mines, 1961-64

Basis: Revised Standard Industrial Classification and New Establishment Concept

Year	Employees										Salaries and wages				
	Production and related workers				Administrative and office		Sales and distribution		Total		Production and related workers		Administrative and office	Sales and distribution	Total
	Mining		Other												
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Mining	Other			
	number										$'000				
1961	4,763	11	48	1	879	114	—	—	5,690	126	27,426	247	6,240	—	33,914
1962	4,139	4	37	1	768	99	—	—	4,944	104	24,204	216	5,495	—	29,915
1963	3,562	2	45	1	720	80	—	—	4,327	83	21,889	266	5,562	—	27,718
1964	2,869	3	129	1	620	74	—	—	3,618	78	17,418	593	4,609	—	22,620

See footnote Table 2.

TABLE 5. Production and Related Workers, Miscellaneous Metal Mines, 1963 and 1964

Basis: Revised Standard Industrial Classification and New Establishment Concept

Year and month	Mine			Mill	
	Surface		Underground	Male	Female
	Male	Female	Male		
	number				
1963					
January	747	–	2,276	727	2
February	718	–	2,254	726	2
March	707	–	2,227	720	2
April	846	–	2,212	742	2
May	880	–	2,207	754	2
June	813	–	1,943	710	2
July	838	–	1,919	707	2
August	828	–	1,945	686	2
September	803	–	1,968	645	2
October	800	–	1,975	639	2
November	794	–	1,996	640	2
December	710	–	2,015	630	2
Averages	**791**	**–**	**2,078**	**694**	**2**
1964					
January	653	–	2,010	699	2
February	651	–	1,939	687	2
March	744	–	1,901	615	2
April	755	–	1,825	590	2
May	788	–	1,738	605	2
June	782	–	1,614	633	3
July	775	–	1,495	596	4
August	764	–	1,406	555	4
September	662	–	1,397	529	4
October	634	–	1,424	493	3
November	573	–	1,376	480	4
December	488	–	1,126	428	4
Averages	**689**	**–**	**1,604**	**576**	**3**

TABLE 6. Purchased Fuel and Electricity Used, Miscellaneous Metal Mines, 1963 and 1964

Basis: Revised Standard Industrial Classification and New Establishment Concept

		1963		1964	
		Quantity	Cost	Quantity	Cost
			$'000		$'000
Bituminous coal:					
(a) From Canadian mines		–	–	–	–
(b) Imported	ton	66,118	974	56,150	856
Sub-bituminous coal (from Alberta mines only)	"	–	–	56,150	–
Anthracite coal		–	–	–	–
Lignite coal		–	–	–	–
Coke		–	–	–	–
Gasoline (including gasoline used in cars and trucks)	Imp. gal.	262,000	105	226,521	93
Fuel oil including kerosene or coal oil	"	7,255,887	1,371	5,107,798	961
Wood		–	–	–	–
Gas:					
(a) Liquefied petroleum gases	Imp. gal.	36,326	14	29,270	5
(b) Other manufactured gas		–	–	–	–
(c) Natural gas		–	–	–	–
Other fuel		–	–	...	20
Electricity purchased	kwh	320,773,816	2,174	276,923,410	1,887
Steam purchased		...	..	...	..
Total fuel and electricity used		...	**4,638**	...	3,824
Electricity generated:					
(a) For own use	kwh	104,531,400	..	86,284,210	..
(b) For sale	"	3,017,400	..	3,129,600	..

TABLE 7. Materials and Supplies, Miscellaneous Metal Mines,[1] 1963 and 1964
Basis: Revised Standard Industrial Classification and New Establishment Concept

Description	Cost	
	1963	1964
	$'000	
Ore or other semi-processed materials purchased and used in mine/mill operations	–	16
Containers, shipping materials and supplies used	217	183
Operating, maintenance and repair supplies used (excluding fuel)	20,404	17,280
Amount paid out to others for work done on materials owned by establishments	702	1,084
Totals	**21,324**	**18,563**

[1] Refer to Explanatory Notes for explanation of differences in Tables 7 and 8 with data published in earlier years.

TABLE 8. Value of Production, Miscellaneous Metal Mines, 1963 and 1964
Basis: Revised Standard Industrial Classification and New Establishment Concept

Description	Value	
	1963	1964
	$'000	
Value of production	142,177	86,291
Amount received in payment for work done on materials and products owned by others	–	–
Subsidies received	–	68
Total value of production and work done	**142,177**	**86,359**

See footnote Table 7.

TABLE 9. Drilling Completed on Miscellaneous Metal,[1] Deposits, 1964

	Footage drilled
Diamond drilling for exploration and testing:	
By mining companies with their own personnel and equipment	39,895
By diamond drilling contractors	214,777
Other diamond drilling:	
Blast hole diamond drilling:	
By mining companies with their own personnel and equipment	–
By diamond drilling contractors	–
Drilling by percussion or other machines[2]	14,426,659

[1] Data are not comparable to those published in earlier years when non-producing mines were included.
[2] Not complete as records are unobtainable at certain mines.

TABLE 10. Specified Taxes Paid by Companies Engaged in Miscellaneous Metal Mines Operations,[1] 1964

Nature of tax	Dollars
Dominion income taxes	–
Provincial taxes	899,012
Municipal taxes	488,704

[1] (a) Data are not comparable to those published in earlier years when non-producing mines were included.
(b) Includes related corporate activities associated with operations of Miscellaneous Metal Mines.

TABLE 11. Miscellaneous Expenditures Made by Companies Engaged in Miscellaneous Metal Mines Operations,[1] 1964

Description	Dollars
(a) Workmen's compensation	902,502
(b) Silicosis assessment	57,472
(c) Unemployment insurance	176,605
(d) Aggregate cost of structures, roads, machinery, equipment, etc., built by or purchased from outside contractors or suppliers and chargeable to Fixed Assets Account	3,971,430
(e) Book value of fixed assets (new structures, roads, machinery, equipment, etc., including major repairs and alterations) produced by own employees and chargeable to Fixed Assets Account	867,293
(f) Other capital expenditures not reported in (d) and (e)	9,600
(g) Cost of materials and supplies used in the production of machinery and equipment and in the construction of roads and new structures (including major repairs and alterations by own employees and chargeable to Fixed Assets Account)	397,398
(h) Cost of office supplies **used** during the year, not chargeable to Fixed Assets Account. Excludes cost of stamps and meter expenses	65,827

[1] Includes related corporate activities associated with Canadian operations of Miscellaneous Metal Mines not allocable separately elsewhere.

ALUMINUM

Although there is no bauxite (the ore of aluminum) in Canada, the aluminum smelting industry in this country is exceeded in size only by that of the United States. The principal factor favouring the establishment of the industry in Canada is abundant and low-cost hydro-electric power at points where necessary raw materials can be cheaply and conveniently assembled.

The output of aluminum ingots measured as molten metal amounted to 842,640 tons in 1964.

The Aluminum Company of Canada, Limited, operated its alumina plant at Arvida and the reduction plants at Arvida, Ile Maligne, Shawinigan Falls and Beauharnois. The Canadian British Aluminum Company Limited operated a reduction plant at Baie Comeau. All these plants are located in the province of Quebec.

In British Columbia the plant at Kitimat is supplied by power generated at Kemano which is about fifty miles distant. Alumina for the smelter is obtained from Jamaica.

The principal imported raw materials used in the Canadian Aluminum industry are bauxite from British Guiana, coal and coke from the United States, and cryolite from Greenland and the United States.

TABLE 12. Production, Consumption, Imports and Exports of Aluminum Ingots, 1955-64

Year	Production	Domestic consumption[1]	Exports	Imports
	tons (2,000 pounds)			
1955	612,543	91,522	510,631	99
1956	620,321	91,869	508,994	1,405
1957	556,715	77,984	478,670	2,122
1958	634,102	101,886	482,927	11,257
1959	593,630	88,797	505,342	852
1960	762,012	120,831	552,155	501
1961	663,173	135,575	487,034	636
1962	690,297	151,893	576,206	3,855
1963	719,390	161,833	635,187	1,954
1964	842,640	172,443	627,992	3,996

[1] Producers' domestic shipments to 1959, consumer reports, since 1960, which includes secondary aluminum.

Note: The above and subsequent tables contain data on commodities in various forms and origins. These series of data are not directly comparable to the industry fiscal data contained in Tables 1 to 11.

TABLE 13. Imports of Aluminum and Bauxite, 1963 and 1964

Item	1963		1964	
	Tons	Value	Tons	Value
		$		$
Alumina and bauxite, n.o.p.	184,583	5,695,788	..	..
Bauxite ore	2,019,400	61,210,583	..	..
Cryolite	4,857	841,766	..	..
Aluminum:				
Pigs, ingots and block	1,954	1,364,959	..	..
Scrap	1,492	318,527	..	..
Angles, channels and beams	1,046	1,684,446	..	..
Bars, rods and wire	888	948,511	..	..
Leaf or foil	...	1,431,929	..	..
Pipes and tubes	460	709,858	..	..
Plates, sheets and strips	28,740	21,621,217	..	..
Powder and paste	164	190,771	..	..
Wire and cable	491	473,724	..	..
Household hollow-ware	...	1,080,065	..	..
Manufactures, n.o.p.	...	15,223,787	..	..
Bauxite ore	..	..	1,751,309	13,890,663
Alumina	..	..	870,974	55,685,516
Aluminum and aluminum alloy scrap	..	..	20,112	848,301
Aluminum:				
Paste and powder	..	..	280	239,457
Pigs, ingots, shot slabs, etc.	..	..	3,996	2,613,293
Castings and forgings	..	..	1,094	2,762,510
Bar and rods	..	..	545	719,811
Plates	..	..	2,017	2,456,129
Sheets and strips	..	..	32,880	23,989,860
Foil or leaf	..	..	645	882,787
Structural shapes	..	..	988	1,837,913
Pipe and tubing	..	..	349	605,764
Wire and cable	..	..	352	298,869
Aluminum and alloy fabricated materials, n.e.s.	..	..	..	3,177,558
Cryolite, natural	..	..	2,423	469,557

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

TABLE 14. Exports of Aluminum, 1963 and 1964

Item	1963		1964	
	Tons	Value	Tons	Value
		$		$
Aluminum ores, concentrates	2,644	357,571	5,041	519,938
Aluminum scrap	43,596	12,643,746	32,807	8,158,867
Aluminum pigs, ingots, slabs	635,187	287,181,031	627,992	300,245,805
Aluminum bars, rods, plates	12,787	7,152,765	18,054	10,752,644
Aluminum foil	465	463,584	379	392,069
Aluminum fabricated materials, n.e.s.	14,303	7,932,763	10,405	6,546,310

Source: Trade of Canada, "Exports by Commodities", Catalogue No. 65-004.

TABLE 15. World Production of Bauxite, by Countries, 1960 - 64

Country	1960	1961	1962	1963	1964
	in thousand long tons				
North America (dried equivalent of crude ore):					
Dominican Republic	678	737	665	761	807
Haiti	268	263	370	327	373
Jamaica	5,745	6,663	7,495	6,903	7,811[1]
United States	1,998	1,228	1,369	1,525	1,601
South America:					
Brazil	119	110	188	167	130
British Guiana	2,471	2,374	3,036	2,342	2,468
Surinam	3,400	3,398	3,245	3,384	3,930
Europe:					
Austria	26	18	17	18	4
France	2,035	2,190	2,160	1,997	2,394
Germany, West	4	4	5	4	—
Greece	870	1,100	1,267	1,261	1,280[2]
Hungary	1,171	1,344	1,450	1,340	1,465
Italy	308	322	305	264	232
Rumania	87	68	30	10	7
Spain	3	6	6	12	—
U.S.S.R.[2,3]	3,500	4,000	4,200	4,300	4,300
Yugoslavia	1,009	1,213	1,311	1,265	1,273
Asia:					
China (diasporic)[2]	350	400	400	400	400
India	381	468	568	560	582
Indonesia	389	413	454	485	638
Malaysia:					
Malaya	452	410	349	444	464
Sarawak	285	253	225	155	158
Pakistan	1	1	—	—	—
Turkey	—	—	—	—	4
Africa:					
Ghana	224	201	239	309	240
Guinea, Republic of	1,356	1,739	1,445	1,638	1,652
Mozambique	5	5	6	6	—
Rhodesia (formerly Southern)	—	—	1	2	2
Sierra Leone	—	—	—	30[2]	151
Oceania: Australia	69	16	30	354	841
World totals[2]	**27,205**	**28,945**	**30,835**	**30,260**	**33,230**

[1] Bone dry equivalent of bauxite shipments and bauxite converted into alumina.
[2] Estimate.
[3] Excludes nepheline concentrates and alunite ores.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

TABLE 16. World Production of Aluminum, 1960 - 64

Country	1960	1961	1962	1963	1964
	short tons				
North America:					
Canada	762,012	663,173	690,297	719,390	843,002
Mexico	—	—	—	6,100	19,487
United States	2,014,498	1,903,711	2,117,929	2,312,528	2,552,747
Totals	**2,776,510**	**2,566,884**	**2,808,226**	**3,038,018**	**3,415,236**
South America: Brazil	20,034	22,078	22,202	19,412	29,366
Europe:					
Austria	74,924	74,578	81,668	84,287	85,646
Czechoslovakia	44,100	55,100	65,000[1]	65,000[1]	65,000[1]
France	262,890	308,047	325,288	328,891	348,319
Germany, East[1]	44,000	50,000	50,000	50,000	50,000
West	186,221	190,212	196,017	230,142	242,418
Hungary	54,602	56,286	58,127	61,176	62,693
Italy	92,206	91,881	91,390	100,782	127,337
Norway	181,662	189,109	226,941	238,209	278,444
Poland (includes secondary)	28,640	52,488	53,007	51,365	52,639
Spain	31,680	41,500	45,953	50,142	54,723

See footnote at end of table.

TABLE 16. World Production of Aluminum, 1960-64 — Concluded

Country	1960	1961	1962	1963	1964
	short tons				
Europe—Concluded:					
Sweden, including alloys	17,619	17,463	17,580	18,878	35,164
Switzerland	43,795	46,530	54,640	66,260	70,805
U.S.S.R.[1]	705,000	980,000	990,000	1,060,000	1,100,000
United Kingdom	32,390	36,169	38,113	34,243	35,516
Yugoslavia	27,635	30,211	30,843	39,567	38,320
Totals[1]	**1,825,000**	**2,200,000**	**2,325,000**	**2,480,000**	**2,645,000**
Asia:					
China[1]	88,200	110,000	110,000	110,000	110,000
India	20,123	20,263	39,025	60,881	60,830
Japan[2]	146,853	169,424	188,991	246,854	292,950
Taiwan	9,106	9,938	12,135	13,148	21,354
Totals[1]	**264,300**	**309,600**	**350,200**	**430,900**	**485,100**
Africa: Cameroon, Republic of	48,436	52,446	57,596	58,327	56,777
Oceania: Australia	13,054	14,789	18,090	46,214	88,194
World totals[1]	**4,950,000**	**5,185,000**	**5,580,000**	**6,075,000**	**6,720,000**

[1] Estimate.
[2] Includes superpurity: 1960, 2,187; 1961, 1,307; 1962, 1,969; 1963, 2,060; 1964, 2,092 tons.

Source: "Minerals Yearbook" published by United States Bureau of Mines.

ANTIMONY

Antimony production consists of the antimony content of antimonial lead alloys, varying from 5 to 25 per cent antimony, made by the Consolidated Mining and Smelting Co. of Canada, Limited, at Trail, British Columbia; and antimony in flue dust and Doré slag shipped from that smelter.

The greatest single use for antimony is as an alloying element with lead to which it adds hardness and mechanical strength such as in the manufacture of storage batteries and cable covering. It is alloyed with tin in the manufacture of babbit bearings and with lead and tin in solders, foil, collapsible tubes and type metal. Its property of expansion on cooling when alloyed makes it particularly useful in the manufacture of type metal. It is used to harden the lead used in ammunition and to flame-proof canvas goods.

TABLE 17. Production of Antimony, 1955-64

Year	In ores and slags exported		In antimonial lead produced		Total	
	Pounds	Value	Pounds	Value	Pounds	Value
		$		$		$
1955	455,732	38,737	1,565,994	524,608	2,021,726	563,345
1956	331,790	27,373	1,808,642	660,154	2,140,432	687,527
1957	452,184	37,934	908,547	332,508	1,360,731	370,442
1958	—	—	858,633	284,208	858,633	284,208
1959	—	—	1,657,797	540,276	1,657,797	540,276
1960	—	—	1,651,786	538,482	1,651,786	538,482
1961	—	—	1,331,297	469,948	1,331,297	469,948
1962	—	—	1,931,397	748,223	1,931,397	748,223
1963	—	—	1,601,253	624,489	1,601,253	624,489
1964	—	—	1,591,523	700,270	1,591,523	700,270

TABLE 18. Available Data on Consumption[1] of Antimony Metal, 1962 - 64

	1962	1963	1964
	pounds		
Used in production of:			
Antimonial lead alloys	749,850	648,126	277,190
Babbitt	101,056	91,187	72,020
Solder	14,698	14,691	16,374
Type metal	180,751	180,273	141,484
Other commodities	164,301	41,350	51,023
Totals accounted for	**1,210,656**	**975,627**	**558,091**

[1] (a) **Source**: Special Survey, Manufacturing and Primary Industries Division, DBS.
(b) Does not represent total consumption as there is no complete record of usage by all establishments.

TABLE 19. World Production of Antimony (Content of Ore), by Countries, 1960 - 64

Country	1960	1961	1962	1963	1964
	short tons				
North America:					
Canada[1]	826	666	966	801	796
Guatemala (U.S. imports)	119	71	32	31	—
Mexico[2]	4,664	3,978	5,257	5,320	5,278
United States	635	689	631	645	632
South America:					
Argentina	—	—	—	—	—
Bolivia (exports)[2]	5,872	7,430	7,331	8,337	10,626
Peru[2]	901	870	575	674	752
Europe:					
Austria	676	668	767	548	585
Czechoslovakia[3]	1,800	1,800	2,200	2,200	2,200
France	—	—	—	110	185
Italy	238	276	369	266	376
Portugal	—	—	—	7	13
Spain	243	190	175	65	60
U.S.S.R.[3]	6,300	6,300	6,600	6,700	6,700
Yugoslavia (metal)	2,657	2,715	2,966	2,933	3,008
Africa:					
Algeria	886	720	149	—	—
Morocco	358	406	449	744	1,720
Rhodesia, Southern	100	68	61	66	49
South Africa, Republic of	13,537	11,804	11,697	12,410	14,200
Asia:					
Burma[2]	180	166	75	[4]	[4]
China[3]	16,500	16,500	16,500	16,500	16,500
Iran[5]	55[5]	—	—	—	66[6]
Japan	299	215	190	212	554
Pakistan	69	15	75	9	90
Ryukyu Islands	159	112	—	—	—
Sarawak	—	—	—	—	86
Thailand	—	25	19	676	1,399
Turkey	1,507	1,502	1,962	1,981	1,915
Oceania: Australia	172	132	74	83	305
World totals[3]	**58,800**	**57,200**	**59,100**	**61,300**	**68,100**

[1] Antimony content of smelter products exclusively from mixed ores.
[2] Includes antimony content of smelter products derived from mixed ores.
[3] Estimate.
[4] Revised to none.
[5] Year ended March 20 of year following that stated.
[6] Exports.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

TABLE 20. Imports of Antimony Oxide, by Principal Countries of Supply, 1960-64

Country	1960	1961	1962	1963	1964
	pounds				
United Kingdom	253,375	170,560	332,280	511,840	403,700
United States	139,476	100,150	128,055	82,200	122,200
Belgium-Luxembourg	44,000	44,007	67,354	11,200	28,600
Germany, West	—	—	—	—	45,000
France	—	44,000	—	—	—
China (Communist)	—	—	99,900	44,092	110,200
Totals	**436,851**	**358,717**	**627,589**	**649,332**	**709,700**

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

BARIUM

The commercial production of barium metal was introduced in Canada by the Dominion Magnesium Limited, at Haley, Ontario, in 1947. There was a small production during the years 1950-64.

The raw material for making barium metal is imported so the output figures are not included in the statistics of Canada's mineral production.

BERYLLIUM

No beryllium ore has been mined since 1941 when some was produced in Renfrew county and stockpiled. in 1950, a carload of this material was shipped to the United States. No shipments were made in 1964.

In Manitoba a little work was done several years ago on beryl showings in pegmatites opened originally for feldspar and lithium minerals in the Winnipeg River and Oiseau (Bird) River areas, but no shipments were reported.

In the Northwest Territories exploration in the area north and east of the Yellowknife gold camp has disclosed numerous occurrences of beryl in pegmatites which also contain lithium minerals and tantalite-colombite. Some of these are considered to be of possible economic interest.

In Quebec scattered occurrences of beryl are known in the Lacorne and Preissac townships, Abitibi county, often associated with molybdenite. None of these, however, is believed to be of economic importance.

Beryllium is used chiefly in the form of beryllium-copper alloys, the most important of which contains about 5 per cent beryllium. A beryllium-aluminum alloy containing 5 per cent beryllium is used as a deoxidizer in making aluminum-magnesium products. Straight beryllium metal has only limited applications, notably for the windows of X-ray tubes, where it is used for its transparency to the rays.

Ground beryl is used as a batch ingredient in spark plugs and other ceramic specialties, to which it imparts high electrical and impact resistance and transverse strength. Some is also used in cooking utensil enamels.

TABLE 21. World Production of Beryl, by Countries, 1960-64

Country	1960	1961	1962	1963	1964
	short tons				
Argentina[1]	1,157	1,488	998	825	442
Australia	—	343	250	123	123
Brazil[1]	3,827	3,503	3,319	2,170	1,566
Congo (Léopoldville)	369	184	304	235	136
India[2]	—	885	150	—	—
Kenya	—	1	—	—	1
Korea, South	—	6	—	—	—
Malagasy Republic	701	836	743	453	234
Mozambique	1,649	1,073	627	613	451
Portugal	—	39	19	2	20
Rhodesia, Southern	539	396	559	249	182
Ruanda	—	525	394	282	328
South Africa, Republic of	—	192	360	425	151
South West Africa	—	252	159	61	8
Swaziland	—	7	—	2	—

See footnotes at end of table.

TABLE 21. World Production of Beryl, by Countries, 1960 - 64 — Concluded

Country	1960	1961	1962	1963	1964
	short tons				
Sweden[2]	—	—	26	—	49
Uganda	470	1,136	1,116	419	434
U.S.S.R.[3,4]	750	900	1,000	1,100	1,100
United States (mine shipments):					
Cobbed beryl	—	317	218	1	[5]
Other lower grade beryllium ore	—	805	760	750	—
Worlds totals[3]	**12,300**	**12,900**	**11,000**	**7,700**	**5,200**

[1] Exports.
[2] United States imports.
[3] Estimate.
[4] Cobbed concentrates at about 11 per cent BeO.
[5] U.S. output very small, not included in world totals.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

BISMUTH

Bismuth is recovered from the lead-zinc ores which are smelted at Trail by the Consolidated Mining and Smelting Company of Canada. The silver-cobalt ores of Cobalt, Ontario contain bismuth, which is recovered by Cobalt Refinery. Bismuth metal is a by-product in the smelting of the copper ores at Gaspé, Québec. The Molybdenite Corporation of Canada produces bismuth metal and bismuth salts at Lacorne, Quebec.

Bismuth is too brittle to be used alone, but its alloys have many uses, such as, in the manufacture of sprinkler plugs and other fire-protection devices, electrical fuses, low-melting solder, dental amalgams and tempering baths for small tools. Like antimony, bismuth expands on solidification and retains this property in a number of alloys, and is used in type metal. This group of bismuth-lead-tin-cadmium alloys is used by the airplane and automotive industries to prepare spotting fixtures, to make moulds for electroforming, to fill thin-walled tubing during bending and to spray-coat wooden patterns and core boxes in foundries.

TABLE 22. Production of Primary Bismuth in All Forms,[1] 1955 - 64

Year	Pounds	Value	Year	Pounds	Value
		$			$
1955	265,896	572,362	1960	423,827	762,048
1956	285,861	544,900	1961	478,118	957,625
1957	319,941	584,917	1962	425,102	839,912
1958	412,792	771,267	1963	359,125	704,103
1959	334,736	590,212	1964	399,958	816,628

[1] Refined metal from Canadian ores, plus bismuth content of bullion and concentrates exported.

TABLE 23. Available Data on Consumption[1] of Bismuth Metal, in Canada, 1963 and 1964

	1963	1964
	pounds	
Used in:		
Fusible alloys and solders	31,707	32,620
Other[2]	16,106	21,056
Totals	**47,813**	**53,676**

[1] See footnote Table 18.
[2] Pharmaceuticals, chemicals and malleable iron.

TABLE 24. World Production of Bismuth, by Countries,[1] 1960 - 64

Country[1]	1960	1961	1962	1963	1964
	pounds				
Argentina (in ore)	14,900[2]	8,600[2]	7,100	1,345	9
Australia (in ore)	265	602	97	–	–
Bolivia	403,700	502,023	669,987	560,873	599,365
Canada (metal)[3]	423,827	478,118	425,102	395,125	399,958
China (in ore)[2]	[2]	660,000	660,000	660,000	660,000
France (in ore)	112,400	116,800	138,890	150,000	140,000
Japan (metal)	261,089	422,326	572,841	823,314	1,115,611
Korea, South (in ore)	317,000	333,000	353,000	349,000	1,100,000
Mexico[3]	599,400	643,700	780,000	941,400	1,040,500
Mozambique	30,000	38,800	13,889	24,317	14,462
Peru[3]	908,438	1,031,795	1,084,227	1,244,367	1,614,779
South West Africa (in ore)	310	485	154	5,115	3,131
South Africa, Republic of (in ore)	511	168	130	2,619	161
Spain (metal)	29,875	21,427	18,799	25,836	25,800
Sweden[2]	79,000	79,000	155,000	155,000	150,000
Uganda	3,640	1,433	110	65	–
Yugoslavia (metal)	231,582	216,348	199,765	194,657	184,660
World totals (estimate)[1]	**5,300,000**	**5,700,000**	**6,700,000**	**6,800,000**	**8,200,000**

[1] United States figure withheld to avoid disclosing individual company confidential data; included in world total. Bismuth is believed to be produced also in Brazil, Germany and U.S.S.R. Production figures are not available for these countries, but estimates are included in the total.
[2] Estimate.
[3] Bismuth content of refined metal and bullion plus recoverable content of concentrates exported.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

CADMIUM

Cadmium is recovered in Canada as a by-product of the electrolytic refining of zinc. The zinc refineries at Trail, British Columbia, and Flin Flon, Manitoba, both produce metallic cadmium. In British Columbia the greater portion of cadmium is derived from the lead-zinc ores of the Sullivan mine, but also a considerable amount is recovered from the customs ores shipped from various mines in British Columbia and Yukon to the smelter of the Consolidated Mining & Smelting Company of Canada, Limited, at Trail. Cadmium is found in the copper-gold-zinc ores of the Flin Flon deposit on the Saskatchewan-Manitoba boundary. Cadmium was recovered from the zinc concentrates exported by three base metal mines in Quebec and one mine in New Brunswick. The Canadian Electrolytic Zinc Limited recovered cadmium from zinc concentrates received from Quebec and Ontario mines.

Cadmium is used mainly in electroplating and in the manufacture of alloys and compounds, the most common use being as a protective coating for steel. To a much lesser extent, it is used in copper alloys. The use of cadmium alloys in motor vehicle bearings and for solders has created a strong demand for the metal. Cadmium is used also in the arts, paints, ceramics and dyeing, etc.

Cadmium is marketed in metallic form, 99.5 per cent pure and better, and as a sulphide. The principal compounds are cadmium sulphide, cadmium oxide, cadmium lithopone and cadmium selenite.

TABLE 25. Production of Cadmium in all Forms, 1955 - 64

Year	New Brunswick, Quebec and Ontario		Manitoba and Saskatchewan		British Columbia and Yukon		Canada	
	pounds	$	pounds	$	pounds	$	pounds	$
1955	–	–	191,691	325,875	1,727,390	2,936,564	1,919,081	3,262,439
1956	–	–	156,986	266,876	2,182,435	3,710,140	2,339,421	3,977,016
1957	–	–	226,348	384,791	2,141,782	4,025,821	2,368,130	4,025,821
1958	–	–	342,587	520,732	1,413,463	2,148,463	1,756,050	2,669,195
1959	–	–	322,792	413,174	1,837,571	2,352,091	2,160,363	2,765,265
1960	66,499	94,429	366,636	520,623	1,924,362	2,732,594	2,357,497	3,347,646
1961	–	–	307,757	492,411	1,050,117	1,680,187	1,357,874	2,172,598
1962	66,293	114,024	317,495	546,092	2,221,185	4,070,841	2,604,973	4,730,957
1963	43,546	104,510	316,050	758,520	2,115,889	5,078,134	2,475,485	5,941,164
1964	446,955	1,448,134	329,552	1,067,748	1,996,477	6,468,585	2,772,984	8,984,467

TABLE 26. Exports of Cadmium, 1963 and 1964

Destination	1963		1964	
	Pounds	Value	Pounds	Value
		$		$
Belgium-Luxembourg	–	–	4,500	17,300
United Kingdom	1,306,465	2,957,358	1,137,725	3,726,684
France	8	238	–	–
Sweden	5,063	14,176	–	–
Switzerland	3	163	–	–
India	33,390	90,694	21,141	73,925
South Africa, Republic of	–	–	1,000	3,535
Brazil	9,036	18,161	–	–
Netherlands	–	–	10,044	33,061
United States	584,929	1,375,682	441,117	1,327,774
Germany, West	16	102	13	103
Israel	200	540	1,700	6,398
Italy	–	–	6,328	21,961
Japan	–	–	11	301
Chile	–	–	100	353
Totals	**1,939,110**	**4,457,114**	**1,623,679**	**5,211,395**

Source: Trade of Canada, "Exports by Commodities", Catalogue No. 65-004.

TABLE 27. Available Data on Consumption[1] of Cadmium, 1963 and 1964

	1963	1964
	pounds	
Used for:		
Plating	185,251	141,099
Solders	19,645	19,914
Other products[2]	3,700	17,115
Totals accounted for	208,596	178,128

[1] See footnote Table 18.
[2] Chemicals, pigments and alloys, other than solder.

TABLE 28. World Production of Cadmium, by Countries,[1] 1960 - 64

Country	1960	1961	1962	1963	1964
	thousands of pounds[2]				
North America:					
Canada (all forms)	2,357	2,222	2,605	2,475	2,773
Honduras	10	10	31	192	231
Mexico (exports)	179	104	63	326	260
United States	10,445	10,466	11,137	9,990	10,458
South America: Peru (refined metal)	185	232	235	382	435
Europe:					
Austria	32	42	49	41	43
Belgium (exports)	1,583	1,988	1,854	1,943	1,858
France	560	560	567	655	849
Germany:					
East[3]	—	—	7	11	22
West	902	952	560	492	705
Italy	648	767	536	622	597
Netherlands[3]	88	88	88	88	88
Norway	243	231	254	243	254
Poland[3]	860	880	880	930	930
Spain	26	76	133	119	119[3]
U.S.S.R.[3]	3,000	3,300	3,500	3,700	3,900
United Kingdom	236	217	237	247	435
Yugoslavia[3]	84	88	88	88	90
Asia: Japan	1,252	1,596	1,948	2,231	2,678
Africa:					
Congo, (Léopoldville)	1,115	1,173	677	871	1,038
Zambia	58	42	37	33	32
Oceania: Australia	672	697	791	1,089	1,107
World totals (estimate)[1,2]	**24,500**	**25,700**	**26,300**	**26,800**	**28,900**

[1] Data derived in part from bulletins of the World Non-ferrous Metal Statistics and annual issues of Metal Statistics (Metallgesellschaft).
[2] Data do not add exactly because of rounding. No estimate included for Bulgaria, but it is reported to be producing cadmium.
[3] Estimate.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

CALCIUM

The commercial production of calcium in Canada started in 1945 when the metal was recovered from lime by Dominion Magnesium Limited, at its plant located at Haley, Ontario. From 1950 to 1955 the value of output was included in the data on magnesium.

Calcium has found increasing use as a deoxidizer in ferrous metallurgy and as an alloy constituent with non-ferrous metals. It has been employed in the reduction of refractory ores of metals, such as chromium, thorium, uranium and zirconium.

TABLE 29. Production (Shipments) of Calcium Metal, 1950 - 64

Year	Pounds	Value
		$
1950 - 55	[1]	[1]
1956[2]	394,900	515,305
1957[2]	221,225	282,378
1958	25,227	31,256
1959	67,429	76,409
1960	134,801	159,241
1961	99,355	100,881
1962	123,511	124,412
1963	98,673	117,247
1964	138,357	151,694

[1] Not available for publication.
[2] Output.

TABLE 30. Exports of Calcium, by Countries to which Shipped, 1962 - 64

Countries	1962	1963	1964
	dollars		
United Kingdom	44,059	11,663	13,702
Belgium-Luxembourg	5,100	11,015	9,815
United States	54,002	32,969	57,935
Germany, West	23,362	22,700	14,000
Netherlands	–	–	14,881
India	22,345	23,667	20,174
Italy	2,318	7,055	–
South Africa, Republic of	5,900	–	–
Japan	–	–	6,244
Australia	–	–	330
Norway	136	–	–
Totals	**157,222**	**109,069**	**137,081**

Source: Trade of Canada, "Exports by Commodities", Catalogue No. 65-004.

CERIUM

A few tons of rock containing cerium and other Rare Earths were shipped from the Parry Sound district to a metallurgical plant in the United States, during 1955. This experimental shipment was valued at $988. No production was reported in 1956 - 64.

Cerium is obtained from monazite, a monoclinic phosphate of cerium metals containing about 32 per cent cerium oxide (Ce_2O_3) and up to 18 per cent thoria (THO_2). Monazite is distributed widely in igneous rocks throughout the world, especially in gneisses that have been intruded by pegmatities, but usually it forms only a small fraction of one per cent of the containing rock, and only the natural concentrations in stream gravels and beach sands have paid for exploration. The chief commercial sources of monazite sand are beach deposits in Brazil and India. There are a few occurrences of monazite in Nova Scotia, Quebec and British Columbia, none of which is of commercial interest. It is usually found as small crystals in granites and pegmatites in the Canadian Shield, and small quantities occur in association with the black sands of the Quesnel river, Lillooet district, British Columbia. In the United States there are commercial deposits in Carolina, Florida and Idaho, and known occurrences in many other states.

CHROMITE

There was no Canadian production of chromite in 1964 This mineral was mined for several years in the Black Lake area in Quebec.

Chromite is one of the principal alloying elements in a great variety of steels, chief of which, in the amount of chromium used, are the stainless and the corrosion-resistant steels. It is used in high-speed tool steels, and as a hard, toughening element in vehicle axles and frames and in aeroplane parts. Chromium in high-temperature alloys is being used for gas turbines, jet-propulsion units and gas engine supercharges. For metallurgical uses chromite should contain a minimum of 48 per cent Cr_2O_3 with a chrome-iron ratio of 3 to 1 or higher and the ore should be hard and lumpy.

Chrome ore is used for making refractory bricks or materials used in basic open-hearth furnaces, in arches of furnaces and in parts of combustion chambers of high-pressure steam boilers, etc. It is used with magnesia to make chrome-magnesia refractories, an important use in Canada being in the manufacture of brucite-magnesia bricks that contain up to 30 per cent Cr_2O_3. Refractory chromite should be fairly high in Cr_2O_3 and alumina, and as low as possible in silica and iron. The ore should be hard and lumpy and not under 10-mesh, and the chromite should be present in an evenly and finely distributed form, not as course grains mixed with blobs of silicate. The Cr_2O_3 content is usually over 40 per cent.

TABLE 31. Production of Chromite, 1946-64

Year	Short tons	Value	Year	Short tons	Value
		$			$
1946	3,110	61,123	1951	–	–
1947	2,162	42,159	1952	–	–
1948	1,715	33,568	1953	–	–
1949	361	7,148	1946-64	–	–
1950	–	–			

TABLE 32. World Production of Chromite, by Countries,[1] 1960-64

Country	1960	1961	1962	1963	1964
	short tons				
North America:					
Cuba[2]	32,774	28,000	39,000	56,000	56,000
Guatemala	200	110	22	–	–
United States	107,000[3]	82,000[3]	–	–	–
South America:					
Brazil	6,246	17,037	27,380	48,546	28,430[4]
Colombia	77	204	154	121	441
Europe:					
Albania	318,650	256,241	277,007	323,657	342,000[2]
Greece (marketable)	38,451	34,324	26,633	18,347	18,000[2]
Portugal	–	–	–	–	–
U.S.S.R.[2,5]	1,010,000	1,015,000	1,270,000	1,355,000	1,435,000
Yugoslavia	110,873	119,188	106,974	103,364	97,398
Asia:					
Cyprus (exports)	15,702	19,822	7,207	5,411	3,341
India	110,354	53,732	73,467	71,419	36,844
Iran[6]	74,957	81,268	99,000[2]	110,000[2]	132,000[2]
Japan	74,394	77,373	64,024	48,205	48,452
Pakistan	20,265	28,116	23,671	16,023	14,884
Philippines	809,579	705,811	585,643	506,094	515,969
Turkey	530,676	443,932	580,964	312,817	454,907
Viet Nam, North[2]	21,400	32,000	36,000	33,000	33,000
Africa:					
Malagasy Republic	–	11,600	20,342	12,346	12,974
Rhodesia, Southern	668,401	590,888	507,685	412,392	493,368
Sierra Leone	6,023	–	12,621	3,067	–
South Africa, Republic of	850,921	989,725	1,006,173	873,212	936,468
Sudan	–	–	8,000	18,700	18,700
United Arab Republic (Egypt)	331	1,532	–	–	–
Oceania:					
Australia	592	–	413	180	80
New Caledonia	43,166	40,413	17,036	–	–
World totals[2]	**4,885,000**	**4,630,000**	**4,790,000**	**4,330,000**	**4,680,000**

[1] In addition to countries listed, Bulgaria and Rumania produce chromite, but data on output are not available; estimates are included in total.
[2] Estimate.
[3] Produced for Federal Government only; excludes quantity consumed by American Chrome Company.
[4] Bahia only.
[5] Output from U.S.S.R. in Asia included with U.S.S.R. in Europe.
[6] Year ended March 20 of year following that stated.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

TABLE 33. Imports of Chrome Ores, 1955 - 64

Year	Tons	Value	Year	Tons	Value
		$			$
1955	51,854	971,522	1960	59,023	1,521,812
1956	64,965	1,529,411	1961	71,267	1,908,920
1957	111,453	2,751,372	1962	71,969	2,122,407
1958	38,136	812,286	1963	49,654	1,688,568
1959	48,678	1,525,438	1964	20,794	1,587,485

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

TABLE 34. Imports of Chrome Ores, by Principal Countries of Supply, 1963 and 1964

Imported from	1963		1964	
	Tons	Value	Tons	Value
		$		$
Mozambique	—	—	218	19,484
Rhodesia, Southern	14,131	446,458	4,711	248,322
United States	13,912	477,866	8,824	817,449
South Africa, Republic of	1,115	19,284	499	19,175
Philippines	18,256	664,162	6,542	483,055
Cuba	—	—	—	—
Turkey	2,240	80,798	—	—
Totals	**49,654**	**1,688,568**	**20,794**	**1,587,485**

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

COLUMBIUM, TANTALUM

The St. Lawrence Columbium and Metals Corporation operated a mine at Oka, Quebec, about 30 miles west of Montreal. The large pyrochlore deposit has been estimated at 62 million tons with an average content of 0.4 per cent columbium pentoxide, Cb_2O_5. The ore is milled to produce a concentrate containing about 52 per cent Cb_2O_5.

Tantalum usually occurs with columbium minerals, but the content is too low in the ores at Oka for economical recovery. Columbium-tantalum occurrences have been reported in British Columbia, Northwest Territories and Ontario.

TABLE 35. Producers Shipments of Columbium, 1955 - 64

	Cb_2O_5 content	Value
	pounds	$
1955	42	1,034
1956 - 60	—	—
1961	62,229	65,619
1962	1,016,514	1,006,349
1963	1,393,444	1,300,009
1964	2,163,359	2,282,522

TABLE 36. World Production of Columbium and Tantalum Mineral Concentrates, by Countries,[1] 1960-64

Country	1961		1962		1963		1964	
	Columbium	Tantalum	Columbium	Tantalum	Columbium	Tantalum	Columbium	Tantalum
	pounds							
North America:								
Canada[2]	119,261	–	1,909,433	–	2,692,935	–	4,222,424	–
South America:								
Argentina[3]	–	4,444	–	3,637	–	4,519	–	–
Brazil:								
Columbium-tantalum[4]	38,477	264,519	38,164	322,804	42,767	231,000	24,643	180,777
Pyrochlore concentrates	3,368,629	–	224,869	–	–	–	712,086	–
French Guiana	–		–		5,031		2,205	
Europe:								
Norway	708,118	–	769,405	–	782,603	–	410,056	–
Portugal (U.S. imports)	22,457	29,793	42,565	95,692	4,465	72,711	21,527	32,281
Spain (U.S. imports)	–	11,148	–	2,645	–	–	14,610	–
Asia:								
Malaysia	212,800	–	246,400	–	197,120	–	125,440	–
Africa:								
Burundi-Rwanda (U.S. imports)	[5]		[5]		[5]		7,716	2,208
Congo, Republic of the (Leopoldville)[3,5,6]	113,085	164,277	55,846	228,185	163,437	147,257	[7]	101,160
Malagasy Republic	46,750		20,720		37,920		7,940	
Mozambique[8]	371,946		346,517		337,927		416,670	
Nigeria	5,257,280	26,230	5,066,880	38,013	4,506,880	33,600	5,239,360	22,400
Rhodesia, Southern	–	138,380	–	159,820	–	151,000	–	141,320
Sierra Leone	–	–	–	–	–	–	–	–
South Africa, Republic of	–	20,000	–	8,000	–	64,000	–	14,000
South West Africa	670	5,790	1,116	10,444	418	4,143	447	1,027
Uganda	16,240		28,851		19,841		12,858	
Oceania:								
Australia	31,808		43,097		30,889		32,636	
World totals (estimate)[2]	**10,975,000**		**9,665,000**		**9,530,000**		**11,745,000**	

[1] Frequently the composition (Cb_2O_5–Ta_2O_5) of these mineral concentrates lies in an intermediate position, neither Cb_2O_5 nor Ta_2O_5 being strongly predominant. In such cases the production figure has been centered.
[2] Shipments.
[3] United States Imports.
[4] Exports.
[5] Burundi-Rwanda included in Republic of the Congo through 1963.
[6] In addition, tin-columbium-tantalum were produced as follows: 1961, estimated 1,400,000 pounds; 1962-4 not available, columbium-tantalum content averaging about 10 per cent.
[7] Revised to none.
[8] Includes microlite as follows: 1961, 68,780 pounds; 1962, 115,080; 1963, 160,060; 1964, 131,050.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

INDIUM

Indium is recovered by the Consolidated Mining & Smelting Co. of Canada, Limited, from the treatment of zinc refinery residues.

The major use has been in heavy-duty composite metal bearings employed extensively in airplanes, tanks and other mobile equipment. A zinc-indium alloy was used in applying a non-corrosive plating to hollow-steel airplane propellers. Minor uses have been in solder and brazing alloys and alloyed with gold and silver, for jewellery and plated articles. The first commercial use about 1927, was as a non-tarnish coating on silverware. Low-melting paint alloys also have been manufactured recently. Indium foil was used as a neutron indicator in the atomic bomb project uranium-graphite piles. Low-energy neutrons, about 1.5 electron-volt, are particularly effective in inducing artificial radioactivity in indium.

TABLE 37. Production of Indium, 1949 - 64

Year	Troy ounces	Value	Year	Troy ounces	Value
		$			$
1949	689	1,550	1954	477	1,278
1950	4,952	12,083	1955	104,774	232,598
1951	582	1,368	1956	363,192	795,390
1952	404	909	1957	384,360	693,770
1953	6,752	9,588	1958 - 64	..	..

MAGNESIUM

Magnesium was produced from dolomite by the Dominion Magnesium Limited, Haley, Ontario. This firm uses the Pidgeon process.

Magnesium is a constituent of aluminum-base alloys that possess high strength and resistance to corrosion. In Canada, this use accounts for the largest quantity. Magnesium finds other applications in cathodic protection of steel structures by magnesium anodes, pyrotechnics, the production of nodular cast iron, and use as a reducing agent in the production of uranium, titanium, beryllium, zirconium and platinum.

Technical information on magnesium is shown in a review published by the Department of Energy, Mines and Resources, Ottawa.

TABLE 38. Producers' Shipments of Magnesium Metal, 1947 - 64

Year	Quebec		Ontario		Canada	
	Pounds	Value	Pounds	Value	Pounds	Value
		$		$		$
1947 - 55	[1]	[1]	[1]	[1]	[1]	[1]
1956	4,572,564	1,536,688	14,639,734	4,543,202	19 212,298	6,079,890
1957	1,585,998	487,853	15,184,373	4,767,043	16,770,371	5,254,896
1958	4,504,343	1,317,070	9,087,362	2,747,755	13,591,705	4,064,825
1959	4,059,508	977,123	8,144,940	2,202,392	12,204,448	3,179,515
1960	—	—	14,577,138	4,313,987	14,577,138	4,313,987
1961	—	—	15,270,618	4,307,570	15,270,618	4,307,570
1962	—	—	17,631,310	4,821,823	17,631,310	4,821,823
1963	—	—	17,810,348	5,357,816	17,810,348	5,357,816
1964	—	—	18,706,020	5,587,909	18,706,020	5,587,909

[1] Not available for publication.

TABLE 39. Exports of Magnesium Metal, 1962-64

Destination	1962	1963	1964
	dollars		
United Kingdom	2,796,590	2,118,500	1,332,564
South Africa, Republic of	2,950	—	35,103
India	4,302	10,627	25,881
Australia	13,454	43,059	77,795
Portugal	—	125	—
Belgium-Luxembourg	39,382	189,608	129,550
Brazil	8,256	3,123	5,567
Chile	—	302	—
Japan	—	57,916	—
France	130,939	258,852	398,642
Germany, West	573,332	493,710	1,374,416
Mexico	—	93,304	126,496
Philippines	—	1,127	1,409
Sweden	—	7,850	20,623
Switzerland	20,710	12,450	7,260
Yugoslavia	—	85,844	340
United States	253,260	243,991	255,338
New Zealand	—	1,354	2,030
Colombia	—	3,015	11,635
Greece	—	1,635	—
Italy	—	250	3,300
Israel	18,155	10,103	39,343
Spain	—	—	11,944
Uruguay	1,893	1,583	9,712
Czechoslovakia	31,260	—	—
Hungary	—	6,100	—
Taiwan	4,892	28,816	16,626
Argentina	1,909	—	15,312
Venezuela	—	2,723	—
Poland	66,580	—	—
Cuba	68	—	—
Bermuda	—	758	—
Denmark	—	—	11,660
Netherlands	—	—	11,575
Rumania	—	—	26,560
Rhodesia, Northern	—	—	103
Hong Kong	—	—	602
Totals	**3,967,932**	**3,676,725**	**3,951,386**

Source: Trade of Canada, "Exports by Commodities", Catalogue No. 65-004.

TABLE 40. Available Data on Consumption[1] of Magnesium Metal, 1963 and 1964

	1963	1964
	tons (2,000 pounds)	
Used for:		
Castings	314	389
Extrusions (shapes and tubing)	355	347
Aluminum alloys	2,569	2,494
Other products[2]	403	532
Totals accounted for	**3,641**	**3,762**

[1] See footnote Table 18.
[2] Includes other alloys, magnesium used for cathodic protection and as a reducing agent.

TABLE 41. World Production of Magnesium Metal, by Countries,[1] 1960 - 64

Country	1960	1961	1962	1963	1964
	short tons[1]				
Canada	7,289	7,635	8,816	8,907	9,353
China[2]	1,000	1,000	1,000	1,000	1,000
France	2,359	2,287	2,337	1,921	1,100
Germany, West[2]	330	440	550	550	550
Italy	6,004	6,365	6,288	6,092	6,645
Japan[3]	2,363	2,477	2,301	2,689	3,237
Norway	11,373	16,018	16,400	22,700	24,300
U.S.S.R.[2]	27,600	33,000	35,000	35,000	35,000
United Kingdom[4]	4,119	5,824	5,559	5,219	5,499
United States	40,070	40,745	68,955	75,845	79,488
Totals (estimate)[1]	**102,500**	**115,800**	**147,200**	**159,900**	**166,200**

[1] This table incorporates some revisions. Data do not add to totals shown due to rounding where estimated figures are included in the detail.

[2] Estimate.

[3] In addition, the following amounts of secondary magnesium were produced: 1961, 3,060; 1962, 2,180; 1963, 1,556 and 1964, 2,478 metric tons.

[4] Primary metal and remelt alloys.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

MANGANESE

Production of manganese ore in Canada has been spasmodic due to the limited number of known deposits. During 1956 a small shipment of manganese bearing silica was exported from British Columbia. During recent years in New Brunswick extensive development work was done by Strategic Materials Corporation on the manganese-iron deposits. Test lots of ores were shipped to the firm's pilot plant where a process was developed for the production of ferro-manganese. Operations did not progress beyond the experimental basis, and eventually ceased.

Most of the imported ore is used in making addition agents for steel manufacturing. High-grade manganese dioxide is used in making dry cell batteries. Manganese compounds are used in the glass, enamel, paint and rubber industries.

TABLE 42. Production of Manganese Ore, 1943 - 64

Year	Tons	Value	Year	Tons	Value
		$			$
1943	48	985	1949	...	—
1944	—	—	1950	—	—
1945	—	—	1951	—	—
1946	—	—	1952 - 55	—	—
1947	225	7,875	1956	...	1,900
1948	3	88	1957 - 64	—	—

TABLE 43. Imports of Manganese Ore, 1955 - 64

Year	Tons	Value	Year	Tons	Value
		$			$
1955	175,282	7,338,269	1960	56,350	2,543,763
1956	207,977	9,137,278	1961	76,016	3,465,313
1957	131,318	7,519,746	1962	90,725	4,037,672
1958	42,060	1,722,965	1963	106,841	3,821,972
1959	118,454	5,017,112	1964	62,813	3,944,744

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

TABLE 44. Imports of Manganese Ore, by Principal Countries of Supply, 1960-64

	1960	1961	1962	1963	1964
	tons				
From:					
Angola	—	—	—	—	6,935
Congo, Republic of (formerly Belgian)	17,032	—	—	23,972	6,908
Japan	4	83	61	190	79
Ghana	22,399	25,484	49,632	45,439	17,448
India	—	13,291	893	—	6,616
France	4	13	7	11	7
United States	4,345	6,388	28,013	16,535	6,659
United Kingdom	44	44	65	29	14
Brazil	6,522	16,785	10,746	20,633	15,530
Mexico	512	—	—	82	19
South Africa, Republic of	5,488	13,928	—	—	—
Greece	—	—	1,308	—	—
Uruguay	—	—	—	—	2,598
Total imports	**56,350**	**76,016**	**90,725**	**106,891**	**62,813**

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

TABLE 45. World Production of Manganese Ore, by Countries,[1] 1960-64

Country	Per cent Mn.	1960	1961	1962	1963	1964
		short tons				
North America:						
Costa Rico (exports)	35+	—	—	—	661	—
Cuba[2]	36-50+	17,644	46,000	83,000	83,400	83,400
Mexico[2]	30+	171,400	155,900	184,900	189,300	206,500
Panama	44+	—	—	—	—	—
United States (shipments)	35+	80,021	46,088	24,758	10,622	26,058
Totals[2]		**269,100**	**248,000**	**292,700**	**284,000**	**316,000**
South America:						
Argentina	30-40	24,251	19,724	13,921	12,436	21,385
Bolivia (exports)		—	53	291	—	—
Brazil	38-50	1,101,387	1,120,336	1,290,461	1,382,727	1,490,077
British Guiana	40	137,454	216,203	303,636	157,331	130,907
Chile	40-50	50,594	35,012	47,578	51,234	21,893
Peru	40+	1,655	3,879	7,403	532	453
Totals		**1,315,341**	**1,395,207**	**1,663,290**	**1,604,260**	**1,664,715**
Europe:						
Bulgaria	30+	27,558	40,785	38,581	42,432	57,320
Greece	35+	34,410	31,195	15,097	16,389	33,100[2]
Hungary	30+	135,888	137,610	142,447	167,960	188,711
Italy	35+	54,561	54,196	48,966	49,887	52,694
Portugal	35+	8,197	12,492	12,666	9,434	7,711
Rumania	35	192,872	227,076	208,337	286,601	110,000[2]
Spain	30+	24,586	17,092	14,101	16,858	17,762
U.S.S.R.[3]		6,473,000	6,583,000	7,057,000	7,345,000	7,822,000
Yugoslavia	30+	14,676	15,595	16,358	8,964	8,580
Totals[1]		**6,965,748**	**7,119,041**	**7,553,553**	**7,943,525**	**8,297,878**
Africa:						
Angola	38-48	25,728	22,695	9,115	—	—
Bechuanaland	50+	25,032	31,737	26,458	11,877	27,116
Congo, Republic of the (Léopoldville)	48+	420,671	348,595	348,547	297,660	341,385
Ethiopia (shipments)	51	10,202	7,716	6,614	—	—
Gabon	50-52	—	—	224,038	702,716	1,045,324
Ghana[4]	48	600,261	483,253	418,263	449,081	509,341
Ivory Coast	48	80,748	137,825	117,928	153,291	150,384
Morocco	35-50	532,508	629,512	517,377	369,217	375,974
Rhodesia, Southern	30+	1,676	205	7,977	—	160
South Africa, Republic of	30+	1,316,732	1,562,729	1,614,599	1,441,503	1,455,271
South West Africa	45+	67,439	50,296	—	—	—
Sudan	36-44	—	—	1,120	300[2]	9,400[2]
United Arab Republic (Egypt)[5]	57	22,046	2,272	42,577	23,798	47,000[2]
Zambia	30+	59,299	58,517	63,432	38,856	41,899
Totals		**3,161,742**	**3,335,352**	**3,398,045**	**3,488,299**	**4,003,254**

See footnotes at end of table.

TABLE 45. World Production of Manganese Ore, by Countries,[1] 1960-64 — Concluded

Country	Per cent Mn.	1960	1961	1962	1963	1964
		short tons				
Asia:						
Burma	35+	324	196	213	220[2]	—
China, mainland[2]	30+	1,323,000	882,000	882,000	1,102,000	1,102,000
Goa	32-50	118,195	109,790	97,732	214,950	112,027
India	35+	1,321,411	1,355,868	1,350,951	1,213,404	1,437,412
Indonesia	35-49	12,026	14,661	7,176	3,136	550[2]
Iran[6]	36-46	8,488	2,315	2,205	3,307	3,300[2]
Japan	32-40	357,131	335,236	340,162	305,028	313,826
Korea, South	30-48	1,521	1,518	1,105	4,580	4,753
Malaysia	60	3,222	7,130	341	7,696	—
Pakistan	42	327	—	1,036	1,553	1,098
Philippines	35-51	19,159	20,986	13,160	8,450	8,824
Thailand	40+	582	588	3,194	7,285	12,185
Turkey	30-50	31,112	33,069	23,422	6,949	22,366
Totals[2]		**3,196,000**	**2,763,000**	**2,723,000**	**2,879,000**	**3,018,000**
Oceania:						
Australia	45-48	67,923	97,901	80,244	40,389	69,450
Fiji	40+	13,073	3,869	1,202	3,621	1,004
New Hebrides	46	—	5,060	21,859	28,016	66,430
New Zealand	48+	134	—	—	—	—
Papua	—	54	2	—	4	3
Totals	...	**81,184**	**106,832**	**103,305**	**72,030**	**136,887**
World totals[2]	...	**14,989,000**	**14,967,000**	**15,734,000**	**16,271,000**	**17,437,000**

[1] In addition to countries listed, Czechoslovakia and Sweden report production of manganese ore, but because the manganese content averages less than 30 per cent, the output is not included in this table. Sweden averages annually 9,000 tons and Czechoslovakia approximately 100,000 tons. Malagasy Republic produces negligible amount of manganese.

[2] Estimate.

[3] Grade unstated. Source: The Industry of the U.S.S.R. Central Statistical Administration.

[4] Dry weight.

[5] In addition to high-grade ore shown in the table, Egypt produced the following tonnages of less than 30 per cent manganese content: 1960, 282,191; 1961, 304,663; 1962, 162,102; 1963, 160,673; 1964, 314,000.

[6] Year ending March 20 of year following that stated.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

MERCURY

During 1964 mercury was produced in the Bridge River area from cinnabar deposits. A small output was reported in 1955 from British Columbia. Previous production had been prior to September, 1944. All of the Canadian production in the past came from the Pinchi mine of the Consolidated Mining and Smelting Company of Canada, Limited, and from the Takla mine of Bralorne Mines Limited, both mines being in the Omineca mining division, British Columbia.

TABLE 46. Production of Mercury, 1941-64

Year	Pounds	Value	Year	Pounds	Value
		$			$
1941	536,304	1,335,697	1945-54	—	—
1942	1,035,914	2,943,807	1955	75	250
1943	1,690,240	4,559,200	1956-63	—	—
1944	735,908	1,210,375	1964	5,548	22,848

TABLE 47. Production of Mercury, Consumption, Imports and Exports, 1955-64

Year	Production	Consumption[1]	Imports	Exports
	pounds			
1955	75	416,632	555,526	3,781
1956	–	212,800	450,006	5,953
1957	–	215,300	400,710	1,425
1958	–	151,021	197,073	2,830
1959	–	161,987	141,219	10,458
1960	–	139,627	243,091	1,918
1961	–	150,588	312,913	..
1962	–	135,291	245,059	..
1963	–	147,396	447,592	..
1964	5,548	208,304	293,900	..

[1] See footnote Table 18.

TABLE 48. Imports of Mercury, from Countries of Supply, 1963 and 1964

From	1963		1964	
	Pounds	Value	Pounds	Value
		$		$
Mercury metal:				
Italy	131,125	311,479	47,300	184,193
United Kingdom	2,382	6,253	29,000	107,748
China (Communist)	37,988	84,123	–	–
Mexico	7,642	16,524	–	–
Netherlands	7,600	19,096	–	–
Yugoslavia	22,800	50,262	34,200	132,871
Spain	231,153	515,215	141,800	407,781
United States	6,902	19,313	26,400	99,652
Turkey	–	–	15,200	59,125
Totals	**447,592**	**1,022,265**	**293,900**	**991,370**

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

TABLE 49. Available Data on Consumption[1] of Mercury, by Principal Uses, 1960-64

Industry	1960	1961	1962	1963	1964
	pounds				
Pharmaceuticals and fine chemicals	11,888	18,258	5,806	15,652	3,109
Heavy chemicals	86,649	96,362	104,189	124,528	190,846
Electrical apparatus	2,962	3,129	4,405	3,603	2,875
Gold mines	4,904	4,086	3,738	3,050	2,653
Miscellaneous	33,224	28,753	17,153	563	8,821
Total accounted for	**139,627**	**150,588**	**135,291**	**147,396**	**208,304**

[1] See footnote Table 18.

TABLE 50. World Production of Mercury, by Countries, 1960 - 64

Country	1960	1961	1962	1963	1964
	flasks of (76 pounds) 34.5 kilograms				
North America:					
Canada	–	–	–	–	73
Mexico	20,114	18,101	18,855	16,302	12,560
United States	33,223	31,662	26,277	19,117	14,142
South America:					
Bolivia (exports)	–	–	11	105	32[1]
Chile	2,876	1,509	791	613	275
Colombia	149	191	–	3	3
Peru	3,034	3,001	3,481	3,092	3,275
Europe:					
Austria	–	–	–	–	–
Czechoslovakia[2]	725	725	725	725	725
Italy	55,492	55,376	54,506	54,448	57,001
Rumania	413	350	222	194	194
Spain	53,369	51,202	52,798	56,954	78,322
U.S.S.R.[2]	25,000	25,000	35,000	35,000	35,000
Yugoslavia	14,069	15,954	16,273	15,838	17,318
Asia:					
China[2]	23,000	26,000	26,000	26,000	26,000
Japan	5,791	5,437	4,199	4,668	4,812
Philippines	3,041	3,167	2,767	2,651	2,496
Turkey	1,339	1,881	2,687	3,042	3,615
Africa:					
Tunisia	166	54	–	–	–
World totals[2]	**242,000**	**240,000**	**245,000**	**239,000**	**255,000**

[1] Purchases by Banco Miners.
[2] Estimate.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

MOLYBDENUM

The principal producer in Canada was the Molybdenite Corporation of Canada Limited at Lacorne, Quebec. The ore is molybdenum disulphide containing some bismuth minerals which are recovered as by-products. The roasting plant at Lacorne produces molybdic oxide. The firm also produces lubricant-grade molybdenum disulphide. Molybdenum concentrates were by-products in the treatment of the ores at Gaspé Copper Mines Limited. Concentrates were shipped by Pax International Mines Ltd. from Matachewan, Ontario. Molybdenum sulphide was recovered from the copper ores of Bethlehem Copper Corp. Ltd. at Ashcraft, B.C.

Molybdenum has a widening range of uses, but by far the greater part of the output is used in steel to intensify the effect of other alloying metals, particularly nickel, chromium, and vanadium. These steels usually contain from 0.15 to 0.4 per cent molybdenum, but in some instances the percentage is considerably higher. For high-speed tool steels as much as 9 per cent added.

Molybdenum alloys are used widely for the hard-wearing and other important parts of aeroplanes. They are used in the automobile industry, in heat and corrosion-resistant allosy, and to some extent in higher-speed tool steels. Molybdenum is used in cast iron and in permanent magnets. Much molybdenum wire and sheet is used in the incandescent lamp and in the radio industries, in new alloys suitable for electrical resistance and contacts, and for heating elements containing molybdenum. An appreciable amount of molybdenum is used in the glass industry in which heavy sheets of the metal act as electrodes to conduct the current through the molten glass in the electric furnaces.

TABLE 51. Producers' Shipments of Molybdenum, 1955-64

Year	Ores, concentrates, sulphides and oxides, shipped[1] or used		Molybdenum content of shipments
	tons	$	pounds
1955	762	823,954	833,506
1956	705	955,828	842,263
1957	633	1,166,557	783,739
1958	744	1,152,838	888,264
1959	658	748,566	940,596
1960	649	1,015,380	767,621
1961	640	1,092,201	771,358
1962	675	1,261,451	817,705
1963	722	1,344,004	833,867
1964	1,050	2,057,383	1,224,712

[1] Shipped from stockpile.

TABLE 52. World Production of Molybdenum in Ores and Concentrates, by Countries,[1] 1960-64

Country	1960	1961	1962	1963	1964
	thousands of pounds				
Australia	—	2	2	13	—
Canada	768	771	818	834	1,225
Chile	4,083	4,037	5,256	6,400	8,594
China[2]	3,300	3,300	3,300	3,300	3,300
Japan	840	807	825	732	619
Korea, South	97	71	163	154	265
Mexico	132	7	128	90	117
Norway	542	531	575	443	509
Peru	—	937[3]	11	1,175	862
Philippines	62	249	249	236	231
U.S.S.R.[2]	11,000	11,900	12,500	12,500	12,500
United States	68,237	66,563	51,244	65,011	65,605
World totals[1,2]	**89,100**	**89,200**	**75,100**	**90,900**	**93,900**

[1] Small quantities of molybdenum were also produced in Argentina, Nigeria, North Korea, Rumania, South West Africa and Spain.
[2] Estimate.
[3] Exports.

SELENIUM

The occurrence of selenium is fairly widespread throughout the world, but it is of commercial importance only in its association with copper-sulphide ores from which it is recovered as a by-product in the refining of copper. A variety of uses have been developed for the metal, but relatively small quantities are involved. In Canada refined selenium and certain selenium salts are produced and most of the output is exported.

Canadian production of selenium is obtained from the refineries of The International Nickel Company of Canada, Ltd., at Copper Cliff, Ontario, and Canadian Copper Refineries, Ltd., at Montreal East, Quebec. At Copper Cliff the metal is derived from International Nickel's copper-nickel ores. The plant has a demonstrated capacity of 270,000 pounds of selenium a year and is probably capable of a larger production. At Montreal East selenium is recovered from the treatment of copper anodes made from the copper-gold ores of Noranda, and Gaspé, Quebec and from blister copper from the copper-zinc ores of Hudson Bay Mining and Smelting Co. Ltd., on the Manitoba-Saskatchewan boundary. The Montreal East plant has an annual rated capacity of 450,000 pounds of selenium, which is larger than any other selenium plant in the world. This plant also produced selenium dioxide, sodium selenate and sodium selenite.

Selenium is generally marketed as amorphous powder, but cakes and sticks are also obtainable. Other selenium products marketed are ferro-selenium, sodium selenate, sodium selenite, selenious acid and selenium dioxide. No figures are available to show the relative consumption of selenium by uses. The most important uses are in the glass, rubber and paint industries, but many new uses have been developed as a result of research. Among the more interesting of the latter is the use of selenium in electrical dry plate rectifiers for radar equipment and aircraft generators. Its use in rectifiers for numerous electronic devices, battery charging, electroplating and welding has been increasing.

In the manufacture of glass, selenium is used to neutralize the green colour caused by iron impurities. When sufficient selenium is added the glass turns a ruby colour highly suitable for stop lights. In the manufacture of rubber, the addition of selenium, in concentrations of from 0.1 to 2.0 per cent, promotes resistance to heat, oxidation and abrasion. It is also used as an accelerator in the vulcanization of synthetic rubber.

The New York price for selenium in December 1964 was $4.50 per pound for commercial grade to $6.00 per pound for high purity grade.

TABLE 53. Production[1] of Selenium, 1955 - 64

Year	Pounds	Value	Year	Pounds	Value
		$			$
1955	427,109	3,203,319	1960	521,638	3,651,466
1956	330,389	4,460,252	1961	430,612	2,798,978
1957	321,392	3,535,312	1962	487,066	2,800,630
1958	306,990	2,302,426	1963	468,772	2,273,545
1959	368,107	2,576,749	1964	465,746	2,258,868

[1] Includes some recoverable selenium in blister copper not necessarily recovered in the designated year.

TABLE 54. Refinery Output of Selenium from Primary and Scrap Materials, 1955 - 64

Year	Pounds	Year	Pounds
1955	422,588	1960	524,659
1956	355,024	1961	422,955
1957	332,011	1962	466,654
1958	342,141	1963	462,385
1959	372,410	1964	462,795

TABLE 55. Exports of Selenium and Selenium Salts, 1963 and 1964

Destination	1963		1964	
	Pounds	Value	Pounds	Value
		$		$
United Kingdom	189,900	1,063,058	199,800	1,081,810
South Africa, Republic of	2,900	17,048	2,800	13,306
Australia	–	–	4,400	18,044
Argentina	2,100	11,325	4,900	23,982
Brazil	3,600	16,831	1,600	7,442
France	7,100	47,497	1,500	10,109
Italy	700	4,663	1,000	6,480
United States	230,200	1,216,210	174,200	990,811
India	600	2,692	3,200	19,541
Spain	1,700	9,649	3,600	18,215
Philippines	–	–	2,700	10,683
Pakistan	–	–	700	2,413
Germany, West	300	1,075	500	1,636
Israel	200	863	–	–
New Zealand	1,200	5,722	–	–
Colombia	3,800	18,682	300	1,376
Venezuela	1,400	6,432	100	236
Totals	**445,700**	**2,421,738**	**401,300**	**2,206,084**

Source: Trade of Canada, "Exports by Commodities", Catalogue No. 65 - 004.

TABLE 56. World Production of Selenium, by Countries, 1960-64

Country	1960	1961	1962	1963	1964
	pounds				
North America:					
Canada	521,638	430,612	487,066	468,772	465,746
Mexico	6,944	5,642	6,953	6,336	9,345
United States	539,000	1,022,000	999,000	928,000	929,000
South America:					
Peru	10,681	16,305	18,382	19,790	16,797
Europe:					
Belgium-Luxembourg (exports)	72,531	51,808	29,542	54,013	87,082
Finland	11,358	13,296	11,797	15,417	14,500
Sweden	176,809	213,846	154,322	156,527	181,540
Yugoslavia	—	1,872	3,986	4,120	8,439
Asia: Japan	278,234	300,262	309,314	313,494	325,926
Africa: Zambia	50,119	38,292	71,453	62,891	57,631
Oceania: Australia[1]	3,500	3,000	3,500	3,500	3,500
World totals[1]	**1,671,000**	**2,097,000**	**2,095,000**	**2,033,000**	**2,100,000**

[1] Estimate.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

TELLURIUM

Tellurium is recovered commercially in Canada at the Copper Cliff, Ontario, plant of the International Nickel Company of Canada, Limited, and at the Montreal East refinery of Canadian Copper Refiners, Limited. At Copper Cliff it is recovered from the slimes formed in the process of refining copper produced from the Sudbury nickel-copper ores. At Montreal East it is obtained from the refining of copper anodes made from copper ores at Noranda, and Gaspé, Quebec, and from blister copper originating from the copper-zinc ores of Hudson Bay Mining and Smelting Co., Limited, at Flin Flon, on the Manitoba-Saskatchewan boundary.

The price of tellurium was quoted at $6.00 a pound in New York in December, 1964.

TABLE 58. Production[1] of Tellurium, 1955-64

Year	Pounds	Value	Year	Pounds	Value
		$			$
1955	9,014	15,774	1960	44,682	156,388
1956	7,867	13,767	1961	77,609	376,404
1957	31,524	55,167	1962	58,725	352,350
1958	38,250	65,025	1963	76,842	499,473
1959	13,023	27,999	1964	77,782	505,583

[1] Includes some recoverable tellurium in blister copper, which was not necessarily recovered in the designated year.

TABLE 58. Refinery Output of Tellurium, 1955-64

Year	Pounds	Year	Pounds
1955	6,516	1960	41,756
1956	15,915	1961	81,050
1957	34,895	1962	57,630
1958	42,337	1963	79,640
1959	8,900	1964	80,255

TABLE 59. Available Data on Consumption[1] of Tellurium in Canada, 1960-64

Year	Tellurium content
	pounds
1960	4,238
1961	4,843
1962	4,306
1963	1,853
1964	1,473

[1] See footnote Table 18.

TABLE 60. World Production of Tellurium by Countries, 1960-64

Country	1960	1961	1962	1963	1964
	pounds				
North America:					
Canada	44,682	77,609	58,725	76,842	77,782
United States	271,000	205,000	264,000	201,000	145,000
South America: Peru	59,343	76,279	50,472	26,634	46,757
Asia: Japan	13,671	16,486	23,168	13,256	7,573
World totals	**388,700**	**375,400**	**396,400**	**317,700**	**277,100**

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

THALLIUM

No production was reported in 1964 but in 1955 there were 275 pounds of thallium contained in the compounds shipped, which were valued at $378. This was the first shipment since 1944 when 128 pounds valued at $1,690 were contained in residues produced by Hudson Bay Mining and Smelting Company, Limited, at the Flin Flon smelter, Manitoba. These residues were exported for treatment in foreign plants. Thallium metal was quoted in the United States at $7.50 per pound nominal, December, 1964.

THORIUM

Thorium oxide and other thorium salts were produced at Elliot Lake, Ontario by Rio Tinto Dow Limited. The waste liquor from the uranium plant is treated to recover the thorium contents. Calcined thorium oxide was shipped to Dominion Magnesium Limited for further processing. Thorium salts were exported for treatment. Data on the quantity and value of production are not available for publication.

TIN

In British Columbia tin is found associated with base metal sulphide ores. The last mentioned type of occurrence is the only one that has been exploited and is the source of the small Canadian production. The lead-zinc-silver orebody of the Sullivan mine, Kimberley, British Columbia, contains a very small percentage of tin. Since 1941 the Consolidated Mining and Smelting Company of Canada, Limited, has been recovering a portion of this tin as a by-product from the concentration of its lead-zinc ore. In 1964 most of the tin concentrates were exported for treatment. Some tin was recovered as a lead-tin alloy during the processing of indium residues at the Canadian plant.

The New York quotations showed the monthly average price for tin was: January, $1.34; April, $1.33; July, $1.59; October, $2.04; December, $1.63; per pound.

TABLE 61. Production of Tin,[1] 1955-64

Year	Pounds	Value	Year	Pounds	Value
		$			$
1955	492,781	408,030	1960	621,718	522,243
1956	756,934	670,441	1961	1,119,350	727,578
1957	709,102	580,342	1962	650,941	442,640
1958	795,496	625,260	1963	927,062	648,943
1959	747,443	630,094	1964	352,350	533,573

[1] Tin content of concentrates and lead-tin alloy.

TABLE 62. Production of New Tin, Domestic Consumption and Imports, 1955-64

Year	Production	Domestic consumption	Imports
	tons (2,000 pounds)		
1955	246[1]	4,500	4,836
1956	378[1]	4,575	4,227
1957	355[1]	4,057	4,654
1958	398[1]	3,688	3,876
1959	374[1]	4,729	4,685
1960	311[1]	4,346	4,220
1961	560[1]	4,428	3,948
1962	325[1]	5,048	2,547
1963	464[1]	4,942	4,696
1964	176[1]	5,094	5,431

[1] Tin content of concentrates and lead-tin alloy.

TABLE 63. Imports of Tin, from Countries of Supply, 1963 and 1964

Country	1963		1964	
	Tons	Value	Tons	Value
		$		$
Tin blocks, pigs or bars				
United Kingdom	617	1,516,814	318	1,302,705
Malaya	3,410	8,522,998	4,522	14,464,371
Belgium-Luxembourg	246	584,412	—	—
Nigeria	62	164,256	—	—
United States	356	883,548	557	1,698,048
Bolivia	5	13,025	34	102,729
Totals	**4,696**	**11,685,053**	**5,431**	**17,567,853**
Tinfoil				
United States	12,628	19,342	..	..
Totals	**12,628**	**19,342**	..	..
Babbitt metal				
United Kingdom	1,100	1,190	..	..
United States	19,300	19,901	..	..
Totals	**20,400**	**21,091**	..	..

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

TABLE 64. Available Data on Consumption[1] of Tin (Ingots or Bars), 1963 and 1964

Used in production of	1963	1964
	tons (2,000 pounds)	
Babbitt	223	232
Bronze	197	233
Galvanizing	5	6
Solder	1,366	1,528
Tin plate and tinning	2,581	2,573
Other used (collapsible tubes, foil, etc.)	570	522
Total accounted for	**4,942**	**5,094**

[1] See footnote Table 18.

TABLE 65. World Mine Production of Tin (Content of Ore), by Countries, 1960-64

Country	1960	1961	1962	1963	1964
	long tons				
North America:					
Canada	278	500	291	414	157
Mexico	372	530	576	1,055	1,207
United States	10	[1]	[1]	[1]	[1]
Totals	**660**	[1]	[1]	[1]	[1]
South America:					
Argentina	238	515	231	225	343
Bolivia[2]	19,407[3]	20,408[3]	21,492[3]	22,752[3]	24,186[4]
Brazil	1,556	582	731	1,150	1,300
Peru (recoverable)	6	14	11	22	22
Totals	**21,207**	**21,519**	**22,465**	**24,149**	**25,851**
Europe:					
Czechoslovakia[5]	200	200	200	200	200
France	21	154	314	272	486
Germany, East[6]	720	720	720	720	720
Portugal[7]	772	729	679	718	676
Spain	196	230	231	158	91
U.S.S.R.[8,9]	16,000	17,000	17,000	20,000	20,000
United Kingdom	1,199	1,210	1,181	1,226	1,226
Totals[6,9]	**19,100**	**20,200**	**20,300**	**23,300**	**23,400**
Africa:					
Burundi	—	—	—	16	85
Cameroon, Republic of	65	65	23	25	40
Congo, Republic of the (Léopoldville)	8,636	6,314	6,875	6,883	7,688
Congo, Republic of (Brazzaville)	34	46	46	43	34
Morocco	10	11	11	9	14
Niger, Republic of	53	47	41	54	48
Nigeria	7,675	7,779	8,210	8,723	8,721
Rhodesia, Southern	642	715	706	498	512
Rwanda	1,277	1,474	1,325	1,271	1,680[6]
South Africa, Republic of	1,276	1,430	1,408	1,530	1,586
South West Africa	261	302	369	443	474
Swaziland	6	5	5	3	3
Tanzania (exports)	138	181	218	234	287
Uganda	32	33	74	163	213
Zambia	—	1	5	1	8
Totals	**20,105**	**18,403**	**19,316**	**19,896**	**21,393**
Asia:					
Burma[7]	1,200	1,140	1,040	1,005	750
China[8]	28,000	30,000	28,000	28,000	25,000
Indonesia	22,596	18,574	17,310	12,927	16,345
Japan	842	853	859	857	796
Laos	397	335	367	326	336
Malaysia	51,979	56,028	58,603	59,947	60,004
Thailand	12,080	13,270	14,679	15,585	15,597
Totals[6,9]	**117,100**	**120,200**	**120,900**	**118,600**	**118,800**
Oceania:					
Australia	2,202	2,745	2,715	2,860	3,638
World totals[6]	**180,400**	**184,100**	**186,600**	**190,300**	**194,500**

[1] Figure withheld to avoid disclosing individual company confidential data: included in world total.
[2] Estimated by authors of the chapter, and in a few instances, from the Statistical Bulletin of the International Tin Council, London, England.
[3] Exports.
[4] Comibol production plus exports by small and medium mines and smelters.
[5] Estimate, according to 51st annual issue of Metal Statistics (Metallgesellschaft) through 1964.
[6] Estimate.
[7] Includes tin content of mixed concentrates.
[8] Estimated smelter production.
[9] Output from U.S.S.R. in Asia included with U.S.S.R. in Europe.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

TITANIUM

At Lac Tio, Quebec, the Quebec Iron and Titanium Corporation mined ilmenite and shipped the ore by rail to Havre St. Pierre on the St. Lawrence and thence by boat to the smelter at Sorel, Quebec. There the ore was treated to produce iron (remelt) and slag.

The smelter slag, having a titanium dioxide content of about 72 per cent, was exported for further treatment. General statistics on the mining of ilmenite are included in the Miscellaneous Metals Industry but the statistics on smelting are included in The Smelting and Refining Industry.

For several years titanium-bearing ores have been shipped from the Baie St. Paul area in Quebec for treatment in the United States.

Some metallic titanium was produced from imported raw material by the Dominion Magnesium Limited, Haley, Ontario.

The paint industry uses, in addition to titanium white, a considerably larger amount of mixed pigments containing titanium, also imported from the United States. Titanium white has many other uses, such as: to make paper opaque, to make rubber white, in ceramic glazes, for printing inks, in linoleum, in cosmetics, and to de-lustre artificial silk.

Titanium is used in many other forms. Ferrotitanium and ferrocarbon-titanium are used under special circumstances to purify steel. It is all imported from the United States.

Prices (nominal) f.o.b. U.S. Atlantic ports at the end of 1964 were: Ilmenite, 59.5% TiO_2, $23 to $26 per gross ton. The nominal quotation for titanium metal, 99.3 per cent, was $1.32 per pound.

TABLE 66. Producers' Shipments of Titanium Ore to Outside Customers, 1952-64

Year	Short tons	Value	Year	Short tons	Value
		$			$
1952	51	459	1957	10,770	97,075
1953	9,292	80,085	1958	–	–
1954	1,541	9,462	1959	26,777	129,565
1955	1,464	10,634	1960	2,947	16,265
1956	2,310	16,561	1961-64	–	–

TABLE 67. Imports of Titanium Oxide and Titanium Dioxide Extended, 1960-64

Year	From the United Kingdom		From the United States		Total imports	
	Pounds	Value	Pounds	Value	Pounds	Value
		$		$		$
1960	19,350,694	4,052,615	33,348,008	3,386,029	53,792,895	7,648,278
1961	20,763,628	4,460,194	31,849,083	3,503,991	52,612,711	7,964,185
1962	23,557,187	5,263,425	26,285,469	2,819,218	49,887,795	8,090,102
1963	3,790,080	811,924	21,582,476	2,580,125	25,372,556	3,392,049
1964	2,240,100	470,562	22,272,972	2,360,973	24,564,272	2,843,378

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65-007.

TABLE 68. Available Data on Consumption[1] of Titanium Oxide, by Industries, 1962-64

Industry	1962		1963		1964	
	Pounds	Cost at works	Pounds	Cost at works	Pounds	Cost at works
		$		$		$
Paints:						
Extended titanium dioxide pigments	21,869,760	2,513,447	17,176,191	1,904,951	19,576,220	2,084,914
Titanium dioxide	36,586,830	9,149,571	41,178,857	10,514,304	45,624,764	11,622,790
Pulp and paper	6,536,557	1,553,825	7,290,281	1,589,736	7,374,161	1,668,821
Linoleum coated fabrics industry[2]	5,215,182	1,255,049	4,361,506	1,054,909	4,301,037	1,054,106
Rubber goods	1,901,147	483,422	1,943,543	496,173	2,951,752	734,940
Miscellaneous non-metallic minerals	1,208,697	304,415	1,569,556	358,602	1,930,847	450,785
Toilet preparations	57,010	18,210	41,835	16,098	47,735	16,786
Industrial chemicals	165,392	40,983	317,738	81,319	81,810	21,994
Synthetic textiles	..	..	79,640	25,649	116,821	37,667
Other chemical industries, n.e.s.	886,884	211,445	1,000,843	225,140	1,072,107	256,002
Totals accounted for	**74,427,459**	**15,530,367**	**74,959,990**	**16,266,881**	**83,077,254**	**17,948,805**

[1] See footnote Table 18.
[2] Includes "Asphalt Roofing Manufacturers" in 1962 but not in subsequent years.

TABLE 69. World Production of Titanium Concentrates (Ilmenite and Rutile), by Countries,[1] 1960-64

Country	1960	1961	1962	1963	1964
			short tons[1]		
Ilmenite					
Australia (shipments)	119,377	186,369	200,332	225,102	340,248
Brazil[2]	—	8,005	5,891	6,484	9,117
Canada (Titanium slag)[3]	389,586	463,361	301,448	379,320	544,721
Ceylon	7,000	11,199	4,652	21,041	50,880
Finland	92,219	21,272	96,110	103,461	127,937
Gambia	—	—	—	—	—
India	275,303	192,018	152,241	28,619	11,849
Japan (titanium slag)	1,444	1,774	578	963	2,161
Malagasy Republic (Madagascar)	3,008	3,640	3,510	4,027	5,291
Malaysia (exports)	132,255	119,693	113,854	164,656	144,774
Mexico	—	—	—	155	—
Mozambique	784	—	—	—	—
Norway	258,542	342,723	276,788	267,090	299,608
Portugal	1,002	109	75	45	63
Senegal	24,159	19,286	24,727	13,436	1,455
South Africa, Republic of	90,432	99,010	87,096	31,039	—
Spain	12,267	33,184	45,935	55,745	48,418
Thailand	—	—	—	—	—
United Arab Republic (Egypt)	13,228	47,475	49,210	596	23
United States[4]	786,372	782,412	807,725	888,400	1,001,132
World totals ilmenite (estimate)[1]	**2,207,000**	**2,331,500**	**2,170,200**	**2,190,200**	**2,587,700**
Rutile					
Australia	99,274	113,603	133,499	205,251	201,640
Brazil	238	422	388	429	315
Cameroon, Republic of	—	—	—	—	—
India	1,082	898	1,781	2,062	2,062
Norway	—	—	—	—	—
Senegal	—	195	811	780	60
South Africa, Republic of	3,695	3,483	3,575	1,385	—
United Arab Republic (Egypt)	1,100[5]	1,100[5]	198	4	—
United States	8,808	9,045	9,981	11,915	8,062
World totals rutile (estimate)[1]	**114,200**	**128,700**	**150,200**	**221,800**	**212,100**

[1] Titanium concentrates are produced in U.S.S.R., but no reliable information is available; no estimates are included in the total.
[2] Production-Comissao National de Energia Nuclear only.
[3] Containing approximately 70-72 per cent TiO_2.
[4] Includes a mixed product containing ilmenite, leucoxene and rutile.
[5] Estimate.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

TABLE 70. Consumption of Ferrotitanium in the Manufacture of Steel, 1955 - 64

Year	Tons	Value	Year	Tons	Value
		$			$
1955	156	48,074	1960	418	207,489
1956	277	84,393	1961	236	109,615
1957	252	82,258	1962	123	78,613
1958	210	76,689	1963	90	96,000
1959	252	84,683	1964	129	93,016

TUNGSTEN

Tungsten concentrates were shipped by Canada Tungsten Mining Corp. Ltd. from mine in Northwest Territories. Data are not available for publication.

As an alloying metal in steel, tungsten (usually as ferrotungsten, but sometimes as calcium tungstate or scheelite concentrate) is used essentially to impart hardness and toughness, which are maintained even when the steel is heated to a high temperature. Almost 80 per cent of the consumption of tungsten in the United States is used for the production of high-speed steels for cutting tools, in which the tungsten content is 15 to 20 per cent. Minor amounts of tungsten are used in steels for dies, valves and valve seats for internal combustion engines and for permanent magnets. Stellite, the best known non-ferrous alloy, contains 10 to 15 per cent tungsten with higher percentages of chromium and cobalt. Tungsten carbide is widely used as an extra hard cutting tool and is now being used as inserts into detachable bits for rock-drilling. Pure tungsten is used in lamp filaments, in radio tubes, contact points, etc.

The E. & M. Journal price quotations for tungsten ore in December 1964 were: Per short ton unit of WO_3 concentrates of known good analysis, basis 65%: Foreign ore per stu of WO_3 nearby arrival, c.i.f. U.S. ports duty extra: Wolfram $21.00 to $21.50 scheelite $21.00 to $21.50 U.S. mined tungsten concentrate, $18 per stu f.o.b. milling point, subject to penalties.

TABLE 71. Production (Commercial Shipments) of Tungsten Concentrate, 1955 - 64

Year	Concentrate	WO_3 content	Value
	pounds		$
1955	3,255,100	1,942,770	5,508,437
1956	3,401,712	2,271,437	6,351,376
1957	2,994,000	1,921,483	5,279,275
1958	1,022,000	690,976	1,898,455
1959 - 61	—	—	—
1962	..	3,580	1,611
1963	..	1,224,305	683,814
1964	..	..	..

TABLE 72. Imports of Tungsten Ores, from Countries of Supply, 1963 and 1962

Country	1963		1964	
	Pounds	Value	Pounds	Value
		$		$
Portugal	—	—	—	—
Bolivia	—	—	34,700	26,080
Korea	443,400	129,814	1,400	1,020
Peru	—	—	—	—
China (communist)	—	—	—	—
United States	2,100	1,604	203,200	111,105
Argentina	200,000	63,139	150,500	29,260
Totals	**645,500**	**194,577**	**389,800**	**167,465**

Source: Trade of Canada, "Imports by Commodities", Catalogue No. 65 - 007.

TABLE 73. World Production of Tungsten Ore and Concentrate, by Countries, 1960-64

(60 per cent WO_3 basis)

Country	1960	1961	1962	1963	1964
	short tons				
North America:					
Canada	—	—	3	—	..
Mexico	203	193	88	36	9
United States (shipments)	7,325	8,245	8,429	5,657	9,244
South America:					
Argentina	893	892	619	184	13
Bolivia (exports)	2,370	3,104	2,798	2,513	2,285
Brazil	1,867	1,361	1,368	612	421
Peru	538	428	435	572	731
Europe:					
Austria	243	317	320	246	116
Finland	—	58	—	—	—
France	753	806	772	—	—
Italy	8	3	1	2	1
Portugal	3,215	3,274	2,754	1,784	1,948
Spain	1,030	1,192	777	162	41
Sweden	311	345	295	301	—
U.S.S.R.[1]	10,500	11,000	11,600	12,100	12,100
United Kingdom	—	—	—	—	—
Yugoslavia	86	9	57	19	144
Asia:					
Burma[2]	1,041	1,102	882	827	529
China, Mainland[1]	24,900	24,900	24,900	24,900	22,500
Hong Kong	39	20	18	9	1
India	3	11	12	6	10
Japan	1,082	1,033	1,160	856	958
Korea: North[1]	5,500	5,500	4,400	4,400	4,400
Republic of (South)	6,321	7,354	7,456	6,092	5,988
Malaysia	46	41	11	8	6
Thailand	487	568	471	2 28	474
Africa:					
Congo, Republic of the (Léopoldville)[2]	634	595	406	223	258
Rhodesia (Southern)	11	55	24	3	—
Rwanda	504	734	165	14	165
South Africa, Republic of	37	30	28	9	4
South West Africa[2]	154	190	171	239	216
Tanganyika (exports)	—	—	—	—	—
Unganda (exports)	84	149	13	2	—
United Arab Republic (Egypt)	—	91	—	—	—
Oceania:					
Australia	2,075	2,866	1,946	1,793	1,860
New Zealand	10	6	10	6	6
World totals[1]	**114,200**	**76,400**	**72,400**	**63,800**	**64,500**

[1] Estimate.
[2] Including WO_3 in tin-tungsten concentrates.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

URANIUM

In 1964 the output of uranium precipitates from the mines in Ontario were valued at $63,606,944. The Beaverlodge area in Saskatchewan shipped $19,902,485 worth of U_3O_8. The mines in the Northwest Territories ceased production in 1960.

Detailed technical data on the uranium industry appears in "Uranium in Canada 1960" Review 26 issued by the Department of Energy, Mines and Resources, Ottawa.

The data for 1941-53 are restricted. The figures for 1954 and 1955 are the value of the products of the refinery at Port Hope, Ontario. The value of the U_3O_8 contained in the precipitates or concentrates shipped from the mines is shown in 1956-64.

TABLE 74. Producers' Shipments[1] of Uranium, Radium, etc., 1955-64

Year	U_3O_8	Value	Year	U_3O_8	Value
	pounds	$		pounds	$
1955	...	26,031,604	1960	25,495,369	269,938,192
1956	4,581,060	45,732,145	1961	19,281,465	195,691,624
1957	13,271,414	136,304,364	1962	16,859,169	158,183,669
1958	26,805,232	279,538,471	1963	12,770,421	102,951,146
1959	31,784,189	331,143,043	1964	14,570,307	83,509,429

[1] Compilation method is shown in text above.

TABLE 75. World Production of Uranium Oxide U_3O_8 by Countries,[1,2] 1960-64

Country	1960	1961	1962	1963	1964
	short tons				
North America:					
Canada	12,748	9,641	8,430	8,352	7,285
United States	17,760	17,399	17,010	14,218	11,847
South America:					
Argentina	7	6[3]	4	9	37
Europe:					
Finland[3]	40	20	—	—	—
France	1,379	1,619	1,978	1,987	1,833
Portugal	—	132	24	—	—
Spain[3]	60	55	55	55	55
Sweden[3]	10	10	10	10	10
Africa:					
Gabon	[4]	428	514	582	586
Malagasy	[4]	94	111	123	169
South Africa, Republic of	6,409	5,468	5,024	4,532	4,445
Oceania:					
Australia[3]	1,300	1,400	1,300	1,200	420
World totals (estimate)[1,2]	**41,130**	**36,300**	**34,600**	**31,100**	**26,700**

[1] In addition to the countries listed, uranium is also known to have been produced in Colombia, India, Italy, Japan and West Germany, but production data are not available. An estimate for these countries has been included in the world total.

[2] Uranium is also believed to be produced in Czechoslovakia, East Germany, Hungary and U.S.S.R. but production data are not available; for these countries no estimate has been included in the world total. Estimates of production for these countries range from 10,000 to 20,000 tons per year.

[3] Estimate.

[4] Malagasy and Gabon included with France.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

TABLE 76. Exports of Uranium Ores and Concentrates, 1962-64

Destination	1962	1963	1964
	dollars		
United Kingdom	16,597,910	40,509,263	39,627,015
Germany, West	206,032	–	158,868
Japan	39,689	130,000	4,609
United States	149,165,248	96,879,093	34,862,680
Brazil	–	13,025	–
Totals	**166,008,879**	**137,531,381**	**74,653,172**

Source: Trade of Canada, "Exports by Commodities", Catalogue No. 65-007.

VANADIUM

Some of the magnetites of the Rainy River district in Ontario are known to contain relatively small quantities of vanadium, and some research has been conducted as to its economic recovery. There is no production of either the metal or its ores in Canada at the present time.

The principal world occurrences of vanadium are in Arizona, Colorado and Utah in the United States; Minasragra in Peru; Broken Hill in Northern Rhodesia; and Grootfontein district in South West Africa.

The metal is employed chiefly in the manufacture of alloy steels and irons. It is also used in the form of ammonia meta-vanadate as a catalyst in the manufacture of sulphuric acid, and in the non-ferrous, glass, ceramic and colour industries.

The United States Bureau of Mines reports that vanadium has been and is now being obtained by some countries from other than vanadium ores, including petroleum, bauxite, phosphate rock and titaniferous magnetites.

Vanadium ore was quoted December, 1964 at 31 cents per pound, (V_2O_5 content) f.o.b. shipping point, by "E & M J Metal and Mineral Markets" New York. Vanadium metal was quoted at $3.45 per pound.

TABLE 77. World Production of Vanadium in Ores and Concentrates, 1960-64

Country	1960	1961	1962	1963	1964
	short tons[1]				
North America:					
United States (recoverable vanadium)	4,971	5,343	5,211	3,862	4,362
South America:					
Argentina	–	4[1]	9	2	2
Europe:					
Finland	625	701	629	771	1,084
Africa:					
Angola	–	–	–	–	–
South Africa, Republic of	656	1,422	1,393	1,392	1,282
South West Africa (recoverable vanadium)	838	1,145	1,019	1,134	1,111
Zambia	146	107	3	–	–
World totals[1]	**7,236**	**8,722**	**8,264**	**7,161**	**7,841**

[1] Estimate.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

ZIRCONIUM

Zirconium ores are not mined in Canada. The Dominion Magnesium Limited, Haley, Ontario, produced zirconium from imported raw materials.

Zirconium is important in certain steel making, ordinarily being added in the form of zirconium-ferrosilicon alloy; its function is that of a powerful deoxidizer, degasifier and grain refiner; zirconium-treated steel being particularly suitable for tools subject to violent stresses, such as stock drills.

Prices quoted in December, 1964 were: zircon ore, 65 per cent ZrO_2, $61 per long ton, at Atlantic seaboard; zirconium sponge, $7 to $14 per pound for commercial grade.

TABLE 78. World Production of Zirconium Ores and Concentrates, by Countries, 1960-64

Country	1960	1961	1962	1963	1964
	short tons				
Australia	114,645	152,836	149,904	207,011	202,762
Brazil[1]	6,358	7,405	2,642	392	569
India	10[2]	10[2]	[3]	[3]	[3]
Malagasy Republic	375	353	390	428	564
Malaysia (zircon exports)	63	63	67	289	165
Nigeria	1,968	833	–	886	–
Senegal	11,408	5,939	2,575	3,383	611
South Africa, Republic of	7,366	7,607	7,581	2,648	–
United Arab Republic (Egypt)	408	105	188	44	..
United States	[4]	[4]	[4]	[4]	[4]

[1] Chiefly baddeleyite.
[2] Estimate.
[3] Data not available.
[4] Figure withheld to avoid disclosing individual company confidential data.

Source: "Minerals Yearbook" published by the United States Bureau of Mines.

List of Establishments classified to Miscellaneous Metal Mines, 1964

Name of firm and product	Head office address	Location of mine or plant
Other Metal Mines: Standard Industrial Classification, 059		
Columbium, Tantalum:		
St. Lawrence Columbium & Metals Corp.	1010 St. Catherine St., Montreal, Quebec	Oka, Quebec
Mercury:		
Silverquick Development Co. (B.C.) Ltd.	21729-22nd Rd., Haney, British Columbia	Haney, British Columbia
Molybdenum:		
Molybdenite Corp. of Can. Ltd.	485, rue McGill, Montréal, Quebec	LaCorne, Quebec
Preissac Molybdenite Mines Ltd.	485, rue McGill, Montréal, Quebec	Preissac, Quebec
Thorium:		
Rio Tinto-Dow Ltd.	335 Bay St., Toronto, Ontario	Elliott Lake, Ontario
Titanium ore:		
Continental Titanium Corp.	5165 Sherbrooke St. W., Montreal, Quebec	St. Urbain Co., Quebec
Quebec Iron and Titanium Corp.	1625 Route Marie Victorin, Tracy, Quebec	Parker Twp.,Sorel, Quebec
Tungsten concentrates:		
Canada Tungsten Mining Corp. Ltd.	12 Richmond St. E., Toronto, Ontario	Flat River, Northwest Territories
Standard Industrial Classification, 057		
Uranium:		
Ontario:		
Denison Mines Ltd.	4 King St. W., Toronto	Quirke Lake
Metal Mines Ltd. (Bancroft Mine)	100 Adelaide St. W., Toronto	Bancroft
Rio Algom Mines Ltd.	335 Bay St., Toronto	Elliott Lake and Quirke Lake
Stanrock Uranium Mines Ltd.	15 Wellington St. W., Toronto	Elliott Lake
Saskatchewan:		
Eldorado Mining & Refining Ltd.	Box 379, Ottawa, Ontario	Beaverlodge
Gunnar Mines Ltd.	135 St. Clair Ave. W., Toronto, Ontario	Athabaska
Supplement		
(The following establishments classified to other industries, e.g., Smelting and Refining, recover the metal indicated and are included for information purposes to support the statistical material relevant to these metals which is presented in this report.)		
Aluminium:		
Aluminium Company of Canada Limited	1700 Sun Life Building, Montreal, Quebec	Arvida, Quebec; Shawinigan Falls, Quebec; Ile Maligne, Quebec; Beauharnois, Quebec; Kitimat, British Columbia.
Canadian British Aluminum Co. Ltd.	Baie Comeau, Quebec	Baie Comeau, Quebec
Antimony:		
Consolidated Mining & Smelting Company of Canada Ltd.	215 St. James St., Montreal, Quebec	Trail, British Columbia
Barium:		
Dominion Magnesium Ltd.	Haley, Ontario	Haley, Ontario
Bismuth:		
Cobalt Refinery Ltd.	Cobalt, Ontario	Cobalt, Ontario
Consolidated Mining & Smelting Company of Canada Ltd.	215 St. James St., Montreal, Quebec	Trail, British Columbia
Gaspé Copper Mines Ltd.	44 King St. W., Toronto, Ontario	Murdockville, Quebec
Molybdenite Crop. of Canada Ltd.	59 St. James St. W., Montreal, Quebec	LaCorne Twp, Quebec
Cadmium:		
East Sullivan Mines Ltd.	1403 Alfred Bldg., Montreal, Quebec	Bourlamaque, Quebec
Solbec Copper Mines Ltd.	507 Place d'Armes, Montreal, Quebec	Stratford Twp, Quebec
Sullico Mines Ltd.	507 Place d'Armes, Montreal, Quebec	Val d'Or, Quebec
Hudson Bay Mining & Smelting Co. Ltd.	500 Royal Bank Bldg., Winnipeg, Manitoba	Flin Flon, Manitoba
Canadian Exploration Ltd.	Royal Bank Bldg., Vancouver B.C.	Salmo, British Columbia
Consolidated Mining & Smelting Co. of Canada Ltd.	215 St. James St., Montreal, Quebec	Trail, British Columbia
Highland Bell Ltd.	789 W. Pender St., Vancouver, B.C.	Greenwood, British Columbia
Howe Sound Company, Britannia Division	500 Fifth Ave., New York 36, U.S.A.	Britannia Beach, British Columbia
Mastodon Highland Bell Mines Ltd.	1200 West Pender St., Vancouver, B.C.	Revelstoke, British Columbia
New Cronin Babine Mines Ltd.	844 W. Hastings St., Vancouver, B.C.	Smithers, British Columbia
Reeves Macdonald Mines Ltd.	413 Granville St., Vancouver B.C.	Remac, British Columbia
Sheep Creek Gold Mines Ltd.	413 Granville St., Vancouver, British Columbia	Zincton, British Columbia
United Keno Hill Mines Ltd.	85 Richmond St. W., Toronto, Ontario	Elsa, Yukon
Calcium:		
Dominion Magnesium Ltd.	67 Yonge St. Toronto, Ontario	Haley, Ontario

List of Establishments classified to Miscellaneous Mines, 1964 – Concluded

Name of firm and product	Head office address	Location of mine or plant
Supplement – Concluded		
Indium:		
Consolidated Mining & Smelting Company of Canada ltd.	215 St. James St,. Montreal, Quebec	Trail, British Columbia
Magnesium:		
Dominion Magnesium Ltd.	67 Yonge St., Toronto, Ontario	Haley, Ontario
Molybdenum:		
Gaspé Copper Mines Ltd.	44 King St. W., Toronto, Ontario	Murdochville, Quebec
Selenium, Tellurium:		
Canadian Copper Refiners Ltd.	1600 Royal Bank Building, Toronto, Ontario	Montreal East, Quebec
International Nickel Co. of Canada Ltd.	Copper Cliff, Ontario	Copper Cliff, Ontario
Thallium:		
Hudson Bay Mining & Smelting Co. Ltd.	500 Royal Bank Building, Winnipeg, Manitoba	Flin Flon, Manitoba
Thorium:		
Dominion Magnesium Ltd.	67 Yonge St., Toronto, Ontario	Haley, Ontario
Tin:		
Consolidated Mining & Smelting Company of Canada Ltd.	215 St. James St., Montreal, Quebec	Trail, British Columbia
Uranium:		
Eldorado Mining & Refining Ltd.,	Box 379, Ottawa, Ontario	Port Hope, Ontario
Milliken Lake Uranium Mines Ltd.[1]	335 Bay St. Toronto, Ontario	Blind River, Ontario
Northspan Uranium Mines Ltd.[1]	335 Bay St., Toronto., Ontario	Elliot Lake, Ontario
Pronto Uranium Mines Ltd.[1]	335 Bay St., Toronto, Ontario	Long Twp. Ontario
Zirconium:		
Dominion Magnesium Ltd.	67 Yonge St., Toronto, Ontario	Haley, Ontario

[1] Amalgamated with Rio Algom Mines Ltd.

EXPLANATORY NOTES

(Including Concepts and Definitions)

INTRODUCTION

The Census of Mines, Quarries and Oil Wells is an annual mail survey covering Canada's Mineral Industries based on the Standard Classification of Industries. While principal statistics are collected and compiled for all mineral industries not all can be published separately by province because of the confidential nature of the data in certain provinces.

The reporting unit for the Census is designated as the establishment (see definition of Establishment in following section) and a return is requested from every establishment classified to a mineral industry. When an establishment is operated for only part of a year a report is required covering the period of operation.

There are four different questionnaires used in this Census: (a) short form (introduced in 1965) (b) long form (c) head office questionnaire and (d) commodity questionnaire. The short and long forms are used to obtain principal statistics and commodities shipped from establishments classified to mineral industries and differ only in the amount of detail requested.

The head office questionnaire is generally used for company head offices and/or auxiliary units separately located from the mineral establishment(s), (see following notes on Head offices and auxiliary units). The Commodity questionnaire is used to survey certain establishments to collect information on the quantity and value of goods of own production shipped or used by such establishments in order to achieve full coverage of domestically produced commodities. (See the following note under Value of production).

General

This report is one in a series of 18 publications which relate to the operations of industries comprising Major Groups 1,3, and 4 of Division 4, Mines (including Milling) Quarries and Oil Wells of the revised Standard Industrial Classification (S.I.C.). These groups are respectively Metal Mines, Non-metal Mines and Quarries and Sand Pits. Industries comprising Major Group 2 (Mineral Fuels) are covered in a separate series of reports. The industries included in Major Group 5, Services Incidental to Mining are not covered by separate reports. However, certain relevant statistics are published in various publications, for example, "Contract Drilling for the Mining Industry" (Catalogue No. 26-207), "Construction in Canada" (Catalogue No. 64-201) and a special report "Private and Public Investment in Canada" (available on request from the Bureau or the Queen's Printer). The Bureau has also developed a new survey "Annual Survey of Mining and Exploration Companies". This survey is being introduced for the 1967 reporting period and will attempt to bring together details on exploration, development and capital and repair expenditures for the mining universe (excluding oil and gas).

The publication of this series of 18 reports constitutes the final phase of the implementation of the revised Standard Classification for these three Major Groups (see above). Because of its size and complexity, this project has to be carried out in several stages and over a period of years. These stages were as follows: (a) reclassification of establishments according to the revised S.I.C. (b) implementation of a new establishment definition (c) an extension of the establishment definition to cover the non-mining activities of mining establishments. The first stage was completed with the 1960 Census of Mines, etc. and the results were published in the 1960 and 1961 reports on the basis of the revised Standard Industrial Classification. This part of the project was confined entirely to a re-coding of existing reporting units. Under the revised Standard Industrial Classification reporting establishments are classified or allotted to specific industries in the classification system on the basis of the value of principal products made or shipped. Full details concerning the revised classification system are contained in the "Standard Industrial Classification Manual", Catalogue No. 12-501, which is available from either the Queen's Printer or the Dominion Bureau of Statistics.

The second stage in the project consisted of the implementation of the new definition of the reporting unit i.e. "establishment" as it applied to **mining activities** of mining establishments (see following note on Establishment). Results of the 1962 Census of Mining reflected this change in concept and, in order to provide comparability of data for previous years, the 1962 reports contained principal statistics on the basis of the new establishment definition for years back to 1957. This naturally included the projection of stage one.

The third stage in the project which was the extension of the definition of the establishment to cover **total activities** of mining establishment, is reflected in the 1964 data presented in the present report. By definition "total activity" relates to all operational data and excludes such non-operational items as rent, interest and dividends. Statistics on man-hours included in the earlier publications for the mining industry will continue to be included as part of the regular series but will be confined to production and related workers as in the reports for the Census of Manufactures. Adjustments and revisions made in the statistics for mining activities covering the period 1961-63 and carried in the mining series of publications for this period were further revised in the course of the final stage of the programme to bring them in line with reporting procedures followed in the 1964 Census of Mining which reflect the final application of the new concept. The 1961-63 statistics on mining statistics on the new basis are thus not comparable with those published in earlier issues in this series. However, the 1961-63 statistics are shown in this publication in both their previously published and revised forms in order to provide a link with the immediate past.

Reference has already been made to changes implemented and in the course of implementation in the mining industries in reports published in this series prior to the 1964 issues: however a more complete account of the changes and additions and brief descriptions of the principal industry statistics are given in the following sections of those notes. This latter includes as well a special section dealing specifically with the impact of a new concept in the treatment of the Smelting and Refining industry on the metal mines industries. A description of conceptual and definitional changes appropriate to the statistics for Major Group 4, Mineral Fuels will be included in the relevant industry reports for this group.

Metal Mines

The effect of the application of a special concept to the reporting procedures followed by plants carrying on integrated mining/smelting/refining operations will be evident in the comparison of the 1961-64 data particularly for the items Materials and supplies and Value of production shown in the publications on Metal Mines and the data published in reports prior to 1964. The industries in which the application of this concept had a major effect are those included in S.I.C. Major Group 1 – Metal Mines of the Annual Census of Mining (Mines (including Milling) Quarries and Oil Wells) but more particularly the following:

Copper-Gold-Silver Mines
Nickel-Copper Mines
Silver-Lead-Zinc Mines

These industries which are dominated by a sector of vertically integrated companies involved in mining and manufacturing (smelting and refining) operations have historically created significant distortions in the statistics for these industries. These were caused, for the most part, as a result of applying a value to the ores, concentrates, etc. which were part of the materials (inputs) of the Smelting and Refining industry. The method of valuation used was based on the recoverable metal content of these materials, that is, ores, concentrates, etc. A similar procedure was followed in valuing the output portion of these mines. Since the major output of the mines served as an input to the Smelting and

Refining industry and in turn became a part of the output of the Smelting and Refining industry there was, in effect, a duplication of values for recoverable metal content in the mining and manufacturing sector (smelting and refining). The procedure followed also tended to understate the total output value of the mines sector because the recoverable metal content was valued at a lower level in the processing operations that is, as ores, concentrates, etc. before smelting and/or refining.

Prior to the full implementation of the establishment concept to include total activities, the "Materials and supplies" section included primarily a limited number of consumable materials such as explosives, drill steel, lubricants, etc. Many kinds of supplies, for example, maintenance and repair supplies were not reported. The extension of the Materials and supplies section in accordance with the total activities concept to provide for a more complete coverage of materials and supplies accounts for a major part of the increase in the total cost of Materials and supplies used. In the case of the vertically integrated companies the procedure followed omitted treatment charges such as milling, smelting refining, etc. from the input side of the mines sector involving these companies as well as from the output side of the Smelting and Refining industry. As a result the cost of materials (inputs) reported, particularly for the industries in the mines sector mentioned above was considerably understated.

As a result of the foregoing it was necessary to find some statistical device which would eliminate the above practices and permit the derivation of more meaningful principal statistics – for both the metal mines and for the smelting and refining industry.

While it has been suggested that smelting and refining should be treated as part of the metal mines, and that the statistics should be compiled on this basis, this would be difficult to justify from the statistical viewpoint. Smelting and refining by the nature of its operations produces a manufacturing activity and is considered such, not only in the Canadian and International classification systems but also in the systems of most foreign countries. To include it as part of the mining universe would not only make international comparisons virtually impossible but would affect the importance of Canada's manufacturing industries even more drastically than the changes which resulted from the approach adopted.

After a thorough study of these problems and consultations with the firms involved, it was found that the only satisfactory solution was to continue to consider smelting and refining as a manufacturing industry and to treat such operations of vertically integrated companies as "custom" operations regardless of whether or not the smelting and refining plants (establishments) of such companies were concerned solely with the smelting and refining of ore, concentrates, etc. of their own company. This procedure eliminated the need to arbitrarily value the ores, concentrates, etc. transferred to the smelter and to value the output of the smelter and refinery in terms of commodities produced. Although, for the purpose of commodity statistics, these are still valued on the basis of recoverable metal content, the revenue from integrated operations accrues to the mines concerned and is not duplicated, as in the past, in both the mining and the smelting and refining industries. Thus the revenue from smelting and refining in such integrated operations now consists primarily of treatment costs of own ores, etc. plus any revenue from toll charges of non-company ores, by-products, etc.

The effects of allocating the final revenues of the vertically integrated companies included in this industry to the metal mining industries and the broadening of coverage for materials used, as well as any changes resulting from the implementation of the revised Standard Industrial Classification and the New Establishment Concept, are reflected in the tables of principal statistics for the years 1961 to 1964. Additionally, these tables reflect the inclusion of the non-mining activities, i.e. the total activity concept.

CONCEPTS AND DEFINITIONS

Establishment

A mining establishment is typically a mine, mine/mill (concentrator), quarry, pit, bog, or plant principally engaged in commercial production activities. In many cases a mining company consists of a single establishment but it is not uncommon for a company to consist of a number of establishments some of which may be in mining i.e. mine/mill and others in manufacturing i.e. smelter, cement plant, etc. In addition a number of locations may be involved. Such firms are requested to submit a separate Census of Mining report for each mineral establishment which can meet the reporting requirements embodied in the following definition of the "establishment".

"The smallest unit which is a separate operating entity capable of reporting the following principal statistics:

Materials and supplies used
Goods purchased for resale as such
Fuel and power consumed
Number of employees and salaries and wages
Man-hours worked and paid
Inventories
Shipments or sales."

Each establishment is required to report on all the activities carried out within its accounting boundaries (except non-operating revenues such as rent, interest and dividends) and data on the different activities (mining etc., trading in goods not of own manufacture, construction by own labour force, revenue from services, etc.) are requested to be reported separately. It should be noted that the statistics for separate activities are not completed consistent since some respondents cannot distinguish, in their records, materials, shipments and inventories relating solely to their own mining activities. For example, inventory of commodities purchased for re-sale may not be distinguishable from inventory of own mineral commodities. Complete consistency, therefore, can be obtained only at the "all operations" (total activity) level and for studies or statistical measures requiring accurate coordinated data, the "total activity" statistics should be used.

The number of establishments represents the number of operating units that are principally engaged in the activities of the mineral industries to which they have been classified. These units do not necessarily represent the total number engaged in the production of a commodity mainly produced in a certain industry. Some commodities are produced as secondary products in other mineral and non-mineral industries. It should be noted that head offices and auxiliary units which are surveyed separately are not included in the establishment count, (see following notes on Head offices and auxiliary units).

Head Offices and Auxiliary Units

Head offices and auxiliary units of companies classified to the mineral industries such as sales offices, administrative offices, warehouses, laboratories, etc. are now surveyed as part of the Census of Mining.

These head offices and auxiliary units are either included in an establishment report or are surveyed by means of the head office questionnaire. The former is the most common case where a single establishment firm has its executive personnel, sales office, etc. located at the site of the mine (establishment). The special head office questionnaire is generally used where a firm, regardless of the number of establishments, has separately located offices or auxiliary units. Such offices or units do not constitute establishments within the Census of Mining as they do not normally generate operational revenues, but give rise only to cost of operations

(mainly salaries and wages) which are automatically included in the value of shipments or sales. Although not considered as establishments, and hence, not included in the "establishment" count for an industry, the operational costs are reflected in either the "Industry" statistics (3 or 4 digit level) or the "Major group" statistics (2 digit level) according to the following rules:

(a) In the case of single establishment firms, statistics of offices and units located in a different municipality to the mining establishment are classified to the same industry (3 or 4 digit) as the mining establishment;

(b) In the case of multi-establishment firms, the statistics for such offices and units are coded to the same industry as the establishments of the firm, when all establishments are in the same industry (3 or 4 digits). When establishments of such firms are coded (1) to different industries within a major group, (2) to industries in different major groups or (3) to industries in different divisions of the Standard Industrial Classification, then the statistics are included in the major group totals (2 digit level) in which the major part of the company's operations are classified. Although this may result in some distortion of major group statistics in the case of (2) and (3) the statistics at the industry (3 or 4 digit) level in all cases will be left free of these company-wide data.

Employees

(a) **Production and related workers – Mining activities**

In addition to those engaged directly in mining production activities, they include those employed in storing, inspecting handling, packing, warehousing, etc. They also include employees engaged in maintenance, repair, janitorial and watchman services and line supervisors (working foremen) engaged in similar work to that of the employees they supervise. For those establishments reporting on the "long" form, production and related workers engaged in mining activity are reported as those receiving pay during the last pay period of each month, an average for the year being obtained by summing the monthly figures and dividing by 12. This procedure is followed even though the establishment did not operate in all months in order to arrive at equivalent annual full-time employment. The numbers are somewhat affected by turnover, in that employment is overstated when an employee changes employment during a pay period. The man-hours of production and related workers in mining activity represent total man-hours paid (total hours at work during the calendar year plus hours not worked but nevertheless paid for, such as paid vacations, sick leave, statutory holidays, etc.). In reporting overtime hours, respondents are requested to report only hours actually at work. It should be noted that the division of hours paid into production and related workers payrolls results in average hourly earnings and does not represent hourly wage rates which are collected and published by the Department of Labour and which are based on selected occupations.

(b) **Production and related workers – Non-mining activities**

Such employees include those on mining establishments' payrolls engaged in activities such as construction undertaken for the use of these establishments and any other production workers who are not engaged directly in the production of ore and/or concentrates.

(c) **Administrative and office employees**

This category includes all executive and supervisory officials such as presidents, vice-presidents, comptrollers, secretaries, treasurers, etc., together with managers, professional, technical and research employees, superintendents and plant supervisors above the line supervisor or working foreman level, and clerical staff. Also included are employees in activities such as advertising, credit collections, purchasing, personnel, legal, medical, etc. It should be noted that prior to 1961 this category also included working owners and partners. Also included in this category are employees located at head offices or auxiliary units separately located from the establishment; in accordance to the rules outlined under "Head offices and auxiliary units" above.

(d) **Sales and distribution workers**

This category includes office personnel whose salaries are charged to selling expense, e.g. travelling salesmen. It may also include some sales employees who are reported as part of a mining establishment but are not working at the establishment. These are generally broken down by location in cases where more than 15 employees are involved in any one location. The figures exclude persons working on a commission basis who are not considered regular employees of the establishment.

(e) **Total employees**

This total comprises the foregoing categories including employees located at separately located head offices and auxiliary units. The numbers of employees included under categories (b), (c) and (d) are reported in the form of annual averages and represent as closely as possible full time employment; adjustments are made when reported figures indicate the existence of part-time or seasonal employment.

Working Owners or Partners

These are not now included in the statistics of employees and salaries and wages. There is some duplication in numbers when a person owns more than one establishment and is reported as a working owner on each Census return. Withdrawals of working owners are defined as amounts withdrawn by owners or partners for normal living expenses excluding withdrawals for payment of income tax.

Salaries and Wages

Salaries and wages refer to gross earnings of employees before deductions for income tax and employees contributions to social services such as sickness, accident and unemployment insurance, pensions, etc. They include all salaries, wages, bonuses, profits shared with employees, the value of room and board where provided, commissions (paid to regular employees only) as well as any other allowance forming part of the worker's earnings. Payments for over-time are included.

Fuel and Electricity

Figures for fuel refer to amounts actually used (including fuel used in cars, trucks, locomotives, etc.), not to purchases unless the quantities are substantially the same. Any fuel and electricity produced by establishments for internal consumption are not included in the total cost. Values represent laid down cost at the establishment including freight, duty, etc. Although fuel and electricity used is considered part of mining activity it should be noted that it also includes relatively small amounts used in non-mining activities since these cannot be reported separately.

Materials and Supplies

(a) **Mining activities**

Figures represent quantities and laid down cost values, at the establishment, of materials, supplies and purchased components owned and used during the year in mining activities and related processes. These statistics represent only commodity items or physical goods (cost of services or overhead charges such as advertising, insurance, depreciation, etc. are not included) whether purchased from others or received as transfers (in the form of materials, components or semi-processed goods) from other establishments of the reporting company. Included are maintenance and repair supplies not chargeable to fixed assets accounts and any amounts charged by other establishments for work done on materials owned by the reporting establishment. Cost of repairs or maintenance done by outside contractors and cost of returnable containers are not included.

(b) **Non-mining activities**

1. Purchases for re-sale as such

Figures represent cost of materials or products purchased from others by the reporting establishment (or received as transfers from other establishments of the reporting company) for re-sale as such in the same condition as purchased. Included are any finished products received on consignment from other countries.

2. Other materials and supplies used

Figures represent the cost of materials and supplies, if any, used in new construction and in the production of machinery and equipment (for the use of the reporting establishment) by the establishment's own employees. Included are materials used for any capital repairs and alterations carried out by the establishment's employees. Amounts paid to outside contractors for construction and repair work are not included nor is the cost of purchased machinery and equipment. Also included is the cost of office supplies not chargeable to fixed assets accounts and the cost of such other items of materials and supplies used as food, beverages and supplies for establishment-operated cafeterias and lunch counters, first aid and medical supplies, laboratory supplies, etc.

Value of Production

(a) **Value of production of goods produced in the establishment**

These figures represent the values in Canadian dollars of products shipped by the reporting establishments adjusted by changes in value between closing and opening inventory values of goods-in-process and finished products on hand. Included are revenues from repairs and custom work performed for other establishments and the cost (book value) of any goods produced by the mining establishment and shipped on a rental basis.

All products and by-products of own production shipped from the establishment are covered, including transfer shipments to sales outlets, distributing warehouses or to other processing plants of the reporting firm, when such units are treated as separate establishments. Production values are net of returned goods, discounts, returns, allowances, sales tax, excise taxes and duties, returnable containers and charges for outward transportation by common or contract carriers. Transportation or delivery expense incurred by the reporting establishment's own carriers are included.

Shipments of goods of own production of establishments which are coded to some other division of the Standard Industrial Classification (on the basis of principal activity) but which are engaged in mining as a subsidiary activity are collected by means of the Commodity questionnaire referred to earlier. Such shipments together with shipments of goods of own production of establishments forming the universe of mineral industries are compiled and recorded under appropriate headings in the various mineral industry publications; however, operational details relating to the production of such commodities are **not** included in the **principal** statistics shown in the reports for individual mineral industries.

(b) **Shipments of goods not of own manufacture**

These figures represent the net selling value at establishment (net of discounts, returns, allowances, sales taxes and excise duties and taxes and transportation charges by common or contract carriers) of all products or materials (including products transferred from other establishments of the reporting firm) sold as such in the same condition as purchased or received as transfers. All sales of consignment goods from other countries are included.

(c) **Other revenue**

Figures represent the book value of fixed assets, if any, (new construction and machinery and equipment including major repairs, alterations, additions, modifications, installation and assembly work) produced during the year for the use of reporting establishments by the establishment's own employees and for which depreciation accounts are maintained. Included also are any revenues from the sale of electricity, servicing revenues, commissions on sales (when not included in value of sales), revenue for company-operated cafeterias and lunch counters and revenue from outside installation or construction work not related to the establishment's own products, sale of used materials (excluding sale of used fixed assets) research and development work, etc. As mentioned previously the figures do not include non-operating revenue such as rent, dividends, interest, etc.

Value Added

(a) **By mining activities**

Figures are compiled by deducting the cost of operating materials, supplies, etc. and fuel and electricity consumed from the value of production.

(b) **By non-mining activities**

The figures are compiled by deducting the cost of goods purchased for re-sale (adjusted for changes in the value of inventories of goods purchased for re-sale) and the cost of non-mining materials and supplies used from the value of shipments of goods not of own manufacture, plus other revenue.

(c) **By total activities**

The figures consist of value added by mining activities plus value added by non-mining activities. "Value added" is sometimes referred to as net output or net production. However, to arrive at the National Accounts concept of net production, or Gross Domestic Product at "Factor cost" it would be necessary to subtract also the cost of advertising, insurance and other business expenses which are not collected as part of the annual Census of mining. "Value added" figures for the primary industries, manufacturing and construction are published in DBS publication Catalogue No. 61-202. "Survey of Production".