

GEOLOGICAL AND NATURAL HISTORY SURVEY OF CANADA.
ALFRED R. C. SELWYN, C.M.G., LL.D., F.R.S., DIRECTOR.

REPORT
ON THE
MINING & MINERAL STATISTICS
OF CANADA

FOR THE YEAR 1887;

BY

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TO ALFRED R. C. SELWYN, C.M.G., LL.D., F.R.S.,

Director of the Geological and Natural History Survey of Canada.

SIR,—I have the honor to forward herewith my report on the mining and mineral statistics of Canada for the year 1887.

As regards silver, iron ore, phosphate and pyrites, the statistics are supplemented by short notices giving details of the recent developments at the mines or of the mode of occurrence of the deposits.

The report "on Canadian Precious Stones" was kindly supplied by Mr. George F. Kunz, of New York, to whom our best thanks are due.

Cordial thanks are also due for the uniform courtesy and kind assistance accorded us in our inquiries for statistics, and I desire to mention especially in this connection the Departments of Mines of Nova Scotia and of British Columbia, and the Department of Customs at Ottawa. The help afforded me by my assistant, Mr. H. P. Brumell, of the Geological Survey, was very efficient, and deserves also a special mention.

I am, Sir,

Your obedient servant,

E. COSTE.

JUNE, 1888.

NOTE.—Throughout this report the ton is of 2,000 lbs., and the year the calendar year, unless otherwise specified.
The fiscal year begins on the 1st of July.

SUMMARY OF THE MINERAL PRODUCTION OF CANADA IN 1887.

NAME OF PRODUCT.	QUANTITY.	VALUE.
Antimony ore..... tons.	584	\$ 10,860
Arsenic..... "	30	1,200
Asbestos..... "	4,619	226,976
Baryta..... "	400	2,400
* Bricks..... thousands.	181,581	986,689
* Building stone..... cub. yds.	262,592	552,267
Cement..... bbls.	69,843	81,909
Charcoal..... bush.	1,610,900	88,823
Chromic iron ore..... tons.	38	570
Coal..... "	2,368,891	4,758,590
Coke..... "	40,428	135,951
Copper..... lbs.	3,260,424	342,345
* Fertilizer..... tons.	498	25,943
* Flagstone..... sq. ft.	116,000	11,600
Gold..... ozs.	66,270	1,178,637
Granite..... tons.	21,217	142,506
Graphite..... "	300	2,400
Grindstone..... "	5,292	64,008
Gypsum..... "	154,008	157,277
* Iron..... "	31,527	1,087,728
Iron ore..... "	76,330	146,197
Lead (fine, contained in ore)..... lbs.	204,800	9,216
* Lime..... bush.	2,269,087	394,859
Limestone for iron flux..... tons.	17,171	17,500
Manganese ore..... "	1,245	43,658
* Marble and Serpentine..... "	242	6,224
Mica..... lbs.	22,083	29,816
* Mineral Paint..... tons.	100	1,500
* Miscellaneous clay products.....		182,150
* Moulding sand..... tons.	160	800
Ochre..... "	385	2,233
Petroleum (a)..... (bbls. of 35 imp. gals.)	763,933	595,868
Phosphate..... tons.	23,690	319,815
Pig Iron..... "	24,827	366,192
Platinum..... ozs.	1,400	5,600
Pyrites..... tons.	38,043	171,194
Salt..... "	60,173	166,394
Silver.....		349,330
Slate..... tons.	7,357	89,000
Soapstone..... "	100	800
Steel..... "	7,326	331,199
Sulphuric acid..... lbs.	5,476,950	70,609
* Tiles..... thousands.	14,658	230,068
Whiting..... tons.	75	600
Estimated value of mineral products not returned....	abt.	1,610,499
Total.....	abt.	\$15,000,000

* Incomplete.

(a) The total given by the direct returns from the refineries was finally adopted as the most correct.

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EXPORTS OF MINERALS AND MINERAL PRODUCTS MINED OR MANUFACTURED IN CANADA
DURING THE YEAR 1887

ARTICLES.	VALUE.	ARTICLES.	VALUE.
Antimony ore.....	\$ 9,720	Forward.....	\$3,651,010
Asbestos.....	158,829	Manganese ore.....	34,855
Coal.....	1,695,783	Mica.....	3,480
Copper ore.....	109,336	Oil, mineral, coal & k'r'sue.	13,831
“ fine.....	29,100	Phosphates.....	433,217
Glass and glassware.....	1,030	Plumbago.....	3,017
Gold.....	920,329	Salt.....	11,526
Grindstones.....	28,769	Sand and Gravel.....	30,307
Gypsum.....	146,542	Silver.....	205,884
“ ground.....	13,953	Slate.....	1,253
Iron & Steel, all sorts, abt.	412,000	Stone & Marble, unwrought	53,986
Iron ore.....	42,634	“ “ wrought..	14,009
Lead ore.....	724	Other articles.....	212,990
Lime and Cement.....	82,261		
Forward.....	\$3,651,010	Total.....	\$4,669,365

EXPORTS OF MINERALS AND MINERAL PRODUCTS MINED OR MANUFACTURED IN CANADA
DURING THE FISCAL YEAR 1887

FORWARDED TO	VALUE.	FORWARDED TO	VALUE.
United States.....	\$3,358,005	Forward.....	\$4,264,636
Great Britain.....	623,216	Belgium.....	8,611
Newfoundland.....	150,000	Japan.....	5,250
Germany.....	46,851	France.....	5,012
Sandwich Islands.....	27,664	British East Indies.....	4,673
St. Pierre.....	15,978	Chili.....	4,341
Australia.....	12,356	British Africa.....	2,006
Argentine Republic.....	11,879	China.....	1,176
British West Indies.....	9,966	Other countries.....	4,785
Spanish “ “.....	8,721		
Forward.....	\$4,264,636	Total.....	\$4,300,490

IMPORTS OF MINERALS AND OF PRODUCTS CHIEFLY MANUFACTURED THEREFROM
DURING 1887.

ARTICLES.	VALUE.	ARTICLES.	VALUE.
Alum & aluminous cake..	\$ 22,148	Forward.....	\$23,727,320
Antimony	6,479	Lime	8,090
Arsenic	1,541	" chloride of.....	53,472
Asbestos, mfrs. of.....	8,489	Litharge	28,705
Asphaltum	9,403	Lithographic stones.....	6,369
Baryta	276	Manganese, oxide of....	3,169
Borax	19,891	Marble.....	82,958
Brass, and mfrs. of.....	501,367	Mercury.....	16,386
Bricks	15,502	Mineral waters.....	38,771
" and Tiles, Fire....	62,329	Ornamental stones.....	21,611
Buhrstones	3,535	Paints	534,451
Building stone.....	73,291	Petroleum	435,481
Cement	12,138	Plaster of Paris.....	5,622
" Portland.....	169,469	Platinum.....	1,636
Chalk	5,223	Potash salts.....	21,860
Clays, all sorts.....	50,980	Precious stones.....	259,328
Coal "	9,547,052	Salt.....	286,676
Copper, and mfrs. of.....	315,959	Sand and Gravel.....	30,508
Copperas.....	5,741	Slate.....	25,214
Earthenware	207,847	Soda salts.....	304,109
Emery and Pumice.....	16,527	Spelter.....	22,250
Emery wheels.....	3,425	Sulphur.....	31,616
Fertilizers	43,745	Sulphuric acid.....	39,210
Flagstones.....	20,269	Tiles, drain & sewer pipes glazed	90,380
Glass and Glassware.....	1,234,522	Tiles, all others.....	7,449
Graphite, and mfrs. of....	14,044	Tin, and mfrs. of....	938,737
" Pencils.....	62,338	Whiting.....	19,360
" Blacklead.....	16,876	Yellow metal.....	42,965
Grindstones.....	19,274	Zinc, and mfrs. of.....	83,263
Iron, Pig Iron and Steel, all sorts, about.....	11,000,000		
Lead, and mfrs. of.....	257,640		
Forward.....	\$23,727,320	Total.....	\$27,166,966

ABRASIVE MATERIALS.

Grindstone. Grindstone was the only abrasive material for which returns were received for the year 1887. Small quantities of infusorial earth and whetstones from Canadian deposits were probably also marketed during the year, but particulars have not been obtained. As to emery, corundum, buhrstones, pumice stone, and other abrasive materials, it is believed that no quantity has ever been obtained commercially from deposits in Canada.

Summary. The total production of grindstones during the year was 5,292 tons, valued, manufactured, at the quarries, at \$64,008. This is an increase of 1,292 tons, and \$17,463, over the returns of 1886, but as the returns last year were incomplete, this does not show the real increase of production.

Production by provinces. The above production was from the provinces of New Brunswick and Nova Scotia, respectively, as below :—

	Quantity.	Value mfd. at quarries.
New Brunswick, 7 producers.....	3,582 tons.	\$38,988
Nova Scotia, 2 producers.....	1,710 tons.	\$25,020

Exports and imports. The following tables show the exports and imports of grindstone, as well as the imports of buhrstone, emery and pumice stone :—

EXPORTS OF GRINDSTONE.

PROVINCE.	1886.	1887.
Ontario.....	.....	\$ 500
Quebec.....	\$ 1	12
Nova Scotia.....	9,400	10,425
New Brunswick.....	14,784	17,832
Totals.....	\$24,185	\$28,769

IMPORTS OF GRINDSTONE.

PROVINCE.	1886.		1887.	
	Tons.	Value.	Tons.	Value.
Ontario.....	862	\$ 9,587	1,255	\$13,718
Quebec.....	222	2,718	442	4,576
Nova Scotia.....	....	69	....	35
Manitoba.....	30	832	30	466
British Columbia.....	18	488	9	479
Totals.....	1,132	\$13,694	1,736	\$19,274

IMPORTS OF BUHRSTONE.

PROVINCE.	1886.		1887.	
	No.	Value.	No.	Value.
Ontario.....	618	\$1,203	366	\$1,184
Quebec.....	....	696	1,865	2,325
British Columbia.....	....	.....	....	26
Totals.....	....	\$1,899	....	\$3,535

IMPORTS OF EMERY AND PUMICE STONE.

PROVINCE.	1886.	1887.
Ontario.....	\$10 461	\$10.781
Quebec.....	3,225	3,968
Nova Scotia....	103	360
New Brunswick.....	1,250	1,413
Manitoba	1	1
British Columbia.....	33	2
Prince Edward Island.....	12	2
Totals.....	\$15,085	\$16,527

IMPORTS OF EMERY WHEELS

PROVINCE.	Value.
Ontario	\$ 759
Quebec.....	1,831
Nova Scotia.....	60
New Brunswick.....	642
Prince Edward Island.....	4
Manitoba.....	55
British Columbia.....	74
Total.....	\$3,425

ANTIMONY.

Summary. The antimony ore in 1887 was nearly all produced in Nova Scotia, only 34 tons having been exported from the Lake George mine, York Co., N.B., which was not worked during the year. Some preparatory work was done at the Lake Nicolet mine, South Ham, Quebec. The total production was 584 tons, valued at \$10,860.

Nova Scotia. According to Mr. Gilpin's report to us, the production in Nova Scotia, at the Rawdon mines, was 550 tons, worth at the mine about \$18 per ton, or \$9,900. This shows a great decrease in the value of the ore, and a poorer quality of ore obtained than during last year.

Exports and imports. The tables of exports and imports are appended.

EXPORTS OF ANTIMONY ORE, YEAR 1887.

TABLE 1.

PROVINCE.	Tons.	Value.
Nova Scotia (<i>a.</i>).....	195	\$8,760
New Brunswick (<i>b.</i>).....	34	960

(*a.*) Shipped to Great Britain.
(*b.*) " " United States.

IMPORTS OF ANTIMONY, YEAR 1887.

TABLE 2.

PROVINCE.	Pounds.	Value.
Ontario.....	47,880	\$3,551
Quebec.....	28,343	2,746
Nova Scotia.....	112	8
New Brunswick.....	2,016	174
Totals.....	78,351	\$6,479

ARSENIC.

There were 30 tons only of refined arsenic shipped during the year Summary.
1887 from the Deloro mine, Ontario, compared with 120 tons in 1886.
The value of this shipment at the mine was \$1,200, or \$40.00 per ton,
and the cost of placing it on the New York market was \$7.50 per ton.
Only a small quantity was sold in the crude state.

Analyses of this arsenious oxide are appended :—

Mean of a car load by P. de P. Rickets, } Columbia College..... }	As ₂ O ₃ impurities.	99.84 0.16	Analyses.
		100.00	
By Baker Edwards of Montreal..... }	Refined arsenic, 97.5 As ₂ O ₃ Crude arsenic, 92.8 "		

Much more of this practically pure arsenic could be manufactured at this mine as the ore, which contains also a considerable percentage of gold, is very rich in mispickel or arsenical sulphuret of iron. The United States market requiring from 1,500 to 2,000 tons every year, according to the statistics of imports of that country and the Deloro arsenic having been well received in the United States, there seems to be no reason why the Deloro mine should not supply at least a much larger proportion of the demand of that country.

No other mine in Canada produced arsenic in 1887.

The following table gives the imports for 1886 and 1887 :—

Imports.

PROVINCE.	1886.		1887.	
	Pounds	Value.	Pounds.	Value.
Ontario.....	12,741	\$351	13,136	\$ 456
Quebec.....	12,828	533	26,536	937
Nova Scotia.....	2,413	85	3,837	144
New Brunswick. ....	.....	....	100	4
Manitoba.....	200	10	.....	....
Totals.....	28,181	\$979	43,609	\$1,541

ASBESTUS.

Summary. According to the direct returns received, the total quantity of asbestos marketed during the year in Canada was 4,619 tons, valued at the mines at \$226,976. This shows an increase of 1,161 tons in quantity, and \$20,725 in value, over the returns of 1886.

Statistics of previous years. In the report for 1886 a table was given of the shipments of asbestos from Canadian mines since the first production in 1879; this table was made up from the returns furnished by the producers. We have since been favored by Mr. James R. Woodward, General Manager of the Quebec Central Railway, with the following table of the asbestos shipments from Thetford and Black Lake stations:—

Fiscal years.	Tons.
1882	410
1883	724
1884	1,104
1885	1,327
1886	1,882

If to this is added 900 tons to cover all the shipments before June 30th 1881, plus about 1,500 tons shipped in the second half of the year 1886, and 515 tons which were delivered from other mines and were included in the table of the last report, we have a total of 8,362 tons to compare with the total of 10,024½ tons given in the 1886 report. This shows the figures in the table above referred to to be about 16 per cent too high, the producers, probably, sometimes returning the output and not the quantities shipped.

Production by provinces. Except 400 tons the whole is from Quebec, and mined by ten different producers at Thetford, Black Lake, Danville and Coleraine. The shipments from Thetford mines and Black Lake mines were 3,661 tons according to the direct returns received, while a detailed statement, kindly supplied by Mr. Woodward, give 3,513 tons as follows:—

Thetford Mines.....	2,560 tons.
Black Lake "	953 "

Ontario. In Ontario 400 tons of a somewhat different article, valued at \$6,000 at the mill, and used principally for asbestos roofing, were produced by Messrs. James & Taylor, of Bridgewater.

The following table 1 represents only the exports from 1st of July to the end of the year, as before that date there was no separate entry for asbestos in the returns of the Customs department. Table 2 gives the imports of the manufactured article :—

EXPORTS OF CRUDE ASBESTUS DURING THE SECOND
HALF OF 1887.

TABLE 1.

Quality.	Tons.	Value.
1st class Asbestos.....	1,761	\$130,707
2nd " "	566½	23,296
3rd " "	184	4,826
Total half year 1887....	2,511½	\$158,829

IMPORTS OF MANUFACTURED ASBESTUS, YEAR 1887.

TABLE 2.

PROVINCE.	Value.
Ontario	\$3,485
Quebec	3,848
Nova Scotia.....	312
New Brunswick.....	576
Manitoba	32
British Columbia.....	236
Total.....	\$8,489

COAL.

The total production of coal in 1887 was 2,368,891 tons, valued at the points of production at \$4,758,590.

This is an increase, as compared with the returns of 1886, of 276,915 tons, and \$741,365, but as the production in New Brunswick and in Manitoba is included in the returns of this year and were not last year, the real increase in the other districts, that is :—in Nova Scotia, the North west Territories, and British Columbia, is 266,475 tons, and \$717,358, or from 12 to 17 per cent.

Total
production and
comparison
with 1886.

Production by
provinces.

The following table gives the total production of each province :—

PRODUCTION OF COAL DURING 1887, BY PROVINCES.

PROVINCE.	Tons.	Value at mine.	No. of men employed.	No. of Prd'cers.
Nova Scotia	1,871,338	\$2,923,966	4,367	20
British Columbia..	413,360	1,653,440	1,463	3
North West Terr..	73,752	156,777	321	10
New Brunswick...	10,040	23,607	110	16
Manitoba	400	800	4	1
Totals	2,368,890	\$4,758,590	6,265	50

Nova Scotia.

Tables A, B, C and D, taken from the report of the Inspector of Mines, give the details of the production and of the sales of coal in Nova Scotia in 1887; table E, from the same source gives the yearly production since 1870.

PRODUCTION, SALES AND COLLIERY CONSUMPTION OF COAL IN NOVA SCOTIA
DURING THE YEARS 1887, 1886, 1885 AND 1884.

TABLE A.

Period.	Production.	Sales.	Colliery consumption.
1887 First quarter, tons..	230,948	155,472	34,992
1887 Second " " ..	474,840	421,315	47,696
1887 Third " " ..	626,480	629,040	34,036
1887 Fourth " " ..	539,070	196,219	39,826
Totals	1,871,338	1,702,046	156,550
1886 "	1,682,924	1,538,504	159,512
1885 "	1,514,470	1,405,051	142,939
1884 "	1,556,010	1,413,048	130,781

DISTRIBUTION OF NOVA SCOTIA COAL SOLD DURING THE YEAR 1887.

TABLE B.

Market.	Tons.
Nova Scotia :—	
Transported by land	297,926
" by sea	227,874
Total	525,800
New Brunswick	208,892
Newfoundland	91,899
Prince Edward Island	56,689
Quebec	738,961
West Indies	6,877
United States	82,759
Other countries	169
Total	1,702,046

COAL TRADE BY COUNTIES IN NOVA SCOTIA DURING THE YEAR 1887.

TABLE C.

Year 1887.	CUMBERLAND.		PICTOU.		CAPE BRETON.		OTHER COUNTIES		Total.	
	Raised.	Sold.	Raised.	Sold.	Raised.	Sold.	Raised.	Sold.	Raised.	Sold.
First Quarter	112,712	103,141	50,133	44,239	68,104	8,094	....	....	230,949	155,471
Second "	140,880	132,167	87,132	71,425	246,827	217,723	....	....	474,839	421,315
Third "	146,600	138,156	145,963	134,592	333,916	356,200	....	....	626,479	629,039
Fourth "	159,217	147,501	147,866	129,462	231,876	219,196	112	67	539,471	496,220
Totals.	559,408	520,965	431,094	379,718	880,723	801,295	112	67	1,871,338	1,702,045

PRODUCTION OF COAL IN NOVA SCOTIA BY COLLIERIES DURING 1887.

TABLE D.

	Colliery.	Tons.	Colliery.	Tons.
Cumberland Co.	Chignecto.....	18,458	Forward.....	1,141,798
	Joggins.....	18,647	Francklyn.....	6,073
	Lawson.....	134	Glace Bay.....	89,058
	Spring Hill.....	522,170	Gowrie.....	143,894
Pictou Co.	Acadia.....	258,284	International.....	122,532
	Barton.....	364	Ontario.....	8,700
	East River.....	1,282	Reserve.....	99,511
	Intercolonial.....	171,164	Sydney.....	191,276
Cape Breton Co. Inverness Co.	Blockhouse.....	8,597	Victoria.....	68,384
	Bridgeport.....	21,577	Mabou.....	112
	Caledonia.....	121,121	Total.....	1,871,338
	Forward.....	1,141,798		

YEARLY PRODUCTION OF COAL IN NOVA SCOTIA SINCE 1870.

TABLE E.

Year.	Tons.	Year.	Tons.
1870	700,861	1880	1,156,635
1871	754,031	1881	1,259,182
1872	984,664	1882	1,529,708
1873	1,117,643	1883	1,593,259
1874	977,446	1884	1,556,010
1875	874,905	1885	1,514,470
1876	794,803	1886	1,682,924
1877	848,395	1887	1,871,338
1878	863,081	Total....	21,024,218
1879	882,863		

The following tables F & G, compiled from the reports of the Minister of Mines of British Columbia, show respectively the details of the coal trade there in 1887, and the yearly output since 1874:—

COAL TRADE OF BRITISH COLUMBIA DURING THE YEAR 1887.

TABLE F.

Name of colliery.	Coal raised.		Sold for home consumption.		Sold for exportation.	On hand January 1st, 1887.		Unsold, including coal in stock, Jan. 1st 1888.	Number of men employed.
	Tons.	cwts.	Tons.	cwts.		Tons.	cwts.		
Nanaimo.....	138,712	11	23,491	12	114,815	882	10	1,288 9	618
Wellington ..	239,217	4	72,464	4	187,193	20,711		271	715
E. Wellington.	35,431		1,000		32,831	2,000		1,340	130
Totals..	413,360	15	96,955	16	334,839	23,593	10	2,899 9	1,463

PRODUCTION OF COAL IN BRITISH COLUMBIA FROM 1874 TO 1887 INCLUSIVE.

TABLE G.

Year.	Tons.
1874.....	81,000
1875.....	110,000
1876.....	139,000
1877.....	154,000
1878.....	171,000
1879.....	241,000
1880.....	268,000
1881.....	228,000
1882.....	282,000
1883.....	213,000
1884.....	394,070
1885.....	365,000
1886.....	326,636
1887.....	413,360

Returns have been received from ten different producers of coal in the North West Territories, and the total of their production for 1887 was 73,752 tons valued at the mines at \$156,777. This, it is believed, represents the total production of the Territories within about 200 tons. It was mined at Lethbridge, Anthracite, Bow River Coal Mine near Cochrane Station, and near Edmonton. This is an increase of about 30,000 tons over the production of 1886.

From New Brunswick 15 returns were received, all from the Grand Lake district, representing 8,360 tons sold for \$20,247 at the mines. Estimating the total missing returns at about 1,200 chaldrons, or 1,680 tons, we have about 10,000 tons as a close estimate of the total production. As coal mining in New Brunswick is only done in a desultory way, it is therefore very difficult to obtain more complete statistics.

Exports and
imports.

The total exports during 1887 were 670,063 tons, of which 89,098 tons were foreign coal previously imported.

The imports amounted to 1,440,152 tons of anthracite and 1,218,333 tons of bituminous coal, which shows a remarkable increase of 47 per cent in the importations of anthracite, due, no doubt, to the removal of the duty.

The following tables 1, 2 and 3, give respectively the exports by Provinces in 1886 and 1887, the exports from Nova Scotia and British Columbia since 1874, and the imports of anthracite and bituminous coal in the last two years by provinces:—

EXPORTS OF COAL (FOREIGN & CANADIAN) BY PROVINCES IN THE YEARS 1886 & 1887.

TABLE 1.

PROVINCE.	1886.			
	CANADIAN.		FOREIGN.	
	Tons.	Value.	Tons.	Value.
Ontario.....	367	\$ 1,299	49,469	\$119,853
Quebec	5,126	21,432	20,342	38,092
Nova Scotia.....	240,459	441,693	5	25
New Brunswick...	17	162	8,610	33,038
Manitoba .....	.....	.....	.....	.....
British Columbia..	274,466	960,649	.....	.....
P. E. Island.....	268	601	17	51
Totals.....	520,703	\$1,425,836	78,443	191,059

PROVINCE.	1887.			
	CANADIAN.		FOREIGN.	
	Tons.	Value.	Tons.	Value.
Ontario.....	.....	.....	67,837	\$170,754
Quebec	14,737	\$ 37,772	15,188	23,413
Nova Scotia.....	207,941	390,738	3,803	9,297
New Brunswick...	1,341	4,025	2,270	7,486
Manitoba.....	15	60	.....	.....
British Columbia..	356,657	1,262,552	.....	.....
P. E. Island.....	274	636	.....	.....
Totals.....	580,965	\$1,595,783	89,098	\$210,950

EXPORTS OF COAL FROM NOVA SCOTIA AND BRITISH COLUMBIA (THE PRODUCE OF CANADA) FROM 1874 TO 1887, INCLUSIVE.

TABLE 2.

Year.	NOVA SCOTIA		BRITISH COLUMBIA.	
	Tons.	Value.	Tons.	Value.
1874	252,124	\$647,539	51,001	\$ 278,180
1875	179,626	404,351	65,842	356,018
1876	126,520	263,543	116,910	627,754
1877	173,389	352,453	118,252	590,263
1878	154,114	293,795	165,734	698,870
1879	113,742	203,407	186,094	608,845
1880	199,352	344,148	219,878	775,008
1881	193,081	311,721	187,791	622,965
1882	216,954	390,121	179,552	628,437
1883	192,795	336,088	271,214	946,271
1884	222,709	430,330	245,478	901,440
1885	176,287	349,650	250,191	1,000,764
1886	240,459	441,693	274,466	960,649
1887	207,941	390,738	356,657	1,262,552
Totals...	2,649,293	\$5,159,577	2,689,060	\$10,258,016

IMPORTS OF ANTHRACITE AND BITUMINOUS COAL BY PROVINCES IN 1886 AND 1887.

TABLE 3.

PROVINCE.	1886.				1887.			
	ANTHRACITE.		BITUMINOUS COAL.		ANTHRACITE.		BITUMINOUS COAL.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
Ontario	649,384	\$2,755,294	937,988	\$2,541,140	1,042,077	\$4,456,827	1,138,279	\$3,226,524
Quebec.....	267,286	957,740	75,864	136,468	340,046	1,315,390	75,324	147,890
Nova Scotia.....	18,803	59,550	1,243	5,963	21,909	79,04	1,131	7,135
New Brunswick..	34,845	111,269	8,922	17,535	33,333	126,449	3,102	7,607
Manitoba	3,437	15,800	69	289	2	25	1,832	4,345
British Columbia.	26	407	589	3,938	112	1,737	665	5,259
P. E. Island.....	1,747	4,975	36	71	2,673	9,950	.....	.....
Totals....	975,528	\$3,905,026	1,024,702	\$2,705,304	1,440,152	\$5,990,233	1,218,333	\$3,398,760

Coke.

Returns received from the Londonderry Iron Works and from the Albion Mines, Nova Scotia, show the quantity manufactured by these two companies to have been 40,428 tons, valued at the ovens at \$135,951. 162 ovens were in fire, and the number of men employed was about 60. Coke ovens were built in December, 1887, at Cow Bay, Cape Breton, and have been in fire since, but had not produced during the year to which these statistics refer.

The following table gives the imports of coke for the last three years:—

IMPORTS OF COKE DURING THE YEARS 1885, 1886 AND 1887.

PROVINCE.	1885		1886		1887	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
Ontario	9,860	\$33,681	11,140	\$38,406	15,981	\$67,797
Quebec	1,682	5,118	2,132	7,510	3,696	13,849
New Brunswick..	.....	.....	2	11	.....	.....
Manitoba	34	237	163	1,150	43	260
British Columbia.	253	1,041	105	364	85	429
Totals....	11,829	\$40,077	13,542	\$47,441	19,805	\$82,335

Charcoal.

The production of charcoal is estimated to have been in 1887, about 1,610,900 bushels, worth at the kilns about \$88,823. Of this 940,400 bushels were used in the manufacture of pig iron at the Radnor and Drummondville Blast Furnaces, and about 670,500 bushels were manufactured in the County of Essex for exportation to iron works in the United States.

COPPER.

Summary.

The total marketed production of copper in 1887 in Canada was, according to the returns received, 40,800 tons of ore containing 3,260,424 lbs* of fine copper, valued, at the average market price for the year of 10½ cts., at \$342,345.

This, compared with the 1886 production, shows a decrease of 344,576 lbs., principally due to the fact that the largest of the producers, Messrs. G. H. Nichols & Co., were extensively engaged during the year in constructing a new mining plant and sulphuric acid works.

* Quantity of fine copper manufactured from the ore of Capelton plus copper contents calculated from assay value in the other returns.

The 1887 production was mined:—at Capelton, in Quebec; at the Sudbury mines, in Ontario; and at the Goodfellow mine, in Albert Co., New Brunswick. The larger part, viz.:—38,773 tons, with a copper content of 2,937,900 lbs., was from the Albert and Crown mines of Capelton. At Coxheath mines, in Nova Scotia, a little exploratory level driving was done, but no returns of ore shipment were made to the Inspector of Mines at Halifax.

There being no copper works in Canada, the whole of the production was exported principally to the United States, and as follows, according to the returns of the Customs Department:—

PROVINCE.	Quantity.	Declared Value.	Destination.
Ontario	567 tons of ore.	\$ 3,416	U. S.
Quebec	1,015½ " " ore.	13,550	G. B.
	1,210 " " fine copper.	121,000	U. S.
Nova Scotia	6 " probably matte.	270	G. B.
New Brunswick...	2 " " "	200	G. B.

The following Table 1 gives the exports from Quebec and Ontario for the last four years as per corrected Customs Department returns, and Table 2 shows that the export returns at Stanstead, our principal port of export for copper ore, are constantly lower than what is really exported, and consequently is a proof that in Table 1 the figures in Quebec should be greater.

EXPORTS OF COPPER FROM ONTARIO AND QUEBEC.
(From details furnished by Customs Department).

TABLE 1.

Year.	Quebec.		Ontario.		Total.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
1884	2,714,400	\$273,422			2,714,400	\$273,422
1885	2,626,000	262,600			2,626,000	262,600
1886	2,736,630	232,855	164,040	\$16,404	2,900,670	249,259
1887	2,555,500	134,550	34,160	3,416	2,589,660	137,966

COMPARATIVE STATEMENT OF COPPER CONTENTS OF SAME QUANTITIES OF CANADIAN
ORES EXPORTED TO THE UNITED STATES.

TABLE 2.

Fiscal Years.	Imported to Vermont as per U. S. Treasury De- partment Returns.		Exported from Stanstead as per Canadian Customs Department Returns.		Difference.	
	Pounds of Copper.	Value,	Pounds of Copper.	Value.	Pounds of Copper.	Value.
1884	2,234,642	\$223,405	1,676,000	\$171,700	558,642	\$51,705
1885	2,943,736	294,413	2,452,000	245,200	491,736	49,213
1886	3,318,723	332,033	2,590,000	267,340	728,723	64,693
1887	3,064,337	170,523	2,770,000	161,200	294,337	9,323

The imports in 1886 and 1887 were as below :—

IMPORTS OF COPPER.

(From Customs Department Books).

PROVINCE.	1886.			1887.		
	Pigs, bars, ingots, old, &c.		Manufac- tured.	Pigs, bars, ingots, old, &c.		Manufac- tured.
	Pounds.	Value.		Pounds.	Value.	
Ontario.....	1,159,200	\$121,994	\$29,162	1,121,400	\$120,204	\$35,768
Quebec	1,146,100	64,349	16,623	794,600	67,855	56,700
Nova Scotia...	64,100	4,823	3,488	37,500	3,054	11,231
N. Brunswick.	66,200	4,547	4,123	54,200	5,153	6,644
P. E. Island ..	3,800	480	112	1,000	119	82
Manitoba.....	.....	.....	4,763	2,100	242	2,642
B. Columbia..	4,400	653	4,503	16,200	1,900	4,365
Totals....	2,443,800	\$196,846	\$62,769	2,027,000	\$198,527	\$117,432

GOLD.

The total production in 1887 was 66,271 ozs., valued at \$1,178,637. ^{Production by provinces.} About 3250 men were employed in gold washing or gold mining during the year. This production compared with that of 1886 shows a decrease of 10,608 ozs. and of \$151,805 or a decrease in the value of 11 per cent, which is principally due to a falling off in British Columbia of about 23 per cent.

By provinces the above total quantity would be divided as follows:—

Province.	Oz.	dwt.	grs.	Value.	No. of men employed.
				\$	
British Columbia.....	40,856	— 8	— 5	694,559 ^a	2,379
Nova Scotia.....	21,211	— 17	— 18	413,614	578
Ontario.....	450	— 7	— 0	6,760	15
North West Terr..... (includ. Yukon dist).	3,660	— 5	— 0	62,100	256
Quebec	90	— 18	— 10	1,604	22
Total	66,270	— 16	— 9	\$1,178,637	3,250

(a) A small amount of bullion obtained at one of the quartz mines is added to the total \$693,709 given in the Minister of Mines' annual report.

The statistics for British Columbia are from the annual report of ^{British Columbia.} the Minister of Mines of that province, and are as follows:—

Table A is the statement of the gold exported by the banks at Victoria during the year.

Table B gives the gold returns as estimated by the Gold Commissioners of the different district.

Table C shows the yearly yield of gold in the province since 1858.

VALUE OF GOLD REPORTED AT THE BANKS AT VICTORIA DURING THE YEAR 1887.

TABLE A.

Bank of British Columbia.....	\$320,794
Bank of British North America.....	58,774
Garesche, Green & Co.....	199,356
	<hr/>
	\$578,924

PRODUCTION OF GOLD AND NUMBER OF MINERS EMPLOYED IN BRITISH COLUMBIA DURING
1887, AS ESTIMATED BY THE GOLD COMMISSIONERS.

TABLE B.

Districts.	Divisions.	Whites.	Chinese.	Yield of gold by divisions.	Total yield by districts.
Cariboo	Barkerville	89	201	\$ 79,373	\$227,673
	Lightning Creek	28	163	30,700	
	Quesnel Mouth	10	127	51,000	
	Keithley Creek	27	211	66,600	
		154	702		
Cassiar	Laketon	24	53	31,430	60,485
	McDame Creek	8	52	23,775	
	Skeena	17	4	5,280	
		49	109		
Kootenay	Northern	100	20	8,550	37,900
	Southern	13	62	29,350	
		113	82		
Lillooet		50	400	106,000	106,000
Omineca		12	18	13,000	13,000
Yale	Hope, Yale and Lytton .....	.....	200	20,000	158,200
	Kamloops	6	16	5,200	
	Okanagan	9	30	5,000	
	Similkameen	102	325	128,000	
		117	571		
	Total Whites	495	.....		\$603,258
	" Chinese .....	.....	1882		
	Total employed	2,377			

ANNUAL PRODUCTION OF GOLD IN BRITISH COLUMBIA SINCE 1858.

TABLE C.

Year.	Amount actually known to have been exported by banks, &c.	Add one-third more, estimate of gold carried away in private hands.	Total.	Number of miners employed.	Average yearly earnings per man.
1858 (6 months.)	\$ 390,265	\$ 130,088	\$ 520,353	3,000	\$ 173
1859	1,211,304	403,768	1,615,072	4,000	403
1860	1,671,410	557,133	2,228,543	4,400	506
1861	1,999,589	666,529	2,666,118	4,200	634
1862	3,184,700	1,061,566	4,246,266	4,100	517
1863				4,400	482
1864	2,801,888	933,962	3,735,850	4,400	849
1865	2,618,404	872,801	3,491,205	4,294	813
1866	1,996,580	665,526	2,662,106	2,982	893
1867	1,860,651	620,217	2,480,868	3,044	814
1868	1,779,729	593,243	2,372,972	2,390	992
1869	1,331,234	443,744	1,774,978	2,369	749
1870	1,002,717	334,239	1,336,956	2,348	569
1871	1,349,580	449,860	1,799,440	2,450	734
1872	1,208,229	402,743	1,610,972	2,400	671
1873	979,312	326,439	1,305,749	2,300	567
1874	1,383,464	461,154	1,844,618	2,868	643
1875	1,856,178	618,726	2,474,904	2,024	1,222
1876	1,339,986	446,662	1,786,648	2,282	783
1877	1,206,136	402,045	1,608,182	1,960	820
1878	1,062,670	1-5th 212,534	1,275,204	1,883	677
1879	1,075,049	" 215,009	1,290,058	2,124	607
1880	844,856	" 168,971	1,013,827	1,955	518
1881	872,281	" 174,456	1,046,737	1,898	551
1882	795,071	" 159,014	954,085	1,738	548
1883	661,877	" 132,375	794,252	1,965	404
1884	613,304	" 122,861	736,165	1,858	396
1885	594,782	" 118,956	713,738	2,902	246
1886	753,043	" 150,608	903,651	3,147	287
1887	578,924	" 115,785	693,709	2,342	296
			\$50,983,226		

The statistics of the gold production of Nova Scotia in 1887 according to the report of Mr. Gilpin, Inspector of Mines of that province, will be found, by districts, in the following table A. Nova Scotia.

Tables B and C, compiled from the annual reports of the Inspector of Mines, give the production by districts as well as the yearly output for the whole of Nova Scotia since the beginning of the year 1862:—

GENERAL STATEMENT OF GOLD PRODUCTION IN NOVA SCOTIA FOR THE YEAR 1887.

TABLE A.

DISTRICTS.	No. of mines.	Days labor.	Mills.	Steam power.	Water power.	Quartz, &c., crushed.	Yield per ton.			Total yield of gold.			Max. yield per ton.		
							tons.	oz.	dwt. grs.	oz.	dwt. grs.	oz.	dwt. grs.	oz.	dwt. grs.
Caribou.....	3	7,832	1	1	0	2,680	0	13	20	1,861	9	22	0	18	5
Oldham.....	2	11,606	1	0	1	2,357	1	2	1	2,599	7	9	2	10	4
Renfrew.....	1	5,098	2	0	2	1,234	0	12	3	750	4	14	0	17	16
Sherbrooke.....	4	9,575	0	0	0	2,413	0	4	20	585	3	5	0	18	7
Stormont.....	2	2,964	1	1	0	663	9	8	20.7	293	15	22	1	5	6
Tangier.....	2	6,319	2	2	0	738	0	8	10	311	10	13	1	10	0
Uniacke.....	1	10,503	3	3	0	689	0	3	2	107	3	1	0	4	6
Salmon River.....	1	33,774	1	0	1	10,602	0	6	3	3,253	0	0	0	9	1
Brookfield.....	1	13,075	1	0	1	1,691	0	16	18	1,418	1	15	1	3	9
Whiteburn.....	2	7,599	3	3	0	1,094	2	2	3	2,305	12	13	6	2	8
Lake Catcha.....	2	12,116	2	2	0	601	4	18	18	2,959	4	0	7	5	4
Rawdon.....	2	31,560	1	1	0	5,302	0	13	5.5	3,507	13	8	1	7	2
Fifteen Mile Stream	1	4,920	1	1	0	829	0	9	15	398	5	0	1	5	4
Unproclaimed, &c.	4	16,437	5	2	3	1,378	0	12	10	856	6	16	1	9	0
Totals.....	28	173,428	24	16	8	32,280	Av. 0-19-11			21,211	17	18	7	5	4

GOLD PRODUCTION OF THE DIFFERENT DISTRICTS IN NOVA SCOTIA FROM 1862 TO 1887
INCLUSIVE.

TABLE B.

District.	Total quan- tity of quartz crushed.	Total Yields.				Average yield per ton of 2,000 lbs.
		Quantity.			Value at \$19.50 per oz.	
		Tons.	Oz.	dwt. grs.		
Caribou	23,647	17,606	0	4	\$343,317	\$14.56
Montague	13,828	28,417	0	10	554,133	40.07
Oldham	33,528	34,059	1	18	664,153	19.80
Renfrew	43,096	30,220	8	13	589,299	13.67
Sherbrooke	161,355	118,868	17	15	2,317,943	14.36
Stormont	16,355	18,656	6	17	363,797	22.24
Tangier	28,156	18,751	10	6	365,653	12.80
Uniacke	31,920	18,215	16	5	355,209	11.12
Waverly	88,953	53,158	18	4	1,036,598	11.65
Salmon River...	10,602	3,258	0	0	63,531	5.99
Brookfield	1,691	1,418	1	15	27,652	16.31
Whiteburn	1,094	2,305	12	13	44,960	41.09
Lake Catcha....	601	2,959	4	0	57,705	96.00
Rawdon	5,302	3,507	13	8	68,399	12.90
Wine Harbor...	38,944	27,287	16	19	532,112	13.66
Darr's Hill.....	39,909	18,715	19	19	364,962	9.14
15 Mile Stream..	1,917	958	11	23	18,693	9.75
Unproclaimed...	44,171	35,262	10	15	687,620	15.56
Total	585,069	433,627	10	12	\$8,455,736	\$14.45

YEARLY PRODUCTION OF GOLD IN NOVA SCOTIA SINCE 1862.

TABLE C.

YEAR.	Tons of quartz crushed.	Total yields.		Average yield per ton of 2,000 lbs.
		Quantity.	Value @ \$19.50.	
		Oz. Dwt. Grs.		
1862	6,473	7,275 8 0	\$141,871	\$21.91
1863	17,000	13,971 13 17	272,448	16.02
1864	21,431	20,017 18 13	390,349	18.11
1865	24,421	25,454 3 22	496,357	20.32
1866	32,157	25,204 13 2	491,491	15.28
1867	31,384	27,310 18 11	532,563	16.96
1868	32,259	20,541 6 10	400,555	12.41
1869	35,144	17,868 0 19	348,427	9.91
1870	30,824	19,866 5 5	387,392	12.56
1871	30,787	19,229 7 4	374,972	12.17
1872	17,089	13,094 17 6	255,349	14.81
1873	17,708	11,852 7 18	231,122	13.05
1874	13,844	9,140 13 10	178,244	12.87
1875	14,810	11,211 14 19	218,629	14.89
1876	15,490	11,978 13 18	233,585	15.08
1877	17,369	16,882 6 1	329,205	19.01
1878	17,989	12,577 1 22	245,253	13.63
1879	15,936	13,760 8 21	268,328	16.83
1880	13,997	13,221 13 22	257,823	18.42
1881	16,556	10,756 13 2	209,755	12.66
1882	21,081	14,107 3 20	275,090	13.04
1883	25,954	15,446 9 23	301,207	11.60
1884	25,186	16,079 14 10	313,554	12.44
1885	28,890	22,203 12 20	432,971	14.98
1886	29,010	23,362 5 15	455,564	15.70
1887	32,280	21,211 17 18	413,631	12.81
Totals	585,069	433,627 10 12	\$8,455,736	\$14.45

Ontario. Very little work was done in the Ontario gold mines in 1887; only small shipments of ore for test purposes were made from three or four of the mines. A new find was made late in the fall near Sudbury, in the township of Denison, from which very good specimens were obtained.

North West Territory and Yukon district. A small amount of gold is obtained every year from the Saskatchewan river alluvions near Edmonton.

Dr. G. M. Dawson, from conversation with the miners, estimates the production of the Yukon district to have been about \$60,000.

Quebec. A little gold was obtained on the Mill river and the Gilbert river, in Beauce county, and also a small quantity at Ditton, Compton county. Some promising exploratory work was done on the Cumberland and Des Plantes rivers.

In the report for last year the available statistics of the production of the Chaudière division in previous years was given. So far we have been unable to improve this imperfect record.

Exports. The following table shows the exports of gold-bearing quartz, dust, nuggets, &c., as per Customs Department returns:—

Ontario.....	\$ 6,650
Nova Scotia.....	321,379
British Columbia.....	592,300
Total.....	\$920,329

Imports. It is impossible to give the imports of gold coin and bullion, and of the manufactures of gold, as these articles are not entered separately in the returns of the Customs Department, but are grouped with the same articles of silver and also with copper coins.

GRAPHITE (PLUMBAGO.)

Summary. The total production of graphite in 1887 has been 300 tons, valued at \$2,400 at the mine, which is situated near St. John, New Brunswick; another locality was being prospected near St. John, and there was also some prospecting work done for graphite in Waltham township, Pontiac county, Quebec. The mines near Buckingham, Ottawa county, Quebec, were not worked during the year.

Exports and imports. EXPORTS OF GRAPHITE (PLUMBAGO) FROM NEW BRUNSWICK DURING THE YEARS 1885, 1886 AND 1887.

Year.	Cwts.	Value.
1885	2,043	\$ 917
1886	8,142	3,586
1887	6,294	3,017

The above table gives all the exports of graphite during the last three years, except 6 cwts. from Quebec in 1885.

In the following tables 1 and 2, will be found the imports of raw and manufactured plumbago, and of pencils and blacklead:—

IMPORTS OF RAW AND MANUFACTURED PLUMBAGO AND OF PENCILS FOR THE YEAR 1887.

TABLE 1.

PROVINCE.	Plumbago.	Manufac- tures of Plumbago.	Pencils, lead, in wood or otherwise.
Ontario.....	\$1,473	\$5,140	\$33,458
Quebec	534	4,033	21,263
Nova Scotia.....	61	1,739	2,769
New Brunswick		657	3,028
Prince Edward Island..		44	.....
Manitoba		96	833
British Columbia	35	232	987
Totals.....	\$2,103	11,941	\$62,338

IMPORTS OF BLACK LEAD.

TABLE 2.

PROVINCE.	1886.	1887.
Ontario.....	\$11,322	\$7,001
Quebec	4,825	2,683
Nova Scotia	4,333	2,121
New Brunswick	4,049	3,550
Prince Edward Island..	640	745
Manitoba	94	165
British Columbia	550	602
Totals.....	\$25,813	\$16,876

GYPSUM.

Crude.

Taking the shipments from Nova Scotia as representing very nearly the total production of that province, the total quantity of crude gypsum produced in 1887 was about 154,008 tons, valued in the raw state at the quarries at \$157,277.

Comparison with 1886.

Compared with the preceding year the returns show a decrease in the quantity of 7,992 tons, and in the value of \$21,465.

Ground or Land plaster.

The total quantity of ground gypsum manufactured in the country and used for land plaster, is calculated to have been about 12,000 tons. Most of the Ontario production is milled and used as such; on the contrary almost the whole of the quantity produced in Nova Scotia is shipped in the crude state, and in New Brunswick most of it is either shipped in the crude state or calcined into Plaster of Paris.

Calcined or Plaster of Paris.

From direct returns it was ascertained that 49,308 bbls. of Plaster of Paris, made in the country from Canadian gypsum, were sold during the year for \$50,058 at the works; this does not include about 5,000 or 6,000 bbls. made in Ontario, of which returns were not received; if this was added, the statistics of this manufacture would probably be very nearly complete.

The Albert Manufacturing Co. of New Brunswick is by far the largest producer, and besides what is made in Ontario there are also small quantities made at Windsor, Nova Scotia, and at Quebec, from Nova Scotia gypsum.

Production by provinces of crude gypsum.

The following table A gives the production of crude gypsum for each province, the value at the mines, the number of producers, and the number of men employed:—

TABLE A.

PROVINCE.	Tons.	Value.	No. of producers.	No. of men employed.
Nova Scotia....	116,346	\$116,346	?	?
New Brunswick	29,102	29,216		179
Ontario	8,560	11,715	5	42
Totals.....	154,008	\$157,277	....	....

In Nova Scotia the different districts produced as follows, according Nova Scotia. to the report of the Inspector of Mines :—

District.	Tons.	Value.
Windsor (a).....	87,175	\$86,595
Cheverie (a).....	23,870	17,840
Walton (a).....	545	382
Halifax (a).....	316	1,543
Arichat, C.B.	340	275
St. Ann's, C.B.	4,100	4,000
Total.....	116,346	\$110,635

(a) Amount exported.

The two districts of Albert and Victoria counties in New Brunswick show the following returns :—

	Tons.	Value.
Albert County.....	27,805 (a)	\$27,805
Victoria "	1,297	1,411
	29,102	\$29,216

(a) A certain proportion of this was suitable for " terra alba " and sold as such, but the exact quantity could not be ascertained.

The producing district of Ontario is along the Grand River, principally in the county of Haldimand, but there are also some quarries in Brant county near Paris. The statistics are given in the above table A.

The tables of the exports and imports of gypsum are given below and show how much greater the exports are than the imports :—

EXPORTS OF CRUDE GYPSUM, BY PROVINCES IN 1886 AND 1887.

TABLE 1.

Provinces.	1886.		1887.	
	Tons.	Value.	Tons.	Value.
Ontario.....	350	\$538	225	\$337
Nova Scotia.....	118,985	114,116	112,557	106,910
New Brunswick.....	23,498	40,559	19,942	39,295
Total.....	142,833	\$155,213	132,724	\$146,542

EXPORTS OF GYPSUM (GROUND) (a) FROM NOVA SCOTIA AND NEW BRUNSWICK IN 1885, 1886 AND 1887.

TABLE 2.

Provinces.	1885.	1886.	1887.
Nova Scotia.....	\$ 294	\$ 265	\$ 662
New Brunswick....	15,404	24,670	13,291
Total.....	\$15,698	\$24,935	\$13,953

(a) Probably all plaster of Paris. This heading is the one in the Customs Dept. returns.

There were no imports of crude gypsum into Canada during 1887, whereas during 1886, 1,557 tons valued at \$2,492 were imported into Ontario.

IMPORTS OF GROUND GYPSUM AND PLASTER OF PARIS DURING THE YEARS 1886 AND 1887.

TABLE 3.

PROVINCES.	Ground Gypsum.				Plaster of Paris.			
	1886.		1887.		1886.		1887.	
	Pounds.	Value	Pounds.	Value	Pounds.	Value.	Pounds.	Value.
Ontario	26,872	\$129	5,506	\$ 73	247,906	\$1,338	243,350	\$1,282
Quebec.....	11,210	36	14,476	157	33,000	165	2,458	13
Nova Scotia					2,056	68	650	6
New Brunswick.	150,800	395	1,900	7	56,900	261	52,800	225
Manitoba.....					242,700	1,297	146,300	733
British Columbia.			15,000	138	254,895	2,473	363,607	3,363
Totals	188,882	\$566	36,882	\$375	837,457	\$5,602	809,165	\$5,622

IRON.

The total production of iron ore in Canada in 1887 was 76,330 tons, Iron ore. valued at the mines at \$146,197.

This includes the quantities used in the blast furnaces at Drummondville which had not been obtained for the 1886 report, so that a comparison of the 1886 and 1887 figures is not possible.

By provinces, the iron ore statistics for 1887 are as follows:—

Production by
provinces.

PROVINCES.	Tons.	Value.	No. of men employed.	No. of Producers.	No. of Mines Producing.
Nova Scotia.	43,532	\$76,181	About 160	2	3
Ontario.	16,598	36,218	129	2	7
Quebec.	13,404	26,808	?	2	2
British Columbia.	2,796	6,990	20	1	1
Totals.	76,330	\$146,197		7	13

In Nova Scotia, according to the report of the Department of Mines, Nova Scotia. the East and West mines of Londonderry continued to be worked, and produced in 1887 43,360 tons and 80 tons of ankerite. There were also 172 tons of limonite mined at Bridgeville, Pictou county, and some prospecting work was done on the George river and on the East Bay deposits in the county of Cape Breton.

The following table compiled from the annual reports of the Department of Mines gives the yearly production since 1876:—

	Tons.
1876.	15,274
1877.	16,879
1878.	36,600
1879.	29,889
1880.	51,193
1881.	39,843
1882.	42,135
1883.	52,410
1884.	54,885
1885.	48,129
1886.	44,388
1887.	43,532

During the year 1887, iron mining in Ontario was almost entirely Ontario confined to the mines of the Kingston and Pembroke Iron Mining

Company, along the Kingston and Pembroke Railway line. Shipments were made from six of these mines, and amounted to 15,478 tons of a value at the mines of about \$33,418. There were also about 1120 tons shipped from the district of Hastings; the other districts did not produce in 1887.

As shown in the tables of our 1886 statistical report, all the iron ore shipped from the provinces of Ontario and Quebec in the last 30 years amounted to about 600,000 tons only. In comparison we give the statistics published by the United States Survey, of the shipments of iron ore from the Vermillion Lake district of Minnesota, since 1884, when it first began to produce:—

	Long Tons.
1884 from August 1st to November 1st.....	62,124
1885 " May to November.....	225,484
1886 " " "	304,396
1887 (a) " " "	390,467
	<hr/>
	982,471 (b)

The Vermillion Lake district not being one of the most productive districts of the United States, the above comparative statement shows how little the iron mines of Ontario and Quebec have yet been developed, though rich deposits exist in those provinces in many places. Similar ores to those of Vermillion Lake and in the same geological conditions are known on the Canadian side of the boundary on Hunter's Island, and along Gun Flint Lake, and it is hoped they will prove equally rich and extensive.

Quebec.

There were 13,404 tons of soft iron ores charged in the blast furnaces of Drummondville, and at the Radnor furnace, near Three Rivers, during the year. A good deal of work was also done at the Bristol mine, Pontiac county, where several thousand tons of iron ore were taken out, but no shipment was made, it being contemplated to previously roast the ore, and for this operation two Taylor Langdon gas kilns were erected.

Operations were suspended in March 1887 at the Texada Island mine and during the rest of the year it was not worked.

There were, nevertheless, 2,796 tons of ore shipped from that mine to Irondale, Washington Territory, and operations at the mine have now been resumed again.

(a) From the Marquette Mining Journal.

(b) This is more than one million short tons.

The following table gives the exports for the last three years.
No iron ore is imported.

Exports.

Imports.

PROVINCE.	1885.		1886.		1887.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
Ontario	15,426	\$45,433	16,032	\$51,175	12,244	\$38,990
Quebec			2	10	38	119
New Brunswick..	12	449				
British Columbia.	190	425	3,130	7,225	1,410	3,525
Totals	15,628	\$46,307	19,164	\$58,410	13,692	\$42,634

There were only four furnaces in blast during the year, one at Londonderry, N.S., two at Drummondville, Quebec, and the Radnor furnace, near Three Rivers. The first-mentioned was run with coke and a little raw coal, and the other three with charcoal. The statistics of their total production and consumption have been grouped in the following table A:—

FIG IRON PRODUCTION, AND CONSUMPTION OF ORE, CHARCOAL, COKE, COAL
AND FLUX, IN 1887.

TABLE A.

Number of furnaces in blast—4.

Production and Consumption.	Quantity.	Value at furnaces.
Pig Iron made.....	24,827 tons.	\$366,192
Iron ore consumed.....	60,434 "	130,808
Fuel consumed {	Charcoal.....	940,400 bush.
	Coke.....	30,248 tons.
	Raw coal....	3,333 "
Flux consumed.....	17,171 "	17,500

About 250 men were employed.

No pig iron is exported.

The imports for the last three years with the values are given by provinces in the following table 1 which shows, by comparison with

Exports and Imports.

the above table, that the importation of pig iron in 1887 was about twice the production in the country, and also that the pig iron manufactured in Canada is of a superior quality and commands a higher price.

IMPORTS OF PIG IRON BY PROVINCES IN 1885, 1886 AND 1887.

TABLE 1.

PROVINCE.	1885.		1886.		1887.		
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Duty.
Ontario.....	17,149	\$248,430	20,490	\$296,290	19,457	\$298,083	\$ 61,291
Quebec.....	21,306	243,997	22,477	233,182	25,317	263,098	77,903
Nova Scotia.....	1,532	19,044	860	13,927	1,197	16,171	3,613
New Brunswick.....	2 684	40,513	2,824	51,352	1,729	36,771	5,362
Prince Edward Island.	67	767	78	814	.....	.....	.....
British Columbia.....	1,021	13,662	631	8,819	557	5,981	1,211
Totals.....	43,759	\$566,413	47,360	\$604,384	48,257	\$620,104	\$149,330

As exhibited in the above tables, the total quantity of pig iron consumed (imported and manufactured) in 1887 was about 73,000 tons, having a value of about one million dollars; this was nearly all used as cast iron in the foundries, as the Londonderry Iron Works and the Nova Scotia Steel Works—which alone made iron or steel from pig iron—used only 3,799 tons of pig iron for that purpose. It must be well understood, however, that the above stated consumption of pig iron does not represent at all the quantity of pig iron that might be annually manufactured for the market of Canada, as besides the pig iron that is imported there is also imported a great quantity of manufactures of cast iron, as well as a very great weight of iron and steel made from pig iron in the iron and steel works of foreign countries. We have calculated from the tables given in the 1886 annual report, pages 42, 43 and 44, and from tables Nos. 2 to 9, inclusive, given below, that the imports of all articles of iron and steel, in the price of which the principal item is the weight of the metal, (not including cutlery, edge-tools, machinery of all sorts, engines and other hardware and manufactures) amounted in 1886 and 1887, respectively, to about 287,798 tons, and 235,792 tons made up as follows:—

1886.		1887.	
Iron.....	110,428 tons.	Iron.....	90,850 tons.
Steel.....	18,723 "	Steel.....	16,630 "
Castings and Forgings...	8,544 "	Iron and Steel.....	48,636 "
Railroad (iron and steel).	142,761 "	Castings and Forgings. ...	7,076 "
Hardware and mfrs.....	7,342 "	Railroad (iron and steel).	72,600 "
Total.....	287,798 tons.	Total.....	235,792 tons.

The equivalents in pig iron of these quantities of iron and steel, which are only a part of what was entered for consumption in 1886 and 1887, would be respectively about 345,000 tons and 283,000 tons. If to this is added the amount of pig iron consumed as such, it will be seen that—excluding all the iron and steel entering into such highly manufactured articles as cutlery, surgical instruments, edge tools, machinery of all kinds, engines and many other hardwares and manufactures—there was a total consumption equivalent in pig iron, in 1886 and 1887 respectively, to about 415,000 tons and 356,000 tons. If made in the country, this quantity of pig iron would represent to our makers at actual prices a value of about \$5,000,000; it would necessitate a yearly supply from Canadian iron mines of 1,000,000 tons of ore, and, before this ore could be melted into pig iron and further made into the different merchantable articles of iron and steel which are now imported, it would also require about 3,000,000 tons of coal.

The above statistical statement of our needs in iron will be a guide Iron and Steel. as to what can be done towards developing iron and steel industries in Canada; it also gives an insight into the splendid future of these industries; let us see now what is actually being done.

Returns were received from the Nova Scotia Steel Co., the Nova Scotia Forge Co., the Londonderry Iron Works and from six rolling mills. We regret very much that notwithstanding repeated efforts, returns could not be obtained from Messrs. J. A. & W. A. Chesley of St. John, N.B., The Montreal Rolling Mills Co., Messrs. Pillow, Hersey & Co., Messrs. Peck, Benny & Co., and the Metropolitan Rolling Mills of Montreal.

As far as received, the returns show :—

Description of articles made or consumed.	Quantity.	Value.
	Tons.	
Iron, all sorts, made	31,527	\$1,087,728
Puddled iron bars consumed	2,312	58,700
Scrap iron and all other, consumed.....	36,448	579,497
Steel, all sorts, made	7,326	331,199
Steel consumed (almost all scrap steel).....	8,407	149,177
Pig iron consumed in the manufacture of iron and steel.	3,799	56,990
Fuel consumed in the manufacture of iron and steel..	58,112	146,986
Men employed—about 850.		

This statement is estimated to represent about $\frac{2}{3}$ of the total production of iron and about $\frac{1}{4}$ of the total production of steel. If the manufacturers named above had not met our repeated requests for returns with a spirit of suspicion or indifference these statistics could have been made more complete ; fortunately, only a minority of the iron makers adopted the course, and it is hoped that even this minority will in the future be convinced of the necessity and advantages of having complete returns.

Exports and
Imports.

The following tables give the exports and imports of iron and steel goods :—

EXPORTS OF IRON AND STEEL GOODS MANUFACTURED IN CANADA. YEAR 1887.

TABLE 1.

PROVINCE.	Iron, Scrap.	Iron Castings.	Iron, Stoves.	Iron, all other, and Hardware.	Steel, and Manufac- tures of.	Total.
Ontario	\$62,108	\$10,240	\$796	\$17,558	\$5,228	\$95,930
Quebec	7,148	2,851	684	52,201	19,307	82,191
Nova Scotia	2,005	1,880	750	18,601	41,030	64,276
New Brunswick...	114	72	....	6,847	434	7,467
Prince Edward Is'd.	....	40	....	7	14	61
Manitoba .....	....	1	143	293	859	1,296
Totals	\$71,375	\$15,084	\$2,383	\$95,507	\$66,872	\$251,221

IMPORTS OF IRON IN SLABS, BLOOMS, LOOPS, PUDDLED BARS, ETC., FOR 1886 AND 1887.

TABLE 2.

PROVINCE.	1886.		1887.		
	Cwts.	Value.	Cwts.	Value.	Duty.
Ontario	291	\$ 812	11,332	\$ 8,995	\$ 899
Quebec.....	354,130	289,702	348,557	285,233	50,520
Nova Scotia	438	369	1,116	8,552	855
New Brunswick	5,493	4,583	6,548	3,948	395
British Columbia.....		8			
Totals	360,352	\$295,474	367,553	\$306,728	\$52,669

IMPORTS OF SCRAP IRON AND SCRAP STEEL FOR 1886 AND 1887.

TABLE 3.

PROVINCE.	1886.		1887.	
	Cwts.	Value.	Cwts.	Value.
Ontario	5,616	\$ 6,788	19,775	\$81,091
Quebec	137,985	87,360	252,042	161,167
Nova Scotia	67,803	54,673	84,349	43,904
New Brunswick.....	36,440	23,115	54,718	40,169
British Columbia.....	40	15	440	262
Totals	247,884	\$171,951	411,324	\$326,593

This Table 3 forcibly exhibits the immediate good results of the new protective tariff which, having very wisely been made to bear more heavily on the manufactured products, has at once given rise to an increase of 66 per cent. in the imports of the raw material for our iron mills, proving a very marked greater activity in those mills since last May.

IMPORTS OF IRON.

IMPORTS OF FERRO-MANGANESE, FERRO-SILICON, SPIEGEL, STEEL BLOOM ENDS AND CROP
ENDS OF STEEL RAILS FOR THE YEAR 1887.

TABLE 4.

PROVINCE.	Tons.	Value.	Duty.
Quebec	1,121	\$16,772	\$2,242
Nova Scotia.....	274	3,531	549
New Brunswick	277	4,385	553
Totals.....	1,672	\$24,688	\$3,344

In the following tables the headings of the articles have been epitomized from the classification used by the Customs Department; this was rendered necessary by the change in the tariff on the 13th May, 1887.

TABLE 5.

ARTICLES.	Quantity.	Value.	Duty.
Bar iron, rolled or hammered..... cwt.	534,972	\$654,918	\$196,384
Boiler or other plate iron, inch nail plate..... "	83,787	132,254	28,594
Tacks, brads and sprigs.....		6,552	1,910
Band and hoop iron..... "	82,623	113,028	28,455
Iron in slabs, blooms, loops, puddle bars, &c..... "	367,553	306,728	52,669
Iron bridges and structural iron work..... lbs.	3,212,220	104,214	\$9,867
Nails, spikes and sheathing nails compressed..... "	24,378	3,161	623
Nails and spikes	357,275	14,521	5,417
" " cut..... "	264,235	9,504	2,692
" " incl. R. R. spikes..... "	133,358	4,588	1,583
Nail and spike rods.....cwt.	2,192	4,744	829
Iron, N. O. P. F..... "	2,427	2,599	454
Ornamental iron work.....		368	90
Rolled round wire rods in coils..... "	187	286	28
Swedish rolled iron nail rods..... "	22,710	33,320	6,663
Tubing of every description.....		436,162	119,296
Wire work, other.....		54,570	13,444
Manufactures of iron, N.O.P.F.....		8,845	2,069
Hoop iron for tubular rivets..... "	73	805	Free
Total.....		\$1,891,257	\$491,007

IMPORTS OF STEEL.

TABLE 6.

ARTICLES.	Quantity.	Value.	Duty.
Wire, spring steel, coppered.....cwt.	1,872	\$6,270	\$1,150
Locomotive tires..... "	9,967	40,572	(a) 1,636
Steel Ingots, blooms, slabs, billets, bars, sheets, &c... "	272,920	516,471	117,337
Axes..... "		11,828	4,313
Saws..... "		63,113	13,945
Steel for manufacture of files..... "	1,348	5,899	Free
" " skates..... "	1,636	6,506	"
" " saws and straw cutters..... "	8,216	67,291	"
" " mower and reaper knives... "	2,002	8,498	"
" " knobs, locks and cutlery.... "	4,708	6,547	"
" " corsets, shoes, & clocksprings "	3,097	11,407	"
" " spades and shovels..... "	2,367	9,022	"
Homo spring steel, for mattresses.....lbs.	569,523	20,397	"
Total		\$773,821	\$143,381

(a) This duty was collected previous to 13th May, 1887, when this article was placed on the free list.

IMPORTS OF IRON AND STEEL.

TABLE 7.

ARTICLES.	Quantity.	Value.	Duty.
Axles and springs of iron or steel..... cwt.	14,469	\$ 29,742	\$ 10,275
Chains over 9-16 inch. diam. "	16,752	32,471	2,138
Chain cables, all other to 13th May, 1887..... "	9,966	30,136	6,049
Iron or steel bolts, nuts, rivets, etc..... lbs.	748,708	45,286	17,689
Rolled iron or steel angles, beams, girders, and all structural shapes..... cwt.	154,251	222,210	30,228
Screws, iron and steel " Wood screws"..... "	...	25,750	8,710
Sheet iron..... "	312,601	615,074	79,026
Wire fencing, barbed, of iron or steel..... lbs.	55,310	2,317	816
" " Buckthorn, etc., iron or steel..... "	44,934	1,458	531
" " of iron or steel, 15 gauge and coarser, N.E.S. ... cwt.	91,973	194,555	42,205
" " rope of iron or steel, N.E.S. "	2,323	30,055	7,510
Mfrs. of iron or steel, N.E.S. "	...	286,508	82,386
Iron or steel rolled round wire rods..... "	57,991	74,482	Free
Iron or steel beams, etc., for composite ships..... "	7,128	14,420	"
Wire iron or steel, 16 gauge or smaller..... lbs.	1,622,994	89,286	"
Wire rigging for ships..... cwt.	2,849	11,033	"
Total.....		\$1,704,778	\$287,563

IMPORTS OF CASTINGS AND FORGINGS.

TABLE 8.

ARTICLES.	Quantity.	Value.	Duty.
Castings of every description and forgings		\$230,344	\$ 65,423
Cast iron pipe of every description..... "		186,573	81,949
Malleable iron castings and steel castings..... "		57,473	16,493
Anvils, to 13th May, 1887..... cwt.	553	3,299	988
Stoves..... "		15,914	4,426
Anchors..... "	2,863	9,715	Free
Total.....		\$503,313	\$169,279

IMPORTS OF RAILROAD IRON AND STEEL.

TABLE 9.

ARTICLES.	Quantity.	Value.	Duty.
Car Wheels	cwt. 7,955	\$ 25,278	\$ 6,319
Railway bars, iron or steel.....	" 13,685	21,948	4,186
" fish plates.....	" 47,950	62,469	29,733
Steel rails	" 900,051	905,072	Free.
" For C. P. Ry.....	lbs. 48,225 640	473,994	"
" " E. & N. Ry.....	" 10,824	555	"
Totals	tons. 72,600	\$1,586,316	\$30,233

SUMMARY TABLE OF THE IMPORTS OF PIG IRON, IRON AND STEEL, FOR THE YEAR 1887
(ARTICLES NOT HIGHLY MANUFACTURED).

TABLE 10.

ARTICLES.	Value.	Duty.
Pig iron.....	\$620,104	\$149,380
Ferro manganese, etc....	24,688	3,344
Scrap iron and steel	326,593	33,694
Blooms, etc.	306,728	52,669
"Iron ".....	1,891,257	491,007
"Steel ".....	773,821	143,381
"Iron and steel ".....	1,704,778	287,563
Castings and forgings....	503,318	169,279
Railroad iron and steel...	1,580,316	30,238
Totals	\$7,731,603	\$1,360,555

IMPORTS OF IRON AND STEEL HIGHLY MANUFACTURED ARTICLES NOT INCLUDED IN
PREVIOUS TABLES, FOR FISCAL YEARS 1886 AND 1887.

TABLE 11.

COUNTRIES FROM WHENCE IMPORTED.	1886.		1887.	
	Value.	Duty.	Value.	Duty.
Great Britain.....	\$688,028	\$182,299	\$889,590	\$235,693
United States.....	2,500,946	692,764	2,369,321	671,810
France	6,469	1,593	8,436	2,353
Germany.....	41,137	10,847	89,094	24,086
Belgium	14,156	2,950	49,509	11,597
Switzerland	1,399	428	2,029	566
Other countries.....	1,514	398	947	242
Totals	\$3,253,649	\$891,279	\$3,408,926	\$946,347

Assuming that the imports shown in the above table 11 for the fiscal years are very nearly the same on the average as those for the calendar years, we see that the total imports of all pig iron, iron and steel articles and goods, were in 1887 of a declared value of a little more than \$11,000,000, and that the duty paid was a trifle over \$2,300,000.

LITHOGRAPHIC STONE.

It is very much to be regretted that the Canadian lithographic stone quarries have not been worked in 1887, and that nothing further has been done to develop them. It is a well-known fact that the Bavarian quarries do not produce now a sufficient quantity of the best quality stones for the requirements of the American market, and it should lead to the development of our own supply. The lithographic stones of the townships of Madoc and Marmora, and of the counties of Peterboro and Bruce have been examined and practically tested by lithographers, and in several cases, pronounced to be of good quality; they have also obtained medals at various exhibitions. They were obtained from the surface in small quarries and possibly, when the quarries are more developed, better stones free from "specks" of quartz or calcite will be available in large slabs.

The following table shows our imports for the last three years

Imports.

IMPORTS OF LITHOGRAPHIC STONES.

TABLE 1.

PROVINCE.	1885.	1886.	1887.
Ontario	\$1,033	\$4,037	\$3,756
Quebec	926	1,715	2,613
New Brunswick.....	2	8	....
British Columbia.....	27	2	....
Total.....	\$1,988	\$5,762	\$6,369

MANGANESE.

Total production and comparison with 1886.

The total production of Manganese ore in 1887 was 1,245½ tons, valued at the mines at \$43,658.

This compared with 1886 shows a decrease in the quantity of 544 tons, but an increase in value of \$2,159, indicating that a higher grade ore was obtained.

Production by provinces.

Nova Scotia and New Brunswick are the only provinces of the Dominion where manganese mines are in active operation, and the production of each of these provinces was as follows:—

	Tons.	Value at mines.
New Brunswick.....	939½	\$22,398
Nova Scotia (a).....	306	21,260
Total.....	1,245½	\$43,658

(a) The 385 tons from Cornwallis of a value of \$2,233 is classed as an ochre.

New Brunswick.

In New Brunswick, the Markham mine which has now been working continuously for 25 years, provides the greater part of the production. Twenty men were employed at the mines and thirty at the works; two classes of ore were produced:—the “metallic” ore worth about \$15.00 a ton at the mine and shipped to England, and the “chemical” ore worth from \$50.00 to \$60.00 and shipped to Boston; these two names sufficiently indicate the uses of these ores

Two other mines in King's county produced also small quantities in 1887, and development work was being proceeded with on an extensive bog manganese deposit at Hillsboro', Albert county.

Nova Scotia.

The following table, taken from the report of the Department of Mines, exhibits the production by districts in Nova Scotia:—

	Tons.	Value.
Onslow mine.....	40	\$2,800
Pembroke.....	25	1,750
Tenny Cape.....	235	16,450
Cornwallis (a).....	385	2,233
Cheverie.....	5	200
Maitland.....	1	60
Total.....	691	\$23,493

(a) Classed as ochre in the above table of the summary production.

Statistics of the production in Nova Scotia, since 1877, according to the annual reports of the Department of Mines, may be found in the report for 1886.

The tables of exports were also given since 1868 in the last report ; ^{Exports and Imports.}
 a table of the exports for the last three years only is now given, and
 one of the imports of oxide of manganese.

EXPORTS OF MANGANESE ORE.

TABLE 1.

Year.	Nova Scotia.		New Brunswick.		Total.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
1885.....	77	\$5,054	1,607	\$29,595	1,684	\$34,649
1886.....	441(a)	30,854	1,377	27,484	1,818	58,338
1887 (b)...	578(a)	14,240	837	20,562	1,415	34,802

(a) A certain amount from Cornwallis included in these quantities more properly comes under the heading mineral pigment.

(b) 7-10ths of a ton valued at \$53.00 exported from Quebec this year.

IMPORTS OF OXIDE OF MANGANESE.

TABLE 2.

Provinces.	1886.		1887.	
	Pounds.	Value.	Pounds.	Value.
Ontario.....	16,464	\$ 824	18,733	\$903
Quebec	29,413	1,530	48,977	2,171
Nova Scotia.....	1,075	75	1,173	79
Manitoba.....	609	26	.....	.....
British Columbia.....	.....	.....	1,010	16
Total.....	47,561	\$2,455	69,893	\$3,169

MICA.

Total production.

The returns received show 22,083 lbs. of cut mica marketed in 1887, valued at the works at \$29,816 ; the average price therefore is \$1.35. The quantity mined and cut during the year was \$39,500 lbs., and there was also marketed 18 tons of ground mica sold for \$700 ; these returns are believed to include the whole of the production in Canada ; they represent the production of four different mines : three in the province of Ontario and one in Quebec, employing altogether about 55 men.

In comparison with 1886, there is an increase of 1,722 lbs., in the amount of cut mica marketed with an increase of price of \$808 ; this indicates a decrease, in the average price, of 7 cts. a pound due to the fact that a market was found for a second class quality mica from one of the mines.

Exports and imports.

There were 1000 lbs. of cut mica exported to the United States from Kingston during the year, according to the returns of the Customs Department.

We regret being unable to give the imports, there being no special entry for mica in the books of the Customs Department.

MINERAL PIGMENTS.

In the following table is given the returned production of some mineral pigments :—

Product.	Tons.	Value.	Prov. where produced.
Baryta.....	400	\$2,400	N.S.
Ochre.....	385	2,233	N.S.
Mineral Paint.....	100	1,500	Ont.
Whiting.....	75	600	Ont.
Total.....	960	\$6,733	

The baryta was all produced in Nova Scotia, no shipments having been made from McKellar's Island, Lake Superior, in 1887.

Imports.

Tables of the imports of these products and other mineral pigments are given below :—

IMPORTS OF UNMANUFACTURED BARYTA.

TABLE 1.

Province.	1886.		1887.	
	Cwts.	Value.	Cwts.	Value.
Ontario.....	45	\$291	2	\$ 24
Quebec	127	80	.....	.....
Nova Scotia.....	238	54	.....	.....
New Brunswick.....	6	47	200	252
Total.....	416	\$472	202	\$276

IMPORTS OF PAINTS.

TABLE 2.

VARIETY.	Lbs.	Value.
Fire-proof paint, dry.....	216,174	\$3,112
Paint, ground in oil or any other liquid ....	.....	112,807
White and red lead and orange mineral, dry.	6,876,910	286,589
White lead in pulp, not mixed with oil.....	... ..	276
Ochres, dry, ground or unground, washed or unwashed, not calcined.....	1,676,434	16,371
Zinc, dry white.....	.....	28,227
Other paints and colors, N. O. P. F.....	.....	87,069

IMPORTS OF WHITING.

TABLE 3.

PROVINCE.	1886.		1887.	
	Cwts.	Value.	Cwts.	Value.
Ontario	10,272	\$3,577	8,868	\$3,325
Quebec	24,839	8,698	52,940	13,659
Nova Scotia.....	8,654	1,823	2,689	1,027
New Brunswick	2,773	1,166	2,494	1,038
Prince Edward Island	109	61	464	190
British Columbia....	739	857	274	121
Total	47,386	\$16,182	67,738	\$19,360

IMPORTS OF CHALK.

TABLE 4.

PROVINCE.	1885.	1886.	1887.
Ontario	\$4,882	\$3,053	\$2,483
Quebec	1,322	1,657	1,864
Nova Scotia.....	230	167	213
New Brunswick.....	66	191	441
Prince Edward Island....	23	20	37
Manitoba	71	208	164
British Columbia.....	13	28	21
Total	\$6,607	\$5,334	\$5,223

IMPORTS OF LITHARGE.

TABLE 5.

PROVINCE.	1886.		1887.	
	Cwts.	Value.	Cwts.	Value.
Ontario	3,843	\$13,001	6,354	\$21,034
Quebec	1,891	6,289	2,353	7,440
Nova Scotia.....	2	8	2	9
New Brunswick.....	13	85	11	74
Manitoba	10	41	33	122
British Columbia....	6	35	3	26
Total	5,765	\$19,459	8,756	\$28,705

MISCELLANEOUS.

Returns of a small production of certain miscellaneous minerals were received and are given in the following table:—

Product.	Quantity.	Value.	Province where produced.
Chromic Iron.....	38 tons.	\$ 570	Que.
Lead.. { Fine contained in ore. }	204,800 lbs.	9,216	B.C.
Moulding sand.....	160 tons.	800	N.S.
Platinum.....	1,400 ozs.	5,600	B.C.
Soapstone.....	100 tons.	800	Que.

The lead ore was obtained at the mine of The Selkirk Mining and Lead Smelting Co., in the Illecillewaet district, B.C.; preparatory work was also continued at the Lake Temiscamingue mine, Quebec.

The platinum was derived from the placer mines of Granite Creek, Similkameen division, B.C., and was sold in Portland, Oregon. In the report of the Minister of Mines of British Columbia, the total production of platinum of the Similkameen division is estimated at 2,000 ozs., by Mr. Tunstall, the gold commissioner of that division.

As shown in the report for 1886, the exports of lead ore from Canada were always very small and of no importance; it is still so in 1887.

The imports of lead and platinum are tabulated below, as well as the imports of zinc, tin and mercury, of which there was no production.

The imports of glass and manufactures of, are also given in table 7. The exports of glass and glassware amounted only to \$1,030.

IMPORTS OF LEAD.

TABLE 1.

ARTICLES.	1886.		1887.	
	Cwts.	Value.	Cwts.	Value.
Lead, old, scrap and pig.....	68,794	\$142,667	69,866	\$182,059
“ bars, blocks and sheets.	10,488	32,450	20,948	58,283
“ pipe	613	2,016	1,783	6,322
“ shot	2,907	9,661	1,260	4,204
“ mfrs. of, N.O.P.F.....	.....	9,884	.....	6,772
Total.....	.....	\$196,678	.....	\$257,640

IMPORTS OF PLATINUM WIRE.

TABLE 2.

PROVINCE.	Ozs.	Value.
Ontario.....	207	\$1,555
Quebec	4	68
New Brunswick (a).....	64	13
Total.....	275	\$1,636

(a) Returns for New Brunswick incorrect.

IMPORTS OF ZINC IN BLOCKS, PIGS AND SHEETS.

TABLE 3.

PROVINCES.	1886.		1887.	
	Cwt.	Value.	Cwt.	Value.
Ontario	5,307	\$19,667	5,981	\$25,947
Quebec	15,457	56,905	10,731	38,981
Nova Scotia	1,456	5,973	2,221	6,668
New Brunswick	1,457	7,387	2,022	7,890
Prince Edward Island ...	102	371	154	578
Manitoba	50	199	825	2,820
British Columbia	209	785	67	379
Totals	24,038	\$91,287	22,001	\$83,263

IMPORTS OF TIN.

TABLE 4.

PROVINCES.	1886.				1887.			
	Blocks, pigs and bars.		Tin-foil.		Blocks, pigs and bars.		Tin-foil.	
	Cwt.	Value.	Pounds	Value.	Cwt.	Value.	Pounds	Value.
Ontario	4,017	\$73,661	30,920	\$ 5,480	4,858	\$78,908	49,232	\$ 8,774
Quebec	7,822	104,717	57,602	11,226	3,441	83,562	65,760	13,289
Nova Scotia	2,423	39,937	1,083	255	984	21,260	4,683	832
New Brunswick	587	11,333	184	45	1,171	12,744	350	113
Prince Edward Island	451	10,047	.....	.....	182	4,114	10	2
Manitoba	42	939	655	230	.....	.....	408	119
British Columbia	1,639	36,301	50	14	847	21,092	37	16
Totals	16,981	\$276,935	90,503	\$17,250	11,483	\$221,680	120,480	\$23,145
Total Tin-foil.—Cwts..	905	17,250	.....	.....	1,204	23,145	.....	.....
Total Tin	17,886	\$294,185	.....	.....	12,687	\$244,825	.....	.....

IMPORTS OF TIN PLATES AND SHEETS.

TABLE 5.

PROVINCES.	1886.		1887.	
	Cwt.	Value.	Cwt.	Value.
Ontario	67,200	\$248,899	81,225	\$245,100
Quebec	75,302	251,240	80,375	286,670
Nova Scotia	29,346	96,101	11,764	74,879
New Brunswick.....	7,769	29,316	5,485	21,076
Prince Edward Island....	9,106	27,006	2,030	6,731
Manitoba	1,415	4,380	1,714	5,246
British Columbia.....	35,933	145,413	16,156	54,210
Totals	226,071	\$802,355	198,749	\$693,912

IMPORTS OF MERCURY.

TABLE 6.

PROVINCES.	1886.		1887.	
	Pounds.	Value.	Pounds.	Value.
Ontario	8,742	\$5,020	25,062	\$12,778
Quebec	1,422	684	2,307	1,210
Nova Scotia	1,648	1,052	1,851	1,222
New Brunswick.....	20	11	.....	.....
Manitoba	80	44	3	2
British Columbia.....	4,210	1,981	1,866	1,174
Totals	16,122	\$8,792	31,089	\$16,386

IMPORTS OF GLASS.

TABLE 7.

DESCRIPTION.	Quantity. Square feet.	Value.
Carboys, demijohns, bottles and decanters, flasks and phials, telegraph and lightning rod insulators, jars and glass balls, and cut, pressed, or moulded table ware.		\$259,389
Carboys and demijohns, bottles and decanters, flasks and phials of less capacity than eight ounces.		43,613
Flasks and phials of eight ounces capacity and over, telegraph and lightning rod insulators jars and glass balls, and cut, pressed, and moulded table ware.		99,099
Lamp and gas-light shades, lamps and lamp-chimneys, side-lights and head-lights, globes for lanterns, lamps, and gas-lights.		214,691
Ornamental, figured, and enamelled stained glass.		4,446
Stained, tinted, painted, and vitrified glass and stained glass windows, figured enamelled, and obscured white glass.		13,419
Common and colourless window glass.	14,750,961	302,122
Coloured glass, not figured, painted, enamelled, or engraved.	36,403	3,426
Photographic dry plates.	17,416	4,221
Plate glass, not coloured, in panes not over 30 sq. ft.	169,148	56,456
" " " over 30 & not over 70 "	157,363	55,136
" " " over 70 sq. ft.	206,808	69,703
Silvered plate glass.		8,366
Porcelain shades, imitation.		12,488
All other mfrs. of glass, N. O. P. F.		87,947
Total.		\$1,234,522

PETROLEUM.

The Petroleum Inspection returns as entered in the books of the Inland Revenue Department show that the number of packages of Canadian refined oil (refined petroleum and naphtha) inspected during the year 1887 were:—

- (1) 221,684 packages at 10c. inspection fee.
 (2) 619 " 5c. "
 (3) 35,134 " 2½c. "

Rating the different packages, (1) (2) and (3) as containing respectively 35, 10, and 4 imperial gallons, we have a total of Canadian refined oils during the year of 7,905,666 imperial gallons, or 225,876 barrels of 35 imperial gallons. This at the yield of 100 crude oil for 38 refined, corresponds to 20,804,384 imperial gallons, or to 594,411 barrels of 35 imperial gallons, of crude oil. Taking the average price for the year on the Petrolea Oil Exchange of 78c. per barrel of crude oil, the value would be \$463,641.

Compared with our Inspection returns of 1886, which were made up as above from the number of packages inspected entered in the books of the Inland Revenue Department, the above statement shows an increase in 1887 of 107,970 barrels, or of 22 per cent in the quantity, but of only \$25,844 in the total value.

In the following table will be found the quantities of Canadian oil inspected, and the corresponding equivalents in crude oil since 1881, obtained for each year by a similar calculation based on the number of packages entered in the Inland Revenue Department books.

CANADIAN PETROLEUM AND NAPHTHA INSPECTED AND CORRESPONDING QUANTITIES OF CRUDE OIL.

TABLE A.

Year.	Refined Oils Inspected.	Crude Equivalent Calculated.	Ratio of Crude to Refined.
1881	5,380,081	10,760,162	100 : 50
1882	5,111,893	11,359,762	100 : 45
1883	6,204,544	13,787,875	100 : 45
1884	6,730,068	16,825,170	100 : 40
1885	5,853,290	14,633,225	100 : 40
1886	6,469,667	17,025,439	100 : 38
1887	7,905,666	20,804,384	100 : 38

Direct returns.
Summary of the
production.

Direct returns were kindly sent from 13 refineries, 9 of which are situated in Petrolea, 2 in London, 1 in Hamilton, and 1 in Sarnia; it is believed that the whole of the refining operations in Canada is nearly covered by these returns, and that there were only two other small refiners, one in Petrolea and one in Montreal, both of whom went out of business during the year, so that it has been impossible to ascertain the statistics of their production and consumption. The three tanking companies of Petrolea have also very willingly forwarded to us the statistics of their operations.

These returns are summarised in the following tables:—

MAIN PRODUCTION OF CANADIAN REFINERIES IN 1887.

TABLE B.

Products.	Imp. gals.	Value at refinery.
Illuminating oils.....	10,387,825	\$991,290
Benzine and Naphtha.....	344,570	31,447
Black and Paraffine oils, (including fuel, gas, and lubricating oils,.....)	6,793,461	240,851
Paraffine Wax.....	lbs. 400,036	24,521
Total value.....	.....	\$1,288,109

MAIN CONSUMPTION OF THE CANADIAN REFINERIES IN 1887.

TABLE C.

Crude Petroleum.....	26,737,668 Imp. gals.
Sulphuric Acid (a).....	3,215,410 lbs.
Soda (a).....	331,898 "
Litharge (a).....	496,163 "
Sulphur (a).....	96,816 "

(a) The quantities consumed by the Sarnia refinery could not be ascertained, but they were small and do not much materially affect the result.

The above tables B and C exhibit:—

1st. That the percentage of the different oils per 100 crude petroleum was as follows:—

Illuminating Oils.....	38.00
Benzine and Naphtha.....	1.30
Black and Paraffine Oils (including fuel, gas and lubricating oils, and paraffine wax).....	25.70
Heavy tar and Residuum, Coke and waste (not returned.).....	35.00
	<hr/>
	100.00

2nd. That, there were 763,933 bbls. of 35 imp. gals. of crude oil consumed during the year in the manufacture of illuminating oils.

3rd. That, besides and above the 7,905,666 imp. gals. of refined petroleum and naphtha inspected during the year, there were also 2,836,729 imp. gals. produced in the refineries and not yet inspected at the close of the year. As this would indicate a stock, carried over from year to year in the country, of some 5,000,000 gals. of refined oils which is much more than the real stock carried, it shows that the calculations based on the number of packages of refined oils inspected give an incorrect and too low a result. The figures in table A above are consequently believed to be about one third too low. It is to be regretted that the Inland Revenue Department does not keep a record of the number of gallons inspected instead of the number of packages.

The returns of the tanking companies give the following results:—

CRUDE OIL.

Stocks on 1st January, 1887.....	388,192 $\frac{3}{5}$ bbls.
Quantity of Oil delivered to tanking Co's. } from wells, in 1887.....	414,273 $\frac{3}{8}$ "
Quantity of Oil delivered by tanking Co's. } in 1887.....	554,672 $\frac{3}{8}$ "
Stocks on 1st January, 1888.....	217,793 $\frac{3}{8}$ "

Compared with the direct returns of the refiners, the above statement shows that the refiners themselves must have received directly from the wells, about 180,000 bbls. of crude petroleum during the year, making the total production from the wells in 1887 to be:—

414,273 $\frac{3}{8}$ bbls. received by tanking Co's.
180,000 " " refiners.
<hr/>
Total..594,273 $\frac{3}{8}$ bbls.

This total production from the wells in 1887 of 594,274 bbls., added to the balance in the stocks on 1st January 1887 and on 1st January 1888, which was one of 170,399 bbls., gives 764,673 bbls. as the quantity of oil available for consumption during the year, and proves that the direct returns from the refiners of their crude consumption are correct. The returns of the tanking companies exhibit also a decrease in the stocks at the end of 1887 of nearly 44 per cent.

Petrolia Oil
Exchange
business in '887.

We are also indebted to James Kerr, Esq., Secretary of the Petrolia Oil Exchange, for the following tables of the business during the year 1887 on that exchange, and of the average closing prices per month for the years 1885, 1886 and 1887:—

PETROLIA OIL EXCHANGE, CRUDE PETROLEUM BUSINESS FOR THE YEAR 1887.

Month.	Opening price.	Highest price.	Lowest price.	Closing price.	Average closing price.	Average price.	Total Sales Barrels of 35 imp. galls each.
January.....	92	92	80	83 $\frac{1}{4}$	84.78	84.71	41,549
February.....	83 $\frac{1}{2}$	84 $\frac{1}{2}$	79 $\frac{3}{4}$	79 $\frac{3}{4}$	81.63	82.38	37,969
March.....	79 $\frac{1}{2}$	79 $\frac{1}{2}$	75	77 $\frac{1}{4}$	76.72	78.26	44,703
April.....	77	77	74	74 $\frac{1}{2}$	75.04	75.61	36,153
May.....	74	74	76	67 $\frac{1}{2}$	69.29	75.89	34,462
June.....	67 $\frac{1}{2}$	68 $\frac{1}{2}$	66	68 $\frac{1}{2}$	67.26	73.42	35,937
July.....	68 $\frac{1}{2}$	68 $\frac{1}{2}$	66 $\frac{1}{4}$	66 $\frac{1}{2}$	67.50	72.34	18,127
August.....	66 $\frac{1}{2}$	83 $\frac{1}{2}$	66 $\frac{1}{2}$	82 $\frac{1}{2}$	71.36	78.55	31,011
September.....	83	84	78 $\frac{1}{2}$	79	81.03	83.78	32,639
October.....	79 $\frac{3}{4}$	79 $\frac{3}{4}$	75	75 $\frac{3}{4}$	77.12	77 $\frac{1}{8}$	25,338
November.....	75 $\frac{1}{2}$	75 $\frac{1}{2}$	76	73 $\frac{3}{4}$	72.21	72 $\frac{1}{2}$	20,479
December.....	73 $\frac{3}{4}$	80	72 $\frac{1}{2}$	76	76.30	77 $\frac{2}{3}$	47,836
Year 1887.....	92	92	66	76	78.02	78	406,203
Puts and Calls.....							45,000
							451,203

“The above is a resumé of sales and resales of crude oil warehouse certificates on the Petrolia Oil Exchange during the year 1887, and indicates the market price of Petroleum Oil (crude) as stated in warehouse. The further charge of 3 cents per barrel is made when the oil is delivered for pipeage to refiners in each case.”

AVERAGE CLOSING PRICE OF CRUDE OIL ON PETROLEA OIL EXCHANGE.

Month.	1885	1886	1887
January.....	75 $\frac{1}{4}$	88 $\frac{1}{4}$	84 $\frac{3}{4}$
February.....	85 $\frac{3}{4}$	88 $\frac{1}{4}$	81 $\frac{3}{4}$
March.....	83 $\frac{3}{4}$	89 $\frac{1}{2}$	76 $\frac{3}{4}$
April.....	80 $\frac{1}{4}$	90	75
May.....	78	90	69 $\frac{1}{4}$
June.....	79	90	67 $\frac{1}{4}$
July.....	83	80	67 $\frac{1}{2}$
August.....	91 $\frac{3}{4}$	75 $\frac{1}{2}$	71 $\frac{1}{4}$
September.....	89 $\frac{1}{2}$	75	81
October.....	79 $\frac{1}{2}$	84 $\frac{1}{4}$	77 $\frac{1}{4}$
November.....	79 $\frac{1}{2}$	93 $\frac{3}{4}$	72 $\frac{1}{4}$
December.....	83 $\frac{1}{2}$	97	76 $\frac{1}{4}$
Year.....	82 $\frac{1}{4}$	86 $\frac{3}{4}$	78

Tables of the exports of Canadian petroleum since the beginning of Exports. the operations in the Ontario oil fields in 1861 are given in the report for 1886, and show how fluctuating the exportations always were: varying from 9,000,000 to nothing; in 1887 they were as follows:—

EXPORTS OF CANADIAN PETROLEUM IN 1887.

TABLE 1.

PROVINCES.	Gallons.	Value.
Ontario.....	472,362	\$13,616
Quebec.....	916	147
Nova Scotia.....	281	68
Totals.....	473,559	\$13,831

Imports.

The following Table 2 is from the inspection returns of the Inland Revenue Department, and Table 3 is from the returns of the Customs Department. Table 4 shows the imports of crude oil, calculated by taking the difference between the totals of Tables 2 and 3.

REFINED PETROLEUM AND NAPHTHA, IMPORTED AND INSPECTED.

TABLE 2.

Years.	Imperial Gallons.
1881	\$1,111,338
1882	1,226,918
1883	1,110,580
1884	1,231,984
1885	1,211,152
1886	1,584,422
1887	1,511,433

IMPORTS OF CRUDE AND REFINED PETROLEUM.

TABLE 3.

PROVINCE.	1886.		1887.	
	Gallons.	Value.	Gallons.	Value.
Ontario	1,563,864	\$179,756	1,688,611	\$174,768
Quebec	759,312	69,526	805,197	69,527
Nova Scotia	699,480	66,690	762,346	63,096
New Brunswick	804,911	82,636	820,639	61,697
Prince Edward Island	170,736	18,818	173,852	13,793
Manitoba	7,627	871	15,486	1,905
British Columbia	173,921	50,934	198,913	44,826
Total	4,179,851	\$469,231	4,465,044	\$429,612

CRUDE PETROLEUM IMPORTED.

TABLE 4.

Years.	Imperial Gallons.
1885	2,599,064
1886	2,595,429
1887	2,953,611

PHOSPHATE AND MANUFACTURED FERTILIZERS.

The total quantity of phosphate (apatite) shipped from the Canadian mines in 1887 is shown by direct returns received to have been 23,690 tons, the total value of which at the mines may be estimated to have been about \$319,815, if \$13.50 is admitted for the average spot value of a ton.

Compared with 1886, it is an increase in the marketed production of 3,195 tons; the increase in the value cannot be fairly ascertained, the average price given for 1886 being probably too high.

The production may be divided as follows:—

Quebec mines, Ottawa county.....	19,589 tons.
Ontario mines	4,101 " "

Returns were received from eleven producers in Ottawa county, employing about 456 men; and from five producers in Ontario, employing about 130 men; it must be understood that in some cases the men were not employed all the year.

The exports of apatite since 1877 were given in the report for 1886. Exports. The following table 1 shows the exports for 1887 by provinces and the destination of the product, but it must be remembered that the great bulk of what is produced in the Ontario district is first shipped to Montreal, and that Quebec is thus credited with more than the production of the mines from the county of Ottawa. Table 2 from the mining and mineral statistics of Great Britain supplements the information as to the destination of our apatite exports, and as to the proportion the Canadian phosphate bears on the English market to the total phosphate imported each year in Great Britain:—

EXPORTS OF PHOSPHATES. YEAR 1887.

TABLE 1.

PROVINCE.	Tons.	Value.	Destination.
Ontario	705	\$8,277	{ All to United States, All to Great Britain and Germany.
Quebec	22,447	424,940	
Total	23,152	\$433,217	

EXPORTS OF CANADIAN PHOSPHATE TO GREAT BRITAIN COMPARED WITH THE
TOTAL IMPORTS OF PHOSPHATES THERE.

TABLE 2.

Year.	Canadian Apatite.		Total Phosphates.		Proportion of value of Canadian Apatite to the value of Total Phosphates Imported into Great Britain.
	Long Tons.	£ stg.	Long Tons.	£ stg.	
1882	8,187	39,851	199,428	613,198	6.5 per cent.
1883	16,531	66,714	246,945	813,825	8.2 "
1884	15,716	52,370	219,225	643,851	8.1 "
1885	21,484	76,179	238,572	628,027	12.1 "
1886	18,069	63,490	223,111	526,885	12.0 "

This table shows that the proportion of the value of Canadian apatite imports to that of the total imports of all phosphates of lime in Great Britain is steadily increasing; in 1886 it had reached 12 per cent., or double what it was in 1882.

Manufactured
Fertilizers.

The following statistics though not quite completed may prove of interest in connection with the manufacture of fertilizers in this country. The industry is merely in its infancy in Canada, but will probably before long attain large proportions, thanks to the great resources of this country in many of the raw or other materials used in this manufacture such as phosphate, gypsum, marls, pyrites (for making the acid), bones, fish and other manures, &c.

Production.

Returns of three producers show a total quantity of fertilizers manufactured and marketed during the year of 498 tons, of a value at the works of \$25,943. The return of Messrs. Jack & Bell of Halifax has not been received. There were 221 tons of Canadian apatite consumed in that manufacture, and also small quantities of the following minerals:—sulphate of ammonia, nitrate of potash, kainite and calcic sulphate which were imported.

Land plaster
used in the
country.

As stated on page 30 it is estimated that about 12,000 tons of ground gypsum were used in the country as a fertilizer during the year.

Exports and
imports.

Table 3 below shows that considerable quantities of bones are exported for use in the manufacture of fertilizers, and table 4 exhibits the imports of fertilizers and of the raw minerals used in that manufacture.

EXPORTS OF BONES FOR THE LAST THREE FISCAL YEARS BY PROVINCES.

TABLE 3.

PROVINCE.	1885.		1886.		1887.	
	Cwt.	Value.	Cwt.	Value.	Cwt.	Value.
Ontario	35,694	\$35,222	39,805	\$35,148	30,084	\$24,169
Quebec.	19,212	15,311	60,782	44,451	21,922	12,797
Nova Scotia	5	5	130	150	1,483	1,066
New Brunswick.....	850	1,398	2,793	2,485	2,575	1,944
P. E. Island.....			405	540		
Manitoba	2,940	1,169	37,379	12,001	26,160	7,844
British Columbia....	502	240	214	120	346	344
Totals	59,203	\$53,345	141,508	\$94,895	82,570	\$48,164

IMPORTS OF FERTILIZERS AND OF THE RAW MINERALS USED IN THAT MANUFACTURE IN 1887.

TABLE 4.

ARTICLES.	Quantity.	Value.
Ground Gypsum..... lbs.	36,882	\$ 375
Potash, German mineral..... "	15,313	935
" muriate and bichromate of (crude). "	573,773	31,641
Kainite	2,700	112
Sulphate of Ammonia	53,555	1,526
Fertilizers.....		7,749
Bones (crude and dust)..... "	11,760	677
Total.....		\$43,015

THE IRON ORES AND PHOSPHATE DEPOSITS IN THE ARCHÆAN ROCKS OF CANADA.

Object of paper The object of this paper is to present in a concise form the conclusions arrived at by the writer as to the mode of occurrence of the iron ores and phosphate deposits in the Archæan rocks of Canada after a careful and minute study of many of these deposits in the iron and phosphate districts of Ontario,* and in the counties of Ottawa and Pontiac in Quebec. It is here presented on account of the practical bearing that it may have on the future developments of these important deposits, as it is hoped that it will be found to be a strong encouragement for the working of many of these deposits in depth as well as a guide in the following of their irregular structure and a help in the further discovery of new deposits of these minerals.

Origin of deposits. We think we may say that our conclusions will be found to be greatly at variance with the views generally admitted here in Canada, expressions of which have been published principally in the different reports of the Geological Survey, and especially in the "Geology of Canada," 1863, and in the well-known subsequent reports of Dr. Hunt, Dr. Harrington, and H. G. Vennor. For indeed we believe that we have gathered year after year strong and clear evidence to show that not only our deposits of iron ores in the Archæan rocks are of an eruptive or igneous origin, but also that our deposits of phosphate are exactly similar and have also the same origin. This is why we are treating here of the deposits of these two minerals together as we believe that they are exactly analogous, and that which can be said for one is applicable to the other. As far as the iron ores are concerned, the view of their deposits in the Archæan rocks being of an eruptive origin is far from being a new one, and has been held by a great many eminent geologists in many countries, principally, I believe, in France, Norway, and Sweden, and also by some of the English and American geologists. In the case of the phosphate (apatite), the eruptive or igneous origin has also been advanced in Norway and in France, but by a smaller number of observers, probably on account of the fact that the apatite deposits are not so numerous as those of iron ores, and thus the opportunities for examination and report were less frequent. Here in Canada, this eruptive origin of the apatite as well as of the iron ores has always been denied so far: and if my conclusions were not backed by so many facts, some of which were only brought to light in the workings of the mines in the last few years, I would feel somewhat reluctant to go thus entirely

* Counties of Haliburton, Victoria, Peterboro, Hastings, Frontenac, Leeds, Lanark and Renfrew.

against the views already arrived at in this country by several very able men, but these facts were repeatedly observed and have been very carefully ascertained.

The principal among these observed points are the following:—

Observations.

1. About 30 different deposits of iron ores (principally magnetite, though sometimes hematite) have been geologically surveyed by us * in the Madoc and Marmora region of Ontario, and were found to occur in the form of irregular veins around and always in close proximity to a large granite mass or to dykes and bosses of granite derived from it. The granite intrusions clearly cut across the Archæan crystalline limestone and schists and the deposits of iron ores are also manifestly veins cutting in a like manner across the Archæan rocks.

2. Away from the main granitic bodies, in the region covered by the map above referred to, there are no large deposits of iron ore, and when small quantities occur there can be seen almost in every case a small dyke of granite along the iron ore; so that the intimate connection of the two cannot be doubted.

3. An exactly similar connection was also observed between the iron ore deposits and intrusive igneous masses in a more extended region of several thousand square miles, also geologically surveyed by us,† and comprising parts of the counties of Hastings, Peterboro, and Victoria, in Ontario. There the iron ore deposits such as those forming the Blairton Mine, Orton Mine, Baker Mine, Emily Mine, Coe Hill Mine, Jenkins Mine, the Snowdon Mines, etc., were always found to be intimately connected in the manner described above with many varied kinds of igneous rock such as granite, granulite, pegmatite, mica syenite, hornblende syenite, diorites and diabases.

4. In the region north of Kingston, in the Counties of Frontenac, Leeds, Lanark, Renfrew, Pontiac and Ottawa, many deposits of iron ores and many deposits of phosphate were observed also in the same association with igneous rocks, and both cutting through the Archæan rocks. In the case of the phosphate the igneous rock was often the rock termed by Dr. Hunt "pyroxenite," but at other times it was a pegmatite or a mica syenite or a pyroxene syenite. In that region the iron ore and the phosphate have been found in the same deposits as witnessed by the evidence at the Foley Mine, the Forsyth Mine, and especially at the Blessington Mines where the writer observed the apatite and the magnetite together in the workings of nine different pits, and where at the time of his examination last summer there were

* This map on the scale of 40 chains to one inch, and comprising an area of 125 square miles, is now in the hands of the engraver and is expected to be ready shortly. It will be accompanied by a report in which the details of our observations will be given at length.

† A map of about 3,500 square miles covering this region, has been prepared and is expected to be published at the scale of 4 miles to the inch in the course of a year or so.

between 500 and 600 tons of iron ore and about 1500 tons of phosphate on the dumps, the two minerals having been taken out from the same pits.

5. In the two regions mentioned above the apatite and magnetite were often seen to be amongst the component elements of these masses or dykes of igneous rocks, which rocks were observed to accompany these minerals in their deposits as a veinstone of quartz or calcite carries other minerals in other veins.

Conclusion.

Considering all this and knowing that similar facts have also been observed in other countries especially in the States of New York and New Jersey, and in Norway and Sweden, it is only natural that we should conclude, like many other geologists have done before in those countries, that the iron ore and phosphate to be found in our Archæan rocks are the result of emanations which have accompanied or immediately followed the intrusions through these rocks of many varied kinds of igneous rocks which are no doubt the equivalent of the volcanic rocks of to-day. These deposits then are of a deep-seated origin and consequently the fears entertained, principally by our phosphate miners, that their deposits are mere surface pockets, are not well founded. These fears are no doubt partly the result of the belief which has been somewhat prevalent that the apatite in them was the metamorphic equivalent of the phosphate nodules of younger formations, and it may be also that they have resulted from the fact that the apatite is irregularly distributed in these deposits and is often suddenly replaced by rock; this is not so often the case in the iron ore deposits which are on a larger scale. But notwithstanding this, when the deposits are properly understood to be, as we hold they are, igneous dykes and veins accompanying the igneous rocks, it will be easily seen why in the deposit itself the economic minerals can be suddenly replaced by rocks which may be said to be nothing else but the gangue. If this origin is understood it will besides facilitate and encourage the working of these deposits in depth, because the accompanying igneous rock, forming a mass or a dyke alongside of the deposit will be easy to follow and, because if it is apatite or iron-bearing at the surface, it will always be a guarantee that it will also be in depth, as each separate mass of igneous rock is generally quite constant in composition.

PRECIOUS STONES.*

By GEORGE F. KUNZ.

Although no mining for precious stones is carried on in Canada, and it can scarcely be called a gem-producing country, yet it furnishes a number of stones that are of more than passing interest to the mineralogist, and of some value in jewellery and the arts. A number of gem minerals, not of gem quality, are found here in examples of such stupendous size and wonderful perfection that they have found prominent places in the cabinets of the world, and are even more prized as such than cut stones from other localities. Their mineralogical value gives them no small commercial importance. For instance, the magnificent zircon crystals, occurring as individuals up to 15 lbs. in weight, many fine ones weighing nearly a pound, and the beautiful twin crystals of the same mineral; the black titanite in simple and twinned crystals up to 70 lbs. each; the vast quantities of amethyst from Lake Superior; the ouvarovite or green chrome garnet from Orford, and the white garnet crystals from near Wakefield, are some of the most notable of Canadian occurrences. Not the least wonderful are the apatite crystals, one weighing over 500 lbs., which are found of such size and beauty that the rich green variety, especially, would do to work into ornaments similar to those made from fluorite, which it exceeds in hardness.

What Canada has produced in precious and ornamental stones was well shown at the Centennial Exhibition, Philadelphia, 1876, and at the Colonial and Indian Exhibiton, at London, in 1886. The finer minerals have found their way into the well-arranged collection of the Geological Snrvey of Canada, at Ottawa, the British Museum, the Mineralogical collection of McGill College, which contains the cabinet of the late John G. Miller, and the Provincial Museum of Nova Scotia. Many of the finest specimens, in full series, grace the cabinets of Mr. Clarence S. Bement, at Philadelphia, King's College, Windsor, N. S., School of Mines, New York, which contains the collection of the late Dr. Henry How, Walter G. Ferrier, Montreal, Colonel W. J. Wilcox (deposited at the United States National Museum), Amherst College, at Amherst, Mass., Prof. O. C. Marsh, New Haven, Conn., and the New York State Museum, at Albany, N. Y.

The field in Canada is so vast that although much has been done in the way of prospecting of late years, only a small part of the territory has been thoroughly gone over. With the great resources developed by the opening of the Canadian Pacific Railway many new localities

* Specimens from the localities marked with an asterisk are in the Geological Survey Museum, Ottawa.

will doubtless be brought to light in the next ten years, and important additions made to the foregoing list.

DIAMONDS—have not been found at any locality in British North America.

SAPPHIRE.—Corundum, in red and blue crystals has been found in the limestone near Burgess, also in grains disseminated through a rock made up of felspar, quartz, calcite and titanite, in contact with the crystalline limestone. These grains are of a light rose-red to sapphire blue color, and are of no gem value, nor in quantity sufficient for commercial use. Chrysoberyl, alexandrite or chrysoberyl cat's eye has not been observed in Canada. Chrysoberyl has been found in Maine, however.

SPINEL.—In the seigniory of Daillebout small translucent octahedrons of blue spinel are found in a bed of micaceous limestone, and from Wakefield* come pink and dark bluish spinels in rounded cubic crystals and opaque light blue cubes nearly an inch in diameter.

Very interesting black spinels in brilliant crystals, one to two inches in diameter, occur in Burgess and Bathurst* townships, Ont., where a vein of them has been traced for a mile in one direction. They are also associated with fluorite in the township of Ross, Ont. None of these possess any gem value, however.

TOPAZ (?).—At the London Exposition, 1862, Mr. McDonald exhibited two topazes (?) from Cape Breton, one in the rough, and the other which had been cut at Pictou, half an inch in length and of a yellow color, the variety of this mineral peculiar to Brazil, which leads to the inference that these stones may have been citrine or artificially decolorized smoky quartz, and not the true mineralogical topaz.

EMERALD.—Emeralds have not been observed in Canada. Although very fine aquamarines have been found in Maine, adjacent to the province of Quebec. Little if any beryl of value for gems has been discovered in Canada. Pale green, well defined crystals have been reported by Dr. Bigsby at Rainy Lake, 230 miles west of Lake Superior. And in Berthier* and Saguenay* Cos., Que., some crystals over an inch in diameter have been found.

ZIRCON.—The zircons of Ontario, especially those from Lake Clear* and Sebastopol* and Brudenell* townships, in Renfrew County, are the most remarkable known for beauty, size, perfection and richness of color. An occasional crystal top or a small fragment will afford a gem of the hyacinth variety, but they rarely exceed a carat in weight.

Some of these individual crystals weigh about 15 lbs., and are more than four inches in diameter. One was observed three inches in diameter and nearly a foot in length. On the land of E. J. Gallagher, 25 miles west of Eganville, Ont., in Brudenell township* fine crystals are obtained. The twin zircons from Lake Clear are especially beautiful and interesting, one of them measuring nearly four inches in length, and many thousand dollars worth have been sold as specimens. Short's Claim,* on the north shore of Lake Clear, yields the finest twin zircons. Perhaps the finest twin crystals ever found and one of the best single crystals are in the British Museum Collection, while perhaps the finest series of this mineral is in the collection of Mr. Clarence S. Bement, of Philadelphia. An enormous single crystal is in the cabinet of the Academy of Natural Sciences at Philadelphia. In Burgess and adjoining townships occur some fine crystals, not so large as those from Renfrew, it is true, but of exquisite polish and highly modified forms; in Templeton* and, near Grenville, Que.,* especially four miles north, are found smaller crystals, often cherry red and transparent, that would make small gems. Highly modified crystals, associated with wollastonite and graphite are also found at this place.

Zircon is now mined by the ton in the United States and about \$150 per ton is paid for it, because of the earth it contains (zirconia) which is used in the hoods for the new incandescent gas burners. The zircons are obtained by washing out the soil resulting from the decomposition of felspathic rocks.

TOURMALINE.—Tourmaline in green crystals is found in Chatham township,* Que., and the green and red (rubellite) varieties in Villeneuve township,* Que. Brown tourmalines are frequently met with in the Laurentian limestone. Fine crystals, rich yellowish or translucent brown in color, often occur imbedded in a flesh-red limestone at Calumet Falls, Que.,* and also in the townships of Ross, Ont.,* Clarendon and Hunterstown, Que. These furnish an occasional gem. Slender crystals in white quartz occur at Fitzroy, Island Portage and Lac des Chats, and of inferior color at McGregor's Quarry in Lachute,* Ont. Black tourmaline of no gem value is found at a number of localities, principally at Yeo's Island, near the upper end of Tar Island, one of the Thousand Islands. It occurs in large crystals at Murray Bay, Cap Tourmente, Que., and in white quartz on the 18th lot, 4th range of Bathurst,* Ont.; in the granitic veins in the township of Ross,* Ont.; on Roche Fendue channel, on Camping Place Bay, on Charleston Lake in Lansdowne, Ont., and on the west side of the North River at St. Jerome, Que.; in Blythfield, on the Madawaska, and at N. Elmsley, and Lachute,* Ont., St. Felix and Calumet Falls,* Que. The velvet black, fibrous tourma-

line found at Madoc* and Elzevir gives a blue powder and is evidently an indicolite, like the variety from Paris, Maine.

PHENACITE.—Phenacite has not yet been observed in Canada, but was recently identified by the writer at Stow, Maine.

GARNETS.—Almandite garnets occur plentifully in magnificent crystals in mica schist along the Stickeen River* in British Columbia. Owing to their perfect form and polish the faces of these crystals are the most beautiful in the world. Although they are not transparent enough to be of value to cut into gems, if obtained in sufficient quantity they would be useful for watch jewels.

Beds of nearly pure red garnet rock, from five to twenty-five feet thick, are sometimes met with in the gneiss at St. Jerome, Que., and in quartzite in Rawdon, and Marmora townships, Ont., and at Baie St. Paul,* Que. Some small pieces would afford gems of little value, but the stone is of considerable use in the arts as a grinding material and for sand paper. The large red garnet, disseminated through a white oligoclase gneiss, at Lake Simon, would not afford gems but if polished with the rock would afford an ornamental stone.

Andradite garnet is found on Texada Island, B. C.,* in fair crystals, not of gem value, however.

Essonite, cinnamon-colored garnet, the so-called hyacinth of the jewellers, is found in small crystals in Grenville, Que., but not of gem value, and in fine crystals, associated with idocrase, in Wakefield,* Que. But few of these would furnish even small gems.

Grossularite, white lime-alumina garnet, is found in Wakefield* and in Hull in considerable quantity, in veins lining the crystalline limestone, and associated with essonite, idocrase and pyroxene. This is the most remarkable locality for this mineral, superb crystals two inches across having been found there, as well as groups of crystals a foot across. In color the crystals vary from colorless to light yellow and light brown, and some of them are transparent enough to afford colorless gems of from one to two carats in weight.

Melanite, black garnet, is found in Marmora,* Ont., but this variety has no use in jewellery.

Ouvarovite, or green chrome garnet, found in Orford,* is one of the most beautiful known occurrences of this rare mineral. The crystals, which are transparent dodecahedrons, rarely over one-eighth of an inch in diameter, and of the deepest emerald green color, are found lining druses in cavities of crystalline limestone, often on the chrome pyroxene and associated with millerite. If it were not for the small size of the crystals, this would be a gem of the highest rank. A few crystals of this mineral have been found in Wakefield, some of which

rival in size any that have been discovered, the largest measuring nearly one-half inch in diameter. They are of a fine green, but opaque, and are sometimes filled with a yellow centre.

IOLITE has not been observed at any Canadian locality.

QUARTZ.—Rock crystal is found in many localities of Canada, especially in veins with amethyst in the Lake Superior region, but it has not been observed of sufficient size to afford crystal balls or other art objects.

The small doubly terminated crystals found in the limestone of the Levis and Hudson River formation, and familiarly called "Quebec diamonds," are sold as souvenirs to tourists, as the Lake George diamonds are in the United States.

Fine crystals are found in the soil in Lacolle, Que., and in the cavities of the calciferous formation in many places in beautiful limpid crystals.

Larger crystals have been found with smoky quartz near Paradise Bay, N. S., (see Smoky Quartz), also in the geodes on agate throughout the entire Bay of Fundy district, and on the Musquash River, N.B., at Cape Blomidon, N. S., etc.

Milky quartz is found all through Canada, but it is never of any value in the arts except for porcelain. Rose quartz is also found at many localities, especially at Shelburne, N. S. It is of little value in the arts, but has been made into various ornaments and charms. Smoky quartz in fine groups occurs in the same veins with amethyst on both Lake Superior and the Bay of Fundy, so uneven in color, however, as to afford gems of little value. It has been found in immense crystals in the vicinity of Paradise River, also near Bridgetown and Lawrencetown, Annapolis County, N.S., from a light yellow color to the dark, smoky "cairn-gorm." Dr. How mentions a crystal 13 inches high and 6 inches in diameter. Single crystals weighing 100 lbs. each have often been obtained from the decomposing granite and have been piled up with the stones from the fields, near Paradise River, and loose in the soil. It occurs in crystals about two inches in length at Mill Village, Lunenburg Co., N. S., and at Margaret's Bay, Halifax Co., N. S. In King's College cabinet there is a specimen of the dark, almost black variety known as "Morion," with crystals one-half inch across. When transparent, smoky quartz has considerable sale for jewellery under the name of cairngorm, Scotch or smoked topaz; when partly decolorized to a yellow and yellowish brown, as Spanish or Saxon topaz.

Amethyst is found in some form in nearly every vein cutting the cherty and argillaceous slates around Thunder Bay,* on the north shore of Lake Superior. At Amethyst Harbor* this mineral consti-

tutes almost the entire vein, and numerous openings have been made to obtain it for tourists who visit the spot. Thousands of dollars worth are annually sold here, and as much more is sent to Niagara Falls, Pike's Peak, Hot Springs, and other tourists' resorts, as well as to the mineral dealers. Surfaces several feet across are often covered with crystals from $\frac{1}{4}$ inch to 5 inches long, rich in color, and having a high polish. Sometimes, especially when large, the crystals have a coating of a rusty brown color, owing to the oxidation of the included goethite. This is one of the most famous occurrences of this mineral, regarded as mineral specimens, but the purple color is very unevenly distributed, resembling the Siberian not the Brazilian in this respect, and as the crystals are not transparent like those from Siberia, they afford very few gem stones of value.

In Nova Scotia, however, fine amethysts occur in bands, veins and geodes at Partridge Island, Cumberland County, N. S., surfaces a foot square being covered with splendid purple crystals an inch across. Dr. Gesner mentions a geode that would hold about two gallons, found at Cape Sharp, nearly opposite Blomidon, N. S. Another, lining walls of chalcedony with concentric bandings, was found at Sandy Cove, Digby County, N. S., and weighed 40 lbs. De Monts is said to have taken crystals from Partridge Island to Henry IV. of France whom they greatly pleased, and a crystal from Blomidon was among the French Crown Jewels twenty years ago. A bushel of crystals were obtained by the late Dr. Webster, of Kentville, N. S., in digging a single well. Dr. Gesner also states that he had seen a band of amethyst some feet in length and perhaps two inches thick, about a mile east of Hall's Harbor, N. S. Other localities are the south side of Nichols Mountain, Cape D'Or, Mink Cove, Scot's Bay, in Nova Scotia, and Little Dipper Harbor and Nerapis in New Brunswick, and other localities along the Bay of Fundy.

The beautiful masses of straight, concentric and irregular banded amethyst (banded with quartz and agates) (see above) found in Nova Scotia on the Bay of Fundy, are somewhat similar to a variety found abroad, and used for ornamental purposes, principally for clock cases and jewel caskets. The material is slit into plates so thin that they are often strengthened by cementing them on plates of glass, and the colors are enhanced by setting the plates so that the light can pass through. Dr. How mentions prase, green quartz, as occurring at Kail's Point, N. S. A beautiful hyaline quartz is found at Scot's Bay, N.S.

Sagenite (Flesche D'Amour, or Venus' hair stone) is reported by Dr. How from Scot's Bay, N. S. It is transparent quartz penetrated with needles of rutile.

AGATE, CHALCEDONY AND CARNELIAN.—Agates are found along the entire coast of Lake Superior in great abundance and often of considerable size and beauty. The finest in this region, however, are derived from the trap of Michipicoten Island,* Ont. They also occur on St. Ignace and Simpson's islands, Ont., on the former only as nodules in the trap. Both chalcedony and agate occur also as veins filling dislocations and cracks which penetrate the trap in several directions. In the Thunder Bay district they are associated with amethysts, occurring also as pebbles. Although these agates are often of rich color, and are beautifully veined, they are rarely over two inches across. Many are sold to tourists for ornaments, and many others could probably be disposed of if a little more attention were given to cutting and polishing them. As natural agates their color is exceptionally fine. Nearly all the large agates sold in this region are foreign material as well as of foreign coloring and cutting. Agate pebbles, known to the collectors as Gaspé Pebbles,* are found in the conglomerate of the Bonaventure formation, on the Baie des Chaleurs, Que., and along the shore of Lake Superior, in the vicinity of Goulais Bay, and especially on the St. Mary's River. Handsome agate and chalcedony in nodules and veins are of frequent occurrence on the south shore of the Bay of Fundy,* between Digby and Scot's Bay, N. S. Large masses of agate have frequently been found on this coast. Gesner mentions a mass of 40 lbs. weight made up of curved layers of white, semi-transparent chalcedony and red carnelian, forming a fine sardonyx. A mass showing distinct parallel zones of cacholong, white chalcedony and red carnelian, was found a few miles east of Cape Split, N.S.* When polished it resembles an aggregation of circular eyes, and hence the name eye-stone, or eye agate is applied to it.

At Scot's Bay, N. S., large surfaces of rocks are studded with these minerals. Fine specimens are also found at Blomidon, and at Partridge Island, N. S. Fine agates and carnelians occur at Digby Neck, six miles east of Sandy Cove, Woodworth's Cove, west of Scot's Bay, and at Cape Blomidon, N.S. Fine agates, chalcedony and carnelians are also found in New Brunswick, at Darling Lake, at Hampton, near the mouth of the Washdemoak River, at Dalhousie and on the Tobique River, in Victoria County.

An unique blue chalcedony, rich brownish green by transmitted light, is mentioned by How, from Cape Blomidon, N. S. Agate often occurs in layers forming an onyx in the Bay of Fundy and Lake Superior regions. Beautiful ones are found at Two Islands, Cumberland County, near Cape Split, at Scot's Bay and at Parrsboro, N.S. At the Queen Charlotte Islands, B. C., they occur abundantly at some localities, being derived from the miocene-tertiary rock.

Beautiful moss agates are found at Two Islands, Cumberland County, and near Cape Split, Partridge Island, also at Scot's Bay, King's County, N. S., exceptionally fine at the latter locality. Chrysoprase of fair color has been found in the Hudson's Bay district, on Belanger's Island.*

Silicified woods are found to some extent in the north-west territories* and in British Columbia. This is a beautiful ornamental stone, when the colors are fine, and it is highly polished.

Jasper conglomerate exists in mountain masses, along with the quartzite masses of the Huronian series, for miles in the country north of the Bruce Mines,* on Lake Superior north of Goulais Bay,* on the St. Mary's river about four miles west of Campment d'Our's, and at two places on the east shore of Lake George, and on Lake Huron, Ont. It is a rock consisting of a matrix of white quartzite, in which are pebbles often several inches across, of a rich red, yellow, green or black jasper, and smoky or other colored chalcedony, which form a remarkably striking contrast with the pure white matrix. It is susceptible of a very high polish, and has been made into a great variety of ornamental objects, such as vases, paper weights, etc. Some very beautiful mosaics have been produced by using the rock and included pebbles. The stone occurs in thick bands which extend for miles, and large boulders of it are scattered along the shores of the lake and rivers. Within half a mile of the northern extremity of Goulais Bay, Ont., there is a ridge containing several varieties of it.

Large quantities of rich, red jasper are found in Hull,* Que. Yellow and red occur at Handley Mountains, Annapolis, Pictou, Gulliver's Hope, Blomidon*, N.S.; at Belleisle Bay, King's County, Grand Manan, Darling's Lake and Hampton, near the mouth of the Washdemoak River; at Red Head and at the Tobique River, Victoria Co., N. B.; Woodworth's Cove, west of Scot's Bay, and all along the shore of the Bay of Fundy from Sandy Cove,* N. S. Near the head of St. Mary's Bay lie large blocks of red, yellow† and yellowish red jasper, often banded, but generally impure, however.

Considering the abundance of this jasper it seems strange that so beautiful an ornamental stone should have been so long neglected, but the recent improvements in sawing and polishing hard stones for ornamental purposes will doubtless bring it into extensive use in the near future.

Heliotrope (bloodstone) in good specimens is of rare occurrence in the North Mountain. Bay of Fundy, N. S.*

* † Specimens of a rich yellow jasper from Pt. La Lime, Restigouche County, N. B., are in the Survey Museum, Ottawa.

Dr. Gesner mentions finding two small nodules of opal, resembling pieces of wax, at Partridge Island, N. S.

Semi-opal has been found at Partridge Island in fine specimens, at Grand Manan, N. B., and other localities in that vicinity.

Cacholong has been found associated with chalcedony in Nova Scotia on the Bay of Fundy.* The hornstone found at Partridge Island admits of a fine polish and is of some use as an ornamental stone.

JADE.—Jade (nephrite) in the form of archaeological implements, has been found from the straits of Fuca northward along the entire coast of British Columbia and the northern end of Alaska. At the latter place it is closely allied with other minerals, such as the new form of pectolite, and is found with other relics of various kinds about shell heaps and old village sites, in graves, or still preserved, although seldom used, by the natives. It is also found as far inland as the second mountain system of the Cordillera belts, represented by the Gold, Cariboo and other ranges, principally among remains from Indian graves, and along the lower portions of the Fraser and Thomson rivers, within the territory of the Selish people. In the interior it is of rare occurrence, the coast Indians having used the tools in the construction of their houses and canoes, which are much superior to those of the interior. Dr. Geo. M. Dawson procured about sixty specimens for the Survey Museum, and at McGill College there is a fine series together consisting of 44 adzes, 6 drills, 2 boulders and 9 other objects. Dr. Dawson says: "It is among the highly altered and decomposed rocks of the Carboniferous and Triassic that silicates of the jade class might be expected to occur, and I feel little doubt that when these rocks are carefully investigated they will be found to be the sources of the jade." The Indians of the region, however, have usually if not invariably obtained their supply from loose fragments and boulders.

Jade is also reported from the Rae River and from the Hudson's Bay district by Mr. Rae.

This stone is highly esteemed in China and India, where it is carved into fine art objects and sold in large quantities,—a single object requiring the work of a lifetime, and selling for thousands of dollars. In New Zealand it is made into charms, trinkets, paper cutters, and in copies of native aboriginal objects.

PECTOLITE.†—Among the minerals sent to the United States National Museum from Point Barrow, Alaska, was a substance which Professor F. W. Clarke identified as pectolite. It had a specific gravity of 2.873, was white, grey and pale green in color, and about as

† A specimen of this mineral from Cathcart Point, Lake Superior, is in the Geological Survey Museum, Ottawa.

hard as jade. Almost simultaneously it was described abroad. Mr. F. Mercier has in the Geological Survey Museum several interesting objects of this material from northern Alaska, and a number of Indian implements are in the museum of McGill College. During the past year Professor W. P. Blake handed the State Mining Bureau of California, a description of a vein of this mineral which occurs in Tehama County, California, where it can be broken out in pieces four inches thick and larger. When freshly broken the color is sea green, but on weathering it becomes white. This material would also make a valuable ornamental stone, and Professor Blake's discovery leads to the inference that it may be found at many other places on the Pacific coast, since objects made of it have been discovered both in Alaska and in California.

AXINITE.—Axinite in fine crystals was reported by Dr. Bigsby from a boulder of primitive rock at Hawkesbury, near Ottawa.

EPIDOTE.—Epidote is found at many localities, though not in gem form, except when with flesh colored felspar in the amygdaloidal trap on Lake Superior. This has been polished to form an odd ornamental stone. At the falls of the Mingam river, Que., and in Ramsay township, Ont., is found a peculiar, fine-grained, reddish gneiss, traversed by veins of a pea-green epidote. It is very beautiful when polished. Pale-green epidote with quartz is found on the Matane river. That which forms mountain masses in the Shickshock Mountains, Que.,* is hard, susceptible of a high polish, and would be of value as an ornamental stone.

MICROCLINE.—Amazon stone (microcline) has been found in Sebastopol,* Ont., and in Hull,* Que., in cleavages of good color.

MOONSTONE.—The Adularia variety of moonstone, similar to the Ceylonese, has not been observed in Canada.

LABRADORITE.—Labradorite, the most beautiful of all the chatoyant felspars, exists in great quantities on the coast of Labrador,* especially at Nain and on St. Paul's Island adjacent to it, where the finest known occurs in veins of some size, whence for over a century it has been brought by the ton for use in the arts. It occurs on Lake Huron, Ont., at Cape Mahul, and the 10th range of Abercombie, Que.,* in fine cleavages several inches in diameter and of rich color, shewing beautiful blue opalescence, at Morin, Que.* In Lewis County, New York, it is extensively quarried for building purposes, and polished into columns and other objects for interior decorations.

PERISTERITE.—This beautiful variety of albite exhibits a peculiar bluish chatoyancy or opalescence, sometimes mingled with pale green and yellow, and called "moonstone." It is found in crystals and by the ton in large cleavable masses, containing disseminated grains of quartz, in veins cutting the Laurentian strata at Bathurst,* Ont., also in crystals on the north side of Stony Lake, near the mouth of Eel Creek, in Burleigh, Ont. in large opalescent cleavable masses of reddish albite, and on the 9th line or concession north of Perth, Ont., on the land of Robert McEwen. This beautiful material is especially adapted for use in the arts.

It is also reported by Mr. Hoffmann in specimens, showing beautiful blue color from Villeneuve,* Ottawa Co., Que.

PERTHITE.—Perthite occurs in large cleavable masses in thick pegmatite veins, cutting the Laurentian strata, and is often made up of flesh-red and reddish-brown bands of orthoclase and albite, interlaminated. When cut in certain directions it shows beautiful golden reflections like aventurine, and being susceptible of a high polish, is adapted for an ornamental stone or for use in jewellery. It is also found in considerable quantity at Burgess,* Ont., about seven miles southwest of the town of Perth, and near Little Adams Lake on what was formerly called Dobey Farm.

SUNSTONE.—Sunstone, aventurine felspar, has been described by Dr. Bigsby in the form of a largely crystallized flesh-red felspar, constituting part of a granitic vein traversing gneiss, 20 miles east of the French river, on the northeast shore of Lake Huron, and occurs in fine specimens at Sebastopol,* Ont.

OBSIDIAN.—Obsidian has been found in British Columbia,* but it has little value except for the cheaper jewellery, and is rarely used for that purpose.

PORPHYRY.—The porphyries which cut the Laurentian limestones in the townships of Grenville* and Chatham,* Que., form a dike running east and west 20 feet in breadth. They have a dark green or brownish black base, homogeneous and compact, containing crystals of red orthoclase, and admitting of a high polish, which strongly recommends it for use as an ornamental stone.

GRAPHIC GRANITE.—The pegmatite at Montgomery's clearing on Allumette Lake, five miles above Pembroke, Ont, consisting of a brownish-red orthoclase with white quartz is a beautiful ornamental stone, and admits of a good polish.

IDOCRASE.—Idocrase in wax-yellow crystals imbedded in limestone is found in Grenville, Que., in crystals of remarkable perfection and rich brown color, in a white calcite near Wakefield,* Que., on Frye's Island,* N.B., and in large brown crystals at Calumet Falls, Que. Some of these would cut small gems, for which there is slight demand to represent the initial "I" in sentimental jewellery.

PYRITE.—Pyrite is found at many localities, but nowhere in great perfection. It was extensively cut and polished for jewellery a century ago, but was superseded by the introduction of steel jewellery.

HEMATITE.—Hematite (specular iron) occurs finely crystallized at Cape Spencer, and exceptionally perfect and brilliant at Digby Neck, N.S., Sussex, King's County, and Black River, St. John Co., N.B. This fibrous form of red oxide of iron is extensively worked into jewellery in England and Germany; but it has not been found of sufficient value in Canada to warrant working, as it can be cut so much more cheaply abroad. All the hematite jewellery of the Lake Superior region is believed to be not only of foreign workmanship but foreign material.

OLIVINE.—Although olivine, chrysolite or peridot, as it is variously known, is found at a number of localities as a rock constituent, and often in the form of imperfect olive and amber-colored crystals one-half inch in diameter, at Mount Royal, Montarville,* Mount Albert and Rougemont, Que.; it has not yet been observed of sufficient clearness and perfection to afford gems.

ANDALUSITE.—The andalusite, found on Lake St. Francis in small flesh-red prisms not exceeding one-tenth of an inch in diameter, and also in black crystals and the variety known as *chiastolite macle*, or cross stone, is sold abroad for use in jewellery. It also occurs at Guysboro,* N. S., in fair macles.

PYROXENE.—The deep chrome-green pyroxene found at Orford,* Que., is of special interest. Many fine crystals have been found. Occasionally they are transparent and would afford gems. The lilac-colored variety from Grenville,* Que., does not admit of a fine polish.

STAUROLITE.—Staurolite has been found at several localities in Nova Scotia, more especially at Guysboro.* This mineral when in perfect crosses finds some sale for charms in Switzerland. A legend, believed by many inhabitants of Brittany, attaches a symbolic meaning to them representing that they have been dropped from the sky.

DROPSIDE.—Diopside is found as a rock constituent at many localities in the Laurentian area. At Calumet Falls, Que., it occurs in crystals six inches long though not of gem value.

SCAPOLITE.—Scapolite, wernerite, occurs in large cleavable masses in a limestone at Grenville,* Que., and Bathurst, Ont. When free from the lilac-colored crystals of pyroxene with which it is associated it admits of a good polish, but is of little value in the arts.

ILVAITE.—Ilvaite was found in a boulder nearly a foot in diameter in the vicinity of Ottawa, Ont.,* and is believed to form a bed in the Laurentian series. It has little value as a gem, but is occasionally used for the letter "I" in sentimental jewellery.

SODALITE.—Sodalite in fine blue grains has been found in the granite of Brome, Que., and at Kicking Horse Pass,* B. C., in seams at Montreal,* Que., and in veins several inches wide on the line of the Canadian Pacific Railway, by Dr. B. J. Harrington. It is occasionally used in the arts.

LAZULITE.—Lazulite is reported from the Hudson's Bay district, but of little gem value even when it is of fine color.

KYANITE.—Kyanite has been found in Vermont adjacent, but has not been observed in Canada.

PREHNITE.—Prehnite is associated with native copper and calcite in the Lake Superior region,* where it is often of a rich green color in spherical masses of crystals an inch across, or in aggregations even larger affording a curious but pleasing green stone resembling a chrysoprase. Prehnite in fine specimens occurs at Clifton, Clark's Head and Black Rock, King's County, N. S.

TITANITE (Sphene).†—The titanites of Canada have a world wide reputation, not only for their color, polish and the perfection of the crystals but also for their great size. A twin crystal of this mineral has been found on Turner's Island, in Lake Clear, weighing 80 lbs. They are found abundantly in this region, associated with apatite. The crystals are generally of such deep brown color as to appear black, and it is rare that even a small transparent gem could be cut from them. As crystals, however, they are unexcelled, and many thousand dollars worth have been sold as specimens. The finest are found in Renfrew County, especially in Sebastopol* and Brudenell* townships, Ont. Yellow crystals have not been observed as yet.

ZONOCHLORITE.—Zonochlorite, said by Hawes to be a chemically impure variety of prehnite, is yet distinctive enough as a gem stone to

† Fine specimens from Grenville and Hull, Que.; S. Sherbrooke, Ont.; and of a variety almost white from Brome, Que., are in the Geological Survey Museum, Ottawa.

entitle it to its name. It occurs in small rolled masses and in the rock at Nepigon Bay, Ont., and was described by Dr. A. E. Foote. It is a dark opaque green stone, beautifully marked and veined, and admitting of a high polish, and ought to find some sale as a local or tourists' gem.

CHLORASTROLITE.—Chlorastrolite, while not occurring on the north shore of Lake Superior, is found at Isle Royale, and Michipicoten Island.* This beautiful, stellated gem stone, which is sold to a considerable extent as an ornamental stone on all sides of the lake, is of purely American occurrence.

THOMSONITE.—Thomsonite of a red color, compact and fibrous, often banded with green in a number of concentric rings, is found on the northern shore of Lake Superior, Ont., and Cape Split,* N.S. The pebbles vary in size from one-eighth of an inch up to one inch across, and are quite extensively sold on all sides of the lake as an ornamental stone. The pebbles when polished find a ready sale among the tourists who frequent that region. The green which Peckham and Hall described as lintonite, an uncrystalline green variety of thomsonite, often forms the centre or band, making an effective gem stone, and is sold for the same purposes.

ILMENITE.—The ilmenite in the parish of St. Urbain,* at Baie St. Paul, sometimes contains grains of a greenish triclinic felspar, and would furnish an ornamental stone similar to the porphyritic menaccanite found at Cumberland, Rhode Island. It also contains rutile crystals, too small, however, to have value as gems, though adding to the beauty of the material when polished.

LAPIS LAZULI.—Lapis Lazuli is specially mentioned in nearly all the early government grants as one of the gem stones reserved for the Crown, but as yet it has not been observed at any North American locality.

NATROLITE.—Natrolite is found in stout crystals with other zeolites at Peter's Point and other localities on the Bay of Fundy,* and at Swan's Creek, Cape Blomidon, and Partridge Island, N. S. When transparent, and of sufficient size, it is occasionally used as a gem to represent the initial N in sentimental jewelry.

APOPHYLLITE.—Apophyllite is often found along the coast of Nova Scotia on the Bay of Fundy,* principally at Cape d'Or, Isle of Haute, Partridge Island, and Swan's Creek just above Cape Blomidon, in magnificent crystals sometimes one inch or more across. It occasionally occurs on agate and amethyst in the trap rock, and would afford a minera-

logical gem, as the pearly lustre produces a curious effect like that of a fish's eye, hence the name *ichthyophthalmite*, or fish eye stone. The color is generally white, but occasionally the crystals have a rich green tinge.

MONAZITE.—Hoffmann has described a part of a crystal from Villeneuve,*Ottawa Co., making this one of the most remarkable occurrences known. If transparent it would afford a hyacinth yellow gem, rather low in hardness.

APATITE.—This mineral, which has added so much to the mining industry of the Dominion, is found in greater quantity and in finer crystals than in any other country. The crystals are often of great size and perfection, one famous crystal from the Emerald Mine, at Buckingham,* Que., weighing 550 lbs. Magnificent crystals are found throughout Eastern Ontario, on the shores of Lake Clear,* several feet in length and of fine color; at Sebastopol* and elsewhere throughout Renfrew County,* and at Wakefield,* Templeton,* Portland* and Buckingham Townships,* Ottawa County, Que. The crystals are often partly transparent, and are of all shades of red brown, brick-red, and often rich, deep green, especially in Ottawa County, in which case they ought to have some of the uses of fluor spars as ornamental stones.

WILSONITE.—Wilsonite is found at Bathurst* and Burgess,* Ont., and Ottawa County,* Que., in masses of some size, associated with scapolite. The specimens are beautiful, the minerals often passing into each other. The rich, purplish-red color of this mineral, and the fact that it admits of a good polish, make it one of the most interesting of gem minerals.

FLUORITE.—Fluorite is occasionally found in purple crystals measuring several inches on a face, associated with and on the Lake Superior amethyst. Green and purple fluor often fills mineral veins in the Lake Superior region,* and veins in syenite opposite Pic Island, on the mainland. On an island near Gravelly Point, in a porphyry, it occurs in green octahedral crystals, with barite; in green cubes associated with calcite and quartz, at Prince's Mine, Ont., and in small, beautiful crystals near Hull,* Que. Fluor spar of a beautiful blue color is found at Plaster Cove, Richmond County, N.S., and also on the west side of the harbor of Great St. Lawrence, Nfld. Small purple crystals of great beauty are occasionally found on pearl-spar in the geodes at Niagara Falls, Ont., and elsewhere in the Niagara formation.* A green, compact variety occurs in white calcite associated with galena, in veins cutting the Potsdam sandstone at Baie St. Paul and Murray Bay, Que. This would work into an ornamental stone. It is frequently found all through the Laurentian rocks. When transparent, the various colors

are called purple (false amethyst), yellow (false topaz) and green (false emerald). It is rarely cut into mineralogical gems, but when compact, of good color, or beautifully veined, it is worked into vases, cups and other ornamental objects, known as Blue John, Derbyshire Spar, etc.

MALACHITE.—Malachite of gem value has not been found to any extent in Canada, although it occurs in nearly every locality where copper and its ores are obtained. It has been observed at Sutton,* Que.

AGALMATOLITE.—The agalmatolite found in Canada is not of such quality as to fit it for the uses of the Chinese figure stone.

JET.—Jet is found at Pictou, Pictou County, N.S., in fine pieces. It has been pretty much superseded in jewellery by black onyx, and the little now used is mined at Whitby, Eng., owing to its superior hardness, and the perfect facilities for working it there.

Further reference to this subject can be found in the following works:—"Remarks on the Mineralogy and Geology of the Peninsula of Nova Scotia, by Charles T. Jackson and Francis Alger, Cambridge, 1832, 4to., page 116; "Geology and Mineralogy of Nova Scotia," Abraham Gesner, Halifax, 1836, 8vo., page 272; "Catalogue of the Mineral Localities of New Brunswick, Nova Scotia and Newfoundland," from the American Journal of Science and Arts, II. Series, Vol. XXXV., 1863, page 8; "Mineralogy of Nova Scotia," by Henry How, Halifax, N.S., 1868, 8vo., page 217; "Geology of Canada—Report of the Geological Survey from its Commencement to 1863," Montreal, 1863, 8vo., page XXVII., 983; "The Mineral Resources of the Dominion of Canada," Ottawa, 12mo., page 72; "Descriptive Catalogue of a Collection of Economic Minerals of Canada at the Philadelphia International Exhibition," Montreal, 1876, 8vo., page 152; "The Woods and Minerals of New Brunswick at the Centennial Exhibition at Philadelphia," Fredericton, N.B., 1876, by L. W. Bailey and Edward Jack, 12mo., page 51; "Dana's Mineralogy," 5th Edition, 8vo., New York, page 827; "Descriptive Catalogue of a Collection of the Economic Minerals of Canada at the Colonial and Indian Exhibition, London, 1886," by the Geological Corps, Alfred R. C. Selwyn, Director, London, 8vo., 1886, page 172.

The writer is indebted for information to Messrs. E. Coste and H. P. Brumell, of the Canadian Geological Survey, Rev. Dr. Honeyman, of Windsor, N.S., and Mr. C. D. Nimms, the indefatigable mineral collector, of Philadelphia.

PYRITES AND SULPHURIC ACID.

The total production of pyrites for use in acid making in 1887 was ^{Pyrites.} 38,043 tons, valued at the mines at \$171,194 at the average price of \$4.50 a ton.

Compared with 1886, it is a decrease of 4863 tons, due to the fact that the force of Messrs. G. H. Nichols & Co. of the Albert Mines was not directed exclusively to extracting the ore, as they were extensively engaged during the year in building sulphuric acid works as well as a new crushing and concentrating plant, new shaft houses, new skip roads, etc.

The whole of the pyrites produced in 1887, which was as in the ^{Exports.} previous years mined at Capelton, Que., was exported to the United States. The following table (A) shews that the growth of this export from 1881 to 1886 was very rapid, and that Canadian pyrites have always been in great favor in the United States, where they form nearly 43 per cent. of all that is used; it also shows that the great industry of acid making from pyrites, which in Great Britain now consumes about 600,000 tons of pyrites yearly, is rapidly increasing in the United States, and it is evident that the result cannot fail to be a great development of Canadian pyrites mines, as there are many other deposits of the same class of ore, as at Capelton, known in the Eastern Townships.

EXPORTS OF CANADIAN PYRITES TO THE UNITED STATES, AND CONSUMPTION OF
PYRITES IN THE UNITED STATES, FROM 1881 TO 1886.

TABLE A.

YEAR.	Exports from Canada to United States. Fiscal Years.	Consumed in United States. Calendar Years.
	Tons.	Tons.
1881.....	10,812	7,840
1882.....	23,980	32,368
1883.....	25,211	50,400
1884.....	26,000	72,800
1885.....	34,123	102,368
1886.....	47,410	125,440
Total	167,536	391,216

Proportion of Canadian Exports to total consumption in the United States for the six years, 43 per cent.

Imports. About 2000 tons of pyrites were imported in 1887 for acid making from the United States.

Sulphuric acid. The total quantity of sulphuric acid manufactured in Canada in 1887 was about 5,477,950 lbs., valued at the works at about \$70,609.

The quantity made in 1886 has not been ascertained exactly, but it is estimated that there was an increase in 1887 of about 50 per cent. This increase is likely to become larger this year on account of the new Capelton chemical works started at the close of 1887.

Imports.

IMPORTS OF SULPHURIC ACID.

TABLE 1.

PROVINCE.	1886.		1887.	
	Pounds.	Value.	Pounds.	Value.
Ontario	55,743	\$733	1,658,860	\$26,233
Quebec	82,754	951	725,749	8,914
Nova Scotia	68,373	857	186,451	1,941
New Brunswick	139,644	1,589	138,264	1,484
Prince Edward Island..	2,045	24	.....	.....
Manitoba	194	4	197	4
British Columbia	15,678	531	21,402	634
Total	364,431	\$4,689	2,730,923	\$39,210

Great increase in consumption. The above table shows the imports in 1887 to have been between eight and nine times greater than in 1886 and, as above stated, the increase in the home production of acid was about 50 per cent. These facts prove a very much larger consumption of sulphuric acid in 1887 in Canada; and, as this acid is the basis of all chemical industries, it may be taken as a sure sign of a very brisk start in the development of these industries.

IMPORTS OF BRIMSTONE OR CRUDE SULPHUR.

TABLE 2.

PROVINCE.	1886.		1887.	
	Pounds.	Value.	Pounds.	Value.
Ontario	2,225,598	\$24,046	1,097,882	\$13,279
Quebec	626,005	9,797	776,237	11,698
Nova Scotia	170,571	2,641	371,625	5,566
New Brunswick	34,513	702	58,287	936
Prince Edward Island..	929	20	1,752	36
Manitoba	370	11	941	27
British Columbia	5,393	179	1,818	74
Total	3,063,379	\$37,396	2,308,542	\$31,616

PYRITES DEPOSITS IN CANADA.

We have in Canada very important deposits of cupreous pyrites, in the Eastern Townships of Quebec. As shown by the statistical Table A. of page 81, these pyrites, from Capelton, P.Q., supplied, from 1881 to 1886 inclusive, 43 per cent of all that was used in the United States, notwithstanding that the transportation and duty charges from Canada to Brooklyn and New Jersey, where they are first treated, amounts to about \$5.00 per ton. This shows what industrial standing Canadian pyrites has acquired in the United States, the reason being that, besides 40 per cent. of sulphur, there is also extracted from it from 3 per cent. to 4 per cent. of copper and from \$3.00 to \$4.00 of silver per ton. None of the American pyrites contain as much copper or silver, as may be seen by referring to the reports on the mineral resources of the United States published by the United States Geological Survey.

Comparing Canadian cupreous pyrites with those used in England, we find, according to the official "Mining and Mineral Statistics of Great Britain," that there were, during the three years, 1884, 1885 and 1886, 1,774,582 long tons of cupreous pyrites imported into Great Britain, principally from the famous Huelva district in Spain and Portugal, of a total value of £3,527,333 sterling; these, after roasting,

Quantity of
Canadian
pyrites used in
the United
States.

Comparison of
the yield of
Spanish and
Canadian
pyrites.

gave 1,217,811 long tons of burnt cupreous pyrites, which were treated for copper, silver and gold, and furnished 54,450 long tons of metallic copper and about \$1,100,000 of gold and silver. This shows that there was saved from these pyrites a copper content of about 2.5 per cent. and a value of gold and silver of less than one dollar a ton, or very much less copper and silver than what is saved from Canadian pyrites.

A similar advantageous comparison could be made between Canadian pyrites and the pyrites used in France and Germany, so that it may be said that Canadian pyrites stand to-day the best in the world.

Capelton Mines Canada can also provide very large quantities, as absolutely proved by the continuous production for the last ten years of many thousands of tons a year from one single vein on which are located the Hartford, Crown and Albert mines of Capelton. This vein is a strong one, and outcrops on the summit of a high flat hill for a length of about 3,000 feet in a north-east and south-west direction; it dips to the south-east with an angle varying from 50° to 60° . On it seven shafts have been sunk: one of these (the No. 5 Hartford Mine shaft continued by the Crown Mine shaft) is now about 1,600 feet deep, and another one (the Albert shaft), about 2,000 feet more to the north-east, is now about 850 feet deep. In both of these shafts, and in the adjoining workings, the vein has varied in width from two and three feet to fifty and sixty feet of massive pyrites, and immense stopes of great height can be seen there. The vein in shape is a succession of large, lenticular bodies of pyrites dipping in the vein to the north-east; it follows very nearly the direction of the Archæan hydro-mica schists in which it is found and with which it was contorted, disturbed and faulted after its formation. Its character as a vein is nevertheless well established by the way it often splits up into several branches across the schists, from the seams running in the walls from the main vein and by the gangues and minerals it contains, viz., quartz, iron pyrites, copper pyrites, mispickel and tetrahedrite. Dykes of diorite, with which eruptions the deposition of the pyrites may have been connected, are to be seen in several places along the outcrop of the vein on the top of the hill, and also all through the hill; this diorite has often been encountered in the workings forming the walls or right in the vein, as in No. 5 Hartford shaft between the 40 and 50 fathoms levels to the east of the shaft, and also in other places. Several slides or faults, with an east and west direction and a north-westerly dip, have been encountered in the shafts, throwing the downward portion of the vein up. Several dykes of columnar trap, of about the same direction as the vein and nearly vertical, have also been found to cut it, but not to throw it.

This vein is now actively worked by the owners of the Crown and Albert mines, who employ there about 300 men. As already mentioned, page 81, sulphuric acid works and a new large mining, crushing, concentrating and transportation plant have been put up during the year 1887 by Messrs. G. H. Nichols & Co., of Brooklyn, N.Y. now the owners of the Albert, Hartford and Capel mines.

Many other deposits of pyrites, very similar to the one just described, are known to exist in the Eastern Townships of Quebec, principally in the Townships of Ascot, Orford, Bolton, Sutton and Acton, and in the Counties of Megantic, Wolfe, Arthabaska and Shefford. Some of these deposits were worked extensively many years ago, but only for their copper, and the work was suspended at most of them on account of the great decline in price of that metal; but, from many of these deposits pyrites are obtainable that could be utilized also for acid-making and for the silver and gold they contain. Like those of Capelton we have no doubt that they would find a ready market not only in the United States but also in Great Britain, France or Germany where we are sure they could be made to supersede in a great measure the famous Spanish or Portuguese pyrites on account of their greater copper and precious metal contents, and of their easy burning for acid.

Other large deposits of pyrites are known in Canada, especially in Leeds, Lanark and Hastings Counties, and at Sudbury, Ont., and often contain nickel and cobalt. One of them, at Elizabethtown near Brockville, Ont., was worked for several years and furnished the sulphur to the Brockville Chemical Works. The pyrites in the Sudbury deposits, now being worked for the last two years, are unfortunately cupreous pyrrhotite or a mixture of magnetic iron pyrites and of copper pyrites, and are of very little use for acid-making, but they may be for their nickel and copper contents. The other Ontario deposits of the counties mentioned above are not cupreous, and their value, being thus consequently reduced to a minimum, is too small to permit of their being transported to the large manufacturing centres.

SALT.

The total marketed production of salt in 1887, according to direct returns very willingly sent to this office by the producers, was 60,173 tons, or 429,807 bbls. of 280 lbs., the value of which at the works was \$166,394; this is the value of the salt alone; the value of the salt plus the packages used was about \$241,605. The average price for the salt alone is thus shown to have been \$2.76 per ton, or 38c. per barrel of 280 lbs.; this high average price is due to the fact that three or four of the producers obtain much higher prices than the other manufacturers, the average price of whose production varies between \$2.00 and 2.50 per ton.

There were in 1887 seventeen producers in Ontario and one in New Brunswick, and they employed about 273 men. Compared with the preceding year the marketed production shows a decrease in 1887 of 2,186 tons, but an increase in the value of \$6,012 for the salt alone exclusive of packages.

The following table of the yearly shipments of salt by the Grand Trunk Railway shows that they have not varied much since 1883:—

SALT SHIPPED BY RAIL.—LAKE HURON DISTRICT—G.T.Ry.

TABLE A.

Year.	Tons.
1883.....	35,961
1884.....	34,850
1885.....	39,600
1886.....	41,577
1887.....	36,311

Exports and Imports.

Tables 1, 2, 3 and 4, give the exports and imports of salt, and compared with the above statement of the production, indicate the total consumption of salt in Canada in 1887 to have been about 148,000 tons.

EXPORTS OF SALT.

TABLE 1.

PROVINCE.	1886.		1887.	
	Bushels.	Value.	Bushels.	Value.
Ontario	224,595	\$16,816	153,475	\$11,425
Nova Scotia.....	240	40	.....	.....
New Brunswick.....	90	25	570	101
Prince Edward Island....	18	5	.....	.....
Total.....	224,943	\$16,886	154,045	\$11,526

IMPORTS OF COARSE SALT PAYING DUTY.

TABLE 2.

PROVINCE.	1886.		1887.	
	Pounds.	Value.	Pounds.	Value.
Ontario.....	855,000	\$2,177	683,370	\$2,110
Quebec			7,240	32
Nova Scotia.....	600	4		
New Brunswick.....			2,260	9
British Columbia.....	10,336	38	72,000	368
Total.....	865,936	\$2,219	764,770	\$2,519

IMPORTS OF FINE SALT PAYING DUTY.

TABLE 3.

PROVINCE.	1886.		1887.	
	Pounds.	Value.	Pounds.	Value.
Ontario.....	688,211	\$2,431	1,000,842	\$ 3,349
Quebec	6,564,801	24,994	4,989,918	14,748
Nova Scotia	302,688	1,093	841,782	1,981
New Brunswick.....	1,800,890	6,177	1,662,300	5,110
Prince Edward Island..	29,698	76	27,138	75
Manitoba	50,300	230	5,900	33
British Columbia.....	1,311,040	5,606	561,100	3,468
Total.....	10,747,628	\$40,607	9,088,980	\$28,764

IMPORTS OF SALT (DUTY FREE) FOR FISHERIES.

TABLE 4.

PROVINCE.	1886.		1887.	
	Pounds.	Value.	Pounds.	Value.
Ontario	6,230,657	\$ 10,159	1,668,942	\$ 2,765
Quebec	60,465,880	79,687	69,118,737	92,194
Nova Scotia	103,153,827	140,458	81,982,510	112,031
New Brunswick.....	30,679,640	49,519	28,207,140	42,300
Prince Edward Island ...	7,199,160	8,165	4,578,787	2,626
Manitoba	133,168	935	252,100	998
British Columbia	672,000	1,458	1,038,452	2,479
Totals	208,534,332	\$290,381	186,846,668	\$255,393

SILVER.

Summary. The total production of silver in 1887 is estimated to have been \$349,330; that is to say, there were about 349,330 ozs. of silver contained in the silver ores and bullion shipped from Canada during the year.

Comparison. Compared with 1886, it is an increase of \$140,240, due principally to the rich bodies of silver ore struck at the Beaver Mine, Port Arthur District, in the month of March, 1887. Three of the other mines in the Port Arthur District—the Silver Mountain, Rabbit Mountain, and Porcupine Mines—also shipped small quantities of ore during the year, and the total shipments from the district amounted to \$190,495. In British Columbia, the Lanark Mine of Illecillewaet made its first shipment in 1887; and it is estimated that about 146,898 ozs. of silver were extracted from the copper pyrites shipped to the United States from the mines of Capelton, Eastern Townships, Quebec.

Exports. The following table, taken from the books of the Customs Department, gives the exports of silver ore in 1887 from the provinces where the outward shipments were made at the Customs offices :—

EXPORTS OF SILVER ORE.

TABLE 1.

PROVINCE.	1886.		1887.	
	Tons.	Value.	Tons.	Value.
Ontario	29½	\$16,505	234	\$184,763
Quebec	17½	8,000	?	450
Manitoba	11	1,452	½	3,741
British Columbia....	...	.....	237	17 331
Totals.....	.....	\$25,957	.....	\$206,284

THE MOST IMPORTANT NEW DEVELOPMENTS IN THE PORT ARTHUR
SILVER DISTRICT IN 1887.

The year 1887 was a very successful year for the silver district south-west of Port Arthur, and, as shown by the statistics, the production of silver in that district has been very much greater than that of the last eight or nine years. The strike of a large body of very rich ore at the Beaver Mine, in the month of March of that year, proved that the famous Silver Islet was not the only rich mine in that district; a fact already known to many but which was none the less more forcibly established and more widely recognized when the wonderful reports of richness from the Beaver Mine were duly authenticated. The interest prospectors and capitalists took already in that region, not only on account of the old mines but also of the more recent discoveries in the Rabbit Mountain and Silver Mountain districts, was at once very much increased; very great activity was soon noticed at Port Arthur and throughout the whole district and lasted during the remainder of the year. The last steps were also taken in 1887 to provide for the construction of a railway through these new silver districts: the surveys were completed, and all financial and other arrangements concluded, so as to start the work early in the following year.

Our examinations in the district were made at the end of July and the beginning of August. The mines† then in active work were the Jarvis Island Mine, the Beaver Mine, the Rabbit Mountain Mine, the Badger Mine, and the Silver Mountain Mine; there was besides a

Date of examination and mines working.

† See map accompanying Mr. Ingall's report—Part II, annual report 1886—for location of these mines.

great deal of exploratory work being done all through the region and openings were being made at some of the new locations showing very encouraging and good veins containing rich ores. After examining all the working mines, except the Jarvis Island Mine, we had witnessed very promising developments at some of them, and were convinced of the truth of the reports of the very rich strike at the Beaver Mine. In the following notes the most important facts observed at the principal mines are summarised.

Beaver Mine
underground
developments.

Beaver Mine.—At the Beaver Mine the underground development work was found to consist of:—†two shafts Nos. 1 and 2, respectively 135 and 108 feet deep, and of three levels drifted in the vein and opening a total length on the vein of about 770 feet. There were, besides, other developments made in search of the veins consisting of:—a gallery about 400 feet long drifted in the foot wall of the vein, a cross-cut about 330 feet long, and a winze about 125 feet deep sunk from the cross-cut.

Bodies of ore
and value of the
ore.

The large ore body ‡ was first struck between No. 1 and No. 2 on the three levels, and was found to extend in the adit level as far S.E. (the vein is about N.W.—S.E. and dips to the S.W.) as No. 2 shaft; but the richest ore was towards its western limits, where, in the adit and No. 2 levels and in stope D, there had been obtained at the time of our visit, besides the mill rock, about 100 tons of selected ore, of an average assay value of \$1,500, some assays going as high as \$15,000 to the ton. The mill rock so far had averaged about \$40 to the ton, and during our stay in the district its average assay value varied between \$50 and \$80. Besides this large body of rich ore, several smaller ones had been encountered at other places in the mine, in stopes A, B, and C shown on the vertical section referred to in note on page 89. As will be noticed by studying the plan and section above referred to, the adit level enters the hill in the hanging wall of the vein, and only reaches the vein a little before the stope C, where good ore was found, and where there was a good massive vein of about 3 feet; the vein then suddenly pinched out and entirely disappeared it may be said for a distance of about 240 feet from the stope C to the south east; the black slates composing the walls are locally disturbed there and have evidently filled that part of the fissure; the vein suddenly opened again and remained well open with a varying width of vein matter of from 2' to 4' 6" as far as shaft No. 2 on that level; there, as stated above, the richest ore was found especially in the first 90 feet nearest

Thickness of
the vein and
description.
Adit level.

† See plate VIII. of plans and sections—Part H. annual report, 1888.

‡ The line showing its western limit on the vertical section referred to in note on page 89 is a little too near shaft No. 1, especially at the No. 2 level, where it should be brought back to the right or south-east about 40 feet.

to shaft No. 1. The following is a section taken across the vein in the "Bonanza" at about 200 feet north-west from shaft No. 2.

Hanging Wall—Black Shales.

1' to 1' 6" of very rich ore.	{ Composed of a first streak on the hanging wall of amethyst quartz, then another of white calcite with dark blende and galena, then another of white calcite with native silver and argentite.
About 2'	{ Of a decomposed soft slate with little stringers of white calcite through it.
3' 6" of mill rock.	{ Composed of quartz, calcite, blende, pyrites, argentite, and native silver.

Foot Wall—Black Shales.

To the south-east of shaft No. 2 in the adit level, the vein is split into two small veins of about 1 foot each by a "horse" of shales 4' or 5' wide.

In No. 2 level a corresponding dead ground to the one in the adit No. 2 level. level below exists between stopes B and D; the shales there dip strongly to the south-west, filling the old fissure of the vein; after that the vein opens in good ore and at the S.E. face was 2' 6" massive with quartz on both walls and calcite in the middle, the minerals being distributed in both gangue stones.

In No. 1 level the vein was strong and well defined in the whole No. 1 level. ground opened, varying between 2' and 4' 6" massive veinstone and ore; in the part of the level through the rich ore body there was always also some soft decomposed slates sometimes in the vein and other times either on the foot or the hanging wall; outside of the ore bodies and in the poor ground the veinstones, calcite and quartz, are coarsely crystallised.

Apart from the gangues already mentioned in the section given above, there was often to be found all through the ore, and principally where it was the richest, a great deal of a very white, soft, unctuous silicate of magnesia, and often some fluor-spar; besides the native silver, argentite, dark colored blende, galena and yellow pyrites already mentioned, there was also noticed in the vein some other minerals such as brittle silver and pyrrhotite. The argentite was often noticed as a pseudomorph of crystals of quartz or calcite, indicating for the silver a subsequent deposition to the gangues in the solid state.

Other vein-
stones and
minerals in
vein.

The mill was not quite completed, but was already a substantial one, capable of crushing between 30 and 45 tons a day. It is situated at the end of a tramway at a little more than 2,000 feet from the mine, and on the banks of Silver Creek. The principal machinery was:—

Mill and out-
side develop-
ments.

CRUSHING PLANT:—

One large Blake crusher (capacity 10 tons per hour) for the mill rock.

One small Dodge crusher (capacity $1\frac{1}{2}$ tons per hour) for sampling and crushing the selected ore.

One double Worthington pump 10 x 12 (capacity 12,000 galls. per hour.)

Two batteries of 5 stamps, fed automatically, 850 lbs. head, 100 strokes per minute, 6 in. drop.

CONCENTRATING PLANT:—

Four Frue vanners.

One Goldengate concentrator, with a Sturtevant aspirator No. 3.

One Krauss concentrator.

AMALGAMATING PLANT:—

Two 5 feet pans.

One 7 feet settler with a canvas filter, an amalgam safe and a small settler to clean the amalgam.

STEAM PLANT:—

One cylinder engine 22 x 24 of 150 horse-power, with a 7 ton fly-wheel 12 feet in diameter, and a Northey feed pump.

Two 66 inches boilers 16' long with a 30 inches mud drum, a 30 inches water drum 15 feet long, 1 steam dome 9 feet x 30 inches, 1 copper flue heater 9 feet x 36 inches, and a 4 feet smoke stack 75 feet high.

The putting up of ten more stamps, four more pans and two more settlers was being proceeded with, as well as the construction of another assay office and of a furnace to evaporate the mercury from the amalgam.

The mining machinery consisted of a two-flue boiler 20 feet by 4, furnishing steam to a Burleigh air compressor No. 4, of a capacity of seven No. 2 Rand drills, with an air receiver of 20 feet x 4 feet, and a 6 inches air pipe; this gave the compressed air to the drills, and to a Copeland and Bacon hoisting engine, 6-in. cylinder, on No. 2 shaft. Other necessary surface plant and houses such as saw-mill, machine repair shop, blacksmith shop, boarding-houses, office, store, etc., were also partially built or being completed; when the mine was first worked in 1885, the place was a perfect wilderness in the woods, and everything had been provided for and built since.

Rabbit Mountain underground developments.

Rabbit Mountain Mine.—The developments at this mine during the year 1887, were small and brought about nothing new. One shaft only, No. 2*, had been sunk below the first level (the 80-foot level) and was, at the end of July 1887, about 270 feet deep, and from that shaft 3 levels, below the 80-foot level, had opened only about 180 feet of

* See Plate VII. part H. annual report, 1886.

ground on the vein, viz.: about 115 feet to the N.E. of the shaft on the second level and about 65 feet to the S. W. of the shaft on the third level; so that it will be seen that the explorations below the 80-foot level are very small yet and cannot consequently prove or indicate much. No. 1 level or the 80 feet level was about 370 feet long. There was besides some work done on what appears to be a branch of the main vein outcropping about 100 feet to the N. W.; the extent of that work can be seen by reference to Plate VII. above mentioned.

Good ore containing a good deal of argentite was found:—in stopes C. D. and E., in shaft No. 2 just below the No. 2 level, in the sump of that level, also in No. 4 level southwest and in the bottom of the shaft just below that level.

The section at the face of No. 4 level was:—

Hanging wall—black shales.

About 1' 6" of quartz and calcite.

About 2' of slickensided slates often impregnated with argentite.

About 1' of good ore composed of galena, light colored blende and argentite in calcite.

Foot wall—black shales, smooth, well separated from vein matter.

Size and description of vein.
No. 4 level.

The northeast face of that level was entering a dead ground in the vein already met in No. 3 and No. 2 levels, about 70 feet N.E. from the shaft, and there was only at that face 6" of vein matter along a good foot wall. At the faces S.W. of No. 3 and No. 2 level the vein was about 4 feet wide, massive, composed of a poor ore almost wholly made up of large crystals of calcite and quartz.

Between No. 2 and No. 1 level in the shaft the vein pinches out and is very small, when it re-opens again to from 2 to 4 feet of a well banded vein of coarse calcite and quartz in No. 1 level. In stopes C. D. and E. very rich nuggets of argentite were obtained. Some 500 feet S. W. of No. 2 shaft an opening shows the vein to be about 5 feet, strong and massive and to be composed of calcite with a little fluor spar, blende and galena.

The vein, apart from the gangues and minerals mentioned above, was also noticed to contain some fluor spar, baryta and iron pyrites.

The mill consisted of a small Blake crusher, 5 stamps, 2 Frue van-ners, 4 settling tanks, 2 pans, one settler, one small settler for cleaning the amalgam, one amalgam safe and one engine and boiler.

Mill and hoisting machinery.

At the time of our visit a new large two cylinder hoisting engine had just been received from the Iron Bay Manufacturing Co., Marquette, Mich., and preparations were being made to replace by it the old small hoisting engine in use so far.

Badger Mine.—The developments at this mine were very small but very promising indeed, showing, as they did, rich ore and a good vein.

They consisted of a cut through about 120 feet of boulder clay, and of a tunnel at the end of that cut running in the vein through the black slates just under a trap hill. This tunnel, at the time of our visit, was only about 25 or 30 feet long, and showed at the face a vein about 2 feet wide: 1' 6" of calcite on the foot and about 6" of quartz on the hanging wall. In the trap just above the tunnel the quartz and calcite were separated into two well defined small veins. The direction of the vein in the tunnel is 36° east of north magnetic, and its dip appears to be S. E., but it was nearly vertical as far down as the tunnel and could not be clearly detected. The minerals and gangues observed in the vein were native silver, argentite, galena, dark colored blende, fluor spar, quartz and calcite; native silver and argentite were only seen in the quartz, the galena and blende were observed in both gangues. The slates at the hanging-wall at the entrance of the tunnel were impregnated with blende, galena and argentite.

There were no surface developments of any account, but we understand that a mill has since been built.

Porcupine Mine.—Work had been suspended at this mine but was, I understand, soon to be started again.

The underground work consisted of 4 short levels and one stope on the west side of the hill and of a small shaft, 60 feet deep, on the east side of the hill, some 600 feet from the centre of the other workings.†

The mean direction of the vein is about 70° east of magnetic north, and it dips a little to the south, but is almost vertical; its width varies between one foot and three feet, and considerable argentite or silver glance has been obtained, and can be seen in the roof and faces of the four levels driven in the slate. The slates are often impregnated with it. Through the trap in the shaft there was no silver in the vein, but there was a little galena and blende. A little native silver has also been obtained, and the gangues are exactly the same as at the other mines, viz., calcite, quartz and fluor spar; argentite has also been observed there as pseudomorphs after quartz. As the shaft was full of water, I could not ascertain if silver was found at the bottom where it enters the slates, but I believe some was found, as I was informed.

No machinery or outside developments of any consequence as yet.

Silver Mountain Mine.—Work had been pushed with vigor at this mine, and quite a little underground development done at the end of July 1887, consisting of three shafts, each about 120 feet deep, two

See Plate VII, Part H., annual report, 1886.

levels each about 600 feet long, two winzes and several pits; the adit level is about 200 feet below the mouth of the shafts, and No. 3 shaft is about 820 feet west of No. 2 shaft.†

The vein cuts across Silver Mountain in an east and west direction (or, more properly, about 72° east of magnetic north is the mean direction of the vein between No. 1 shaft and No. 3 shaft, but it curves to the north between No. 1 shaft and No. 3 pit), dips north, and occupies a well-marked line of fault, with a downthrow of the hanging wall of about seventy feet, as evidenced by the junction of the trap and slates being found on the hanging wall of the vein in No. 1 and No. 2 shafts at ninety feet from the surface instead of twenty feet as on the foot wall.

Rich ore was found in several small bunches at different places in the eastern part of the mine and generally along the foot wall:—in No. 4 pit and in the drift below from that pit, in the two stopes above No. 2 level, and in No. 2 shaft at about sixty-five feet down. Good ore (pieces of which assayed \$90 to the ton) was also found in No. 3 shaft at the depth of about seventy feet. Bodies of rich ore.

The vein is a long one, and of good width as a rule, notwithstanding that the thickness is very variable and almost nothing in some places. In No. 2 level, in nearly the whole of the ground opened, there is a total width of about five or six feet of veinstone, generally separated into several seams as at the west face of that level where the following section was obtained from the hanging to the foot wall:— Size of the vein.

- 1' 6'' of quartz, calcite and fluor-spar.
- 2' of slates.
- 2' of quartz, calcite and fluor-spar.
- 1' 6'' of slates.
- 3' of fractured slates, all impregnated with vein matter.

In No. 2 shaft, the width all the way down varied between three and six feet; and in No. 3 shaft it was seven feet wide at the start, a few inches only at sixty-five or seventy feet down, and about two feet six inches again at the bottom, 120 feet. No. 1 drift is in dead ground all the way, that is to say, the fissure is almost completely filled up with slates, except about sixty feet around the first winze sunk below the adit, where there is a very brecciated vein of about two feet, and except the last fifteen feet near the face where there was about one foot of brecciated vein. No. 2 shaft.
No. 3 shaft.
No. 1 level or
adit level.

The gangues forming the vein are calcite, quartz (white and amethystine) and fluor spar. The following minerals are disseminated through these veinstones:—light-colored blende, galena, iron pyrites, argentite and native silver. Composition of the vein.

† See Plate IX., Part H., Annual Report, 1886.

Mining plant. No mill had yet been put up at the Silver Mountain Mine, and the mining plant consisted of the following machinery, viz.:—one small air compressor, capable of running three No. 1, Rand drills, and fed by a tubular boiler of thirty horse-power, and one hoisting engine of two 12-inch cylinders, with a 4 feet drum, fed by a twenty horse-power tubular boiler, on No. 3 shaft.

Other veins discovered and worked a few years ago. A great many other veins of precisely the same nature were discovered all through that district; they contain exactly the same minerals and veinstones, and are exactly in the same geological conditions, that is:—they cut through the cherts, black slates and traps of an horizontal series, the Animikie, resting unconformably on the Archæan rocks. Some of these veins were a little worked, and at many places rich ores were obtained, as we had occasion to ascertain ourselves at some of them. It is unnecessary here to mention them all as their progress will be followed when they become more developed.

New discoveries last year. Numerous and important new discoveries were made also during the summer of 1887, and have further extended the area of Animikie rocks in which silver-bearing veins were already actually known to occur. We have ascertained this to be a fact by going ourselves to Atik Lake (five or six miles west of Whitefish Lake, and about two miles north of the east end of Arrow Lake) and there we saw that good ores, containing rich black blende and some argentite, had been found in four different veins, and also that some native silver had been obtained in one of them; the veins were several feet wide and in exactly similar geological and other conditions as those described above.

Conclusion. We think that every one will now admit what we have said in the beginning of this article, viz.:—that the year 1887 was a very successful one for the Port Arthur Silver district; and, to conclude briefly, we will say that the recent developments in that region, principally those of 1887, have again brought it forward before the eyes of the public, as it was at the time of the discovery and of the working of the Silver Islet and the other old mines, as a region containing a great number of very well-defined veins containing very rich silver ores; and everybody understands now that it only needs, no doubt in many cases, active work and the help of capital to develop these veins into rich mines. We know also now that these veins will be found all through the area occupied by the Animikie rocks, which the researches of Messrs. Ingall and Lawson, of the Geological Survey, have proved to extend as far west as Gun-Flint Lake, and to occupy about 1,500 square miles, the greater part of which is still unexplored.

STRUCTURAL MATERIALS.

Granite.—The total production in 1887 as reported directly to this Granite office, was 21,217 tons, valued in the rough state at the quarries at \$142,506. It is an enormous increase over 1886 of 145 per cent. in the three provinces of Ontario, Quebec, and New Brunswick; we cannot say as to Nova Scotia as we had not the figures for that province last year; this increase speaks for itself, and demonstrates how much the granites from Kingston and from St. George, N.B., which are worth from \$10.00 to \$18.00 per ton at the quarries, are becoming appreciated.

The production by provinces was as follows :—

Production by
provinces.

Ontario.....	7,663 tons.	\$ 73,800
New Brunswick.....	6,681 "	48,281
Nova Scotia.....	6,289 "	15,125
Quebec	584 "	5,300
Total.....	21,217 tons.	\$142,506

In New Brunswick, besides the very valuable granite from St. George, (worth about \$1.00 per cubic foot in the rough state) there was also a large quantity of gray granite quarried at Hampstead, Queen's Co., for structural purposes, and of less value.

A good deal of Canadian granite is polished and manufactured for ^{Manufactured} ornamental and monumental purposes in the country. The exact ^{article.} quantity thus manufactured and marketed during the year could not be ascertained but is estimated to have been about 3,500 tons, sold for about \$350,000.

Marble and Serpentine.—The production, as far as returned from ^{Marble and} three quarries, was 242 tons valued, in the rough state but ^{serpentine.} quarried to sizes, at about \$6,224. This is not a complete statement of the total production.

The value of the imports of marble, and manufactures of stone or ^{Imports.} granite N.E.S. (as classified in the returns of the Customs Department) will be found in the following tables 1 and 2:—

VALUE OF IMPORTS OF MARBLE.

TABLE 1.

Provinces.	1886.		1887.	
	Blocks.	Slabs.	Blocks.	Slabs.
Ontario	\$1,879	\$44,330	\$2,205	\$37,468
Quebec	414	21,073	1,581	21,259
Nova Scotia.....	736	5,637	2,060	7,520
New Brunswick.....	737	6,420	306	6,376
Prince Edward Island		2,683	106	1,891
Manitoba	12	78	.....	110
British Columbia.....		1,147	226	1,850
Total.....	\$3,778	\$81,368	\$6,484	\$76,474
	Blocks.	3,778	.....	6,484
Totals.....		\$85,146	.....	\$82,958

VALUE OF IMPORTS OF OTHER ORNAMENTAL STONES.

TABLE 2.

Manufactures of Stone or Granite, N.E.S.	1886	1887
Ontario	\$28,695	\$15,253
Quebec	8,425	3,286
Nova Scotia	1,037	491
New Brunswick.....	1,058	465
Prince Edward Island.....	443	117
Manitoba	373	1,059
British Columbia.....	1,052	940
Total.....	\$41,083	\$21,611

Slate.

Slate.—The production of slate in 1887 was 7,357 tons which were valued manufactured at the quarries at \$89,000 ; it is an increase over 1886 of a little more than 2,000 tons and was also all quarried in the province of Quebec.

Flagstone.—The returns of flagstone received amount to a production of 116,000 square feet with a value at the quarries of about \$11,600 ; the great bulk of this is from Dudswell, Quebec.

The tables of exports and imports of slate and flagstone are ^{Exports and} _{imports.} appended.

EXPORTS OF SLATE FOR LAST FOUR YEARS.

TABLE 3.

Year.	Quebec.		Nova Scotia.	
	Tons.	Value.	Tons.	Value.
1884.....	539	\$6,845	.....	.....
1885.....	346	5,274	.....	.....
1886.....	34	495	.....	.....
1887.....	27	373	22	\$880

IMPORTS OF SLATE.

TABLE 4.

Province.	1886	1887
Ontario	\$16,253	\$17,299
Quebec.....	8,071	2,211
Nova Scotia.....	1,438	927
New Brunswick.....	3,130	3,909
Prince Edward Island	182	88
Manitoba	329	191
British Columbia	289	589
Total.....	\$29,692	\$25,214

IMPORTS OF DRESSED FLAGSTONES.

TABLE 5.

PROVINCE.	1886.		1887.	
	Tons.	Value.	Tons.	Value.
Ontario	1,494	\$11,513	2,531	\$20,233
New Brunswick.....	.....	.....	1	36
	1,494	\$11,513	2,532	\$20,269

Building stone. *Building Stone.*—We have received many more returns this year, their number being 129 instead of 94 received last year; and the recorded production of 1887 is nearly 100,000 cubic yards more than what was returned in 1886. This simply demonstrates that the 1886 returns of building stones were unfortunately very incomplete owing to the short time then available for collecting addresses of the producers; the value also was over-stated in the returns, and included probably a great deal of freight costs. Though the returns for 1887 are much improved, they are still incomplete, and every producer is earnestly requested to send in his address before the end of the year, and thus render possible a complete record for 1888.

PRODUCTION OF BUILDING STONE IN 1887.

As returned to this office, and estimated to be three to four-fifths of the total production.

TABLE 6.

PROVINCE.	No. of Returns.	Cubic Yards.	Value.
Ontario	70	184,426	\$343,046
Quebec	16	41,251	72,958
Nova Scotia.....	About 25	22,328	68,682
New Brunswick.....	8	6,871	52,901
Prince Edward Island...	4	1,536	2,700
Manitoba.....	3	3,052	5,050
British Columbia.....	1	1,000	1,500
North-West Territories..	2	2,128	5,430
Total	About 129	262,592	\$552,267

The following exports and imports tables of stone are given as classified by the Customs Department; the marble could not be separated from other stones. Exports and imports.

VALUE OF EXPORTS OF STONE AND MARBLE, WROUGHT AND UNWROUGHT.

TABLE 7.

PROVINCE.	1886.		1887.	
	Wrought.	Unwrought.	Wrought.	Unwrought.
Ontario	\$ 103	\$27,922	\$ 17	\$ 4,490
Quebec	1,206	.....	670	.....
Nova Scotia	121	18,377	425	24,476
New Brunswick ..	18,596	26,954	12,827	24,925
British Columbia ..	.....	.....	70	95
Total	\$20,026	\$73,253	\$14,049	\$53 986

IMPORTS OF DRESSED FREESTONE AND ALL OTHER BUILDING STONE.

TABLE 8.

PROVINCE.	1886.		1887.	
	Tons.	Value.	Tons.	Value.
Ontario	777	\$5,108	?	\$3,189
Quebec	5	185	11	74
New Brunswick	2	10	.....	.....
Prince Edward Island .....	.....	.....	.....	2
British Columbia ..	.....	.....	240	148
Totals	784	\$5,303	.....	\$3,413

IMPORTS OF ROUGH FREESTONE, SANDSTONE AND BUILDING STONE.

TABLE 9.

PROVINCES.	1886.		1887.	
	Tons.	Value.	Tons.	Value.
Ontario	7,499	\$39,282	6,384	\$47,610
Quebec	202	1,909	2,649	22,014
New Brunswick.....	25	453	25	254
Totals	7,726	\$41,644	9,058	\$69,878

Lime. *Lime.*—The same remarks that were made for the building stone apply to the lime returns; 133 returns were received instead of 87 last year, and the value is \$100,000 more than the total value arrived at last year. About four-fifths of the total production is now estimated to have been returned.

Cement. *Cement.*—The compilation of seven returns received from cement works gives the following result which is believed to be very nearly a complete record :—69,843 bbls., valued at the works at \$81,909.

PRODUCTION OF LIME IN 1887, AS RETURNED TO THIS OFFICE.

TABLE 10.

PROVINCES.	No. of returns.	Bushels.	Value.
Ontario	78	1,239,451	\$178,153
Quebec.....	21	424,316	79,137
Nova Scotia	10	49,400	11,442
New Brunswick	13	478,410	103,463
Prince Edward Island.	3	30,280	8,214
Manitoba	5	32,800	8,500
British Columbia.....	1	10,080	2,688
North-West Territories	2	4,350	3,262
Totals.....	133	2,269,087	\$394,859

EXPORTS OF LIME AND CEMENT.

TABLE 11.

PROVINCES.	Value.
Ontario	\$4,269
Quebec	83
Nova Scotia	142
New Brunswick	77,518
Manitoba	4
British Columbia	241
Prince Edward Island	4
Total	\$82,261

IMPORTS OF LIME AND CEMENT FOR THE YEAR 1887.

TABLE 12.

PROVINCE.	BbIs.	Value.
Ontario	4,379	\$3,487
Quebec	3,441	2,501
Nova Scotia	450	407
New Brunswick	46	44
Manitoba	904	791
British Columbia	700	860
Total	9,920	\$8,090

IMPORTS OF HYDRAULIC CEMENT.

TABLE 13.

PROVINCE.	1886.		1887.	
	Bbls.	Value.	Bbls.	Value.
Ontario.....	3,553	\$3,408	3,505	\$3,705
Quebec	1,414	2,119	46	163
Nova Scotia	9	15	31	70
New Brunswick.....	1,576	1,840	1,476	2,054
Prince Edward Island	25	31	.....	.....
British Columbia....	564	1,896	35	136
Total	7,141	\$9,309	5,093	\$6,128

IMPORTS OF CEMENT IN BULK OR IN BAGS.

TABLE 14.

PROVINCE.	1886.		1887.	
	Bushels.	Value.	Bushels.	Value.
Ontario	4,520	\$1,134	6,029	\$1,554
Quebec	918	470	.....	.....
Nova Scotia .....	.....	.....	18,666	4,456
Total	5,438	\$1,604	24,695	\$6,010

IMPORTS OF PORTLAND CEMENT.

TABLE 15.

PROVINCE.	1886.		1887.	
	Bbls.	Value.	Bbls.	Value.
Ontario	\$ 5,049	5,705	\$ 7,761
Quebec	131,238	98,760	139,409
Nova Scotia.....	5,900	6,911	11,124
New Brunswick....	2,999	2,846	4,307
Prince Edward Island	290	123	186
Manitoba	3	.....	.....
British Columbia....	3,358	2,515	6,682
Total.....	\$148,837	116,860	\$169,469

Sand and Gravel.—The exports and imports alone have been ascer- Sand and
tained through the Customs returns. Gravel.

EXPORTS OF SAND AND GRAVEL.

TABLE 15.

PROVINCE.	1886.		1887.	
	Tons.	Value.	Tons.	Value.
Ontario	124,662	\$23,902	180,699	\$29,470
Quebec .....	.....	.....	.....	22
Nova Scotia.....	200	200	161	815
New Brunswick....	3	124	.....	.....
Total.....	124,865	\$24,226	180,860	\$30,307

IMPORTS OF SAND AND GRAVEL.

TABLE 16.

PROVINCE.	1886.		1887.	
	Tons.	Value.	Tons.	Value.
Ontario	11,298	\$15,002	10,361	\$16,956
Quebec	5,794	6,191	6,586	7,931
Nova Scotia	1,307	4,015	1,264	4,271
New Brunswick	906	1,120	1,014	1,300
Manitoba	30	83	15	40
British Columbia	27	45	1	10
Total	19,362	\$26,456	19,241	\$30,508

Bricks and
Tiles.

Bricks and Tiles.—The same remarks as above for building stone and lime apply here also; 26 more returns were received this year for bricks and 13 for tiles, and the proportion of the returns to the total production is now believed to be about three-fourths.

Miscellaneous
clay products.

Fifteen returns were also received of \$182,150 worth of miscellaneous clay products manufactured in 1887, such as glazed sewer pipes, pottery, ornamental bricks, fire bricks, bath bricks, pressed artificial stone and carbonized drain tiles.

PRODUCTION OF BRICKS DURING 1887, AS RETURNED TO THIS OFFICE.

TABLE 17.

PROVINCE.	No. of Returns.	Thousands.	Value.
Ontario	222	149,821	\$778,757
Quebec	25	13,820	80,117
Nova Scotia	15	6,981	43,311
New Brunswick	11	6,476	43,454
Prince Edward Island ..	6	1,328	9,145
Manitoba	4	835	8,125
British Columbia	2	2,020	19,480
North-West Territories.	2	300	4,300
Total	287	181,581	\$986,689

PRODUCTION OF TILES DURING 1887, AS RETURNED TO THIS OFFICE.

TABLE 18.

PROVINCE.	No. of Returns.	Thousands.	Value.
Ontario	88	14,456	\$226,546
Nova Scotia	2	45	435
New Brunswick	5	157	3,087
Total	95	14,658	\$230,068

IMPORTS OF BUILDING BRICK.

Imports.

TABLE 19.

PROVINCE.	1886.		1887.	
	Thousands.	Value.	Thousands.	Value.
Ontario	213	\$1,269	173	\$1,861
Quebec	119	1,133	1,620	13,444
Nova Scotia	2	11	.....	82
New Brunswick,	13	59	21	64
Prince Edward Island..	3	57	.....	.....
Manitoba .....	.....	.....	1	18
British Columbia .....	.....	.....	165	33
Total	350	\$2,529	1,980	\$15,502

IMPORTS OF DRAIN TILE AND SEWER PIPE, GLAZED.

TABLE 20.

PROVINCE.	1886.	1887.
Ontario	\$45,706	\$71,424
Quebec	8,510	16,041
Nova Scotia .....	.....	554
New Brunswick.	979	914
Prince Edward Island..	16	.....
Manitoba	506	809
British Columbia	654	638
Total	\$56,371	\$90,380

IMPORTS OF FIRE-CLAY.

TABLE 21.

PROVINCE.	1886.		1887.	
	Cwts.	Value.	Cwts.	Value.
Ontario	20,750	\$5,033	23,822	\$7,285
Quebec	78,863	10,273	130,959	17,861
Nova Scotia	2,152	704	3,014	1,106
New Brunswick	780	84	3,675	312
Prince Edward Island..	90	27	86	36
Manitoba	240	120	240	120
British Columbia	750	330	1,474	724
Total	103,625	\$16,571	163,270	\$27,444

IMPORTS OF FIRE BRICKS, TILES, ETC.

TABLE 22.

PROVINCES.	1886.	1887.
Ontario	\$23,887	\$21,221
Quebec	25,903	31,240
Nova Scotia.....	4,216	687
New Brunswick.....	6,735	7,778
Prince Edward Island...	41	263
Manitoba	79	178
British Columbia	1,226	962
Total	\$62,087	\$62,329

IMPORTS OF CLAYS, ALL OTHER N. E. S.

TABLE 23.

PROVINCES.	1886.		1887.	
	Cwts.	Value.	Cwts.	Value.
Ontario	16,369	\$3,238	15,433	\$5,502
Quebec	12,787	1,553	1,245	473
New Brunswick.....	13,203	279	1,044	233
British Columbia.....	.....	.....	.....	3
Totals	42,359	\$5,070	17,722	\$6,211

IMPORTS OF EARTHENWARE.

TABLE 24.

ARTICLES.	Value.
Brown and colored Earthen and Stoneware and Rockingham ware...	\$ 29,563
Decorated, printed or sponged, and all Earthenware, N. E. S.....	171,836
Demijohns or jugs, churns and crocks	6,448
Totals	\$207,847.