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

DIVISION OF

MINERAL STATISTICS AND MINES

ANNUAL REPORT

FOR

1891

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OTTAWA
PRINTED BY S. E. DAWSON, PRINTER TO THE QUEEN'S MOST EXCELLENT MAJESTY
1893

NOTE

Except for the figures of imports, which refer to the fiscal year, beginning 1st July, the year used throughout this report is the calendar year, and the ton, that of 2,000 pounds, unless otherwise stated.

The figures given throughout the report referring to exports and imports are compiled from data obtained from the books of the Customs Department, and will occasionally show discrepancies, which, however, there are no means of correcting.

The exports and imports, under the heading of each province, do not necessarily represent the production and consumption of the province, *e. g.*, material produced in Ontario is often shipped from Montreal and entered there for export, so falling under the heading, Quebec.

The values of the metallic minerals produced, as per returns to this Department, are calculated on the basis of their metallic contents at the average market price of the metal for 1891. Spot values have been adopted for the figures of production of the non-metallic minerals.

N.E.S.= Not elsewhere specified.

To Dr. A. R. C. SELWYN, C.M.G., F.R.S., &c.,
Director and Deputy Head,
Geological Survey Department.

SIR,—I beg herewith to hand you the report of this Division on Mining and Mineral Production throughout the Dominion during 1891.

As in past years, it will be found to represent as complete a review of the mineral activities of the country and of their commercial results as it is possible to obtain with the means at command. These include the personal investigations of the officers of the Division, supplemented by the issue of circulars asking the production direct from the operators themselves, as well as information selected from official provincial reports and various other sources.

The labour of collecting, comparing and collating this very varied material so as to ensure accurate results and secure a complete and uniform presentment of them is very great, but it is hoped that the result will prove satisfactory.

As in the past, care is still taken to avoid injury to private interests in the manner of publishing results. The confidence of the mining community thus gained has resulted in an increasingly hearty response to our circulars, although, to complete our data, personal application is yet necessitated with a small number of people.

My own absence on sick leave and other exceptional causes explain the unusual delay in the presentation of this report, which it is hoped will not recur, whilst a yet more prompt response on the part of all applied to will help still further towards an earlier publication of the material.

Apart from the preparation of the annual report, the other functions of the Division have been performed as heretofore.

Numerous inquiries have been received and answered respecting the mining and mineral resources of the country, often involving considerable research to give the details asked for.

The preliminary summary of the mineral production in 1891, was issued the end of April, 1892, a revision of which will be found in the folder following p. 4 ss.

The reproduction herewith of the revised general summary statements for past years in tabular form speaks for itself.

During the summer season the field-work of the officers of the Division was as follows :—The writer was engaged in the study of a number of points in the phosphate districts of Ottawa county, Que., relating to the nature and mode of occurrence of the deposits of that mineral, begun in previous years. This investigation was incomplete when the new duties of my present office were undertaken. Mr. Brumell visited the various mining districts throughout New Brunswick and Ontario to collect information regarding the results of discovery and development work there. Mr. Jas. White continued the mining surveys in the phosphate, mica and iron district traversed by the Kingston and Pembroke Railway.

It is desired to gratefully acknowledge the aid received from various sources. Thanks are due to those who, although too numerous to specify here, have, by answering our circulars or letters, provided much valuable material for the compilation of this report. Thanks are also due for aid received from the field officers of the Survey in making inquiries for us. Special mention must be made of the services rendered by my colleague, Mr. H. P. Brumell, assistant to the division, for his very important and efficient aid in every branch of the work. He has further contributed a separate report on Natural Gas and Petroleum (vol. V., part Q.) which will be a valuable addition to our knowledge of these mineral resources in Canada.

Our acknowledgments are also due the Provincial Departments of Mines of Nova Scotia and British Columbia and to the Dominion Customs Department for aid received.

I have the honour to be, sir,

Your obedient servant,

ELFRIC DREW INGALL.

Division of Mineral Statistics and Mines,

4th May, 1893.

Mineral Products of Canada, Calendar Years 1886 to 1891.

PRODUCTS.	1886.		1887.		1888.		1889.		1890.		1891.		PRODUCT.
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
METALLIC.													
Copper, (c) lbs.	3,505,000	$ 354,000	3,260,424	$ 342,345	5,562,864	$ 667,543	6,809,752	$885,424	6,013,671	$902,050	8,928,921	$1,160,760	Copper.
Gold, (d) ozs.	76,879	1,330,442	66,270	1,178,637	61,310	1,098,610	72,328	1,295,159	64,046	1,149,776	51,303	930,614	Gold.
Iron Ore (a) tons.	69,708	126,982	76,330	146,197	78,587	152,068	84,181	151,640	76,511	155,380	68,979	142,005	Iron Ore.
Iron Ore, Chromic (a) "	60	945	38	570	.....	.....	.....	.....	.....	.....	.....	.....	Iron Ore, Chromic
Lead (e) lbs.	.....	.....	204,800	9,216	674,500	27,472	165,100	6,604	113,000	5,085	588,665	25.607	Lead.
Nickel (f) "	.....	.....	.....	.....	.....	.....	.....	.....	1,435,742	933,232	4,626,627	2,775,976	Nickel.
Platinum ozs.	.....	.....	1,400	5,600	1,500	6,000	1,000	3,500	.....	4,500	.....	10,000	Platinum.
Silver ozs.	.....	209,090	.....	349,330	.....	395,377	383,318	343,848	400,687	420,662	414,523	406,233	Silver.
Total value, Metallic	.....	$2,021,459	.....	$2,031,895	.....	$2,347,070	.....	$2,686,175	.....	$3,570,685	.....	$5,451,195	
NON-METALLIC.		(a)		(a)		(a)		(a)		(a)		(a)	
Antimony ore tons.	665	$31,490	584	$10,860	345	$3,696	55	$ 1,100	26	$ 625	10	$ 60	Antimony ore.
Arsenic "	120	5,460	30	1,200	30	1,200	.....	.....	25	1,500	20	1,000	Arsenic.
Asbestus "	3,458	206,251	4,619	226,976	4,404	255,007	6,113	426,554	9,860	1,260,240	9,279	999,878	Asbestus.
Coal "	2,091,976	5,017,225	2,368,891	4,758,590	2,658,134	5,259,832	2 719,478	5,584,182	3,117,661	6,496,110	3,623,076	8,144,247	Coal.
Coke, (g) "	35,396	101,940	40,428	135,951	45,373	134,181	54,539	155,043	56,450	166,298	57,084	175,592	Coke.
Felspar "	.....	.....	.....	.....	.....	.....	.....	.....	700	3,500	685	3,425	Felspar.
Fire Clay "	.....	(b)	.....	(b)	.....	(b)	400	4,800	.....	(b)	250	750	Fire Clay.
Graphite "	500	4,000	300	2,400	150	1,200	242	3,160	175	5,200	260	1,560	Graphite.
Grindstones "	4,020	46,545	5,292	64,008	5,764	51,129	3.404	30,363	4,884	42,340	4,479	42,587	Grindstones.
Gypsum "	166,000	202,742	154,008	157,277	175,887	179,393	213,273	205,108	226,509	194,033	203,605	206,251	Gypsum.
Limestone (flux) "	.....	(b)	17,171	17,500	16,857	16,533	22,122	21,909	18,478	18,361	11,376	11,547	Limestone (flux).
Manganese ore "	1,789	41,499	1,245	43,658	1,801	47,944	1,455	32,737	1,328	32,550	255	6,694	Manganese ore.
Mica lbs.	20,361	29,008	22,083	29,816	29,025	30,207	36,529	28,718	770,959	68,074	.....	71,510	Mica.
Mineral Pigments.													
Baryta Tons.	3,864	19,270	400	2,400	397	7,900	.....	.....	1,842	7,543	.....	.....	Baryta.
Ochres "	350	2,350	485	3,733	1,100	3,850	794	15,280	275	5,125	900	17,750	Ochres.
Mineral Water galls.	.....	(b)	.....	(b)	124,850	11,456	424,600	37,360	561,165	66,031	427,485	54,268	Mineral Water.
Molybdenite lbs.	150	156	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Molybdenite.
Moulding sand tons.	.....	(b)	160	800	169	845	170	.....	320	1,410	230	1,000	Moulding sand.
Petroleum (h) bbls.	486,441	437,797	763,933	595,868	733,564	755,571	639,991	.....	765,029	902,734	755,298	1,004,546	Petroleum.
Phosphate tons.	20,495	304,338	23,690	319,815	22,485	242,28	30,988	316,662	31,753	361,045	23,588	241,603	Phosphate.
Precious stones	.....	.....	.....	.....	.....	.....	.....	.....	.....	700	.....	1,000	Precious Stones.
Pyrites tons.	42,906	193,077	38,043	171,194	63,479	285,6	72,225	307,292	49,227	123,068	67,731	203,193	Pyrites.
Quartz "	.....	.....	.....	.....	.....	.....	.....	.....	200	1,000	.....	.....	Quartz.
Salt "	62,359	227,195	60,173	166,394	59,070	185,460	32,832	129,547	43,754	198,897	45,021	161,179	Salt.
Soapstone "	50	400	100	800	140	280	195	1,170	917	1,239	.....	.....	Soapstone.
Structural Materials.													
Bricks m.	139,345	873,600	181,581	986,689	165,818	1,036,746	200,561	1,273,884	211,727	1,266,982	176,533	1,061,536	Bricks.
Building stone c. yds.	165,777	642,509	262,592	552,267	411,570	641,712	341,337	913,691	382,563	964,783	187,685	708,736	Building stone.
Cement bbls.	.....	(b)	69,843	81,909	50,668	35,593	90,474	69,790	102,216	92,405	93,473	108,561	Cement.
Flagstones sq. ft.	70,000	7,875	116,000	11,600	64,800	6,580	14,000	1,400	17,865	1,643	27,300	2,721	Flagstones.
Granite tons.	6,062	63,309	21,217	142,506	21,352	147,305	10,197	79,624	13,307	65,985	13,637	70,056	Granite.
Lime bush.	1,535,950	283,755	2,269,087	394,859	2,216,764	339,951	2,948,249	362,848	2,501,079	412,308	1,829,894	251,215	Lime.
Marble tons.	501	9,900	242	6,224	191	3,100	83	980	780	10,776	240	1,752	Marble.
Miscellaneous clay products (i)	.....	112,910	.....	182,150	.....	.....	.....	239,385	.....	.....	.....	.....	Misc. clay products.
Pottery	.....	(j)	.....	(j)	.....	27,750	.....	(j)	.....	195,242	.....	258,844	Pottery.
Roofing cement tons.	.....	(b)	.....	(b)	.....	(b)	.....	(b)	1,171	6,502	1,020	4,810	Roofing Cement.
Sands and Gravels (k) "	124,865	24,226	180,860	30,307	260,929	38,398	283,044	52,647	342,158	65,518	243,724	59,501	Sands and Gravels.
Sewer pipe	.....	(j)	.....	(j)	.....	266,320	.....	(j)	.....	348,000	.....	227,300	Sewer Pipe.
Slate tons.	5,345	64,675	7,357	89,000	5,314	90,689	6,935	119,160	6,368	100,250	.....	(l)	Slate.
Terra cotta	.....	(j)	.....	(j)	.....	49,800	.....	(j)	.....	90,000	.....	113,103	Terra Cotta.
Tiles m.	12,416	142,617	14,658	230,068	7,518	114,057	10,526	134,265	10,521	140,877	11,839	141,399	Tiles.
Whiting bbls.	400	600	400	600	30	240	.....	.....	500	500	.....	.....	Whiting.
Total value, non-metallic	.....	$9,096,719	.....	$9,417,419	.....	$10,271,866	.....	$11,162,110	.....	$13,719,394	.....	$14,359,174	
" metallic	.....	2,021,459	.....	2,031,895	.....	2,347,070	.....	2,686,175	.....	3,570,685	.....	5,451,195	
Estimated value of products unspecified or not reported (m)	.....	881,822	.....	800,686	.....	881,064	.....	651,715	.....	709,921	.....	689,631	
Grand Total	.....	$12,000,000	.....	$12,250,000	.....	$13,500,000	.....	$14,500,000	.....	$18,000,000	.....	$20,500,000	

(a)—Value at mine, quarry or works.
(b)—Not reported.
(c)—Copper contents of ore, matte, etc., at the average market price for the year.
(d)—Nova Scotia gold at $19.50 per oz., British Columbia at $17.00.
(e)—Lead contents of ore, matte, etc., at average market price for year.
(f)—Nickel " " " "
(g)—Oven coke, the production of Nova Scotia.
(h)—Calculated from official inspection return and computed at average yearly price per barrel of 35 imp. gallons.
(i)—Includes (for the years given) terra-cotta, pottery, sewer-pipe and earthenware.
(j)—Included in miscellaneous clay products.
(k)—Exports only.
(l)—Confidential returns, cannot be quoted.
(m)—Mostly structural materials.

NOTE.—The above figures represent the summary statements incorporated in the annually issued reports of the Division, those for back years being revised to make the method of statement conform with that adopted for recent years.

EXPORTS. Exports.

MINERALS AND MINERAL PRODUCTS MINED OR MANUFACTURED IN CANADA DURING 1891.

Product.	Value.	Product.	Value.
Asbestus, first class	$ 338,072	Oil, refined	$ 104
" second class	209,833	Ore, antimony	60
" third class	13,636	" iron	11,573
Bricks	1,163	" lead	5,000
Cement	2,881	" manganese	6,694
Clay, manufactures of	158	" silver	225,312
Coal	3,393,773	Phosphate	384,661
Copper	348,109	Plumbago, crude	72
Gold	344,692	" manufactured	163
Grindstones	28,433	Salt	1,277
Gypsum, crude	181,795	Sand and gravel	59,501
" ground	588	Slate	195
Iron and steel, about	300,000	Stone, unwrought	46,162
Lime	119,853	" wrought	13,398
Mica, crude and cut	35,252	Other articles	12,194
" ground	2,338		
Nickel	667,280	Total	$6,772,693
Oil, crude	18,471		

EXPORTS

OF PRODUCTS OF THE MINE, WITH DESTINATIONS, DURING FISCAL YEAR 1891.

Exported to.	Value.	Exported to.	Value.
United States	$4,600.800	Spanish West Indies	$ 11,454
Great Britain	851,794	Hong Kong	9,640
Newfoundland	141,692	Australia	8,418
Sandwich Islands	49,064	British Guiana	5,114
France	31,217	Japan	4,664
Germany	22,774	China	150
Mexico	16,188		
British West Indies	16,023	Total	$5,784,143
St. Pierre	15,151		

Imports.

IMPORTS.

MINERALS AND MINERAL PRODUCTS FOR FISCAL YEAR 1891.

Product.	Value.	Product.	Value.
Alum and aluminous cake..	$ 22,411	Iron and steel	$ 10,354,073
Antimony	17,483	Lead and manufactures of.	315,146
Arsenic	4,027	Lime	4,273
Asbestus and mfrs. of	13,298	Litharge	27,613
Ashes, pot, pearl and soda.	2,757	Lithographic stone	5,724
Asphaltum	50,728	Manganese, oxide of	3,743
Borax	22,602	Marble	107,661
Brass and manufactures of.	603,078	Mercury	20,223
Bricks	9,744	Mineral water	41,797
" bath	2,299	Nickel	62
" and tiles, fire	116,390	Ochres	20,550
Buhrstones	2,089	Paraffine wax	52,391
Building stone	170,890	Petroleum and mfrs. of	513,966
Cement	9,061	Plaster of Paris	8,412
" Portland	304,648	Platinum	4,055
Chalk	8,193	Potash salts	10,185
Clay, china	24,429	Precious stones	77,988
" fire	24,878	Salt	380,550
" all other, N.E.S.	6,827	Sand and gravel	23,620
Coal, anthracite	5,224,452	Silex	1,929
" bituminous	4,060,896	Slate	46,104
" dust, &c	36,130	Soda salts	402,332
" tar and pitch	35,721	Stone and granite, N.E.S.	61,051
Coke	179,539	Spelter	31,459
Copper and mfrs. of	573,974	Sulphate of copper	43,614
Copperas	6,310	Sulphur	46,351
Earthenware	634,907	Sulphuric acid	2,466
Emery and pumice	19,875	Tiles, sewer pipes, &c	87,195
Fertilizers	45,375	Tin and manufactures of	1,206,918
Flagstones	36,348	Whiting	27,504
Fuller's earth	4,511	Yellow metal	125,605
Glass and glassware	1,247,692	Zinc and manufactures of	112,201
Graphite and mfrs. of	41,710		
Grindstones	16,991	Total	27,747,879
Gypsum	855		

ABRASIVE MATERIALS.

ABRASIVE MATERIALS.

There is nothing new to add to what was said in last year's report on this subject. The only production coming under this head of which any figures are available is that mentioned as under, relating to grindstones.

Grindstones.

Grindstones.—The total production of this commodity for the year was as follows:—

New Brunswick	2,499 tons,	valued at	$22,787
Nova Scotia	1,980	"	19,800
	4,479		$42,587

From New Brunswick returns are received direct from the producers, whilst the only figures furnished by the Provincial Department of Mines for Nova Scotia are those of exports.

As shown by the following figures the extent of this industry has remained practically constant for several years past:—

1886—4,000 tons,	valued at	$46,545
1887—5,292	"	64,008
1888—5,764	"	51,129
1889—3,404	"	30,863
1890—4,884	"	42,340
1891—4,479	"	42,587

As in former years, a number of operators with quarries situated in New Brunswick and Nova Scotia have contributed to the total production, those of the former province being chiefly situated in Westmoreland, Northumberland and Gloucester counties, and in the latter in Pictou and Cumberland counties.

Referring to his visit to the quarries at Rockport, N.B., during the course of his summer's field work Mr. Brumell furnishes the following notes:—

"Along the shores of Cumberland Basin at many places between Cape Maringouin and Wood Point large quantities of grindstones are made. The stone, which is gray in colour and very free from 'mud spots' or 'bulls,' is obtained under tide-water and floated into the shallower parts where it is 'scabbled' and shipped principally to Boston and points in the New England States. Only large stones are shipped, the average weight being about two tons."

Tripoli.

Tripoli.—Although deposits of infusorial earth of greater or less extent are plentiful in the bottoms of many lakes in Nova Scotia and New Brunswick there are no available records of production. It is known, however, that if any has been produced during the year the amount must be insignificant.

Pumice, Emery, Buhrstone.

Pumice, Emery, Buhrstone.—None of these materials have been mined in Canada during the year.

The subjoined tables of exports and imports of abrasive materials explain themselves.

ABRASIVE MATERIALS.

Exports and Imports.

ABRASIVE MATERIALS.

TABLE 1.

EXPORTS OF GRINDSTONES.

Year.	Value.
1884	$28,186
1885	22,606
1886	24,185
1887	28,769
1888	28,176
1889	29,982
1890	18,564
1891	28,433

ABRASIVE MATERIALS.

TABLE 2.

EXPORTS OF GRINDSTONES.

Provinces.	1889.	1890.	1891.
Ontario			
Quebec	$ 1,387	$ 12	
Nova Scotia	7,150	8,536	$12,387
New Brunswick	21,437	10,016	16,046
Manitoba	8		
Totals	$29,982	$18,564	28,433

ABRASIVE MATERIALS.

TABLE 3.

IMPORTS OF GRINDSTONES.

Fiscal Year.	Tons.	Value.
1880	1,044	$11,714
1881	1,359	16,895
1882	2,098	30,654
1883	2,108	31,456
1884	2,074	30,471
1885	1,148	16,065
1886	964	12,803
1887	1,309	14,815
1888	1,721	18,263
1889	2,116	25,564
1890	1,567	20,569
1891	1,381	16,991

ABRASIVE MATERIALS.

ABRASIVE MATERIALS.

TABLE 4.

IMPORTS OF "SILEX."*

Imports.

Fiscal Year.	Cwts.	Value.
1880	5,252	$2,290
1881	3,251	1,659
1882	3,283	1,678
1883	3,543	2,058
1884	3,259	1,709
1885	3,527	1,443
1886	2,520	1,313
1887	14,533	5,073
1888	4,808	2,385
1889	5,130	1,211
1890	1,768	2,617
1891	3,674	1,929

* The material thus classified by the Customs Department as "Silex" probably represents tripoli or manufactures of the same.

ABRASIVE MATERIALS.

TABLE 5.

IMPORTS OF PUMICE STONE AND EMERY.

Fiscal Year.	Value.
1880	$ 7,854
1881	11,179
1882	15,762
1883	17,823
1884	16,518
1885	14,450
1886	14,458
1887	15,617
1888	18,564
1889	16,888
1890	19,925
1891	19,875

ABRASIVE MATERIALS.

Imports.

ABRASIVE MATERIALS.

TABLE 6.

IMPORTS OF BUHRSTONES.

Fiscal Year.	Value.
1880	$12,049
1881	6,637
1882	15,143
1883	13,242
1884	5,365
1885	4,517
1886	4,062
1887	3,545
1888	4,753
1889	5,465
1890	2,506
1891	2,089

ANTIMONY.

ANTIMONY.

Production.

Small as has been the production of the ores of this metal in Canada of late years, the amount reported for this year is still less, viz., 10 tons, valued at $60.

The production since 1887 is as follows:—

1887	584	tons, valued at	$10,860
1888	345	"	3,696
1889	55	"	1,100
1890	26½	"	625
1891	10	"	60

This is all the production of the province of Nova Scotia, the Department of Mines of which province furnishes the above data, but gives no further information, neither was it found possible for a visit to be made to the vicinity by any of our own officers.

The following table, No. 1, gives the exports of antimony ore:—

Exports.

ANTIMONY.

TABLE 1.

EXPORTS.

Year.	Tons.	Value.	Year.	Tons.	Value.
1880	40	$ 1,948	1886	665	$ 31,490
1881	34	3,308	1887	229	9,720
1882	323	11,673	1888	352½	6,894
1883	165	4,200	1989	30	695
1884	483	17,875	1890	38	1,000
1885	758	36,250	1891	3½	60

The figures of imports as given in Table No. 2 will represent Canada's consumption of the metal, as no ores are imported. ANTIMONY.

ANTIMONY.

TABLE 2.

IMPORTS. Imports.

Fiscal Year.	Pounds.	Value.
1880	42,247	$ 5,903
1881		7,060
1882	183,597	15,044
1883	105,346	10,355
1884	445,600	15,564
1885	82,012	8,182
1886	89,787	6,951
1887	87,827	7,122
1888	120,125	12,242
1889	119,034	11,206
1890	117,066	17,439
1891	114,084	17,483

ARSENIC. ARSENIC.

In regard to this mineral product there is nothing different to report. The already small record of past years was slightly lowered again in 1891, to which year we can only credit 20 tons, valued at $1,000. These amounts as compared with former years are as follows:— Production.

1885	*440	tons, valued at	$17,600	spot.
1886	120	" "	5,460	do
1887	30	" "	1,200	do
1888	30	" "	1,200	do
1889	Nil	" "	Nil	do
1890	25	" "	1,500	do
1891	20	" "	1,000	do

As in previous years, the arsenious oxide above mentioned is manufactured by resubliming the crude arsenious oxide found in the condensation chambers of the mines which were working in 1885 on the arsenical gold ores of Deloro in the Madoc region of Ontario. Small quantities of this crude material, resulting from the roasting of these ores, have been refined from year to year to meet a limited demand. This work employed three men for two months.

* Imports into United States from the Deloro mine, according to Report on the Mineral Resources of the United States, 1885.

ARSENIC.

ARSENIC.

TABLE 1.

Imports.

IMPORTS.

Fiscal Year.	Pounds.	Value.
1880	18,197	$ 576
1881	31,417	1,070
1882	138,920	3,962
1883	51,953	1,812
1884	19,337	773
1885	49,080	1,566
1886	30,181	961
1887	32,436	1,116
1888	27,510	1,016
1889	69,269	2,434
1890	138,509	4,474
1891	115,248	4,027

ASBESTUS.

ASBESTUS.*

Production.

During 1891 the production of asbestus fell off considerably as compared with the output of the year previous, that for 1891 being only 9,279 tons, valued at $999,878, against 9,860 tons, valued at $1,260,240, which was the quantity extracted in 1890. For past years reference must be made to the accompanying graphic table, wherein may be traced the growth of the industry from 1880, when but 380 tons were produced.

Of the total amount shipped from the mines the greater part was exported, largely to the United States, small quantities only going to the various European markets.

By the kind permission of the author, we have incorporated the following exhaustive paper, read on the 14th June, 1892, before the General Mining Association of Quebec by Mr. L. A. Klein, manager of the American Asbestus Co. at Black Lake, Que. :—

Present condition, etc., of the industry.

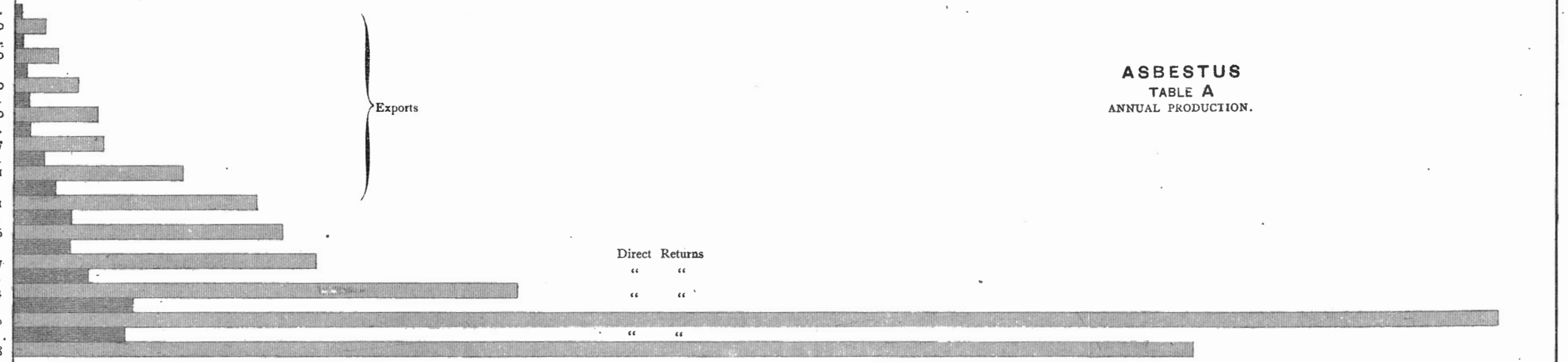
THE CANADIAN ASBESTUS INDUSTRY.

By L. A. Klein, M.E., Black Lake, Que.

"The asbestus industry of Canada has assumed a rank which makes it well worth while to study how to further develop the same, and many have turned their eyes towards our province and its serpentine regions: Governments, capitalists, mining men, speculators, prospec-

*See Foot note p. 14 ss.

Year.	Tons.	Value.
1880	380	$24,700
1881	540	35,100
1882	810	52,650
1883	955	68,750
1884	1,141	75,097
1885	2,440	142,441
1886	3,458	206,251
1887	4,619	226,976
1888	4,404	255,007
1889	6,113	426,554
1890	9,860	1,260,240
1891	9,279	999,878



ASBESTUS

TABLE A

ANNUAL PRODUCTION.

tors, and so on—all have contributed in their own way to this purpose. ASBESTUS.

"Many things have been said and written on asbestus, asbestus formation, asbestus industry, asbestus uses and markets, and it is certainly not the lack of talk on the subject which has induced me to take it up for this paper. I have been led to do so in consideration of the facts that by former writers on the subject a good many practical points have not been touched—points which must be of special interest to those who are about to interest themselves in the industry, be it with money, be it with actual work—but also in consideration of the fact that amongst those not intimately connected with the industry, opinions of an altogether erroneous nature as to the value and character of the industry are spread about, which may occasionally lead to a very inconvenient disappointment. There are even a good many things amongst us mining men out here on which the difference of opinion has not as yet reached a settlement, as it is naturally with an industry in such a young state as ours. Present condition, etc., of the industry.

"I have tried to get the co-operation of all my fellow miners in the industry to make my statements as complete as possible, and I tender my heartiest thanks to those who have complied with my request. I must, however, add that the opinions expressed in this paper are individual, and under no other authority than that of my own observations and my own judgment.

"I had still another object in delivering this paper, and that is to show the asbestus industry in Canada from a national and economic point of view, or, in other words, to look at it as a whole, and a resource for our province and the Dominion of Canada respectively.

"You have to-day looked over the asbestus mines in Thetford and Black Lake, and, while the time was very limited and no chance whatever could be given to follow up a special line of the business in which we are engaged, you have, however, had an opportunity to see in general the mode of occurrence and production of asbestus. While you have done so you have seen the area which, I may safely say, produces about 85 per cent of all the asbestus used in the world.

"Serpentine covers quite a large area in Canada, and especially in the eastern townships of Quebec. It is not my object to-day to describe its extent, which has been done in an exhaustive way as well by members of the Geological Survey as by the authorities of our Provincial Government, but I will confine myself to those districts which have as yet received prominency and which practically supply the demand of the world. These are in the districts of Thetford and Black Lake, with some more or less encouraging developments to the Mode of occurrence.

ASBESTUS. Mode of occurrence.

north and south; the district of Danville, with, so far, one prominent mine in the production of asbestus; and the Templeton district, in which, however, the industry has not yet assumed more than an exploratory character.

"If you compare these very limited areas, representing the region of the big serpentine belt which produces asbestus in a quantity and quality which will, economically worked, yield a profit to the investor, with the comparatively enormous extent of serpentine rock, you will readily come to the conclusion that it takes more than the finding of the serpentine to have a paying asbestus mine, and that is one point I would like to pick out and submit to your consideration.

"While the undoubted success of some of the existing mines, in combination with erroneous ideas on the formation, occurrence and of production and so on, nursed by speculators, lead many to believe that they struck a fortune when a locality was shown to them which contained serpentine of a very good or just the right colour, with occasionally a small asbestus seam in it; and while many have been induced to spend a considerable amount of money under these false impressions, I may state that not one enterprise has proved successful in this industry which has not had anything else to look on than serpentine of a good colour. All those successful mines had as surface indications asbestus in good and large veins of real commercial value, and I do not hesitate to say in some cases larger veins than they can get to-day. We may be able to declare a locality worthless as an asbestus mine, judging from colour and sections of serpentine, but I am certain that neither I, nor any of my confrères who have devoted some of their time to the study of the subject, would commit ourselves in recommending a locality as an asbestus mine from the good look of the serpentine, without having seen besides really valuable and marketable asbestus veins in sufficient quantity, and this notwithstanding the expression of one of our scientific authorities that the rock likely to prove asbestus-producing can be determined by certain peculiarities of texture, colour or weathering.

Characteristics.

"I will not take up your time with a detailed description of the mineral, but merely make a very few general remarks.

"Asbestus is a fibrous variety of serpentine,* and is, chemically speaking, a hydrous silicate of magnesia. From several analyses of a number of specimens all over the world, which I had at my disposal, the percentage of silica is from a little over 40 to 40½ per cent, while

* Whilst the term "asbestus" now includes commercially the fibrous variety of serpentine, chrysotile, which is the mineral mined in Quebec if applied primarily and still applies mineralogically only to the fibrous varieties of hornblende.

magnesia is from 41½ to 43 per cent; other more prominent admixtures were ferrous-oxide and alumina in quantities of from one to three per cent, and further, traces of lime, potash, soda, chlorine and sulphuric acid. This composition is completed by water, to which we have to attach the most importance from a business point of view. This, of course is not water in the form of a moisture, but water intimately" (chemically) "associated with the silicate of magnesia. The importance of this water has been shown by the fact that good and fine asbestus fibre, may it be from the Italian variety, or from the Cambrian rocks of the EasternTownships, or the Laurentians from the north of the St. Lawrence, contains from 13½ to 14 per cent of this water, while some very harsh and brittle specimens of asbestus have shown considerably below 12 per cent. Experiments have further shown that it is comparatively easy to dissociate a part of this water from a fine and silky specimen of asbestus fibre and to render the same hard and brittle by heating it to a certain extent. This peculiarity leaves us to conclude why we find such considerable differences in the qualities of asbestus in comparatively close proximity, as, for instance, the larger percentage of "thirds" in Black Lake than in Thetford; and then even at the best mines, qualities of no, or very little, commercial value. The asbestus in these localities has been rendered harder by the influence of heat through the intrusion of heated matter, following the original formation of it, and this heated matter has been the masses of granulite which we find throughout our serpentine region, with the exception of a small knoll of serpentine in Thetford, where granulite appears only in very small dykes. And here is another point where I differ from some of our fraternity who hold that the presence of these masses of granulite are a good indication of asbestus—a theory which I think can scarcely be maintained, at least, however, as to asbestus of commercial value, in the close neighbourhood of these masses of granulite. ASBESTUS. Characteristics.

"Thirteen incorporated companies with an authorized capital of about three and one-half million dollars, of which a part, however, is employed in the manufacturing business in England, with a number of very prominent private concerns, occupy themselves to-day with the production of asbestus and asbestus mining, and I believe that my estimate that about two and one-quarter millions of dollars are invested in the industry in Canada comes very close to the reality. Companies working.

"While until about four or five years ago, with one single exception, hand work, occasionally connected with horse power hoisting, was exclusively used in asbestus mining, the leading mines are now equipped with more or less extensive plants of machinery to carry on the work. Mining.

ASBESTUS. Mining.

"This work consists,

"Firstly—Of the proper mining operations, such as the drilling, blasting, removing of the broken rock out of the pits to the dumps, hand in hand with the gathering up of the asbestus veins and transport of same to the dressing establishments or cobbing sheds.

"Secondly—The dressing or cobbing, that is, the separating of the asbestus fibre from the adhering rock and the grading of the former in different qualities, followed by packing, transport to railroad, loading, shipping and marketing. It may not be unwise to review these different operations shortly, as the circumstances under which asbestus is produced are entirely different from nearly any other mineral or ore, and we find nearly every item which we were used to consider as a thoroughly established rule greatly changed by these circumstances.

"This is readier understood when we consider the large amount of rock which has to be handled in comparison to the ore, the peculiar nature of this rock, the character of the ore, which is a fine silky fibre, and must be carefully protected from injury, and so on.

"As to the drilling, hand drilling is still in exercise in all the newly opened mines for prospecting work, and even in one or the other of these mines which have already reached considerable prominency. It is further nearly exclusively used for block-holing—only very recently one of the mines has introduced a small size machine drill for the purpose. It is done by three men with 1 inch octagon steel, and 6 to 7 pound hammers. The average capacity is about 15 to 16 feet a day of 10 hours, and the cost about 20 cents per foot. The depth of holes is thus seldom exceeding 4 feet. Some of the mines have not long ago adopted a plan of block-holing with one man only, using a three-quarter inch steel, and 3 to 4 pounds short-handled hammer. The capacity is thus about 8 feet for 10 hours' work and the cost only about 14 cents.

"Most of the mines do their drilling, however, with steam or compressed air, 45 feet per day of 10 hours in the former case, and from 50 to 55 feet in the latter being considered a fair day's work. The expense per foot may be set, considering the present prices for fuel, at from 7 to 8 cents per foot, not including wear and tear on machinery and interest for capital involved in the buying of the necessary machinery. There are in all 7 compressors with a total of 44 drills capacity in use, four of them being built by the Rand Drill Company, two by the Ingersoll Rock Drill Company, and one by the Norwalk people. At present also, 44 steam" (machine) "drills are employed in the industry, of which, however, 11 are run by steam. About one-half of all drills in use are Rand's Little Giant No. 3, 3 Rand sluggers, 5 Ingersoll 3-inch, and 12 Sergeant's—a couple or so being

of other manufacture. The steel in use is $1\frac{1}{4}$ octagon and costs in the neighbourhood of 10 cents a pound. As a rule the drills are worked under 80 pounds pressure to square inch. We may consider an expense of $3\frac{1}{2}$ cents to the ton of broken rock as the average cost at present. ASBESTUS. Mining.

"The blasting is now generally done with dualin, which contains 35 per cent of nitro-glycerine, of which the cost is at present 20 cents per pound, but which prices will be very likely further reduced through the competition of a newly erected powder factory in the district. With all of the larger mines the blasting is done by electricity; still there are some which hold to the system of one hole blasts, claiming that by this system less of the asbestus veins are smashed to small particles and scattered all over the place, therefore involving more expense to pick them up. The expense for explosives is about 3 cents to the ton of rock broken.

"The next operation is the removing of the broken rock from the pits to the dumps with which the picking up of all the asbestus veins goes hand in hand. If the bottom of the pits are on the same level with the top of the dumps, the operation is simply to load the refuse rock on trucks, stone-boards, wheelbarrows, etc., and bring it by one or the other of these means to the dumps; where this is not the case, as in most of the more extensively worked mines, where pits vary in depth from about 30 to 150 feet, the rock has to be hoisted up by means of derricks. At the disposal of this industry there are at this time about 75 derricks, of which, in two cases hand, and in twelve or thirteen cases horse-power is applied as motor, the rest being steam derricks. Hand and horse derricks have of course only a right to exist where there is a comparatively small amount of rock to be handled and where the works are of a more or less exploring character only, and the first expenses of putting in steam plant seems unadvisable. The steam derricks are to be distinguished in two classes, boom and cable derricks; from the latter class only two being so far in use. Boom derricks consist of a mast held by means of guys in a vertical position and turnable on its own axle, while to the foot of the mast a boom or arm is attached and suspended in a more or less horizontal position by means of ropes stretching from end of mast to end of boom. The length of the latter is generally from 40 to 50 feet, and it is clear that the working space of such a boom is limited by its length and can, economically, hardly be extended to more than say 50 feet.

"The cable derricks have a mast somewhat similar to the former, but instead of a boom, a cable with a traveller on it, which cable is stretched from top of mast to some point across the pit, allowing by

ASBESTUS. Mining.

means of the traveller, to hoist from any point of the cable. As this may be stretched to a length of 400 and more feet the enormous advantage over boom derricks seems clear, and I have no doubt that its general introduction is only a question of time. The ropes used for hoisting are $\frac{5}{8}$ to $\frac{3}{4}$ in. crucible cast steel, the guy ropes generally $\frac{7}{8}$ of an inch; the cables $1\frac{1}{2}$ or 2 in. steel ropes.

"There are 18 double and 24 single drum hoistings and winding engines employed in the industry, or a total of 60 drums. The so hoisted refuse rock is placed on lorries and wheeled out on the dumps either by hand, or, where the dumps are somewhat long, by horses, and there discharged. In some of the mines, to a great advantage, self-dumping cars of a very simple construction are being used. While now nearly all the larger mines use iron or steel rails, and lately, specially of the lighter sort (19 lbs. Canadian make, at a price of $40 per ton delivered) there are still some wooden rails with band iron top in use, which practice, however, with the growth of the industry, will have to be soon abandoned.

"The transport of the crude asbestus to the dressing or cobbing sheds is in most cases done by the simple means of a cart and a horse, or where sheds of a more or less provisional character are placed right on the edge of the pits, carried in by hand. Where the cobbing is more concentrated in a special and permanent establishment we find rail connection for the purpose. Two of the mines, however, have a more or less systematic handling of the stuff in this state—consisting of iron self-dumping skips, which are loaded directly from the pits, hence they proceed down an inclined railroad and discharge their loads directly in the cobbing establishment. The skips are brought back by means of winding engines. The cost of the above-described operations, viz., removing of refuse rock, hoisting, picking of asbestus and its transport to sheds, are of course somewhat influenced by the size of the veins in the respective bed rock, the heights and accessibility of the pit's face, lengths of dumps, and so on, but may with fair certainty be set at 22 cents per ton of rock handled in summer time, which figures unfortunately increase in winter time, in some cases to 35 cents, and may be accepted with 25 cents for all year round work.

Dressing.

"The second part of the operation at the asbestus mine is the dressing, or commonly called cobbing, which comprises the freeing of the asbestus veins from rock as much as possible (the crude asbestus in the market still contains from 15 to 40 per cent of rock, some manufacturers even claim more than that while they are negotiating new contracts), and the grading in two, three or four different grades. This operation is as a rule done by hand by little boys, with the aid of

a hammer weighing about 1½ lbs. Some of the mines, however, have partially or entirely adopted the aid of machinery, and this more particularly for the transformation of the so-called cobbing stones—*i.e.*, larger pieces of rock with a more or less valuable asbestus vein in it, a vein, however, which did not give away from the blast, and which requires the breaking away of the adhering rock by means of powerful blows (sledge hammers), or compression (crushers). The first to try and solve the problem was the Scottish Canadian Asbestus Co. Unfortunately the development of the process sustained a sudden interruption by the closing of the mines in the autumn of 1888. Their plant consists of a 50 horse-power engine, Blake rock breaker, travelling picking tables, set of Cornish rolls, revolving screens, elevators, shakers, two large blowers, and so forth. Next the American Asbestus Co. started in to experiment in the winter of 1890–91. The main object then was to do away with the somewhat indistinguishable grade of No. 2, an object, however, which was difficult to reach, unless the fibre could have been thoroughly loosened and freed from stone. Their plant consisted in the main of a Blake crusher, to which the crude asbestus is conveyed by an inclined railway, and automatically dumped in front of the crusher. The jaws of the crusher are set at 1½ inches, the crushed stuff drops on an inclined sieve in shaking motion, which separates all the loose fibre and the dust from the larger pieces of rock and asbestus veins, the former going directly to the cleaning or grading machines, the latter dropping on a revolving picking table, where the barren rock is removed by hand to one side of the table, the asbestus veins being left on the other. At the end of the table is a receiving chute which is divided into two compartments, and into which rock and asbestus are discharged respectively. The rock drops from the chute directly into a lorry and is wheeled to the dumps, while the asbestus is conveyed either to the dry kilns, as necessary in winter time or rainy weather, or to the fine crushers for further manipulation. These latter are of unique construction, of which the object is to allow particles of a certain size and loosened fibre to go through, without being further crushed, as thereby the asbestus fibre is likely to be injured. This so reduced stuff is brought to the cleaning and grading machines, consisting mainly of a set of inclined sieves in rapid shaking motion in connection with blowers, fans, etc.—remaining unbroken stone and unloosened fibre going back to a set of still finer crushers to undergo the process again. The plant at King Bros.' mines in Thetford, which was principally erected for the extraction of asbestus out of large pieces of rocks on the old dumps works—which some years ago did not warrant the expenses for block-holing

ASBESTUS. Dressing.

ASBESTUS. Dressing.

and further handling—consists of a Blake crusher, from which the stuff is conveyed on a set of Cornish rolls with the intention of having all stone reduced to powder—from there to a revolving screen of which the object was to screen out all the dust and leave the clean fibre. This object, however, has not been fully realized, owing to the failure of the rolls to break up the rocks entirely, and an additional blowing and screening plant has been put in, which produces now a very clean product of one grade. The Anglo-Canadian also runs a crusher and a set of sieves, and the Johnson's Co. has recently put in a couple of crushers to overwork the old dumps. None of the processes at their present state, however, may as yet be considered complete, the main difficulties being two :—

"1. That, if asbestus is crushed with a considerable amount of stone together until the latter is reduced to powder—the long and most valuable asbestus fibre is partially destroyed.

"2. If the stone is not entirely reduced before grading it is nearly impossible to free the fibre from the stone, and a large amount of waste is the result.

"Besides, development of this part of the industry has to stand other very trying circumstances, as the objections of a good many of the manufacturers to buy prepared fibre; the trouble with the customs, which is rather inclined to classify the so prepared asbestus as manufactured, and to levy a duty of 25 per cent value on same, and the considerable amount of low grade waste which is found very hard to dispose of.

"The cost of cobbing varies, of course, considerably, according to the quality of material. While some stuff will break from the stone very easy, other requires considerable labour; then larger veins will sooner be gathered than small ones, and while some stuff occasionally may be contracted at $3 per ton (this, however, never includes the manipulation of cobbing stones), others may cost as high as $15 or $18 and more dollars per ton. I believe that, including the breaking of the cobbing stones, $7 is the average cost of cobbing of asbestus for a ton at the leading mines of this section.

"The stuff, after being graded, which is, however, in the entire discretion of every particular mine, (prices of some No. 2 and No. 3 last year differed about 400 per cent), is put in bags of 100 pounds each. Cost of bags are from 5 to 6 cents each, cost of bagging, 20 to 25 cents per ton. The cost for transport to cars and loading on this section, vary from 10 to 60 cents a ton, according to distance from railroad.

"To complete this part of my statement I may add that in this industry there are 40 boilers with a capacity of 1,825 horse power, and about 2,000 men employed, The value of plant, that is, machinery, buildings for stores and dwelling purposes, water reservoirs, roads, etc., is estimated at $355,000. ASBESTUS.

"If I try to give now, in the following, an idea about the cost of asbestus mining, it must be understood that it cannot be applied to any individual mine. The cost of every one will naturally depend in first line upon the quality of the ground the mine is on, and upon how near the respective mine comes to the average with regard to purchase price, invested capital or plant, expenses of management, and s on. As to the quality of ground, I have, therefore, chosen to calculate the expenses on the ton of rock, and the cost of asbestus production will depend upon how many tons of rock, in a certain mine, have to be removed in order to produce one ton of asbestus. On this subject the opinions of the asbestus miners are considerably different, and while some claim to mine only on 50 or so tons of rock to the ton of asbestus, others go as high as 150. I am of the opinion that, as a rule, the quantity of rock mined to the ton of asbestus, is greatly underestimated. Basing, on the capacity and actual work of our machinery appliances, the known quantity of lorry loads removed from a mine during a year, and the known average weight of each load, in relation to the total of asbestus produced, I hold that 1 ton of asbestus to 100 tons of rock is a fair average. If we accept this, the cost of production of asbestus may be set down as follows: drilling, 3½ cents; blasting, 3 cents; labour for removing rock and gathering asbestus in the pits, 25 cents, making a total of 31½ cents to the ton of rock, or $31.50 to the ton of asbestus; $7 for cobbing; $1.50 for bags and bagging; 50 cents for loading; $5.50 for supplies that includes fuel, tools, iron, steel, timber, other materials and repairs; $6 for general business expenses, such as management, insurance, offices, marketing and others; $3.75, 10 per cent wear and tear, calculated on a total of $355,000 in plant and 9,000 tons production, making a total of $55.75 to produce one ton of asbestus. If we calculate now that we have to pay interest on a total invested capital of about two and one-quarter millions of dollars, for which at least 10 per cent must be expected, we have in our sales to average a price of at least $80 per ton of asbestus. Relating to the totals of production for the last eleven years, the figures at my disposal show for 1891 an output of nearly 9,000 tons, with a value of about $1,000,000, thereby ranking third or fourth as far as value of mineral production in the Dominion of Canada goes, being exceeded only by the coal production, valued at about seven and three-quarter Cost of mining, etc.

ASBESTUS.

million dollars, and on about even terms with copper, petroleum and brick.

Growth of industry.

The output of asbestus in 1880 (eleven years ago) has been about 380 tons, amounting to $24,700. Since then the industry has steadily increased, with the only exception of 188-, and has reached in 1890, 9,860 tons, with a value of $1,260,240, taking the official figures as given by the Geological Survey, which, however, seem to me rather high, especially as far as the value is concerned. During the period between 1880 and 1890, the increase has been nearly 2,600 per cent in tonnage, and 5,100 per cent in value.

Prices and market.

"It may be interesting to see what the average value per ton for these last ten years has been, as this is the only measure by which we can judge the industry from a national and economic as well as a business point of view. The years 1880, 1881 and 188-2 brought to the asbestus miners a price of $65 in average, while the price per ton in 1883 reached $72. From here we find the average price steadily decreasing, owing to the large proportions of No. 3 asbestus, until it reached the lowest point, in 1887, of $49. The respective figures are a trifle over $65 for 1884, $58 for 1885, $59.75 for 1886, and, as stated before, $49 for 1887; 1888 yielded an average of $60; 1889, $69.75, until 1890 brought the large figure of over $127 as an average price for every ton of asbestus, if the statements made by the Geological Survey are correct. This enormous increase in prices was due to several circumstances, chiefly relating to the state of the European market, and, in particular, that at the time a number of speculators had bought and kept from the market considerable amounts of stock in expectation of a further rise, while manufacturers as well were anxious to lay in as much stock as possible, under the impression that the mines had nearly reached the top of their capacity, and that prices would be driven to the utmost if stocks should run short. The real state of affairs transpired when the speculators tried to unload. Here a reaction set in, and while manufacturers before were very anxious to buy, they then decided to first await a settlement of the affairs. This, however, was promptly answered with the slacking down in the working of the mines last summer, and led in consequence and in consideration of other obnoxious circumstances—such as the Quebec Mining Act—to the entire shutting down of nearly all the mines in November last. Since then things have somewhat changed.

"It is clear that a mineral which has been successfully exposed to a heat of 4,500 to 5,000 degrees F., which is a non-conductor of electricity, and which may be spun like cotton and flax, has its merits in itself and will stand on those merits. The uses of asbestus are steadily increasing. I cannot, however, dwell on this point, and have to refer those

who are especially interested in the subject to an excellent paper read before the Asbestus Club in September last by Mr. Ed. Wertheim. One thing, though, I would like to mention with regard to the market for crude asbestus, and that is that it seems as if the American market is now rather inclined to buy as good grades as the European, while *vice versa*, manufacturers on the other side of the water are taking up lower grades along with first qualities—circumstances which never prevailed before. So it seems that those two main buyers of our products—America and Europe—are coming on more even terms than ever before. ASBESTUS. Markets.

"There is no doubt that the industry is still on a steady and very healthy increase, and while we may have temporarily to stand a slight reaction, things will brighten up before long. The sound judgment of those men interested in our industry will soon restore the balance between demand and production and will continue to develop the asbestus industry as wonderfully as they have done so far."

Regarding the exports and imports of asbestus during 1891 and previous years, the following tables are self-explanatory. Exports and Imports.

ASBESTUS.

TABLE 1.

EXPORTS.

Quality.	1888.		1889.		1890.		1891.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
1st class.....	3,625	$262,552	4,579	$319,461	5,453	$453,704	4,530	$338,072
2nd "	110	5,306	593	27,308	1,172	58,973	3,186	209,833
3rd "	201	9,884	416	13,375	373	15,853	298	13,636
Totals.....	3,936	$277,742	5,588	$360,144	6,998	$528,530	8,014	$561,541

ASBESTUS.

TABLE 2.

IMPORTS.

Fiscal Year.	Value.
1885.....	$ 674
1886.....	6,831
1887...	7,836
1888.....	8,793
1889...	9,943
1890...	13,250
1891.....	13,298

Coal.

COAL.

Production.

The production of this mineral for the whole Dominion is given in the accompanying graphic Table A, in Plate II., from which it will be seen that there is again a very encouraging increase in the figures of production over those of the previous year.

The 3,127,661 tons, valued at $6,496,110, returned for 1890, compared with the 3,623,076 tons, valued at $8,144,247, produced during 1891, show the amount of this increase to have been 505,415 tons and $1,648,137. This result must be credited almost wholly to British Columbia. The greater proportionate increase in the figures of value is also due to the greater proportion of this higher priced coal, included in the total.

From Table B, showing the proportion contributed to the grand total of tonnage by the several provinces, it will be seen that Nova Scotia still retains the chief place; British Columbia comes next in the amount of its production, whilst the North-west Territories and New Brunswick contribute but a relatively small proportion.

Table C speaks for itself.

The following Table No. 1 illustrative of coal mining in New Brunswick and the North-west Territories, explains itself:—

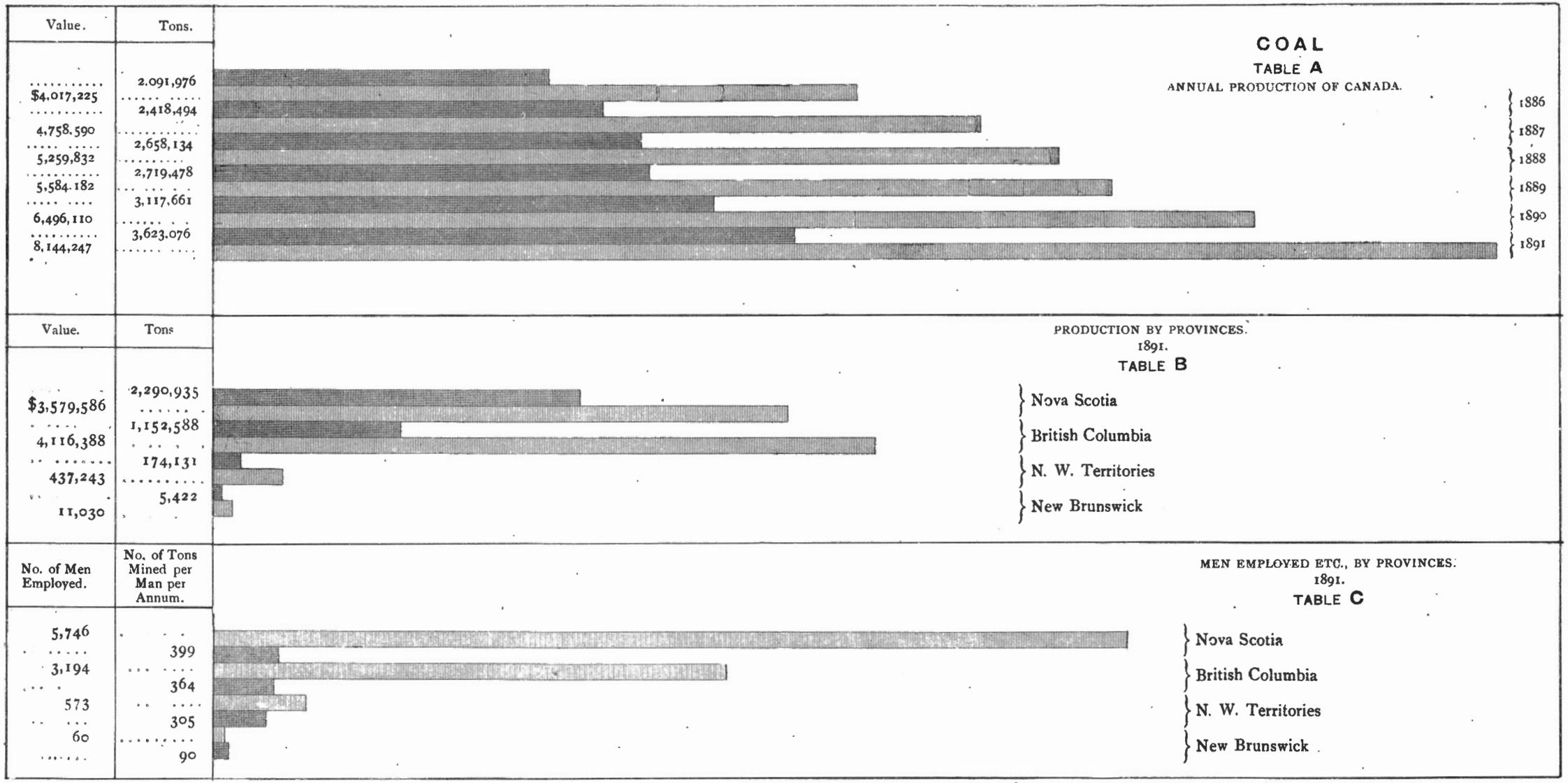
Coal.

Table 1.

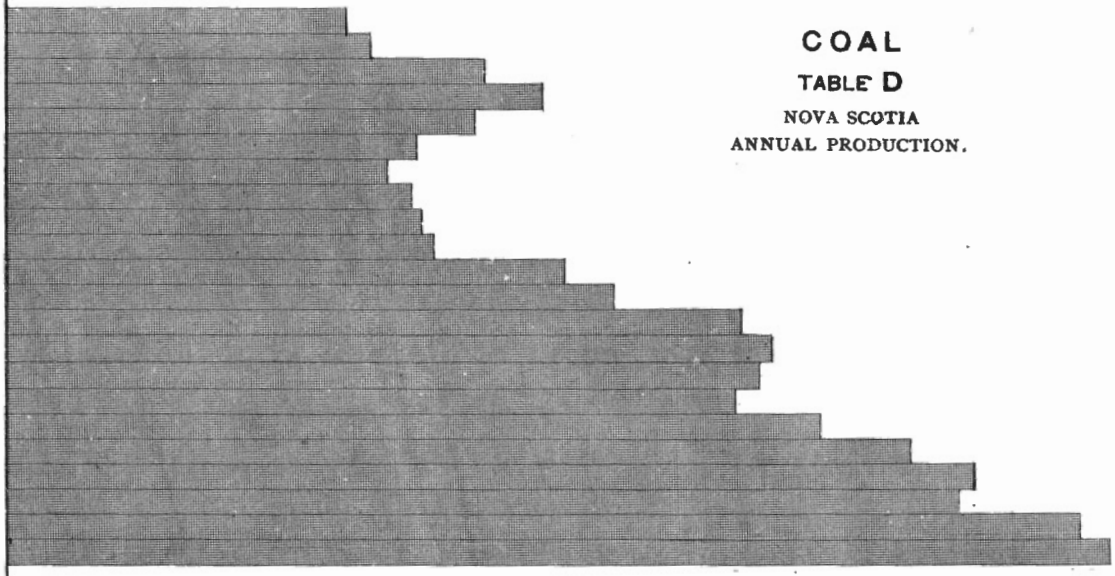
Production in New Brunswick and North-west Territories.

Year.	New Brunswick.		North-west Territories.	
	Tons.	Value.	Tons.	Value.
1887	10,040	$ 23,607	74,152	$ 157,577
1888	5,730	11,050	115,124	183,354
1889	5,673	11,133	97,364	179,640
1890	7,110	13,850	128,953	198,498
1891	5,422	11,030	174,131	437,243

The amount and value of the coal exported from the country are given in Tables Nos. 2, 3 and 4 following, and in graphic Tables F and G.


Value.
Tons.
2,091,976
$4,017,225
2,418,494
4,758,590
2,658,134
5,259,832
2,719,478
5,584,182
3,117,661
6,496,110
3,623,076
8,144,247
COAL
TABLE A
ANNUAL PRODUCTION OF CANADA.
1886
1887
1888
1889
1890
1891
Value.
Tons
2,290,935
$3,579,586
1,152,588
4,116,388
174,131
437,243
5,422
11,030
PRODUCTION BY PROVINCES.
1891.
TABLE B
Nova Scotia
British Columbia
N. W. Territories
New Brunswick
No. of Men Employed.
No. of Tons Mined per Man per Annum.
5,746
399
3,194
364
573
305
60
90
MEN EMPLOYED ETC., BY PROVINCES.
1891.
TABLE C
Nova Scotia
British Columbia
N. W. Territories
New Brunswick

Year	Tons
1870	700,861
1871	754,031
1872	984,664
1873	1,117,643
1874	977,446
1875	848,395
1876	794,803
1877	848,395
1878	863,081
1879	882,863
1880	1,156,635
1881	1,259,182
1882	1,529,708
1883	1,593,259
1884	1,556,010
1885	1,514,470
1886	1,682,924
1887	1,871,338
1888	1,989,263
1889	1,967,032
1890	2,222,081
1891	2,290,935

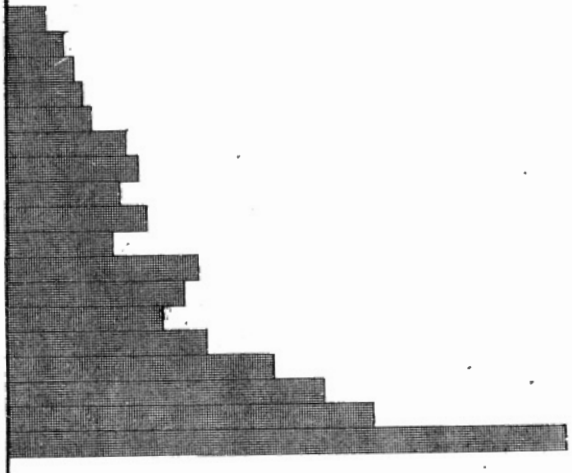


COAL

TABLE D

NOVA SCOTIA
ANNUAL PRODUCTION.

Year	Tons
1874	81,574
1875	110,145
1876	131,192
1877	154,052
1878	170,846
1879	241,301
1880	267,595
1881	228,357
1882	282,139
1883	213,299
1884	394,070
1885	365,596
1886	326,636
1887	413,360
1888	548,017
1889	649,409
1890	759,517
1891	1,152,588



COAL

TABLE E

BRITISH COLUMBIA
ANNUAL PRODUCTION.

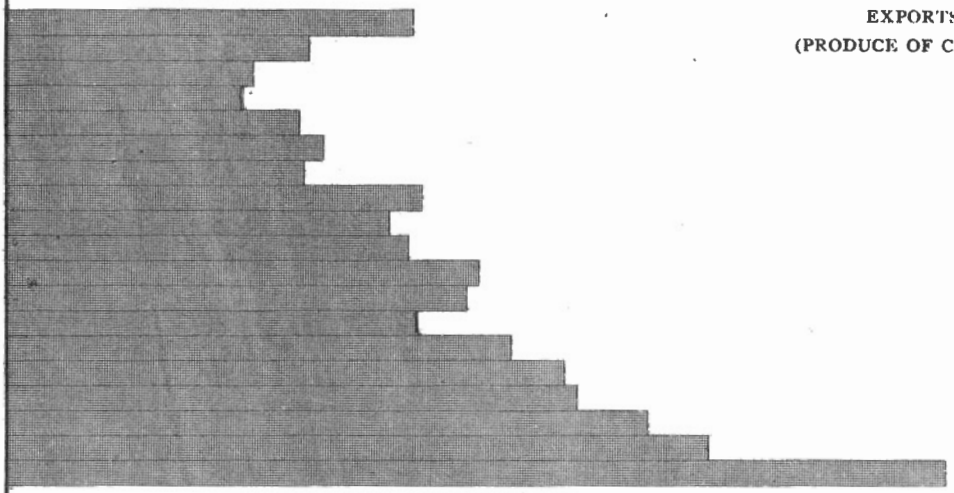
COAL

TABLE F

EXPORTS

(PRODUCE OF CANADA)

Year	Tons
1873	420,683
1874	310,988
1875	250,348
1876	248,638
1877	301,317
1878	327,959
1879	306,648
1880	432,188
1881	395,382
1882	412,682
1883	486,811
1884	474,405
1885	427,937
1886	520,703
1887	580,965
1888	588,627
1889	665,315
1890	724,486
1891	971,259



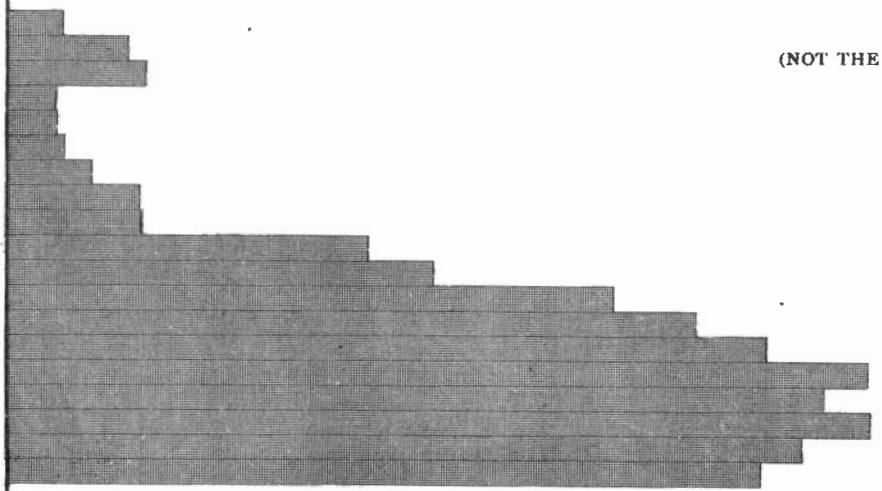
COAL

TABLE G

EXPORTS

(NOT THE PRODUCE OF CANADA)

ar	Tons
1873	5,403
1874	12,859
1875	14,026
1876	4,995
1877	4,829
1878	5,468
1879	8,468
1880	14,217
1881	14,245
1882	37,576
1883	44,388
1884	62,665
1885	71,003
1886	78,443
1887	89,098
1888	84,316
1889	89,294
1890	82,534
1891	77,827



COAL. COAL.

TABLE 2.

EXPORTS: THE PRODUCE OF CANADA. Exports.

Province.	1890.		1891.	
	Tons.	Value.	Tons.	Value.
Ontario	368	$ 559	.....	.....
Quebec	12,599	32,233	4,644	$ 7,304
Nova Scotia	202,387	426,070	194,867	417,816
New Brunswick	37	161	1,747	5,194
Prince Edward Island	142	478	35	109
Manitoba	71	214	2,232	4,655
British Columbia	508,882	1,977,191	767,734	2,958,695
Totals	724,486	$2,436,906	971,259	$3,393,773

COAL.

TABLE 3.

EXPORTS: NOT THE PRODUCE OF CANADA.

Province.	1890.		1891.	
	Tons.	Value.	Tons.	Value.
Ontario	63,251	$150,258	63,777	$158,416
Quebec	13,185	31,042	11,565	25,953
Nova Scotia	5,784	15,055	2,319	6,217
New Brunswick	136	395	165	432
Manitoba	178	801	1	15
Totals	82,534	$197,551	77,827	$191,033

Coal.

Coal.

Table 4.

Exports and Imports.

Exports: Nova Scotia and British Columbia.

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	199,552	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
1888	165,863	330,115	405,071	1,605,650
1889	186,608	396,830	470,683	1,918,263
1890	202,387	426,070	508,882	1,977,191
1891	194,867	417,816	767,734	2,958,695

The amount and value of Canada's imports of coal for this and past years is given in the tables below, Nos. 5, 6 and 7, which, it must be remembered, are for the fiscal year ending 30th June.

Coal.

Table 5.

Imports of Bituminous Coal.

Fiscal Year.	Tons.	Value.
1880	457,049	$1,220,761
1881	587,024	1,741,568
1882	636,374	1,992,081
1883	911,629	2,996,198
1884	1,118,615	3,613,470
1885	1,011,875	3,197,539
1886	930,949	2,591,554
1887	1,149,792	3,126,225
1888	1,231,234	3,451,661
1889	1,248,540	3,255,171
1890	1,409,282	3,528,959
1891	1,598,855	4,060,896

COAL. COAL.

TABLE 6.

IMPORTS OF ANTHRACITE COAL. Imports.

Fiscal Year.	Tons.	Value.
1880	516,729	$1,509,960
1881	572,092	2,325,937
1882	638,273	2,666,356
1883	754,891	3,344,936
1884	868,000	3,831,283
1885	910,324	3,909,844
1886	995,425	4,028,050
1887	1,100,165	4,423,062
1888	2,138,627	5,291,875
1889	1,291,705	5,199,481
1890	1,201,335	4,595,727
1891	1,399,067	5,224,452

COAL.

TABLE 7.

*IMPORTS OF COAL DUST.

Fiscal Year.	Tons.	Value.
1880	3,565	$ 8,877
1881	337	666
1882	471	900
1883	8,154	10,082
1884	12,782	14,600
1885	20,185	20,412
1886	36,230	36,996
1887	31,401	33,178
1888	28,808	34,730
1889	39,980	47,139
1890	53,104	29,818
1891	60,127	36,130

*NOTE.—This table includes coal dust and all coal other than that specified as anthracite and bituminous.

An idea of the annual consumption of coal in Canada may be gained from the figures below, assuming that the imports, which are for the fiscal year, are about what they would be for the calendar year :— Consumption

	Tons.
Production	3,623,076
Imports	3,058,049
	6,681,125
LESS—Exports	1,049,086
	5,632,039

Coal. Markets.

A reference to Table 11 will show that only about 8 per cent of the coal produced in Nova Scotia is shipped abroad, the sister colony of Newfoundland being our largest buyer, and the United States coming next, whilst the West Indies take a small quantity.

The other great producing district, that of British Columbia, finds a home market for about one-fifth of its production, and the largest proportion of the rest finds a market in California, while smaller consignments are sent to Alaska, China, Japan and the Hawaiian Islands, and a certain amount is utilized by the shipping on the Pacific.

Nova Scotia.

Nova Scotia—In Nova Scotia there were twenty collieries producing, their relative contributions to the output of the province being given in Table No. 8:—

Coal.

Table 8.

Nova Scotia.

Production by Collieries.

1891.

Collieries.	1888.	1889.	1890.	1891.
	Tons.	Tons.	Tons.	Tons.
Cumberland Co.				
Chignecto	16,584	20,801	11,336	1,075
Joggins	54,261	50,870	68,181	67,263
Minudie	1,544	1,456		1,867
Salt Springs			157	
Springhill	454,939	476,167	469,293	513,483
Pictou Co.				
Acadia	325,620	301,960	307,924	319,617
Black Diamond	26,884	38,097	37,270	20,321
East River	879	1,730	1,523	3,276
Holmes		286	65,303	
Intercolonial	177,708	141,072	120,668	157,615
Cape Breton Co.				
Blockhouse	7,625			
Bridgeport	27,134	24,076	31,610	34,605
Caledonia	126,318	128,015	174,915	179,183
Francklyn	9,230	4,531	810	
Gardner				23,820
Glace Bay	89,431	90,630	124,848	131,899
Gowrie	145,018	125,104	158,031	177,032
International	114,429	138,780	160,262	149,161
Ontario	5,166	3,210	10,135	3,484
Reserve	135,650	136,247	174,615	191,345
Sydney	170,224	162,362	203,359	191,174
Victoria	100,619	121,633	101,841	124,361
Inverness Co.				
Broad Cove				175
Rankin				179
Totals	1,989,263	1,967,032	2,222,081	2,290,935

The above table, together with all those here given relating to Nova Scotia, are compiled from material provided by the Government Department of Mines of that province. The details of the coal trade of the province are given in tables Nos. 9, 10 and 11 below :— Coal. Nova Scotia.

Coal.

Table 9.

Nova Scotia.

Production, Sales and Colliery Consumption.

Period.	Production.	Sales.	Colliery Consumption.
	Tons.	Tons.	Tons.
1891—First quarter..	404,460	247,306	41,384
" Second "	629,534	542,269	57,965
" Third "	729,531	794,606	51,807
" Fourth "	527,410	487,757	44,825
" Totals.....	2,290,935	2,071,938	195,981
1890 "	2,222,081	2,000,444	180,589
1889 "	1,967,032	1,741,720	177,106
1888 "	1,989,263	1,765,895	176,336
1887 "	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

Coal.

Table 10.

Nova Scotia.

Coal Trade by Counties.

Year 1891.	Cumberland.		Pictou.		Cape Breton.		Inverness.	
	Raised.	Sold.	Raised.	Sold.	Raised.	Sold.	Raised.	Sold.
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
First quarter.	137,944	122,160	118,978	95,207	147,363	29,771	175	168
Second "	146,917	130,827	126,309	111,610	356,308	299,832	.....	.....
Third "	141,721	123,872	129,177	129,583	458,633	541,151	... ...	... ...
Fourth "	157,106	140,880	126,365	117,307	243,760	229,525	179	45
Totals.....	583,688	517,739	500,829	453,707	1,206,064	1,100,279	354	213
1890.....	548,966	491,241	532,700	482,170	1,140,415	1,027,033	.....	.....

COAL.
Nova Scotia.

COAL.

TABLE 11.

DISTRIBUTION OF COAL SOLD.

Market.	1890.	1891.
	Tons.	Tons.
Nova Scotia:—		
Transported by land	390,322	404,031
" sea	283,869	312,474
Total	674,191	716,505
New Brunswick	251,749	256,833
Prince Edward Island	62,544	75,570
Quebec	842,163	868,320
Newfoundland	107,557	121,651
West Indies	5,284	4,576
United States	56,956	28,483
Total	2,000,444	2,071,938

Discovery and development in Nova Scotia.

The details of discovery and development in this province, as gleaned from the report of the Department of Mines* of Nova Scotia, are as follows:—

"The returns show a sale during the past year of 1,849,945 tons against 1,786,111 tons during the preceding year. The increase was not as large as anticipated in the spring, and the explosion at the Springhill collieries, reported on in the report for the year 1890, reduced the output of Cumberland county by about 30,000 tons.

"As compared with the sales of the year 1890 the most noticeable points are:—

"The home sales were 639,737 tons compared with 601,956 tons in 1890.

"The province of Quebec took 775,286 tons against 751,931 tons in 1890.

"The sales to the United States were 2,585 tons of round, 58 tons of run of mine, and 22,788 tons of slack coal, in all 25,431 tons, as compared with 50,854 tons in 1890.

Cumberland County.

"The sales to Newfoundland and New Brunswick, Prince Edward Island and other points show little difference.

"The sales of the county were 462,267 tons against 438,608 tons in 1890.

*The ton mentioned in the following quotations from this source is the long ton of 2,240 lbs.

"The production of the collieries of the Cumberland Railway and Coal Company was 459,395 against 419,012 tons in 1890, in spite of the delay caused by the explosion. Since that date the enlargement and completion of the air-way has been finished. New pumps, screens, etc., have been put in, and the colliery generally placed in excellent order. Safety lamps alone are used underground, and no explosives. COAL. Discovery and development in Nova Scotia.

"The Chignecto mine has remained closed, and no returns of a satisfactory character have been received of the results of the prospecting carried on for other seams.

"A little work has been done on the Maccan River collieries by Mr. Smith and others. Mr. Sharp of Amherst, and others, have traced the Styles seams further to the east, and added materially to our knowledge of this part of the district.

"At the Joggins mines the system of long wall has been continued, and improvements made to the railway and wharf. The output was 60,056 tons.

Pictou County.

"The sales were 405,096 tons as compared with 430,509 tons in 1890.

"The home sales were 265,098 against 277,753 tons in 1890.

"The province of Quebec took 63,219 tons compared with 90,461 tons in 1890.

"The output of the Acadia Company was 286,372 tons, and of the Intercolonial Company 140,728 tons. The Black Diamond colliery was purchased by the Acadia Company, which will continue the extraction of the pillars, etc.

"At the Albion colliery the work of reopening the Ford pit has been continued with success.

Intercolonial Coal Mining Company, Westville.—"The principal work in this mine during the past year has been extracting the pillars on the 3,000 feet lift; on the north side the pillars have been very satisfactorily drawn, and all the plant from that side taken to the south side. A large proportion of the work done was in the S. Holmes area, in which they are successfully mining a large percentage of coals. There are yet, however, on their own area, a block of coal, 450′ × 1,800′, standing with (4) four back-balances driven up to mine bord on next lift. A tail-rope running with 22 boxes on each trip is used on this level, and has proved an economical feature in underground haulage, and from the success obtained in its use I would wish to draw to it special attention, as

COAL.

Discovery and development in Nova Scotia.

with it in this district one boy can alone do the work that hitherto (8) eight horses and as many drivers were required to do, which success, I trust, will induce others to follow the example. From this level a tunnel has been turned off to strike the Scott pit seam ; the tunnel, it is computed, will require to be driven a distance of (600) six hundred feet, and to strike the seam down a distance of about 3,000 feet from the surface. As the Scott pit seam improves in quality to the dip, it is believed that at this point the coal will be of extra good quality. On the lift below this the levels have been driven in on each side a distance of about (600) six hundred feet, and they intend driving them until the line is reached on each side, before extracting the coal, any further than to put up balances for returns, and then bring back the pillars on the fresh timber. There is sufficient coal on the 3,000 feet lift to keep the mine working until the levels in the lower lift are in to the line. The Scott pit is now idle, and will remain so until the next season's shipping begins. The management intend to commence sinking another lift of (600) six hundred feet. The new winding engine, of which I made mention in last year's report, hoists (11) eleven boxes each trip.

" Considerable expenses have been incurred this year in building the most important of which was a new brick engine house for the hoisting engine, also a new car shop ; and the bank house being too small, was enlarged.

Acadia Mine, Westville.—" In last year's report I made mention of the difficulties they had to contend with in this mine, viz., firedamp and bad roof. I regret to say that in this respect during this year the difficulty has not lessened, but increased. This mine has a perpendicular depth of about 1,500 feet, and as the coal is tender and contains a large percentage of gas, the enormous pressure causes the gas to evolve from roof, pavement and sides, and the mine being as well very dusty, it is therefore difficult to manage. * * * * * All the workmen are now in the 3,560 feet lift, as the 3,100 feet lift is finished ; the pressure was so great on this lift that some little coal was lost in the finishing up, being the first coal lost in this mine in my time ; the air returns were damaged some, but are pretty well opened up now. The new hoisting engine is giving good satisfaction, also the new pump. It is difficult to describe the difficulties met with in a mine of this description, and only the men who work in it, and the management who anxiously conduct it, can fully estimate or realize the trouble and cost of keeping air-ways open, and the mine in good order and safety.

Discovery and development in Nova Scotia

Vale Colliery, Thorburn—Six Foot Seam.—"In my last report I spoke of the introduction of the long-wall system. This has been carried on during the year in the lower lift 2,000 feet down, but is not meeting with the desired success; the roof is of a very strong nature, and the slips run into the coal face, giving considerable trouble, making it expensive to keep the working faces open. On the 1,000 feet lift during the year, pillar work principally has been carried on with very good results. Some very heavy feeders of water have been struck in this mine, entailing considerable loss and expense, as the pumps were of insufficient capacity to keep the water out; they were obliged to flood the lower mine bord, causing them to carry the air for hundreds of feet with brattice, and the bottom being of a soft nature, caused falls in the mine bord, which had to be cleaved and timbered. The management were obliged to place two new Knowles pumps in the mine; these pumps throw about 560 gallons per minute. The mine was partly idle for 7 or 8 weeks until the pumps were started, reducing the output of coal considerably. The following buildings, viz., the locomotive shop, carpenter's shops, office, stables, store house and boiler house, were moved from the McBean slope and put up at this mine, and caused considerable expense in so doing. Culm is used in firing the boilers instead of coal. Now that everything is placed and the mine in good order, I would not be surprised to hear of a larger output of coal next year.

McBean Seam, Thorburn.—"No attempt has been made to open up this mine during the past year.

McGregor Pit, Stellarton.—"At my official visitation of this mine, on 24th April, I found the pillar work spoken of in last year's report stopped, and masons busily employed building them off, the temperature kept continually rising, and as it was beginning to get alarmingly high, the management, after careful survey, decided it was all but on fire, and therefore determined to close up this portion of the mine with brick, stone, sand, &c. Through the past summer the north and south slants have been connected at the bottom, and as in consequence the north engine can hoist all the coal, the south engine is idle, and in future can be used for sinking purposes. Two new back-balances have been started off during the year, but as there is now a very large area of this mine resting on pillars, it is not desirable to make very rapid progress until the overlying seams are dealt with, but as these seams are now being developed, it is only a matter of time until the pillars can be safely drawn. The depth of the mine is now about 2,670 feet down, angle of descent from 16° to 25°.

COAL.

Discovery and development in Nova Scotia

Foord Pit.—"It has been found necessary in the development of this mine to build some very extensive brick arches, the roof having been broken to such a height it was supposed the air was getting into the old workings. The stone arches around the bottom of the shaft were very much wrecked by the fire, and there is now some 500 feet of brick arch about the bottom, all well filled and packed at the back with sand, thus making them air-tight, and giving a soft rest to the pressure. The bottom now looks very well. Quite a number of other large brick stoppings have been built. Two slants have been sunk to the dip, a distance of about 400 feet, and still sinking. Soon they will be mining the coal from the deep.

"The coal-cutting machine did not prove as satisfactory as anticipated; the lower part of the seam having some very hard boulders, it was not quite able to cope with them. Some changes are now being made in the machine to meet this difficulty. The pit-head gear has been renewed and the latest improved screens and tipples fitted up, and everything around the pit-head is new. Fifty new coke ovens have been built, and a tunnel driven to conduct the gas from the ovens to the boilers to utilize the gas for raising steam in lieu of coal, which must undoubtedly result in great economy of labour and coal.

"On one side of the mine the temperature is about 80°, and necessitates a considerable quantity of air to keep it cool enough for the men to work; and as they proceed to the dip the gas makes freely, and, unless greater power be used, there is no means of increasing the volume of air, and as it is necessary to obtain increased air-way, the English slopes that were sunk 1,700 or 1,800 feet have been started sinking again, and a place turned off the north level of the Foord pit to cross-cut the measures and meet the slants; thus as there are two slants, when completed, will make a good travelling-way and air-way, and give a good field of coal, giving the Foord pit two more seams, viz., the Cage pit and four feet seam immediately overlying it, all down hill for the coal excepting through the tunnel, which will be about 300 or 400 feet, and as the water now finds it way to the Foord pit they will not experience much difficulty from that source. There has been some five or six places driven into the old works, which would seem to indicate some errors in the old plans. These places had to be built off with iron rails and brick and sand. They have had many difficulties to contend with, but so far every difficulty has been met, and this mine is again assuming its usual appearance.

"*Third Seam Slopes.*—It is understood that the Cage pit and Third Seam are connected by a tunnel some 250 feet in length, and the

extension of this tunnel has cut another 4 feet seam of the best coal probably in this county and a band of iron stone which carries 45 per cent of iron. It takes time to advance levels and get new works like this opened out, but I am pleased to say that this has been systematically and quickly done. During the year there was a back-balance driven up on the north side of Third Seam, and nine bords turned away, and the levels extended a considerable distance beyond. COAL. Discovery and development in Nova Scotia

"On the south side there has been a balance with 8 bords worked out nearly, and the levels extended. In the Cage pit seam the levels on north and south side have been rapidly extended and balances driven up.

"In the Four Feet Seam the levels are also being extended and places driven up hill. Some of the iron has been taken out and roasted at the mine with satisfactory results. This seam of coal will be worked long wall.

Spring Hill Mines.—"It is unnecessary for me to say anything at length in reference to the explosion which occurred here on the 21st of last February, the investigation having been published in last year's report. * * * * * *

"It was only two weeks after the explosion when the mine was again being partially worked, the damage underground being slight when we think of the terrible loss of life. These collieries are now comparatively clear of gas. At the working faces there are times when a few inches is found by the fire-boss, more especially in up-hill places where the brattice is not kept close up; but as to gas being in standing places or old work, I never found it, nor do I know of any man who ever did. The overlying strata in Cumberland county does not carry firedamp like the Pictou county coal seams. The Pictou county coal basin has for its cover bituminous shale, while Cumberland county coal basin has more freestone and fireclay, which accounts for being less gas than in Pictou collieries. Safety lamps is the only kind of light now used in this mine. Explosives are not used.

"There has been quite a lot of work done in the air-ways, and the volume of air considerably increased. The new lift which was sunk last year in the east slope has been opened up this year, and levels driven east and west. During the year the west slope has been sunk down to 1,200 feet. There is also a new lift in the north slope, and one in the east slope 600 feet each, and 1,200 feet in the west. Properly speaking, we do not know the extent this lift may be driven westwardly, as every year further developments are made of this seam westerly, until now they are proven for some miles with slight varia-

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tions southerly, caused by up-throw dikes or faults. Easterly the No. 5 slope is proved to some extent a distance of one mile, roughly speaking.

"There are somewhere about 1,400 men and boys employed in these mines, and when we take into consideration the hazardous nature of their employment the casualties that do occur are comparatively few. During the year there has been placed in the north slope a new duplex pump—high and low pressure, water barrel 10 inches, stroke 36 inches, water-column 10½ inches; the pipes are lined inside with wood.

Joggins Mines.—"All the work done in this mine during the year was long wall. It has proved very successful here, as the coal taken out under this system is larger, and a larger percentage of coal is won. I would say that 95 per cent of all the coal is taken out, it may require more timber, but the larger percentage of coal obtained amply pays the difference. The men also can dig a larger quantity per shift than under the old system.

"The water level has been cleaned and timbered from the shore to the slope, a distance of one mile and an eighth.

"Formerly the road for delivering the coal at shipping, which was one mile and an eighth in length, was laid with double tracks and operated by an endless rope, the engine operating it being at the mine. The coal was then dumped into a chute of about 150 feet in length, and run into the vessels lying at the wharf, of which only one could be loaded at a time. During the past year the whole business has been remodelled. At the wharf, instead of the chute, in the same place there have been two tracks laid and the wharf extended, and several places made in which vessels can lie and be loaded at the same time with different kinds of coal. At the head of these two tracks is placed a drum barrel with brake attached, and the full boxes running down bring up the empty ones. Instead of two tracks from the pit and an endless rope, there is now only one track with sufficient descent in it for the full boxes to run down with rope attached, and the engine then pulls back the empty ones, thus doing away with half of the track and rope formerly used.

"The mine is now in order to yield a large output of coal. There has been no gas reported in this mine during the year, and during the same time has been free from any kind of accidents.

"No explosives are used in working the coal; the powder and dynamite used was in stone, and in cutting through a large fault in three places, and some brushing for horse roads.

Minudie.—"This mine was worked for two or three months last winter, and then remained idle until the middle of November, when it

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was started again with 10 or 12 men, the object being local sales for the winter.

Lawson Mine.—"This mine was idle for two or three months during the summer on account of their engine-house being destroyed by fire. It has been rebuilt, and the mine at work again with from 8 to 10 men employed in it.

Chignecto Mines.—"This mine was worked during the winter along the crop, a few men being employed getting out coal for local sales. In the spring Frank Burrows, the underground manager, started prospecting the property. He was supplied with a diamond drill, capable of drilling 1,000 feet, and had 10 to 12 men employed, and has up to my last visit, December 1st, continued at work, and has drilled a series of holes from near Athol station to the Stoney half-mile. I learned he had drilled through some of the coal measures. He has now drilled three holes of about 600 feet depth each, and has began to drill the fourth.

Scotia.—"Alexander Dewar, reported as having 3 or 4 men employed at this mine, ceased operations at the end of the year, and has not resumed since.

Black Diamond Mine.—"Principally pillar work done here during the year. They are getting along very successfully and mining a good percentage of coal. It is now under the management and control of the Acadia Coal Company, Limited.

East River Area—John Muir and Sons.—"Work has been carried on here just as usual.

"On November 28 and 30 I visited Leicester in Cumberland county, where coal was reported to have been discovered. I found Mr. Sharp at work with 6 men east of the Styles mine, on the bank of a brook. He had 5 seams of coal exposed; about sixty feet of measures were between the first three seams, which appeared in thickness to be as follows: 1st seam, 3 feet; 2nd seam, 5 feet 4 inches; 3rd seam, 3 feet 6 inches. Then 107 yards south were the other two seams, one 6 feet and the other 9 feet, dipping south 10° west at an angle of 45°.

"There are good indications further east, lots of drift coal on the surface and a good level country. I cannot probably do justice to this section of the country, as the crop-out of the seams appeared disturbed. I never saw any coal burn better than it does in a stove.

Cape Breton County.

"The total sales for this county were 982,392 tons against 916,994 tons in 1890.

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"The increase was principally in the home sales and those to the province of Quebec.

"During the past year the Gardener mine was got into good working order by the Burchell Bros., who introduced a Jeffrey's electrical coal-cutting machine. The Sydney and Louisburg Coal and Railway Company reopened the Emery seam. Both these mines are said to yield a coal ad pted for steamer uses. Preparations are being made for introducing mechanical coal-cutting machinery into several mines in the Cape Breton district. As a result of the construction of the Cape Breton Railway, coal from this district is burned on the Eastern Extension Railway.

"Prospecting was carried on at several points in Cape Breton county, and it is claimed that a new and workable seam has been found underlying the Gardener seam. Such a seam would prove, owing to the great extent of country it would underly, a great addition to the coal resources of the Island.

"At East Bay, Mr. Young, on behalf of some American capitalists, has been engaged in sinking on a bed of hard coal, and will continue with better sinking appliances in the spring.

"The Mabou Gypsum Company have opened one of the Mabou seams and sold a few tons. The seam is 7½ feet thick and of good quality. A wharf has been built, and it is expected that next summer a considerable trade will be done with Nova Scotia and Prince Edward Island.

Sydney Mines.—"The north side pump deep has been driven further to the dip and a new landing opened there, 291 yards below the old landing. No. 1 angle deep, south side of pit bottom, has been driven through the trouble and extended, so that a new landing has been opened at 330 yards further to the dip than the old landing; also No. 2 angle deep, south side, has been extended and a new landing opened out 330 yards further to the dip than the old one.

"A new and larger spur wheel has been put on the north side underground engine to increase its hauling capacity. A new Jack engine drum and ropes have been put in for lowering and drawing the men from the pit. Also the back of the cages are boarded in and an iron bar placed across the front for safety.

"The ventilating fan has been much improved in efficiency by tacking sheet rubber to the periphery or margin of the blades, also by enlarging the outlet for the escaping air. A second new apparatus has been erected to help the filling away of the bank coal during shipping season. Cast iron tubing has been provided with which to line the

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pumping shaft at points where the stone is wasting away by reason of the heat from the steam of the underground engine.

"The heapstead pit tops, boiler seats, and engine houses, have been lighted by electric lights. A small horizontal engine and dynamo have been put up for that purpose, all of which gives satisfaction.

Victoria Mines.—"Work has been brisk at this mine during the last season. Since my last report the east levels in the 1,800 feet lift has been driven 380 yards, and another balance has been driven up. The west levels in the same lift have been driven about 150 yards; and a balance won out. The 1,200 feet east levels have also been extended about 400 yards.

"Stoping has been successfully carried on during the shipping season. A new angle deep has been driven off the main east slope, at a much lighter angle of dip, for the purpose of shortening the haulage in the level by horses; and also to enable the surface hauling engine to bring out a much larger trip of coal each time. The west levels in the 1,200 feet lift in the west slope have been standing nearly all this season, and only one balance is being worked at present; but the main slope is being driven down to win out another lift of 600 feet. The new engine for the fan mentioned in my last report has been placed and working for some months.

"A tubular boiler, 14½ feet long and 5 feet diameter, with 75 tubes in it, has been placed near the fan, and is quite able to supply the two fan engines with steam.

"A new fan shaft, 8 feet square and 40 feet deep, has been sunk and connecting with the main air-way.

"The erection of another Champion or Murphy fan, 8 feet diameter, has commenced. They have also put in another common egg end boiler, 36 feet by 5 feet 4 inches diameter, in place of two small ones. A gangway was erected in the spring between the coal bank and heapstead, and a donkey engine placed underneath it to draw the coal to the screens.

Lingan.—"A few men have been working in the pit there this season, getting out some coal which has been taken to Sydney Mines to make coke of.

Gardener Mine.—"Since last report this mine has been dried, equipped, and put in operation. Its condition was found to be better than was anticipated. Engine-house, forge, office, and dwelling-house are all being repaired, also a new store has been built. The heapstead has been finished, the shaft has been cribbed, buntings and guides put in. The two Cameron pumps that remained in the mine under water

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for about twelve years were in good condition, and with slight repairs are found to be all that is necessary for keeping the mine dry.

"The air-shaft has been cribbed and the water that formerly used to go down it has been dammed off. Ladders are placed in it for the workmen's convenience. In the latter part of the season the air was changed from its former course bringing it in a shorter direction to where the men work; this made a marked improvement in the ventilation.

"The bottom of the main roads both north and south of the pit bottom have been blasted up, admitting the use of larger horses for hauling; also the management has disposed of the tubs formerly used in this mine, and instead are using on the south side of the pit a tub of double the capacity.

"The extension of the south level and the next rooms above it shows a marked improvement in the thickness of the seam. The Jeffery coal-cutting machine has worked steadily since August; the results attained are satisfactory. A gradual gain is made as the men get more acquainted with the machine.

"Mr. Burchell informs me that in the latter part of December a cutting of 270 square feet was made by the machine with two men in three and one half hours, which would be equal to 770 square feet in a shift of 10 hours. The electrical plant was manufactured by Messrs. A. Robb & Sons, Amherst, N.S. This plant, besides furnishing power for the machine, supplies the engine-house and bankhead with electric light.

Caledonia.—"During the last season the main or west deeps have been extended about 600 feet, and two sections on both sides won and opened there. The west high lift levels have been extended and rooms broken off. The levels on the east side from the bottom of the 700 feet deep slant have also been extended and a large section opened out.

"The workings to the rise were carried on as usual. A line of stone stoppings has been built and put in place of where the wood and board stoppings were, from the furnace to the lower landing on the main deep. A second furnace of the same size has been added to the former one; it is built on the east side, and the escaping air goes from both through the same shaft and cupola. This furnace ventilates the east side of the pit and the former the west side, both having separate inlets and returns, all of which have made a great improvement in the ventilation. On surface a new building of 100 x 28 feet has been erected, to be used as a forge and a carpenter's work-shop. A new stone boiler-house has also been built.

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Old Bridgeport.—"A new incline plane 900 feet long has been driven and put in operation from the south side of the pit bottom towards the rise. The south levels have been extended, and are now about 1,600 feet from the bottom of the shaft. The ventilation has been greatly improved in this mine during the past season.

"Stoppings have been put up along the levels, headways and through the rooms where required, also a return air-way has been driven from the south side of the high workings direct to the back part of the furnace, giving two returns.

Reserve Mines.—"This mine has been worked pretty busily during the last season. The French or east slope has been driven down 350 feet further, and levels turned off south and north. The south levels were driven 600 feet, and the north levels about 450 feet. A new landing has been made there and a fine section of rooms opened out. The coal is hauled from this section by means of a new steel wire rope leading from one of the engines on surface to the low landing. The trip is taken from this landing to the upper landing, when it is caught there by another rope and engine drawing it to the surface; this works remarkably well. Very little time is lost in unhooking from the empty and hooking on the full trip, and *vice versa*. The pillars have been nearly all drawn from the west side of the main slope. Work ceased there in October. A new cupola has been built on the east side instead of the old one that was blown down in October by a heavy gale.

Emery Mines.—"The dip slants have been driven about 650 feet and rooms broken off and worked during the latter part of the season. The north levels on the high lift have been extended about 650 feet, and the south side levels 320 feet. As the dips are extended the coal seems to improve in quality and thickness of seam.

Ontario Mines.—"Mr. Alexander McPherson commenced in the latter part of last March to secure and timber the slope and horse roads, and also to pump the water out of the dip. He succeeded while the weather remained dry, but as soon as the fall rain came he found that he was unable to keep the water down, so he finally abandoned the work. However, during the season he mined coal from a few rooms on the south side of the slope, below the high level.

Gowrie Mines.—"This mine has worked in its usual systematic way during the most part of the year. From the bottom of the west deep slant a horse road has been driven northerly over the fault, and a pair of levels turned off and driven westerly a distance of 300 yards, and a section won out between the fault and the anticlinal.

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Also, south and parallel to the fault the levels have been extended westerly 200 yards.

"A good travelling road for the workmen has been made from this district to the high level near the pit bottom. On the east side main deep, where the roof was considered dangerous, 150 yards of it has been taken down an average thickness of 3 feet, and the place well secured with timber 1 foot or more in diameter.

"The levels going east have been driven 300 yards, and those going west extended about 400 yards, those levels have struck the fault that is leading from the west dip slant.

Little Glace Bay.—"During the past year the north levels have been driven about 900 feet, the south levels have been stopped, leaving a large barrier between them and the seashore at the harbour. The management has commenced driving a new deep on the south side of the pit bottom, with the intention of gaining a lift of 600 feet.

"A new shaft 40 feet deep and 8½ feet square has been sunk as an air-shaft, and an 8-foot fan placed in position. This is called the Murphy ventilating fan, and is reversible, the same as the one at the International. It works admirably well, and will be used as a blow-down this winter if required.

"A new double-acting 12-inch fire pump, with 9-inch columns, is being put in for the purpose of relieving the pumps now in use. A new block of four tenants are added to the workmen's houses. A new block of crib-work, 160 feet long, has been built and placed on the southern side of the harbour for its protection.

International Mines.—"The south side slant deep road has been extended down 600 feet deep, and another landing opened out there. This is the second landing on that road below the main level.

"The main overcast north side of pit bottom has been reconstructed in the shape of an arch with old railroad rails bent for that purpose. They make a good strong arch and suit well where the roof is bad. They are lasting and can be moved to any other part of the pit for the same purpose if required.

"An air-shaft has been sunk 90 feet deep, 10 feet diameter, and an 8-feet fan, known as the Murphy ventilator, erected there. It is so constructed that it can be made to either exhaust or blow down, and is at present working as a blow-down, but the intention of the management is to have it exhaust in summer seasons. It is capable of giving 80,000 cubic feet of air per minute if required. There have also been two new locomotives purchased and running during the past season in place of two of the old ones.

McAdam's Lake, East Bay.—"Prospecting has been going on at this place during part of the season by American capitalists. * * * * A shaft 65 feet deep by 8 feet long, and 4 ft. 6 in. in width, has been sunk on a seam of very black shale. There are several seams of this shale showing on both sides of a brook that runs down towards the lake crossing the strata.

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Cariboo Cove.—"I visited this mine on the 18th of December, and found twenty-two men employed there. A shaft has been sunk 130 feet deep, 14 feet by 6 feet, divided in three compartments. The seam of coal that it is sunk on is called the 7-feet seam, but has not been proved as yet to be over 3 feet 9 inches thick. The coal is hard and burns well.

"A new engine-house has been built and a double cylinder friction hoisting engine, 35 horse-power, put in position; also a pumping engine, 7-inch cylinder, 15-inch stroke, and a portable boiler 10 by 5 feet diameter. This engine, besides pumping the water from the shaft, drives a fan which ventilates the pit.

"A level has been driven from the seashore in on the 11-foot seam, a distance of 125 feet, and well timbered. A new dwelling-house has been built, an office, barn and forge. The company operating this mine reside in Rhode Island, U.S. President of the company, W. B. Gincks; secretary, T. A. Buel; underground manager, James W. Wilson. The management says it is the intention to ship coal early next spring."

The following shows the average thickness of the coal seams now worked in the dip workings in Cape Breton mines:—

Name of Mines.	Thickness of Seam.	
	Feet.	Inches.
Sydney Mines	5	6
Victoria Mines	6	8
Gardner Mines	4	4
Old Bridgeport Mines	5	9
Reserve Mines	8	9
Emery Mines	4	9
International Mines	5	10
Little Glace Bay Mines	5	10
Caledonia Mines	8	6
Ontario Mines	8	4
Gowrie Mines	5	8

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NEW BRUNSWICK.—For this province, a total production of 5,422 tons, valued at $11,030, has been reported. As formerly, it all results from operations on the seams of the Grand Lake coal field. These operations continue to be of the desultory nature and limited extent of those of past years, resulting mostly from the work of the inhabitants of the district for short periods on the small seams found there.

The work is done near the surface, and the coal obtained is used locally in the provinces.

The nature of these operations can be judged when it is pointed out that the returns show that the number of men employed by the different operators, varied from two to eight, working for periods of from two to nine months.

Some of the operators complain that the industry is crippled by lack of good roads and of railroad communications, and by the scarcity of miners in the district.

East Albert Company's Property.—Prospecting has been done on this property by the New Brunswick Mineral Developing Company. The work done so far shows three small vertical veins of albertite, running a little south of east, the largest measuring about twelve inches in width. The Albert mines are still idle.

NORTH-WEST TERRITORIES.—The amount of coal produced in this region, viz., 174,131 tons, shows an increase over last year of 45,178 tons. Returns were received from operators located at various points in the Territories. Of the mines mentioned, the only three that were worked extensively were those of the Alberta Railway and Coal Company, with mines at Lethbridge; the Canada North-west Coal and Lumber Syndicate, with mines at Canmore in the Cascade Coal Basin, where the coal produced is a semi-anthracite, and those of Messrs. H. W. McNeill & Co., working in the same basin.

The latter company commenced operations in June, having leased the mines of the Canadian Anthracite Coal Company, and it is reported that a vigorous policy has been inaugurated with a view to taking rank amongst the chief producers of Canada.

Mr. R. G. McConnell, of the Geological Survey Staff, in his report to the director speaks as follows of the results of his work in this district during a short period in the spring:—

"This work was carried out during the month of June and was undertaken with a view of ascertaining whether the coal-bearing Cretaceous rocks of the Cascade basin recur east of the mountains. The section along the Bow proved to be too complicated and was intercepted by too many concealed intervals to trace the sequence of the formations

definitely throughout, but sufficient evidence was collected to show that in all probability the conglomeritic beds exposed at the Kananaskis Falls are the equivalents of those overlying Marsh's mine, south of the Gap siding in the Cascade basin, and that the underlying dark shales consequently represent the coal-bearing formation. East of the mouth of the Kananaskis the conglomerates and underlying shales fold over a light anticlinal, and several hundred feet of the latter are exposed without any coal seams being seen. The summit of this anticlinal, which occurs three-quarters of a mile east of the mouth of the Kananaskis River, offers the most favourable site for testing by means of a bore hole for the presence of coal. The coal horizon of Marsh's mine, assuming the identification of the conglomerates to be correct, lies at this point at a depth of 1,300 feet below the surface. There is, however, no absolute certainty that even if this depth was reached coal would be obtained, owing to the lack of persistence of the Cretaceous coal seams, and on the other hand workable seams might be struck at a much less depth. The rocks near the mouth of the Kananaskis River are comparatively undisturbed, and coal, if present, would be much less crushed and also more easily worked than is the case with many of the seams inclosed between the more highly inclined beds of the Cascade basin, and on this account a bore hole to test its presence would be desirable."

COAL. Discovery and development in Nova Scotia

The remainder of the coal production credited to this region, results from the operations of farmers and others working for longer or shorter periods during the year, in the outcroppings of lignite and lignitic coal found on their properties, for the purpose of meeting a local demand for fuel in a district where wood is scarce.

These seldom employ more than three or four men, and that only for a few months during the year, the total annual production of any one amounting to but a few hundred tons. The seat of these activities is chiefly in the vicinity of Calgary, in the foothills of the Rocky Mountains, about the creeks forming the headwaters of the Bow and Belly rivers, and to the northward, in the vicinity of Edmonton.

Similar operations have been inaugurated in the Souris and Turtle Mountain districts, south-west from Brandon, in the province of Manitoba.

BRITISH COLUMBIA.—In this province, the coal-mining industry shows a most encouraging increase of over fifty per cent on the figures for 1890. See graphic Table E.

British Columbia.

COAL.

Production, etc., in British Columbia.

The following tables, Nos. 12 and 13, give statistical data regarding the industry, and afford a means of comparison between the two years, 1890 and 1891 :—

COAL.

TABLE 12.

BRITISH COLUMBIA.

PRODUCTION, SALES, &C., FOR 1891.

Name of Colliery.	Coal raised.	Sold for home consumption.	Sold for exportation.	On hand, 1st Jan., 1891.	On hand, 1st Jan., 1892.	Number of men employed.
	Tons.	Tons.	Tons.	Tons.	Tons.	
Nanaimo ...	590,751	157,652	429,952	6,802	9,949	1,464
Wellington	386,604	61,291	316,346	2,794	11,760	957
E. Wellington..	46,666	7,748	40,523	1,605	....	188
Union.	128,567	329	116,435	3,720	15,523	585
Totals.....	1,152,588	227,020	903,256	14,921	37,232	3,194

COAL.

TABLE 13.

BRITISH COLUMBIA.

PRODUCTION, SALES, &C., FOR 1890.

Name of Colliery.	Coal raised.	Sold for home consumption.	Sold for exportation.	On hand, 1st Jan., 1890.	On hand, 1st Jan., 1891.	Number of men employed.
	Tons.	Tons.	Tons.	Tons.	Tons.	
Nanaimo	436,246	110,141	327,946	10,744	6,802	1,493
Wellington ...	195,436	78,141	119,035	3,416	2,794	646
E. Wellington..	49,954	9,502	39,348	612	1,605	170
Union.....	77,881	1,659	82,933	10,431	3,720	350
Totals.....	759,517	199,443	569,262	25,203	14,921	2,659

COAL.

Markets for British Columbia coal.

The details given below are quoted from the report of the Minister of Mines for the province to show the present condition of the industry, and its progress during the year :*—

"Continuing the statements of the various sources from which California, our chief foreign market for coal, is supplied with that commodity, I beg leave to submit hereunder a statement compiled up to the end of 1891, from an authentic commercial source :—

	1888. Tons.*	1889. Tons.*	1890. Tons.*	1891. Tons.*
British Columbia	345,681	417,904†	350,388	517,477‡
Australia	271,612	408,032	153,920	275,490
England and Wales	126,167	32,890	53,374	200,777
Scotland	10,680	12,727	1,490	34,225
U. S. Eastern States	30,118	18,950	32,701	42,237
Puget Sound	568,948	372,514	450,762	393,163
Coos Bay and Mount Diablo	81,194	87,600	74,210	90,684
Japan	13,808	1,340	13,250	20,506
Carmel Bay				1,200
Alaska				150
Total at San Francisco	1,448,208	1,351,957	1,130,095	1,575,909
At Lower Ports, viz. : Wilmington, San Pedro, and San Diego, in California	211,598	11,805	123,312	160,820
Total California	1,659,806	1,363,762	1,253,407	1,736,729

"The totals above stated are of the quantities of coal actually received into California, while some of the coal shipped in 1891 from this province, destined for that state, would be on the way and not arrive until 1892. And, on the other hand, some of the coal shipped in the province in 1890 would have arrived there in 1891, and be included in the above statement. The last year's total of coal delivered by collieries of this province and Washington State, also Coos Bay, in Oregon, called in the market 'Coast Collieries,' together with the totals of 'foreign' shipments (other than those of this province), shows a growing power of absorption of our great 'natural product' of coal, by our friendly neighbours and customers of many years past, that is most gratifying from a commercial and industrial point of view. It will be seen that in 1888 California touched the present total within about 77,000 tons, so that it may be hoped that a total of two

* The ton mentioned in the following quotation from this source is the long ton of 2,240 lbs.

† Some of this export, as of other exports in this column, were delivered at lower ports in Carlifornia, but the returns in 1889 did not distinguish the quantities, beyond the 11,805 tons. There were altogether 139,060 tons from various sources delivered at lower ports in 1889.

‡ In addition to this export of 517,477 tons from British Columbia, there was an export to and delivery at lower ports, from the province, of 123,534 tons, which is included in the 160,820 tons, noted as delivered at lower ports.

Coal.
Markets for British Columbia coal.

millions will soon become the normal amount of coal consumption in California, with a rapid progressive increase, and that by wise legislation and negotiation on the part of Dominion statesmen, a treaty of reciprocity with the United States, in the article of coal, may enable our coal industry to hold its own against the severe competition it has now to sustain from the cheaper mined coal of other countries, as well as to maintain and increase our enormously developed capacity for production of this necessary staple article, of undoubted quality and utility, proved and established in the market.

"Owing to the absence of an equitable reciprocity treaty between Canada and the United States, within the past few months excessive shipments of coal from distant countries to California have so disturbed the balance of supply and demand that existed during the greater part of the past year, that a prudent diminution of output and shipment of coal took place generally from the collieries of this province, in order to ease off the glut that was brought about by such extraordinary deliveries into California, and it is calculated that early in the spring the market will have assumed its normal condition, and that the collieries of British Columbia will be worked up to their highest power, with a brisk trade, which is a result devoutly to be wished for, on behalf of our very numerous and deserving body of miners in this province, who have been for some time working only four days or less a week, while their personal, family and household expenses have been going on all the time at full rate. Otherwise, I can truly say that the collieries of Nanaimo, Wellington, and Comox were never in better condition than now, and that prospects never looked so well for putting out coal; and it may be expected that after the present lull in the coal market blows off, we shall see every mine worked to its full capacity and to the best advantage of all concerned.

Development and discovery.

"*Nanaimo Colliery.*—With the exception of a few days at the end of the year, the coal has been in good demand from this colliery during the past year.

"*No. 1 Pit, Esplanade, in Nanaimo.*—This mine, being part of the Nanaimo Colliery, belongs to the New Vancouver Coal Mining and Land Company, Limited, and is a most valuable mining property, with resources of coal that are practically inexhaustible. Now, as in previous years, the workings from No. 1 pit have been from what are known as the Nos. 1 and 2 north levels. The No. 1 level is from the bottom of the shaft (or pit), in a northerly direction, going under the water of Nanaimo Harbour, with its windings, for about two miles, being the longest underground hauling road of any colliery in the district. The face of the level is under Protection (or Douglas) Island.

Coal in here has been very good. The level is not working at present, but it stands on good coal. The coal is worked from this level on the pillar and stall system, and will average about six feet in thickness. In some parts it is thin, but at other places it is thick, and will be about the average named. All the work, for about 1,400 yards, has been on the west side, and much of this is not started away from the level. On the east side it is all solid for the above-mentioned distance; except near to the face there is a slope down 300 yards in good coal all the distance. The object of this slope is to connect with the shaft being sunk on Protection Island, which I shall refer to under its own heading.

"No. 3 level is also in good coal, and from this level a considerable quantity of coal has been taken out through the year. There has been much rock work here, but now they have got into good coal, about seven and a half feet thick, and to all appearances they have got into the same tract of excellent coal that they have been and are now working in the No. 1 level, but a long distance to the eastward of No. 1.

"Ventilation in this mine is good. When I was down in December, I found that there were 59,600 cubic feet of air passing per minute for the use of 120 men and 18 mules—23,400 feet to No. 1 level, and to No. 3 level, 36,200. The motive power to keep this volume of air circulating consists of two double fans, on the Murphy principle, on the up-cast (or No. 2) shaft, driven by steam engines, with water gauge eight-tenths. Very little gas has so far been discovered in this mine, and there is also freedom from dust.

"The management have been making great preparations in the levels, and tramways, underground, and also on the surface, for carrying out the purpose of the company to have the coal brought from those long roads to the shaft by electricity, so that in about a month, or as soon as the electric works are completed, an opportunity will be afforded of seeing the electric motors hauling the coal under the harbour, and the ships in the harbour taking the coal away to the other countries.

"*No. 3. Pit (Chase River), Nanaimo Colliery.*—This mine of the New Vancouver Coal Company has worked steadily most of the year, excepting a day occasionally for repairs. The coal from this pit has been exceptionally good, both as regards hardness and quality. As I have previously mentioned the workings here are on the pillar and stall system, and during the year, up to the 12th October, nearly all the mining had been at those pillars, but on the above date the company suspended work, and the mules, etc., were taken out of the mine. There is, however, a considerable quantity of coal

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obtainable in the mine, and it is the intention of the manager to let it stand till the coming summer, or till late in the spring.

"Ventilation was always good; at the time the mine stopped 45,000 cubic feet of air were passing per minute for the use of 40 men and 8 mules. The motive power here was a large fan on the up-cast shaft.

"*Southfield Mines, Nos. 1 and 2.*—Both are known as the Southfield mine of the New Vancouver Coal Company. The mine is worked by a slope, down 800 yards, but there has not been much mining done near the bottom. It has been and is now the greatest producing mine of the extensive Nanaimo colliery. The coal is hard and good. In some places the coal is 12 feet thick, much of it with a strong conglomerate roof close to the coal, making it safe to work with ordinary care. Much of the mining here is now done at the pillars, which represent fully one-third of the whole original seam of coal. Besides this, coal has been mined in stalls. This has been and is now a valuable mine, but the company have had, and yet have, faults to contend with in the workings.

"Ventilation, good; motive power, a large fan. This mine is worked on the separate split system, having three splits—two to the south and one to the north side of the slope. When I was down in December, there were 98,000 cubic feet of air passing per minute for 130 men and 9 mules. There is seldom any gas. The mine is also free from dust.

"*No. 4, Southfield Mine.*—In this slope a great deal of work has been done. The prospects not being encouraging work has been stopped for the present. Another shaft has been put down to the coal further to the dip—the shaft next mentioned as

"*No. 5 Pit, Southfield.*—In a previous report you will have seen that this shaft of the New Vancouver Coal Company, was down 100 feet, and that their trouble was then commencing, as the water was coming in freely, while the rock was very hard; but perseverance, in most cases, is sure to be rewarded, and in this case it was, for, after the company had persevered against water and hard rock, the coal was struck at the depth of 508 feet, and proved six feet and a half thick. It was somewhat soft in the bottom of the shaft, but as they worked out it got better, and is now much improved and a fine vein of coal. In starting a new work like this, after the coal is reached, there is a large amount of work to be done in the way of headgear, engines, railway, and many other things that an onlooker does not notice, and they all take time. Now they have started in earnest, and appearances are most favourable here for a good mine. This shaft is to the dip of both

Southfield Nos. 1 and 2 and No. 4 mine, and is quite a valuable acquisition to the New Vancouver Coal Co.'s colliery, and it is sincerely hoped by all their well-wishers—and they are many—that this mine will roll out the coal for years to come. This coal is much wanted in the California market, and always commands the highest market price when it is taken there. COAL. Discovery and development. —British Columbia.

"*Protection Island Shaft.*—This is the property and new work of the New Vancouver Coal Company, and is on the south point of Protection (or Douglas) Island, and on the north side of Nanaimo Harbour. The workings of No. 1 shaft, Esplanade, Nanaimo, extend under this island, and the company knowing that the coal was good, but having a long distance to haul it underground, and judging from the character of the formation on the surface along the coast line and into the sea that, in all likelihood, the coal extended for miles, concluded to put this shaft down on the island. The contract for sinking the shaft was let early in the spring of 1891, and on the 12th of March work commenced, and has continued on to the finish almost without a stoppage of any kind until the 12th of January of this year, when it was successfully finished at a depth of 670 feet. The size of the shaft is 18 by 12 feet in the finish, timbered with plank four inches thick, and with a partition dividing it into two compartments from top to bottom. Here, as was expected, the coal is five feet thick. On the 22nd January, 1892, they holed through on to the slope mentioned, as put down near to the face of No. 1 level in No. 1 shaft, and, after arrangements are complete, that will be the intake for the air of No. 1 level, which will be a great relief to that mine. The air will only have to go through, in place of having to go in and come out. Although the shaft is down, there is yet much work to be done before they can say that they have got fairly started to ship coal from the Protection Island shaft.

"The company are now erecting a large double hoisting engine, which will be the machine for taking out the coal from this place. The cylinders of this engine are 26 inches, with 42-inch stroke. It was made by the Hamilton Manufacturing Co., Peterborough, Ont. The headgear is also framed and put together, ready for hoisting into position, but, in addition to what is already accomplished, there is much to be done, viz., the putting up, and the fillings about the pit head. There is only a short piece of railway to make, and that is nearly ready for the rails. There is a complete set of new wharfs to build, which will have to be done before much coal can be taken away from this new pit, but from what I have seen this company do, I am satisfied that all the works required here will be carried on with the

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greatest speed, so that they may be able to take coal into the ships for foreign ports. With the great prospects here for coal, and the largest ships being able to go within 400 feet of the mouth of the shaft, the company will be able to compete for putting the coal into the market as cheaply, if not at less price, than any that can oppose them.

"The New Vancouver Coal Company has made a large outlay of capital, but it would be hard to represent the vast amount of coal that stands in view against the outlay, and to all appearance this is going to be the coal mine of Nanaimo.

"*Northfield Mine, Nanaimo Colliery.*—This mine, mentioned in a previous report, is in the northern part of the extensive estate of the New Vancouver Coal Mining and Land Company, hence the name Northfield, which seems to be very appropriate, as in the other end of the estate there is the Southfield mine. This mine is entered by a shaft, and from the bottom of the shaft there is the south level, and on the north side there is also a level of this name; but the principal part of the mining at present is from a slope starting from near the shaft on this side, running about north-east.

"Work has been going on steadily during the past year, except on occasions that could not well be avoided, as the repairing day must come to all works where machinery is one of the prime movers. The coal from the Northfield mine is hard and of a very good quality. It is in brisk demand in the Victoria (B.C.) and California markets, and in other places where it has been introduced always commands the highest price.

"The coal is worked on the longwall system, from the levels and both sides of the slope, and is of a varied thickness of from two to four feet.

"Ventilation is good, but owing to the system in use the air goes along the face, and about shot-firing time in some places there is smoke, quite a large quantity of powder being used. The ventilation being on the separate split system, the smoke soon goes past. When I was down, in December, I found that there were 62,640 cubic feet of air passing per minute for the use of 130 men and 5 mules, and in the following divisions: two main splits from the shaft to the north and south sides; to the north split there were 30,960 cubic feet; this goes down the slope, and is again divided to each side along the face of the workings to where it has to leave them, when it goes along the air-way to the up-cast shaft. On the south side there was 31,680 cubic feet passing per minute. This went in by the south level and returned by the way of the face (coal) to the up-cast shaft. There is little or no gas in the mine, which is also free from dust.

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"*The Harewood Estate (Nanaimo Colliery).*—This estate is now the property of the New Vancouver Coal Mining and Land Company. Considerable prospecting has been done on this estate at different times, but the company got the diamond drill to work during the past summer, at about one mile and a half in a south-east direction from the old Harewood mine. This bore-hole got on well, and when down 150 feet they struck the coal, which proved by boring to be five feet six inches thick. They were so well satisfied with the prospects that they commenced to sink a shaft as soon as tools and machinery could be got on the ground, and expect to reach the coal early in the spring. It is to be hoped that this company will be successful in their enterprise. Previous to the company acquiring the property, two parties attempted coal mining here, but both failed to make it a success, and I trust that it now remains for the New Vancouver Coal Company to be the winning party.

"*Prospecting by the New V. C. Co.*—There has been much prospecting and exploring by the New Vancouver Coal Company. In addition to the sinking of the shaft mentioned, they have just put down a series of bores in their Northfield estate, and from the encouragement afforded by the prospects of those bores, we may expect to see a shaft started in the Northfield estate soon.

"*Wellington Colliery—No. 1 Pit.*—This pit is near to Departure Bay, and was put down to the coal about fourteen years ago, but excepting a little coal taken out of one of the upper seams, no mining was performed. Work was resumed here about four months ago to erect machinery and all the necessary works for the sinking of a shaft. As this shaft was only a small hole, they started at the surface to enlarge it to the usual size of the shafts in this colliery, expecting to reach the coal early in the spring. The calculation is that good coal will be found here, which will be good for the district, as well as for Messrs. Dunsmuir & Sons.

"*No. 3 Pit, Wellington Colliery.*—With the exception of keeping the water out, there has been little or no mining done here, yet there is quite a large quantity of coal to come out of this shaft.

"*No. 4 Pit, Wellington Colliery.*—This pit is about 1,000 yards to the east of No. 3 shaft, and is connected by a good travelling road to the same. Here, as in all the working mines of this colliery, the men have been working regularly during the past year, except a day now and again to perform repairs that were necessary. The coal is in good demand in the California market and in other places to where it was sent, as well as by steam-boats calling for fuel, and for home consumption.

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"This mine is worked on the pillar and stall system, and in some districts there has been much mining done, in taking out the pillars, which are fully a third of the whole. The coal is hard, and of the usual good quality of the Wellington coal. This is a very extensive mine, being well spread out. It is worked in four districts, viz., south, east, north, and west. No expense is spared to make the works safe. Ventilation is very good. Motive power, a large fan on the up-cast shaft, which is about 500 yards north of No. 4 shaft. The south side is ventilated from No. 3 pit. You will have seen that this mine is ventilated on the separate split system. The air is split at the bottom of the shaft, taking, what are called, the north and south sides. That going to the south is diverted to the east level, and that to the north is for the north and west workings, and, as I have said, the south side is ventilated from No. 3 pit. When I was down in December I found that there were 130,400 cubic feet of air passing per minute, with a velocity of 1,450 feet per minute, and this was for 196 men and 18 mules. The mine is free from coal dust, but in some places they have a regular system of pipes to put water on, where or when it might be required.

"In addition to the manager there is a general superintendent, and the overman and fireman, besides a staff of shot lighters, to examine and see that everything is safe before a shot can be fired, and also to examine the place after the shot is fired, to see that the place is safe, and to give instructions if it is otherwise. The staff use safety lamps only, and in the absence of the overman have all the power that is necessary to have everything that may be found or appear to be dangerous made safe. There is now very little gas to be found in this mine.

"*No. 5 Pit, Wellington Colliery.*—As mentioned in a previous report, this is the only mine of the Wellington Colliery that has connection with the Esquimalt and Nanaimo Railway, by which the principal part of this famous coal which is used in Victoria finds its way to the market. To this mine Messrs. Dunsmuir & Sons have also an extension of their own railway system in connection with their shipping point at Departure Bay.

"In this pit, as in the other mines of this colliery, the men have been working steadily the most of the year, except a day occasionally during the past two months.

"This is a very extensive mine. The coal is brought to the shaft from the east by a level, from the north by a slope, and from the south and west by a self-acting incline. In the east the coal is mined on the pillar and stall system: in the slope it is longwall, and in the south

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and west incline all the mining is at the pillars (coal) which contains fully one-half of the whole which was in the district. In the longwall, down the slope, there is a long face working of about half a mile in one stretch, all good coal, without a fault of the smallest kind, and from four and a half to eight feet thick, so that in all the districts of this mine it never looked better nor had as good an opening for taking out coal as there is now.

"Ventilation is very good. Motive power, a large fan on the upcast shaft driven by a steam engine. When I was down, in December, I found that there were 112,222 cubic feet of air passing for the use of 197 men and 19 mules; fan making 99 revolutions per minute; water gauge $\frac{8}{10}$ of an inch. This mine is ventilated on the separate split system, the three main divisions being at the bottom of the shaft, to the east level, 35,340 cubic feet per minute, which is again split away further in the level, for the use of 70 men and 10 mules. There were 32,860 feet per minute going down the slope, this being also divided into two currents down the slope, and being for 80 men and 3 mules. In the south incline and west level there were 44,020 cubic feet circulating per minute, for 47 men and 6 mules. In this division it will be observed, that there are the least men, but most air passing. That is owing to the fact that all the mining being done here is at the pillars (coal) and sothat all the caves from the roof may be kept clear. There is very little gas now found here, but occasionally it is seen in the longwall workings, when there is a fall of rock, and then not often, as there is a strong air blowing along the face. This mine is also free from coal dust.

"In addition to the overman and fireman, there is a staff of shot lighters and examiners in each district. These men have to be in all the places at different times every shift, so that very little that happens can escape their notice. They cannot be long in one place unless something special requires them to stay.

"*No. 6 Pit, Wellington Colliery.*—This pit is mentioned in a previous report as being about 900 yards east of No. 4 pit, yet the workings of the two mines are quite close to each other, leaving a solid strip of about 40 yards, as it is not intended that the two should be connected. This will be an extensive mine, there being a very large area of ground solid in coal to be taken out. Coal is hard, and of the usual good quality of the Wellington seam, varying in thickness from four to eight feet. There is much of this mine worked on the pillar and stall system, which works well; but there are two other districts where longwall is found to work well, and this is the favourite work of this mine for getting coal.

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"Ventilation is very good, and on the separate split system; there are five separate splits in the air, all of them near to the bottom of the shaft, three on the east and two on the west side from the shaft, and the air is well conducted to the face of the pillar and stall working, by brattice and otherwise. In the longwall works the air goes along the face, some escaping at each road, is caught when it gets to the face; this keeps the roadway free from any impurities. In December last, when I was down, there were 75,000 cubic feet of air passing per minute. The motive power of this is a fan on the same shaft as the coal is hoisted from, there being a tight partition in the shaft, and one-half of the shaft being the intake and the other the exhaust.

"The air passing as above per minute is for the use of 130 men and 8 mules. There is very little gas found in this mine, but what is found comes mostly from the roof in the longwall, when it breaks up in holes.

"This pit is now connected and has a travelling road to No. 5 pit; the connection is only in one place; and there are doors, so that one pit cannot injure the other by taking away the air; both being independent, except the travelling road.

"This mine is free from coal dust; it is not what can be called a wet mine, and yet it is not dry.

"*No. 2 Slope, Wellington Colliery.*—There has not been any work done here during the past year.

"*Alexandra Mine.*—This mine belongs to Messrs. Dunsmuir & Sons, and is about one mile south of the Southfield mine of the New Vancouver Coal Company's Nanaimo colliery. There has not been any work done here during the last year, but I have been informed that it is expected something will be done with this place in the spring.

"*East Wellington Colliery.*—This colliery belongs to the East Wellington Coal Company, and comprises two shafts.

"In No. 1 pit only a few men are mining coal, and that is near to the No. 2 pit. The coal is of excellent quality, hard, but thin for what is known as the Wellington seam. The coal on the west side of this shaft is getting well worked out. On the east side, or what is called the east level, there has not been any regular vein of coal yet, but they are working in the place where the coal should be, and there are yet good hopes that there will be good coal got in this side, which is where the larger area of the company's land is situated, and the expectation is that it will in the near future prove to the company that it is the most valuable part of their property in this district.

"*No. 2 Pit, East Wellington.*—In this pit they have been working steadily all the year, except when repairs have been needed. Coal is good and is in full demand in the San Francisco market.

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"This mine, as well as the No. 1 mine of this company, is worked on the longwall system, although the roof is very soft, and the coal has been considerably broken, which makes it very difficult to work. There is quite a large body of coal in sight, with narrow roads run into it. Some of the places look well, and it is hoped that these prospects will not disappoint the fair expectations raised by them, as the company and its management have been persevering and pressing forward, and are highly deserving of success.

"Ventilation is good. Motive power a fan, erected near the top of No. 1 pit, which is the up-cast for both No. 1 and No. 2 pits. When I was down in December I found there were 20,000 cubic feet of air passing per minute for the use of 35 men and 5 mules. This current is split at the bottom of No. 2 shaft; 5,000 per minute going to those in the west side, and 15,000 to the east side, but both connect and go in one volume to the No. 1 pit. This being longwall working, the greater part of the air goes along the face, the remainder escaping at the roads and keeping them clear. There is very little gas seen in this mine, there not being much chance for it to collect, the old works being well filled in nearly every particular, and every precaution is taken to prevent accidents of any kind. In addition to the manager and overman, there are three firemen, one on each shift of eight hours, going about the works. As there are not many miners working the fireman can see all the places frequently during the day.

"*Union Colliery, Comox.*—This colliery belongs to the Union Colliery Company. The mines are only a few miles from the extensive farming settlement of Comox, with a good road thereto. There have been three mines on three veins here, but at present the company are working in two of the veins. The upper seam (or vein) comes out on the hill in the south side of the railway, and into this there are the Nos. 1 and 2 tunnels or adit levels. No. 1, the lowest one, is in about 600 feet; No. 2 is in about 1,000 feet. Coal is hard and of a good quality, and from two to three feet thick, with a strong sandstone rock for a roof. This is mined on the longwall system, making very safe workings.

"Ventilation very good. Motive power a furnace; the air going in both tunnels and returning by the way of the face of the workings. There has not been any gas found in this mine, and it is free from dust.

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"*No. 1 Shaft, Union Colliery.*—There is nothing being done here at present, and there has been very little done during the past year.

"*No. 1 Slope, Union Colliery.*—This slope is mentioned in a previous report as down about 700 yards. There are three levels from this slope to the north side. The coal here is of good quality and very hard, but they are much troubled with faults, although it is improving as they go north, and now it varies in thickness from three to seven feet. This is worked on the pillar and stall principle; some of the places are very soft, and in other places it is very strong.

"Ventilation good. Motive power a fan on Murphy principle, driven by a steam engine. This mine is ventilated on the separate split system, the intake being the slope, afterwards it is split into two divisions, one for No. 4 level and the other for No. 3; after going round the working places it again gets into one volume and goes along the air-way and out at the up-cast shaft. When I was down in December I found that there were 23,400 cubic feet of air passing in this mine per minute, for the use of 70 miners. The mine gives off some gas, as the roof is soft in some places and it falls out, leaving a hole, and those are the places that give the trouble. There is a fireman on each shift to examine and attend to the safety of the mine, in conjunction with the overman. There is no dust in this mine, it being wet throughout.

"*No. 4 Slope, Union Colliery.*—This is the new mine mentioned in my former report as No. 2 slope, and then just getting opened out. This is now down about 400 yards. The coal is of varied thickness, from five to eight feet for the whole distance.

"The coal is very hard and of good quality; in texture it resembles Wellington coal. The engineer of one of the large steam-ships that load here informed me that it gave better results than any coal he has used on the coast. At the face of the slope just now the coal is seven feet thick and hard, proving a most valuable piece of property to the company. This mine is worked on the pillar and stall system, the works being to both sides of the slope. They are now taking about 400 tons of coal per day from this mine.

"Ventilation is very good, and on the separate split system. The laying out of the mine is very well arranged for proper ventilation; motive power is a fan. In December, on my inspection, there were 39,200 cubic feet of air passing per minute, the fan running slow, for the use of 100 men. The mine is free from dust. There is no gas in the mine.

"From what the management know, by a series of bore-holes, great work is expected from this place, and no expense is spared to put it in first-class order.

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"There is a large trestle work from the entrance of this mine, rising gradually until it gets to the height required; then there is quite a long flat place where the cars that come out of the mine can stand, so that little energy is used to make them go either way. The car dumping or tipping appliances here are the finest and easiest on coal, so as not to break it, of any in the province, and quite a mechanical invention. The loaded car goes on to the tipper just enough to let the coal out, when it comes back again to the level and the next car comes along, sends the first car over the machine and gets on to a lower level, then runs back nearly to the top of the slope, or far enough to fill in when there is a train of them. The connection between the hoisting and tail ropes seems to work to perfection, one or two men being able to handle all the coal that can be brought from the mine. At this mine there is also a large double winding engine, specially constructed and geared to double drums, which is the mode used here and seems to work very well. The steam engine and machinery for both the tipping and hauling came from the Eastern States.

"In this mine the company have introduced, and have been working for the past five months, coal mining machinery from the Jeffrey Manufacturing Company, Columbus, Ohio; operated by electricity. With the exception of the coal mining machines, the engines, dynamos, and all other appliances are out on the surface about 300 feet from the entrance of the mine; the connection being made to the mine by heavy wire, which is easily connected to the coal mining plant, of which there are four different motors with coal cutters. Either one or all four can be used as required, and at any place, just to suit where work is wanted to be done. They do good work, and, what is about the hardest to do, viz., undermining, this being the work that they are made for. The machines, when at work, stand end on to the face of the coal, with the cutter bar three feet three inches long; this at regular distances from each other is set with teeth, so that there is four inches cut, neither more nor less. After the machine is set in motion, in four minutes it has undermined a hole close to the floor three feet three inches wide, six feet in the face and four inches high; when it has done this work it comes out again, and then it is put over for another cut, which takes about five minutes, and so on until the place is all undermined, when a shot in each corner will bring all the coal down that is undermined. About one of the best day's work that one of these machines has done here was to undermine ninety feet long and six feet deep; this must have been a great saving in powder and coal, not to say anything in the saving of labour.

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"*Tumbo Island Coal Mining Company.*—The island of the above name is situated at the south-east entrance of the Straits of Georgia, and about two miles north-west of East Point Lighthouse. There has been but little work done here during the past year. The old company have negotiated with another party, who has started in earnest and is now sinking a shaft on the south side of the island, this having been previously bored to the coal at the depth of 325 feet. It is hoped that the company will make a successful find in this valuable property. A colliery here will not be out of the way for steam-boats going between Victoria and the mainland, and would also be most convenient for the coaling of the China steam-ships, as they go close past, within hailing distance. A good colliery here would be a fine thing for the company having the same, and also for the province in general.

"*Nanaimo Colliery.*—Name of seams or pits—Southfield No. 2, Southfield No. 3, Southfield No. 5, No. 1 Esplanade shaft, and No. 1 Northfield shaft.

"Value of plant—$350,000.

"Description of seams, tunnels, levels, shafts, &c., and number of same—Southfield No. 2, worked by slope, seam 6 to 10 feet; Southfield No. 3, worked by shaft, seam 5 to 10 feet; Southfield No. 5, worked by shaft, seam 5 to 10 feet; No. 1 Esplanade shaft, worked by shaft, seam 5 to 12 feet; No. 1 Northfield shaft, worked by shaft, seam 4 feet 6 inches.

"Description of length of tramway, plant, &c.—Railway to Southfield, 6 miles, with sidings; railway to No. 1 shaft, 1 mile, with sidings; railway from Northfield mine to wharf at Departure Bay, 4½ miles; rails are of steel, 56 pounds per yard, of standard gauge, viz., 4 feet 8½ inches; 8 hauling and pumping engines; 15 steam pumps; 5 locomotives; 200 coal cars (6 tons), besides lumber and ballast cars; fitting shops for machinery repairs, with turning lathes, boring, drilling, planing, screw-cutting machines, hydraulic press, steam hammer, &c., &c.; diamond boring machinery for exploratory work (bores to 4,000 feet); wharfs, 1,070 feet frontage, at which ships of the largest size can load at all stages of the tide.

"*Wellington Colliery.*—Name of seams or pits—Wellington.

"Value of plant—$150,000.

"Description of seams, tunnels, levels, shafts, &c., and number of same—4 shafts with slopes, air-ways and levels; 3 air shafts; 1 shaft sinking.

"Description and length of tramway, plant, &c.—5 miles of railway, with sidings and branches; 6 locomotives; 250 coal cars; 13 station-

ary engines; 9 steam pumps; 4 wharfs for loading vessels; and bunkers. COAL. Discovery and development. —British Columbia.

"*East Wellington Colliery.*—Name of seams or pits—East Wellington Coal Co.'s Nos. 1 and 2 shafts.

"Value of plant—$100,000.

"Description of seams, tunnels, levels, shafts, &c., and number of same—1 seam, 2½ to 7½ feet; 2 shafts; 7 levels.

"Description and length of tramway, plant, &c.—4½ miles standard narrow gauge; 2 locomotives; 31 (4½-ton) coal cars; 2 hoisting engines; 2 donkey engines; 1 steam pile driver; 1 steam saw-mill, capacity 12,000 feet per day; 5 steam pumps.

"*Union Colliery.*—Name of seams or pits—Union and Lake.

"Value of plant—$100,000.

"Description of seams, tunnels, levels shafts, &c., and number of same—Nos. 1, 2, and 4 slope, with air-ways and levels; Nos. 1 and 2 tunnels.

"Description and length of tramway, plant, &c.—12 miles of railway, 4 feet 8½ inches gauge; 4 locomotives; 100 coal cars, 25 tons each; 1 diamond drill; 3 stationary engines; 3 steam pumps; 1 steam saw-mill; 2 wharfs; 1 pile hammer."

Apart from the coal production of the above described districts, the coal of the interior was mined in the Tertiary rocks of the Nicola Valley. This was a very small amount and was for local consumption only. Nicola Valley

Attention has been directed, however, and a great deal of interest taken in the coal occurring in the vicinity of the Crow's Nest Pass, which crosses the divide between the province and the Territories. To this place the director of the Geological Survey paid a visit of inspection in July, the results of which he gives as follows :— Crow's Nest Pass.

"On the 30th of July we camped at Lee's Lake, on the Crow's Nest Pass trail. On the 31st Col. Baker joined me here, and on the following day we camped at the east end of Crow's Nest Lake, and on the next day, 2nd of August, we reached the coal prospecting camp situated about 1,200 feet above the trail, on the ridge which runs in a north-easterly direction between Marten Creek and Michel Creek and forms the west side of the valley of the west branch of Michel Creek. From this ridge a number of spurs with steep intervening gullies descend abruptly to the trail; in these and on the intervening ridges a wonderful series of coal seams is disclosed, one above the other from near the level of the trail to the summit of the ridge.

COAL. Crow's Nest Pass.

"No exact measurements were taken and it may be that some of the lower cannel seams are the upper ones repeated by faulting. The outcrops which can all be seen on the ground are as follows, twenty seams in all, showing a total thickness of 132 feet of coal :

	Feet.	
No. 1	5	No. 1 to 10 inclusive are cannel coals.
2	3	
3	4	
4	2	
5	4	
6	3	
7	2	
8	4	
9	5	
10	6	
11	4	
12 (Peter seam)	15	
13	7	
14 (Selwyn seam)	6	So named by Col. Baker.
15 (Jubilee do)	30	
16 (Williams do)	20	
17	5	These four are cannel coal.
18	3	
19	2	
20	2	
	132	

"The number and thickness of these seams in the above table are as supplied me by Mr. Fernie, who has superintended all the exploratory work that has been done on the seams. Between the most eastern outcrops I examined, and the western ones close to the junction of Marten Creek and the west branch of Michel Creek, is a distance of about two miles along the steep mountain side, to the north of the trail. Within this distance the outcrops were seen of nearly all these seams, either on the ridges or in the sides of the ravines which score the face of the mountain. The few hours I was able to spend on the ground, while not sufficient to enable me to affirm the absolute correctness of the details of the table, were, however, ample to enable me to see that there is in the Crow's Nest pass, between the eastern summit, 4,330 feet above tide, and the valley of Elk River, in British Columbia, an area of not less than 144 square miles, that is destined to be one of the most valuable and most productive coal fields in Canada. A rough calculation would give about 49,952,000 tons per square mile. If one-half of this is available, there are in each square mile 24,976,000 tons. The average elevation of the field is about the same as that of Canmore and Banff, or between 4,000 and 5,000 feet. From

Pincher Creek westward to Elk River, the pass presents no difficulties for railway construction. The eastern entrance to the pass in Alberta is 3,800 feet, and where it comes out on the Elk River is 3,300 feet; the highest intervening summit being 5,500 feet. A better route to the Elk River, however, than that of the present trail, would be to follow down Michel Creek, from near the eastern summit, and thus avoid the western and higher summit, and reach Elk River about ten miles above the mouth of Coal Creek. The distance through the pass from Lee's Lake, Alberta, to the Elk River, is about thirty-seven miles. COAL. Crow's Nest Pass.

"On the 4th of August, after devoting the forenoon to a further examination of the Marten Creek seams, we proceeded through the pass and reached Elk River at 6 p.m. No coal seams were seen till about four miles above the mouth of Coal Creek; here at the mouth of a steep rocky gully, about 200 yards to the right of the trail, a fine seam of coal, 7 feet thick, had been cut into. The section exposed showed in descending order:

Shale	10	feet.
Hard ferruginous band	1	
Coal	1·6	
Shale	7·6	
Coal	7·6	

"Cherty conglomerate and massive gritty sandstones are seen both above and below; the dip is about E. 10° N. 15°—20°. A close search along the mountain side, between here and the water-shed at the head of Coal Creek, would almost certainly disclose the outcrops of many more of the Marten Creek seams.

"On the 5th of August, we descended the Elk River valley, about seven miles, then turning to the left ascended the mountain, a steep climb of 1,500 feet. Here on top of a broken-down cliff of massive sandstone, about 50 feet thick, we came to the first of a series of coal seams; the dip being E. 20° N. 35° and the seam 25 to 30 feet thick, with a shale parting about 2 feet; bar. 24·93. Ascending 130 feet over shales and brown thick-bedded sandstone forming a similar broken-down cliff of about 50 feet, a second seam of coal was reached, also 30 feet thick; bar. 24·80. Above this four more seams were examined:

No. 3	15 feet,	bar.	24·57
4	4 do	do	24·50
5	7 do	do	24·42
6	30 do	do	24·35

COAL. Crow's Nest Pass.

"Above No. 6 there are six more seams which were not visited, but the particulars of which given me by Mr. Fernie are as follows :—

No. 7.....	10	feet—	100	feet from	No. 6
8.....	4	do	100	do	7
9.....	7	do	100	do	8
10.....	2	do	100	do	9
11.....	7	do	100	do	10
12.....	4	do	200	do	11

"The distances are approximate only, they have not been measured.

"The above gives a total thickness of 148 feet of coal against 132 feet in the Marten Creek area on the eastern side of the basin, while in other respects the seams correspond so closely as to make it almost certain that, except where cut out in the valleys, they are continuous beneath the whole intervening area. For much detailed information respecting the Crow's Nest Pass the Annual Report of the Geological Survey, Vol. I., part B., 1885, already cited, and the accompanying map, can be referred to.

"Many of the seams are first-class coking coals, and others are good gas coals, but none of them are anthracites. For analyses of those of the Jubilee and Peter seams, Marten Creek, see Annual Report Geological Survey, Vol. III., part II., pp. 12 s. to 15 s., and for those of the 'cannel' seams, Vol. IV., pp. 7 R. and 8 R.

"On the 6th of August I reached Pincher Creek, and Ottawa on the 14th."

Coke.

Coke.

In this industry there is little new to report. The production, viz., 57,084 tons, valued at $175,592, shows a slight increase over the figures of last year, which were 56,450 tons and $166,298 respectively. This all represents oven-coke and, as in former years, is all the production of the province of Nova Scotia.

Although slight, there has been a steady growth in this industry, as shown by the subjoined figures for past years, obtained from direct returns to this office :—

1886.....	35,396	tons,	valued at	$101,940
1887.....	40,428	"	"	135,951
1888.....	45,373	"	"	134,181
1889.....	54,539	"	"	155,043
1890.....	56,450	"	"	166,298
1891.....	57,084	"	"	175,592

Most of the product represented by the above figures, is used in the iron smelting industry.

The following table, No. 1, gives, as stated, the imports of oven-coke only, but besides this, the books of the Customs Department show an importation of a small amount of gas coke to the extent of 494 tons, valued at $1,934. This would represent a home consumption of 96,111 tons, apart from the large and unknown quantities of gas coke, resulting as a by-product from the manufacture of illuminating gas throughout the country. COAL. Coke.

COKE.

TABLE 1.

IMPORTS OF OVEN COKE.

Fiscal Year.	Tons.	Value.
1880	3,837	$19,353
1881	5,492	26,123
1882	8,157	36,670
1883	8,943	38,588
1884	11,207	44,518
1885	11,564	41,391
1886	11,858	39,756
1887	15,110	56,222
1888	25,487	102,334
1889	29,557	91,902
1890	36,564	133,344
1891	38,533	177,605

COPPER.

PRODUCTION.

In the matter of the production of this metal in the Dominion there is little new to report. The total amount is made up as under, viz. :— COPPER. Production.

	Lbs.
Quebec	5,401,704
Ontario	3,527,217
	8,928,921

This amount, taken at 13 cents per pound, which was the average market price for the year, gives a value of $1,160,760. As compared with last year'sfigures, viz., 6,013,671 pounds and $902,050, there is shown a considerable increase, over 46 per cent in the one case and over 28 per cent in the other. The lesser increase in the values is due to a lowering of the average price for the present year of two cents per pound as compared with 1890. The amount of the total, as given above, represents, as in former years, the copper contents of the sul-

COPPER. Production.

phuretted ores mined in the Eastern Townships of Quebec and of the nickeliferous pyrrhotite of the Sudbury district. The basis of valuation adopted has, as formerly, been the average market price of Lake copper for the year, but whilst it is manifestly best in illustrating the annual realization of the mineral resources of the community to conform thus to a uniform and definite standard of valuation for the metallic products, it must be borne in mind that the actual value to the producer is much below this and dependent upon the state of concentration in which he ships his product, its more or less refractory nature, etc. Thus for the same district different operators may ship very varying grades of material, raw ore, partly concentrated material, or, in some cases, the final metallic product itself, and further, the policy of the individual operators themselves is being constantly changed in this respect.

DISCOVERY AND DEVELOPMENT.

Discovery and development.

There is little or nothing new to note in this respect, the condition of the industry continuing much the same as last year.

Nova Scotia.

NOVA SCOTIA.—In Nova Scotia work was continued at the Coxheath copper mine, working sulphuretted ores of the metal, the particulars of which are given in the report of the Department of Mines for that province as follows:—

"There is little new to report. A lease to work copper ore at Brierly Brook was applied for by B. G. Gray and J. A. Grant.

"At Coxheath a good deal of work was done. The following will give an idea of the increased value shown by last season's operations at this important mine:—

"The principal mining development at the Coxheath mine during the year has been the sinking of No. 2 shaft to the 320 feet level; at that depth a cross-cut was driven to the north, which cut the 'B' vein at 89 feet from the centre of the shaft, which is about the same distance from the shaft at which this vein was encountered in the 250 feet level; the hanging wall was cut at 141 feet from the shaft. The main ore body in the vein is about 17 feet in width, and the ore averages in quality fully as high grade as in the upper levels; low grade ore is scattered through the remainder of the vein on this level, and the outlook is certainly encouraging for values entirely out of the usual order. The company intend to sink this shaft to the 400 feet level before hoisting ore for market.

"On the New Mountain vein, No. 3 shaft was sunk to its first level at 100 feet, but the vein was not driven upon when operations closed

for the season. This vein is of great promise, and several other explorative pits were sunk on it at various points, with good results; and the surface work has located the point of junction of this vein with vein 'B' at a location about 1,700 feet easterly from No. 3 shaft, and 1,300 feet easterly from No. 2 shaft. COPPER. Discovery and development. —Nova Scotia

"A new residence has been erected for the mining captain and staff, and a grade crossing of the Cape Breton Railway been granted by the Dominion authorities.

"On the Argyle area work was confined to additional surface prospect work. In August the mine was visited and reported upon by Geo. Grant Francis, M.E., of London, and Mr. Walter Ingalls of the staff of the 'New York Engineering and Mining Journal;' at that time it was estimated that the ore on the dumps amounted to about 3,000 tons, with a total amount of ore in sight of 42,732 tons; since then the cutting of 'B' vein on the 320 feet level has increased the ore in sight to about 50,000 tons.

"The following is the labour return for 1891:

	Days.
Skilled labour, underground.....	5,941
Unskilled " "	3,867
Skilled " overground.....	2,930
Unskilled " "	4,492
Coal teamster, &c.....	1,249
"Total	18,679

"During the year Mr. Peters visited the mine and perfected plans for concentrating and smelting works. As usual, the work at the mine has been lessened during the winter, but it is hoped that in the spring the construction of the railway will be proceeded with."

QUEBEC.—Development and production has been continued on the same lines as those of last year by the same firms and companies operating the mines at Capelton and Eustis and the Howard and Moulton Hill mines. At the two latter the work was largely of a developmental nature, as it was also at the Harvey Hill mine, near East Broughton, on the Quebec Central Railway. The Excelsior Copper Co., formerly operating this mine, has been reorganized, and is now known as the Leeds Copper Company (Limited). Active operations at this point were suspended late in the year. Quebec.

NEW BRUNSWICK.—In this province, outside of various reports of discovery of copper-bearing veins, about which no further details are to hand, there is nothing to report. New Brunswick.

COPPER.

Discovery and development. —Ontario.

ONTARIO.—As stated above, the copper shipped from this province is contained in the matte and other products resulting from the mining of the nickel ore deposits at Sudbury. As thus contained in the matte produced, its spot value is, of course, far below its market value when finally extracted from the same. As, therefore, it does not as yet suit the arrangements of the producers to push the process of extraction in Canada to its final end, the price obtained by them for the copper will be very low. One of the large operators explains to us that its value in this association will not be more than from 4 to 6 cents per pound. Taking them on an average of 5 cents, the spot value of the copper produced in Ontario will be $206,385.

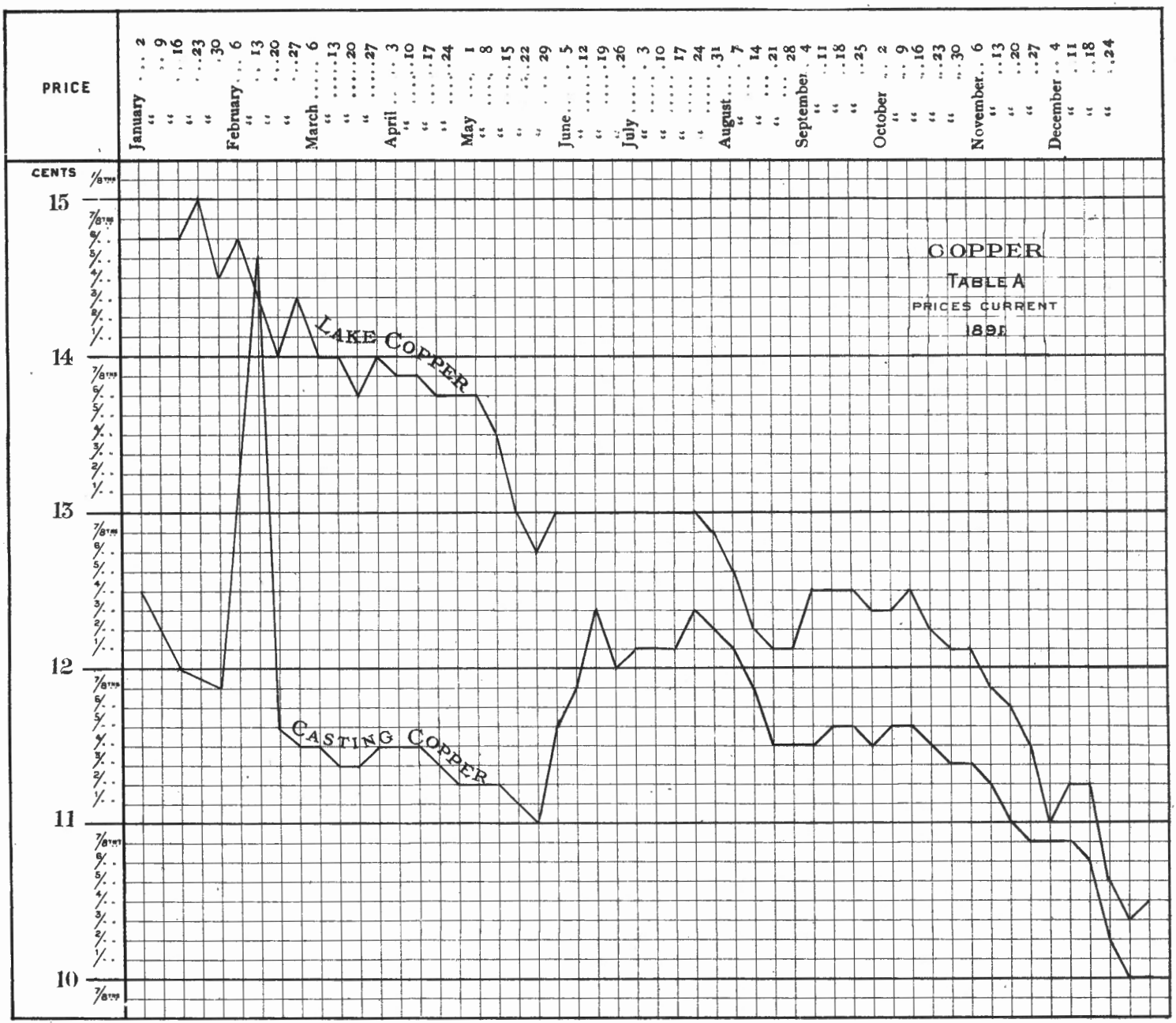
Outside of the productive operations above alluded to, the ordinary amount of sporadic prospecting has been carried on in the province, a specially interesting feature being the start made in the fall to further test the native copper-bearing rocks of the Keeweena formation at Mamainse, about 40 miles north-west of Sault Ste. Marie, on the east shore of Lake Superior. Here a small force of men has been placed with the necessary machinery and provisions for some months' work.

British Columbia.

BRITISH COLUMBIA.—From this province news continues to come in of new discoveries of veins carrying sulphuretted ores of copper, generally intermixed with galena, and of further test works prosecuted upon similar veins found in the last few years, which ores being argentiferous, particulars of the work done are given in the article on "Precious Metals."

Great interest centres in the Kootenay district, in which these veins are mostly located, and whilst the progress made towards establishing the mines upon a complete and profitable basis has not been so rapid as could be wished, still the opening up of the country by the various contemplated lines of railway can hardly be much longer delayed, when the realization may be fairly expected of the bright hopes entertained for the success of this section of the country, and a considerable addition can be expected to Canada's annual production of copper.

Outside of the Kootenay district, some interesting finds are reported in the report of the Minister of Mines for the province, one in the Similkameen district, where three veins of "peacock copper ore" have been located on Friday Creek, a tributary of the Similkameen River. On one claim a tunnel 100 feet long has been driven, at the end of which the vein is reported six feet wide. Over $1,000 have been spent on these three claims during the season. Other discoveries are alluded to situate on Copper Creek, which empties into Kamloops Lake about three miles east of Savona. "Some splendid samples of


PRICE
January 2 9 16 23 30
February 6 13 20 27
March 6 13 20 27
April 3 10 17 24
May 1 8 15 22 29
June 5 12 19 26
July 3 10 17 24 31
August 7 14 21 28
September 4 11 18 25
October 2 9 16 23 30
November 6 13 20 27
December 4 11 18 24
CENTS
15
14
13
12
11
10
LAKE COPPER
CASTING COPPER
COPPER
TABLE A
PRICES CURRENT
1891

native copper have been taken from them, but sufficient work has not been done to determine the importance of the deposit." COPPER.

MARKETS AND PRICES.

Markets and prices.

The accompanying graphic table "A" shows the fluctuation in the price of this metal, which, compared with last year, shows a continuation in the fall in price which began in the middle of November in that year.

Most of the copper products shipped from Canada go to the United States, a smaller proportion going to Great Britain. With regard to the nickel copper mattes shipped from Sudbury, the difficulties regarding the economical separation of the metals experienced by the refiners by late discoveries and methods adopted seem now to be largely removed; alluding to which fact the *Engineering and Mining Journal* of New York points out that owing to this "and the new and larger markets found for the nickel, the large development of these great Canadian deposits may be expected. The large purchases of nickel mattes by the United States Government for use in making armour plate has been a great advantage to the Canadian producer, even though the price he realized was far below any figure heretofore quoted."

Exports.

In the following tables will be found the figures of exports and imports as returned to the Customs Department:—

COPPER.

TABLE 1.

EXPORTS.

Year.	Ontario.	Quebec.	Total.
1885	.....	$262,600	$262,600
1886	$16,404	232,855	249,259
1887	3,416	134,550	137,966
1888	.....	257,260	257,260
1889	.....	168,457	168,457
1890	2,219	396,278	398,497
1891	64,719	283,385	348,104

COPPER.
Imports.

COPPER.

TABLE 2.

IMPORTS: PIGS, OLD AND SCRAP.

Fiscal Year.	Pounds.	Value.
1880	31,900	$ 2,130
1881	9,800	1,157
1882	20,200	1,984
1883	124,500	20,273
1884	40,200	3,180
1885	28,600	2,016
1886	82,000	6,969
1887	40,100	2,507
1888	32,300	2,322
1889	32,300	3,288
1890	112,200	11,521
1891	107,800	10,452

COPPER.

TABLE 3.

IMPORTS: MANUFACTURES.

Fiscal Year.	Value.
1880	$123,061
1881	159,163
1882	220,235
1883	247,141
1884	134,534
1885	181,469
1886	219,420
1887	325,365
1888	303,459
1889	402,216
1890	472,668
1891	563,522

GRAPHITE.

PRODUCTION.

GRAPHITE.
Production.

In last year's report much was said about Canadian graphite and graphite deposits, which it is unnecessary to repeat. With all the numerous known occurrences of the mineral in the Laurentian rocks of the Dominion, but little was done during the year in the way of development and discovery.

Altogether there was only a production of 260 tons, valued at $1,560. GRAPHITE. Production.

The production of back years was as follows:—

1886	500	tons, valued at	$4,000
1887	300	" "	2,400
1888	150	" "	1,200
1889	242	" "	3,160
1890	175	" "	5,200
1891	260	" "	1,560

From this it will be seen that the industry has never been extensive and is carried on in a very desultory manner.

DEVELOPMENT AND DISCOVERY.

NEW BRUNSWICK. The province of New Brunswick was visited by Mr. Brumell and information was obtained regarding development and discovery as follows:— Discovery and development.—New Brunswick.

"*St. John.*—W. F. Best *et al.* of this city are operating on the Hazen property on a continuation eastward of the vein operated until recently by S. S. Mayes. The vein, which is north-east of and near the Cantilever Bridge at St. John, lies at the contact of the crystalline limestone and a trap dyke or mass, and strikes N. 60° E.

"The vein at this working does not show on the surface, but was struck at a depth of 8 feet, where it started in about 2 inches wide. The shaft is now down 50 feet, at which point a level is run 14 feet to the east on the vein, which is 8 or 9 feet wide, divided in the centre by a "horse" of trap about 2 feet wide. The "horse" was found at 30 feet from the surface, and extended to 50 feet, where it disappears; what its lateral dimensions are is not known. The hanging wall of the vein shows a dip of 55° S. The shaft is very free from water, one man with a hand-pump being sufficient to keep it clear; the owners, however, intend putting up steam hoisting gear and pump. The graphite is sometimes associated with pyrite, which, however, breaks away easily, leaving the ore exceptionally pure. Price, f. o. b., $7 per ton.

"*Thorn Brook, N.B.*—On the land of Chas. McAlpin, on the east side of Thorn Brook, is a deposit of earthy graphite. The deposit is about 20 feet wide, striking north-east, and is in altered slates, which are very much jointed and broken up. The graphite is nowhere very solid where exposed, but can readily be dug with pick and shovel. It is said the deposit can be traced for over a mile on the strike of the vein."

GRAPHITE.
Discovery and development. —Quebec.

QUEBEC.—In Quebec new discoveries of graphite are reported from near Quebec city, and from lot 11, range 2, in the township of Lathbury, Ottawa county.

Walker Mine.—The Walker mine, in Buckingham township, Ottawa county, which was the chief centre of operations in 1890, has not been regularly worked, owing to financial troubles which obliged the operators to discontinue work on the mill then in process of enlargement.

Weart Mine.—Operations were being carried on in the same township near Plumbago Lake, on the old Pew and Weart's lots. Here work is being prosecuted upon what would appear to be a belt in the rusty gneisses of the vicinity, impregnated with graphite. The material mined is thus what is known locally as "disseminated ore," from the mineral occurring disseminated through the rock, as distinguished from the solid form of graphite filling the fissures often found cutting the formation. The works are operated by Mr. Jacob Weart, of Jersey City, N.J., U.S.A., the property comprising N. $\frac{1}{2}$ lot 26 in Range V., lots 25, 26 and 27 in Range VI., and the S. $\frac{1}{2}$ of lots 25 and 26 and lot 28 in Range VII. These lots have long been held for graphite, and some small amount of work was done in 1870, but they have been idle since then until this year, when operations were inaugurated for further development. These comprise the erection of the dwellings, offices and other buildings necessary to carry on operations, including a large mill-building, in which the graphite is separated from the associated rocky matter by the Napenberger process. This is a secret process, dependent, however, in general, upon the method of separating by air currents and the bolting of the crushed and powdered material. Previous to this stage in the treatment, the ore is roasted or burnt in a kiln, very similar to the common lime kiln, and then, passing through a Blake crusher, is finally reduced to powder in a corncracker. The object of the preliminary roasting is to render the rock more friable, a result so far attained, that it is claimed a small corncracker, costing $25, will put through 20 tons per day of the burnt ore.

The mining operations consist mostly of a number of strippings of the rock and shallow parts, together with one open cut about 50 feet long, 25 wide, and 40 deep into the side of a hill. These openings, some seven in all, are spread over an area measuring about 500 by 400 feet, and show the presence of the graphite in the rock exposed. The developments so far made, whilst not extensive enough to demonstrate the width of the belt, nor the length along its strike, for which it is graphitic, prove the existence of a satisfactory extent of ore ground.

A large dyke of columnar trap cuts the rocks in the vicinity of the pits. The property is being worked by the owner, chiefly for the purpose of supplying his own factory in the United States with suitable graphite, for use in the manufacture of his patent self-lubricating bushings. These are metal bearings for buggy axles, wind-mills, and for the moving parts of any other machinery. The requisite lubrication is effected by the graphite, which is compressed into spiral grooves on the inside of the bearings. As these uses do not call for very large quantities, the mine will only be operated for short periods, as necessity arises, unless the general demand for the material justifies more extensive and continuous work. The graphite required for the above-mentioned lubricating purposes, must be very pure, fine, and tenacious, in which latter quality, it is stated, the graphite of this mine excels the Ceylon material, which is too soft and friable for the purpose.

GRAPHITE.

Discovery and development.

EXPORTS AND IMPORTS.

As shown in tables Nos. 1, 2 and 3 below, there was a total exportation of $72 worth of this mineral, the value of the imports, apart from such highly manufactured articles as lead pencils, amounting to over $41,000.

Exports and Imports.

GRAPHITE.

TABLE 1.

EXPORTS.

Year.	New Brunswick.		Ontario.	
	Cwts.	Value.	Cwts.	Value.
1886.....	8,142	$3,586	.....	.....
1887.....	6,294	3,017	.....	.....
1888.....	2,700	1,080	.....	.....
1889.....	660	422	22	$116
1890.....	400	160	329	1,369
1891.....	464	72	.....	.....

GRAPHITE.
Imports.

GRAPHITE.

TABLE 2.

IMPORTS OF RAW AND MANUFACTURED PLUMBAGO.

Fiscal Year.	Plumbago.	Manufactures of Plumbago.
1880	$1,677	$2,738
1881	2,479	1,202
1882	1,028	2,181
1883	3,147	2,141
1884	2,891	2,152
1885	3,729	2,805
1886	5,522	1,408
1887	4,020	2,830
1888	3,802	22,604
1889	3,546	21,789
1890	3,441	26,605
1891	7,217	26,201

GRAPHITE.

TABLE 3.

IMPORTS OF BLACKLEAD.

Fiscal Year.	Value.
1880	$18,055
1881	26,544
1882	25,132
1883	21,151
1884	24,002
1885	24,487
1886	23,211
1887	25,766
1888	7,824
1889	11,852
1890	10,276
1891	8,292

GYPSUM.

GYPSUM.
Production.

The total quantity of gypsum mined and marketed in the Dominion during 1891 was 203,605 tons valued at $206,251, showing a decrease in quantity of 22,904 tons, while the value has increased $12,218. The production is, as in former years, altogether that of the provinces of Ontario, Nova Scotia and New Brunswick, as may be seen on reference to the following table :—

GYPSUM.

TABLE 1.

PRODUCTION BY PROVINCES.

GYPSUM. Production.

Provinces.	Tons.	Value.
Nova Scotia.	161,934	$153,955
New Brunswick.....	36,011	33,996
Ontario	5,660	18,300
Totals	203,605	$206,251

The greater part of the above quantity was shipped in the raw state to the United States.

The amount of rock ground and sold as land plaster was 5,400 tons, having a net value in the manufactured state of $23,499, and of plaster of Paris, 61,370 barrels, or 7,671 tons, which would be equivalent to 9,590 tons of crude rock, the value of the finished product being $55,039. There is thus shown to have been 14,990 tons of crude rock manufactured in Canada, or about seven and a half per cent of the total output.

Besides ground and calcined plaster, a quantity of "Alabastine" and "Plastico" was produced by the Alabastine Company, of Paris, Ont., and a considerable quantity of rock suitable for the manufacture of "terra alba" was shipped by the Albert Manufacturing Company, of Hillsboro', N.B.

The following figures are those of production for the past six years :—

1886	162,000	tons, valued at	$178,742
1887	154,008	"	157,277
1888	175,887	"	179,393
1889	213,273	"	205,108
1890	226,509	"	194,033
1891	203,605	"	206,251

Discovery and development.

There is nothing new to report in the industry, the work being carried on by the same firms as in 1890, viz. :—In Ontario : The Alabastine Co., Paris ; Thos. Martindale & Co., Cayuga ; L. H. Johnson, Caledonia ; W. Donaldson & Co., Mount Healy ; Grand River Gypsum Co., Cayuga. In New Brunswick : The Albert Mfg. Co., Hillsboro' ; McQueen & Stewart, Andover ; Jas. Stratton, St. John ; E. W. Lyndes, Hopewell Hill.

GYPSUM.
Nova Scotia.

Of those operating in Nova Scotia no list can be given here, as our returns are not received direct from producers, but through the Department of Mines for that province.

The following tables illustrate the exports and imports for the year, and explain themselves:—

GYPSUM.

TABLE 2.

Exports.

EXPORTS OF CRUDE GYPSUM.

Years	ONTARIO.		NOVA SCOTIA.		NEW BRUNSWICK.		TOTAL.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
1874	.....	.....	67,830	$ 68,164	.....	.....	67,830	$ 68,164
1875	.....	.....	86,065	86,193	5,420	$ 5,420	91,485	91,613
1876	120	$ 180	87,720	87,590	4,925	6,616	92,765	94,386
1877	.....	.....	106,950	93,867	5,030	5,030	111,980	98,897
1878	489	675	88,631	76,695	16,335	16,435	105,455	93,805
1879	579	720	95,623	71,353	8,791	8,791	104,993	80,864
1880	875	1,240	125,685	111,833	10,375	10,987	136,955	124,060
1881	657	1,040	110,303	100,284	10,310	15,025	121,270	116,349
1882	1,249	1,946	133,426	121,070	15,597	24,581	150,272	147,597
1883	462	837	145,448	132,834	20,242	35,557	166,152	169,228
1884	688	1,254	107,653	100,446	21,800	32,751	130,141	134,451
1885	525	787	81,887	77,898	15,140	27,730	97,552	106,415
1886	350	538	118,985	114,116	23,498	40,559	142,833	155,213
1887	225	337	112,557	106,910	19,942	39,295	132,724	146,542
1888	670	910	124,818	120,429	20	50	125,508	121,389
1889	483	692	146,204	142,850	31,495	50,862	178,182	194,404
1890	205	256	145,452	139,707	30,034	52,291	175,691	192,254
1891	5	7	143,770	140,438	27,536	41,350	171,311	181,795

GYPSUM.

TABLE 3.

Imports.

IMPORTS OF CRUDE GYPSUM.

Fiscal Year.	Pounds.	Value.
1880	1,854	$3,203
1881	1,731	3,442
1882	2,132	3,761
1883	1,384	3,001
1884	.....	3,416
1885	1,353	2,354
1886	1,870	2,429
1887	1,557	2,492
1888	1,236	2,193
1889	1,360	2,472
1890	1,050	1,928
1891	376	640

GYPSUM.

TABLE 4.

IMPORTS OF GROUND GYPSUM.

GYPSUM. Imports.

Fiscal Year.	Pounds.	Value.
1880	1,606,578	$5,948
1881	1,544,714	4,676
1882	759,460	2,576
1883	1,017,905	2,579
1884	687,432	1,936
1885	461,400	1,177
1886	224,119	675
1887	13,266	73
1888	106,068	558
1889	74,390	372
1890	434,400	2,136
1891	36,500	215

GYPSUM.

TABLE 5.

IMPORTS OF PLASTER OF PARIS.

Fiscal Year.	Pounds.	Value.
1880	667,676	$2,376
1881	574,006	2,864
1882	751,147	4,184
1883	1,448,650	7,867
1884	782,920	5,226
1885	689,521	4,809
1886	820,273	5,463
1887	594,146	4,342
1888	942,338	6,662
1889	1,173,996	8,513
1890	693,435	6,004
1891	1,035,605	8,412

The market for gypsum in Canada will therefore be, as shown by the foregoing tables, equivalent to about 33,000 tons, as follows :— Home consumption.

Production	203,605	tons.
Imports, crude gypsum	376	"
do ground do	18	"
do plaster of Paris	518	"
	204,517	"
Less exports	171,311	"
	33,206	"

IRON.
Production.

IRON.

PRODUCTION.

The production of iron ore during 1891 shows somewhat of a decrease compared with that of 1890, the figures being 76,511 tons, worth $155,380, for the latter, as compared with 68,979 tons, valued at $142,005, for the former.

Nova Scotia still continues the main contributor, its production constituting over seventy-five per cent of the grand total, the rest being produced in the province of Quebec, with a small quantity from British Columbia.

The following table (No. 1) illustrates the course of the iron mining industry in the province of Nova Scotia :—

IRON.

TABLE 1.

NOVA SCOTIA: ANNUAL PRODUCTION OF ORE.

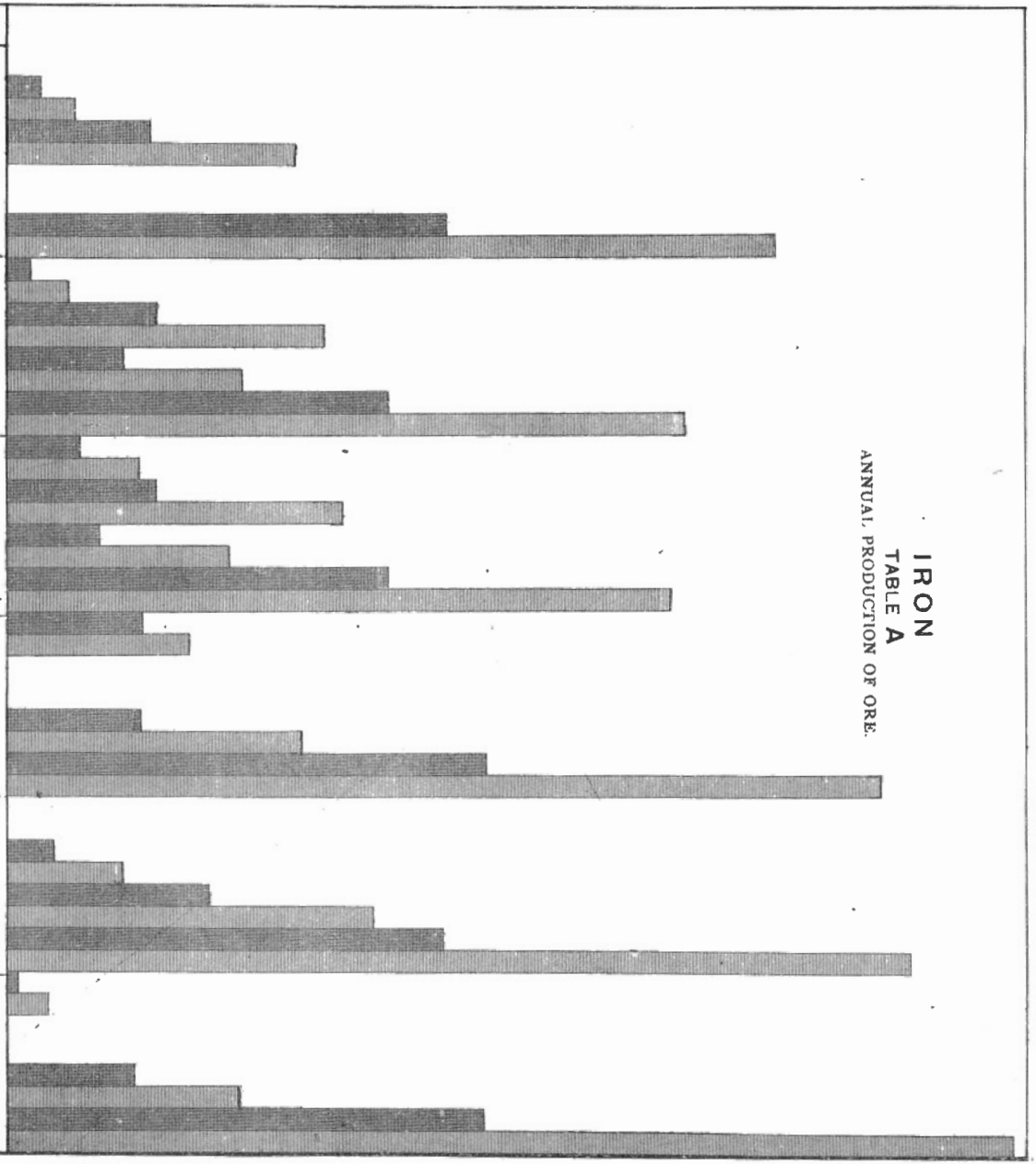
	Tons.
1876	15,274
1877	16,879
1878	36,600
1879	29,889
1880	51,193
1881	39,843
1882	42,135
1883	52,410
1884	54,885
1885	48,129
1886	44,388
1887	43,532
1888	42,611
1889	54,161
1890	49,206
1891	53,649

IRON

TABLE A

ANNUAL PRODUCTION OF ORE.

Year	Province	Quantity	Value
		TONS	$
1886	B. C.	3,941	7,882
	ONT.	16,032	32,064
	QUE.	.....	.....
	N. S.	49,735	87,036
1887	B. C.	2,796	6,990
	ONT.	16,598	36,218
	QUE.	13,404	26,808
	N. S.	43,532	76,181
1888	B. C.	8,372	14,950
	ONT.	16,894	37,710
	QUE.	10,710	24,899
	N. S.	42,611	74,509
1889	B. C.	15,487	20,742
	ONT.	.....	.....
	QUE.	14,533	33,091
	N. S.	54,161	97,867
1890	B. C.	.....	.....
	ONT.	5,000	12,500
	QUE.	22,305	41,196
	N. S.	49,206	101,684
1891	B. C.	950	4,750
	ONT.	14,380	24,510
	QUE.	53,649	112,745
	N. S.		



ANNUAL REPORT FOR 1891; DIVISION OF MINERAL STATISTICS AND MINES.
E. D. INGALL, M. E., IN CHARGE.

EXPORTS AND IMPORTS.

Iron.
Exports and Imports.

The exports as shown by the below given table have fallen off very considerably since last year. This is chiefly due to Ontario having shipped none, and some of the Quebec mines having produced less :—

IRON.

TABLE 2.

EXPORTS OF ORE.

Province.	1888.		1889.		1890.		1891.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
Ontario.	31,161	$36,397	4,108	$10,407	18,601	$38,967	2,259	$3,932
Quebec..... .	10	380	.....	2,700	120	1,640	191	2,683
Nova Scotia	.....	.....	.....	100	.....	. .. .	.....	... .
British Columbia.	7,300	18,400	13,335	26,680	33	83	359	4,958
Totals.... ..	.... .	$55,177	.....	$39,887	18,754	$40,690	2,809	$11,573

As usual no ore has been imported into Canada.

DISCOVERY AND DEVELOPMENT.

Discovery and development. —Nova Scotia

NOVA SCOTIA.—In Nova Scotia, according to the report of the Department of Mines for the province, " the past season has exhibited a general increased interest in iron smelting, etc. The Londonderry Iron Company have rebuilt one of their furnaces and raised it to a height of seventy-five feet instead of sixty-three, as originally built. Two new kilns for roasting the spathic ores found so abundantly on the company's property, and having a capacity of 100 tons daily, have been erected.

" The New Glasgow Iron, Coal and Railway Company expect to have their furnace in blast next June. Their railway to Bridgeville is about completed, and their development work secures them an abundant supply of good ore. The furnace is sixty-five feet high ; bosh, twenty-five feet six inches ; hearth, nine feet nine inches. Three hot blast stoves. Two blowing engines of 1,000 horse power each. Capacity, 15,000 feet of air per minute. Anticipated yield, 100 tons

IRON.

Discovery and development. —Nova Scotia

per day. The coke ovens are of the Coppee pattern, and are likely to be the first of their pattern to go into operation in America. Capacity of each oven about six tons, making seventy to eighty tons of coke per day. The coal is all to be crushed and washed before coking, and the ash reduced to about four or five per cent in the coal.

"The Pictou Charcoal Iron Company have located themselves at Bridgeville, on the line of the New Glasgow Company's Railway, and the object of their work may be gathered from the following remarks of Mr. E. J. Sjostedt, Mines Manager :—

"'Our object is to establish a charcoal iron plant here at Bridgeville, and to use the brown ores principally, and to produce a charcoal iron specially adapted for car wheel making, and also for especially strong machine castings. With this object in view we have purchased mining rights of iron ore, limestone and manganese ore, and some six thousand (6,000) acres of hardwood land. The size of our furnace will be eleven feet bosh, and fifty feet in height, and the estimated output for the first few years, five thousand tons per annum.'

"The following memorandum of the operations at Torbrook will be of interest, as marking the commencement of a mining industry in Annapolis county, which promises to be valuable and permanent :—

"'About the beginning of March last active operations were first commenced at Torbrook, Annapolis county, on the bed of red hematite ore discovered there during the previous year. The ore extends along the base of the South Mountain, the strike being about N. 60° E., and has been traced on the surface from Nictaux Falls eastwards to the King's County line, a distance of four miles. The bed has an average thickness of five and a half feet clear ore, and is so tilted up as to dip at an angle varying from seventy to eighty degrees. Both the hanging and foot walls are of a variegated talcose slate, very light in colour and between eighteen to twenty-four inches thick. These walls form a fairly good support for the time being, although slightly soft The country rock is of a dark bluish state, probably of upper Devonian age. A fair sample of the ore yields about sixty per cent metallic iron ; silica, nine to ten per cent ; lime, four to five per cent ; phosphoric acid, 0·3 per cent ; sulphur, trace.

"'When decided operations were first entered upon, a shaft was sunk in the ore eighty feet deep, levels driven east and west, and the ore taken out by back stoping. Inside of a month another shaft was sunk, about 350 feet from the first, and the ore mined by underhand stoping. A hoisting engine was soon got into position, and ore raised at the rate of twenty-five tons daily. In the spring a survey was made, and

in the summer a railroad constructed from Wilmot station to the mines at Torbrook, a distance of three miles. The track runs alongside of the shafts, the cars being loaded from chutes. Since the construction of this branch line, two new shafts have been put down, and new hoisting gear has replaced the old. At present we have in operation one four-drum hoist, and one single drum hoist. Three small pumps are required to free the mine from water. Steam is supplied to engines and pumps from three boilers. Some slight difficulty has been experienced with faults; but these seem to grow smaller as the depth increases. Some having already disappeared even at the comparatively slight depth of the present workings.

IRON. Discovery and development —Nova Scotia

"'All the ore is shipped *via* Windsor Junction to Londonderry. Last month, January, 105 cars were loaded at Torbrook, in all about 1,650 tons.

"The following figures show the production of iron ore during the year:—

	Tons.
Pictou Charcoal Iron Co., Bridgeville, Pictou Co....	681
Londonderry Iron Co., Londonderry, Col. Co.....	46,350
Ore from Springville, Pictou Co.....	113
" Bridgeville "	680
" Pugwash, Cumberland Co.....	214
" Torbrook, Annapolis Co.....	7,273
New Glasgow I. C. & Ry. Co., Springville, Pictou Co..	2,000
Total.....	57,311

NEW BRUNSWICK.—In New Brunswick a small amount of work has been done in prospecting some of the deposits of ore found there and regarding which Mr. H. P. Brumell during his visit to the province, reports as follows:— New Brunswick.

"On the Millstream River, Gloucester county, about one mile east of the Rocky Brook galena vein and on the north side of the river a property has been taken up by W. R. Payne and John Ellis, of Bathurst. On it is a bed of magnetic iron ore interstratified with a highly altered and siliceous argillite. The bed is about twenty-five feet thick, the upper and lower parts being somewhat intermixed with the country rock which strikes E. and W. at an angle of 90°. The ore contains a considerable proportion of iron and copper pyrites, sufficient in the specimens and exposures seen to materially decrease its value.

"Developments consist of a tunnel about twenty-five feet long and a shallow shaft on the bed at the end of the tunnel."

IRON.

Discovery and development —New Brunswick.

Mr. Chalmers, of the Geological Survey corps, calls attention to the various deposits in Kent county, visited by him during the course of his field work, as follows :—

"Bog-iron ore was found on the south side of Buctouche Harbour, Kent county, occupying an area of several acres. Where openings were made in two places, the deposit showed a thickness of from twelve to fifteen inches.

"Just south of Richibucto Head, another deposit of this material was observed, but its extent and thickness was not ascertained. Bog-iron ore was also noticed on the south side of the mouth of Kouchibouguac River by Mr. Wilson, and in a number of other places. No use has yet been made of it."

Quebec.

QUEBEC.—In the province of Quebec, work is still being prosecuted by the Canada Iron Furnace Co., with works at Radnor, and by Messrs. Jno. McDougall & Co., operating at Drummondville. The former employ about 350 and the latter about 125 men. The ores used at these furnaces, for the most part, continue to be those from the bog-iron ore deposits of the vicinity, regarding which the following notes are furnished by Messrs. Giroux and Low of the Geological Survey. According to the former :—

"A pretty good deposit of bog-iron ore was observed in the county of Joliette, along the railway. The Canada Iron Furnace Co., of Radnor, began to work this deposit last July, and their foreman informed me in September, 1891, that he thought he would be able to ship about 200 car loads of the ore to the blast furnace in Radnor by the fall."

Mr. Low writes as follows, of the working of these deposits and others in his district :

"On the north side of the Mekinac River and along a tributary flowing out of Trout Lake, large masses of iron ore have been found in a dark greenish-red gneiss composed chiefly of orthoclase and epidote, but as all the ore yet found contains a large percentage of titanic acid it is practically of no value. Similar ore is found in a large quartz vein, on the west side of the St. Maurice River, about seven miles above the Grandes Piles and near Lake Bouchard, in the Seigniory of Radnor, also in the township of Shawenegan, and about the lakes of the Laurentide Fishing club.

"At Lac Tortue, the Canada Iron Furnace Company have lowered the water of the lake some four feet, and as the lake is very shallow with slightly sloping banks, a large area is laid bare around its edge, and here the bog-iron ore which has been formed in the lake as

flat concretions is washed out of the surface mud with hand sieves, while the ore in the deeper part of the lake is raised by a dredge which carries three rows of buckets on an endless belt. IRON. Discovery and development —Quebec.

"Apart from Lac Tortue, in all the flat country about Three Rivers on both sides of the St. Lawrence, bog-iron ore is found in patches which vary from three to eighteen inches in thickness. The ore is gathered by the farmers from their lands, and brought in and sold at the furnace. As iron smelting has been in operation about Three Rivers since 1737 the supply of ore in the vicinity is somewhat exhausted, but new supplies of great extent have been found about Gentilly, opposite Three Rivers, and along the Joliette branch of the Canadian Pacific Railway, so that enough ore will be forthcoming to run the new furnace at Radnor which will have a capacity of thirty to fifty tons a day, smelting magnetite from St. Jérôme along with the bog ore.

"On a point about one mile above the mouth of the Mattawin River is a large vein of dark red pegmatite holding masses of magnetite, the only known locality in this region of such ore free from titanic acid."

It is reported of the St. Jérôme mine that it has been operated by capitalists of Albany, N.Y., who had a force of about twenty men at work.

The only other work done in this province was that at Bristol, in Pontiac county. The ore produced at this mine, which is worked by Messrs. Ennis & Co., of Philadelphia, is altogether shipped to the United States. A force of sixty men was employed for some seven months of the year, operations ceasing in July, when it is said a large amount of ore was in stock at the mine. The plant includes two furnaces for roasting the ore for the purpose of removing the sulphur it contains and which varies between fifteen and twenty per cent; this amount is, it is said, reduced to 0·025 per cent by the roasting process.

ONTARIO.—For Ontario, as is shown by the graphic table A, there is no production to report. The exports represent ore mined in Quebec but entered at an Ontario port. In several parts of the province development has been done on various deposits. Ontario.

Mr. Brumell, during his summer's work, ascertained that "the Ledyard mine on lot 19, con. I. of Belmont, in the county of Peterborough, has lately changed hands, having been sold by Mr. T. D. Ledyard, of Toronto, to the Belmont Bessemer Ore Co., of New York, who were in November, 1891, busily engaged in connecting the property by rail with the Canadian Pacific Railway. On completion of this short piece of railway active operations will be commenced at once, and a large output is confidently looked for."

IRON.

Discovery and development —Ontario.

In the western part of the province in the Thunder Bay district, though no shipments have been made, considerable interest has been taken in the subject of the iron ore deposits. Development work has been in progress near Gunflint Lake, on the boundary, and in Marks township, both south-west of Port Arthur, and also near Finmark on the Canadian Pacific Railway, where the diamond drill was used.

The chief interest has centred, however, on the deposits of the Atic-okan River, where developments have been made by Messrs. Marks & Co., of Port Arthur, in further testing the deposits of magnetite. These were alluded to in last year's report, where the analyses given showed an iron content of from sixty-three to sixty-eight per cent of metallic iron, together with a complete absence of titanium in all the specimens examined, and a sulphur content ranging, where it is specified in the return, of from 0·052 to 0·185.

The work, mentioned in the above report as having been done to prove the property in the way of test pits and surface strippings, has been followed by extensive operations with the diamond drill to explore the deposit in depth. Of the details of the results of this work, however, no information is obtainable.

Mr. W. H. C. Smith, the officer of the survey intrusted with the geological investigation of the district, has not yet concluded his examinations, but gives the subjoined information tentatively :—"The ore in this belt would appear to occur as a series of lenticules lying in vertical attitude which in some cases overlap each other, as shown by one of the diamond drill borings, which was put down at a large angle with the horizon, passing through two such lenses and an intervening rib of rock.

"The stripping done has not been sufficiently extensive to admit an accurate measurement of the size of these lenticules, but they are estimated at between one hundred and two hundred feet long and from thirty-five to fifty feet wide. The depth, so far as determined by diamond drill borings, is not yet made public, but from the position of the ore bodies they are probably of great proportional depth. There is good reason to believe that these isolated ore bodies occur at various depths below the surface.

"The ore is associated with a schistose chlorite rock merging into and probably derived from compact fine-textured greenstones. The rocks flanking the ore bodies to the north have every appearance of being a volcanic series. The valley of the river conceals for the most part the rocks to the south, but they would seem to be more micaceous and to merge into the mica schist of the Coutchiching series.

"From his preliminary investigations, Mr. Smith inclines to the opinion that these greenstones mark a definite ferruginous volcanic horizon in the formation probably referable in age to later Huronian times." IRON. Discovery and development —Ontario.

The developments made have extended over the belt for a length of about 1,400 feet and a width of about fifty to seventy-five feet.

Negotiations were in progress for the transfer of these properties to Belgian capitalists, and at the close of the year it is reported that a basis of agreement had been arrived at by which the owners give till November, 1892, to test the deposits, and that if these tests result satisfactorily, the mine will be worked upon a royalty with a guaranteed output of 300,000 tons, and a railroad will immediately be built to connect the mine with the Canadian Pacific Railway.

BRITISH COLUMBIA.—From British Columbia there is little to report. The Puget Sound Iron Company report that no work has been done at their mine at Texada Island, but that operations may be again proceeded with next year. British Columbia.

The only other item with regard to iron is given in the report of the Minister of Mines for the province, as follows :—

"*Glen Iron Co.*—Work on the Glen Iron Mining Company's ground, consisting of 200 acres of land, situated at Cherry Creek Bluff, about twelve miles west of Kamloops, has been prosecuted with commendable activity during the past year, with results which admit of no doubt in regard to its value.

"The veins, four in number, vary from ten to twenty feet in width, and are visible on the surface at distances from three hundred to six hundred feet in length, and possess the great advantage of being situated near the track of the Canadian Pacific Railway. The works are supplied with a chute three hundred feet long, and an aerial wire tramway thirteen hundred feet in length, capable of delivering one hundred tons per ten hours on the cars.

"The ore is pure magnetite of the best quality, particularly adapted to the manufacture of Bessemer steel, and capable of being utilized for the purpose without any intermediate treatment. Seven hundred and fifty tons were shipped last summer to Tacoma, Wash., U.S., and two hundred tons to the Revelstoke Smelting Works for fluxing operations. There is every prospect of heavy shipments being made during the present year. This new mining industry is capable of wide expansion, and promises, in the near future, to assume proportions of great extent, which cannot be overestimated in its influence on the prosperity of the surrounding country."

IRON.

PIG IRON AND STEEL.

Pig iron production.

Of the 68,979 tons of iron ore mentioned above as produced in Canada during 1891, the returns show that 60,933 tons were smelted, producing 23,891 tons of pig iron, showing an increase over last year's yield of 2,119 tons.

This quantity resulted from the running of four furnaces, operated by the following firms :—

The Londonderry Iron Co., Londonderry, N.S.

The Canada Iron Furnace Co., Radnor, Que.

Jno. McDougall & Co., Drummondville, Que.

The two latter firms use charcoal for fuel in smelting the bog ores as before mentioned and produce a pig iron which is used for the manufacture of railroad car wheels.

The following table, No. 3, gives further details.

IRON.

TABLE 3.

PIG IRON PRODUCTION : CONSUMPTION OF ORE, FUEL, ETC.

Production and Consumption.		1890.		1891.	
		Quantity.	Value.	Quantity.	Value.
Pig Iron made	Tons.	21,772	$331,688	23,891	$368,901
Iron ore consumed	"	57,304	117,880	60,933	130,955
Fuel consumed. Charcoal	Bush.	589,860	29,493	441,812	22,091
Fuel consumed. Coke	Tons.	32,832	97,659	30,626	98,402
Fuel consumed. Coal	"	1,241	2,638	2,170	2,868
Flux consumed	"	18,478	18,361	11,377	11,546

Table No. 4 below gives the exports of iron and steel goods from Canada, and tables 5, 6 and 7 following give data regarding the country's consumption of similar commodities, whose value is based rather upon the amount of iron they contain than upon their highly manufactured condition.

IRON. IRON.

TABLE 4.

EXPORTS OF IRON AND STEEL GOODS, THE PRODUCE OF CANADA.

Exports of iron and steel goods.

Province.	Pig Iron.	Scrap Iron.	Iron Stoves.	Iron Castings	Iron, all other, and Hard-ware.	Steel and Manufac-tures of.	Totals.
Ontario	.....	$2,463	$1,244	$943	$ 9,460	$13,326	$27,436
Quebec	$95	801	308	1,218	39,530	11,087	53,039
Nova Scotia	.....	8	1,231	546	20,413	41,540	63,738
New Brunswick	.....	.....	235	.....	5,367	.....	5,602
P. E. Island	.....	.....	.....	.....	14	.....	14
Manitoba	.....	.....	107	45	4	188	344
British Columbia	..	1,600	.....	15	810	321	2,746
Totals	$95	$4,872	$3,125	$2,767	$75,598	$66,462	$152,919

IRON.

TABLE 5.

IMPORTS OF PIG IRON, ETC.

Imports of pig iron.

Fiscal Year.	Pig Iron, Charcoal.		Pig Iron, all other.		Pig Iron, Kentledge, &c.		Total.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
1880	.....	.....	23,159	$371,956	.....	.....	23,159	$371,956
1881	.....	.....	43,630	715,997	.....	.....	43,630	715,997
1882	6,837	$211,791	56,594	811,221	.....	.....	63,431	1,023,012
1883	2,198	58,994	75,295	1,085,755	.....	.....	77,493	1,144,749
1884	2,893	66,602	49,291	653,708	.....	.....	52,184	720,310
1885	1,119	27,333	42,279	545,426	.....	.....	43,398	572,759
1886	3,185	60,086	42,463	528,483	.....	.....	45,648	588,569
1887	3,919	77,420	46,295	554,388	.....	.....	50,214	631,808
1888	.....	.....	.....	.....	48,973	$648,012	48,973	648,012
1889	.....	.....	.....	.....	72,115	864,752	72,115	864,752
1890	.....	.....	.....	.....	87,613	1,148,078	87,613	1,148,078
1891	.....	.....	.....	.....	81,317	1,085,929	81,317	1,085,929

IRON.

IRON.

TABLE 7.

Imports, iron and steel goods.

IMPORTS: IRON IN SLABS, BLOOMS, LOOPS AND PUDDLED BARS, ETC.

Fiscal Year.	Cwt.	Value.
1880	195,572	$244,601
1881	111,666	111,374
1882	203,888	222,056
1883	258,639	269,818
1884	252,310	264,045
1885	312,329	287,734
1886	273,316	248,461
1887	522,853	421,598
1888	110,279	93,377
1889	80,383	67,181
1890	15,041	45,923
1891	41,567	38,931

IRON.

TABLE 8.

IMPORTS OF IRON AND STEEL GOODS.*

Fiscal Year.	Value.
1880	$6,620,260
1881	8,484,175
1882	8,578,685
1883	8,613,739
1884	6,143,870
1885	4,606,193
1886	4,698,882
1887	6,084,704
1888	5,147,111
1889	7,108,052
1890	7,260,845
1891	9,188,502

* These figures do not include those of hardware, engines, agricultural implements, or other highly manufactured iron or steel goods.

LEAD.

LEAD.

Production.

The amount of this metal produced in Canada is small for this year as in the past, our returns only giving 588,665 lbs., which, at the average market price of the metal for the year of 4·35 cents per lb., would have a value of $25,607. Small as this is, however, the figures are five times as great as those of last year.

Regarding discovery and development there is little to say.

NEW BRUNSWICK.—In New Brunswick development work was done on veins of argentiferous galena on "Rocky Brook," a branch of the Millstream River, in Gloucester county, and at the Britton mine, near Woodstock. Discovery and development.

QUEBEC.—In Quebec the galena mine at the head of Lake Temiscamingue was operated for a few months, but was closed down in March, and the work was suspended. This had been begun in the previous year, and included a thorough outfitting of the mine with plant for mining, concentrating and smelting the ore.

ONTARIO.—In Ontario there is only developmental work to report, and that chiefly on two of the galena-bearing veins traversing the rocks of the Nepigon series of the Black Bay district, near Port Arthur, on Lake Superior.

BRITISH COLUMBIA.—In British Columbia the work done in testing the promising veins carrying argentiferous galena, and copper ores of the new districts in the S.E. corner of the province has resulted of course in the extraction of much lead-bearing material. As this was not shipped, however, it does not enter into the statistics of this year. This stocking of the ore mined has been due to the heavy tariff imposed by the "McKinley Bill" on such ores entering the United States which, with the present condition of communication of these districts, must form for a time the chief market for these ores.

The following tables explain themselves :—

LEAD.

TABLE 1.

IMPORTS OF LEAD. Imports.

Fiscal Year.	OLD, SCRAP AND PIG.		BARS, BLOCKS, SHEETS.		TOTAL.	
	Cwt.	Value.	Cwt.	Value.	Cwt.	Value.
1880.....	....	.....	.....	....	30,298	$124,117
1881.....	16,236	$ 56,919	18,222	$70,744	34,458	127,663
1882.....	36,655	120,870	10,540	35,728	47,195	156,598
1883...	48,780	148,759	8,591	28,785	57,371	177,544
1884..... ...	39,409	103,413	9,704	28,458	49,113	131,871
1885.....	36,106	87,038	9,362	24,396	45,468	111,434
1886.....	39,945	110,947	9,793	28,948	49,738	139,895
1887.....	61,160	173,477	14,153	41,746	75,313	215,223
1888...	68,678	196,845	14,957	45,900	83,635	242,745
1889.	74,223	213,132	14,173	43,482	88,396	256,614
1890.....	101,197	283,096	19,083	59,484	120,280	342,580
1891..... ..	86,382	243,033	15,646	48,220	102,028	291,253

LEAD.

Imports.

LEAD.

TABLE 2.

IMPORTS OF LEAD MANUFACTURES.

Fiscal Year.	Value.
1880	$15,400
1881	22,629
1882	17,282
1883	25,556
1884	31,361
1885	36,340
1886	33,078
1887	19,140
1888	18,816
1889	16,315
1890	25,600
1891	23,893

MANGANESE.

MANGANESE.
Production.

Compared with years previous, the production of manganese for 1891 is only small, as but 255 tons, valued at $6,694 were exported. What the actual production was could not be ascertained, though it is not thought to have been much more than the above amount. For comparison, the following table is presented wherein it will be seen that the decrease in exports, and consequently in production, is very material.

MANGANESE. MANGANESE.

TABLE 1.

EXPORTS OF MANGANESE ORE SINCE 1873. Exports.

Years.	NOVA SCOTIA.		NEW BRUNSWICK.		TOTAL.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
1873	.. ....	....	1,031	$20,192	1,031	$20,192
1874	6	$ 12	776	16,961	782	16,973
1875	.....	200	194	5,314	203	5,514
1876	21	723	391	7,316	412	8,039
1877	106	3,699	785	12,210	891	15,909
1878	106	4,889	520	5,971	626	10,860
1879	154	7,420	1,732	20,016	1,886	27,436
1880	79	3,090	2,100	31,707	2,179	34,797
1881	200	18,022	1,504	22,532	1,704	40,554
1882	123	11,520	771	14,227	894	25,747
1883	313	8,635	1,013	16,708	1,326	25,343
1884	134	1,054	469	9,035	603	20,089
1885	77	5,054	1,607	29,595	1,684	34,649
1886	(a) 441	854	1,377	27,484	(a)1,818	58,338
1887	578	14,240	837	20,562	1,415	34,802
1888	87	5,759	1,094	16,073	1,181	21,832
1889	59	3,024	1,377	26,326	1,436	29,350
1890	177	2,583	1,729	34,248	1,906	36,831
1891	22	563	233	6,131	255	6,694

(a) 250 tons from Cornwallis should more correctly be classed under the heading of mineral pigments.

Regarding the imports of manganese the following table (2) is thought to be sufficient. No ore is imported. Imports.

MANGANESE.

TABLE 2.

IMPORTS: OXIDE OF MANGANESE.

Fiscal Year.	Pounds.	Value.
1884	3,989	$ 258
1885	36,778	1,794
1886	44,967	1,753
1887	59,655	2,933
1888	65,014	3,022
1889	52,241	2,182
1890	67,452	3,192
1891	92,087	3,743

MANGANESE.
Discovery and development.

As in years previous, operations were confined to the provinces of Nova Scotia and New Brunswick, wherein are found extensive deposits, and for a description of which the reader is referred to the report of this Division for 1890.

NOVA SCOTIA.—Of operations in Nova Scotia the only available data are the following notes obtained from the report of the Minister of Mines for Nova Scotia for 1891 :—

"Mr. J. W. Stephens took out a few tons from his Teny Cape mine. A few tons were shipped from the Onslow mine ; and Mr. E. T. Moseley, of Sydney, reported having shipped twenty-eight casks of ninety per cent ore from St. Peter's. It is anticipated that a larger out-put will be made during the year 1892."

Regarding the operations in New Brunswick, Mr. Brumell furnishes the following notes as the result of his visits to the districts during the summer.

"*Gowland Mountain.*—Since my visit of the year previous small development operations had been carried on, several shallow pits were sunk and a stripping made in the bed of a small creek on the land of Geo. Harrison. In all of these, very small shows of low grade ore—psilomelane—were found in the granite. No limestone is found on the property, so the probability of large masses of manganese occurring is not good. About twenty tons of rock were taken out on the creek stripping, the rock containing about twenty-five per cent of low grade psilomelane.

"*Markhamville.*—Operations were being carried on by a small force of men who were employed in sorting and milling dump stuff and exploring by means of diamond drill. In all seventy-one holes, averaging 100 feet each, had been sunk—8th September, 1891. In hole No. 68, twelve feet of iron had been bored through, and in No. 69 twenty-five feet of ore ground. Very little ore was being shipped, only sufficient to pay working expenses.

"*Jordan Mountain.*—This property is still idle, and in litigation, after having been bonded to an American company for $40,000. The sale is said to have been prevented through lack of ability to give a clear title. Twenty-five tons of ore now at Sussex awaiting sale or shipment consist principally of manganite with a small proportion of pyrolusite.

"Operations were suspended during the year at Quaco Head and Dawson Settlement, neither of which points were visited owing to lack of time.

MICA.

Production.

During the past few years there has been a steady growth in the production of mica, the output in 1891 having a value of $71,510, an increase over the previous year of $3,436.

The production for the past few years is given below :—

1886	$29,008
1887	29,816
1888	30,207
1889	28,718
1890	68,074
1891	71,510

Of this the greater part was used in electrical construction, though small quantities were sold to various Canadian stove founders, and a certain quantity was ground for lubricants and fireproof paints and cements.

During 1891 there were exported 388,064 pounds of crude and cut mica, valued at $35,252, and $2,338 worth of ground mica, the latter being from Quebec, while of the crude and cut product the exports were as follows :—

Ontario	384,964 pounds, valued at	$35,077
Quebec	3,100 " "	175

During the past few years the exports have been as follows :—

1887	$ 3,480
1888	23,563
1889	30,597
1890	22,468
1891	37,590

MINERAL PIGMENTS.

Ochres.

Ochres.—The only material produced in Canada during 1891 that might be classed as a mineral pigment was ochre, the production of which was 900 tons, valued at $17,750, showing an increase over last year of 625 tons and $12,625.

The production was altogether that of the province of Quebec, where many extensive deposits of ochre are known to occur.

The production of ochre for the past four years is as follows :—

1887	385 tons, valued at	$	2,233
1888	397 " "		7,900
1889	794 " "		15,280
1890	275 " "		5,125

MINERAL PIGMENTS.

In the summary report of the Geological Survey Department for 1891, Mr. Low speaks thus of the occurrence of ochre in Champlain county, Que :—

Ochres.

"Ochre is a common mineral in this part of the province and is at present worked in two localities—at St. Malo, eight miles from Three Rivers, and at St. Tite junction on the Piles Branch railway.

"At St. Malo the deposit has been proven across twenty-two lots and in width from 100 to 300 yards, with a depth of from one to twenty feet. At St. Tite junction the ochre occurs in two gulleys which join, and run into the St. Maurice; the ore has been proven along both gulleys for nearly half a mile and has everywhere a considerable thickness.

"The St. Maurice Metallic Paint Co. and the Johnson Paint Co. have furnaces for burning the ore at St. Malo, the former grinding the burnt material at Cap Magdeleine, near Three Rivers, the latter at Montreal. At St. Tite junction a furnace and grinding mill are in course of erection by the Radnor Paint Co."

During his summer's work in New Brunswick, Mr. Brumell visited a deposit in Northumberland county, New Brunswick, of which he reports as follows :—

"About one mile above Chaplin's Island, on the north-west branch of the Miramichi River and about 18 miles from Newcastle, occur a number of small veins of a very heavy pure oxide of iron. The deposits, which are small, are scattered throughout the rocks of the district—altered slates—and are rather of the nature interbedded lenticular masses than veins. The rocks strike east and west dipping 65° north. The largest deposit exposed was about three inches wide, and possibly ten or twelve feet long, the depth being unproved.

"The deposits are well developed on the land of Daniel Dennis, which is under a mining license held by John Ferguson, of Newcastle.

"Although the material is remarkably pure there does not seem sufficient to be of great commercial value."

The imports of ochre are shown in the following table 1 :

MINERAL PIGMENTS.

TABLE 1.

IMPORTS OF OCHRES.

Fiscal Year.	Pounds.	Value.
1880	571,454	$ 6,544
1881	677,115	8,972
1882	731,526	8,202
1883	898,376	10,375
1884	533,416	6,398
1885	1,119,177	12,782
1886	1,100,243	12,267
1887	1,460,128	17,067
1888	1,725,460	17,664
1889	1,342,783	12,994
1890	1,394,811	14,066
1891	1,528,696	20,550

Baryta.—No baryta was produced during 1891, nor was any imported as may be seen on reference to the following table 2.

Baryta.

MINERAL PIGMENTS.

TABLE 2.

IMPORTS OF BARYTA.

Fiscal Year.	Cwt.	Value.
1880	2,230	$1,525
1881	3,740	1,011
1882	497	303
1883		185
1884		229
1885	7	14
1886		62
1887	379	676
1888	236	214
1889	1,332	987
1890	1,322	978
1891		

MINERAL PIGMENTS. Litharge.

Litharge.—As in previous years, there is no production of this material to report; the only statistics available are those of imports, as follows :—

MINERAL PIGMENTS.

TABLE 3.

IMPORTS OF LITHARGE.

Fiscal Year.	Cwt.	Value.
1880	3,041	$14,334
1881	6,126	22,129
1882	4,900	16,651
1883	1,532	6,173
1884	5,235	18,132
1885	4,990	16,156
1886	4,928	16,003
1887	6,397	21,865
1888	7,010	23,808
1889	8,089	31,082
1890	9,453	31,401
1891	7,979	27,613

MINERAL WATER.

MINERAL WATER.

Production.

Returns were received by this office which show that during the year there were 427,485 gallons of mineral water placed upon the market, with a value at the springs of $54,268. This shows a very material decrease from last year, amounting to 133,680 gallons, having a value of $11,763. The production for the past three years has been :

1888	124,850 gallons	$11,456
1889	424,600 "	37,360
1890	561,165 "	66,031

The producers making returns for 1891 were :—

St. John, N.B. ..... John R. Smith.
Havelock, N.B. ..... Havelock Mineral Springs Co.
Camperdown, Ont. ..... Emily Wensley.
Ottawa, Ont. ..... King Arnoldi.
do ..... Wm. Borthwick.
do ..... F. O. Ring.
West Winchester, Ont. ..... Dr. W. J. Anderson.
Brecken, Ont. ..... L. Forrest.
Treadwell, Ont. ..... W. K. Kains.
Preston, Ont ..... Chris. Kress.

St. Léon Springs, Que.....St. Léon Mineral Springs Co. MINERAL
St. Hyacinthe, Que .....La Cie. d'eau Min. dé St. Hyacinthe. WATERS.
Montreal, Que. .....J. H. M. Hart.
St. Casimir, Que.....Jos. Douville fils.
Wilmot, N.S.....Wilmot Spa Springs Co.

A marked feature of the industry is the St. Léon mineral water, of which during the year some 200,000 gallons were shipped. This is, of course, irrespective of the water consumed in the baths and the hotel at the springs. This water is now retailed in all the important cities of the Dominion, and a considerable export trade has been initiated, water having been sent even to South America, where it has been very well received. No statistics of exports are available. The following table illustrates the imports, of which the greater part are from Europe :—

MINERAL WATERS. Imports.

TABLE 1.

IMPORTS.

Fiscal Year.	Value.
1880.	$ 15,721
1881....	17,913
1882.....	27,909
1883..... ...	28,130
1884....	27,879
1885...	32,674
1886...	22,142
1887....	33,314
1888.....	38,046
1889.....	30,343
1890.....	40,802
1891.....	41,797

MISCELLANEOUS.

MISCELLANEOUS.

Production.

The production of the several materials which are produced to a slight extent only, is given comparatively with the year previous in the following table :—

MISCELLANEOUS.

TABLE 1.

PRODUCTION.

Product.	1890.		1891.	
	Quantity.	Value.	Quantity.	Value.
	Tons.	$	Tons.	$
Felspar	700	3,500	685	3,425
Fire clay	.....	.....	250	750
Moulding sand	320	1,410	230	1,000
Platinum	.....	4,500	.....	10,000
Precious stones	.....	700	.....	1,000

Felspar.

Felspar.—The production of this mineral is largely that of Ontario, a small quantity only being from Ottawa county, Que. The shipments were made to St. John's, Que., where the material was used in the manufacture of porcelain and finer grades of pottery.

Platinum.

Platinum—As in previous years, the production of platinum is altogether that of British Columbia, where it is found in placer workings associated with gold. As may be seen on reference to the following table, the production shows a marked increase over that of previous years, the increase being, however, largely due to the higher price of the metal, which is now increasingly used in dentistry and electricity.

The yearly production since 1887 has been :—

1887	$ 5,600
1888	6,000
1889	3,500
1890	4,500
1891	10,000

The following table shows the imports of this metal in all forms. No exports are reported. Miscellaneous.

Platinum.

MISCELLANEOUS.

TABLE 2.

IMPORTS OF PLATINUM.

Fiscal Year.	Value.
1883	$ 113
1884	576
1885	792
1886	1,154
1887	1,422
1888	13,475
1889	3,167
1890	5,215
1891	4,055

Precious Stones.—The production of precious stones given in the first table is that of cut gems and does not include the value of the many rough and polished agates, chlorastrolites, etc., of Lake Superior. The minerals most frequently used as gems are found to a great extent in Ottawa county and consist of the various forms of garnet, tourmaline, asteriated quartz and albite, smaller quantities only of the Nova Scotia agates and jaspers being used. Precious stones.

The value of the various precious stones, including diamonds, imported during the fiscal year ending 30th June, 1891, was $77,988.

Whiting and Chalk.—The two following tables give the imports of these two materials and comprise all the available information regarding them:—

MISCELLANEOUS.

TABLE 3.

IMPORTS OF WHITING.

Fiscal Year.	Cwts.	Value.
1880	84,115	$26,092
1881	47,480	16,637
1882	36,270	16,318
1883	76,012	29,334
1884	76,268	28,230
1885	67,441	23,492
1886	65,124	25,533
1887	47,246	15,191
1888	76,619	20,508
1889	84,658	22,735
1890	96,243	27,471
1891	84,679	27,504

MISCELLANEOUS.

MISCELLANEOUS.

TABLE 4.

Chalk.

IMPORTS OF CHALK.

Fiscal Year.	Value.
1880	$2,117
1881	2,768
1882	2,882
1883	5,067
1884	2,589
1885	8,003
1886	6,583
1887	5,635
1888	5,865
1889	5,336
1890	7,221
1891	8,193

Mercury, tin and zinc.

Mercury, Tin and Zinc.—The following tables illustrate the imports of these metals of which none has as yet been produced in Canada :

MISCELLANEOUS.

TABLE 5.

IMPORTS OF MERCURY.

Fiscal Year.	Pounds.	Value.
1882	2,443	$ 965
1883	7,410	2,991
1884	5,848	2,441
1885	14,490	4,781
1886	13,316	7,142
1887	18,409	10,618
1888	27,951	14,943
1889	22,931	11,844
1890	15,912	7.677
1891	29,775	20,223

MISCELLANEOUS.

TABLE 6.

IMPORTS OF TIN AND TINWARE.

Tin.

Fiscal Year.	Value.
1880	$ 281,880
1881	413,924
1882	790,285
1883	1,274,150
1884	1,018,493
1885	1,060,883
1886	1,117,368
1887	1,187,312
1888	1,164,273
1889	1,243,794
1890	1,289,756
1891	1,206,918

MISCELLANEOUS.

TABLE 7.

IMPORTS OF ZINC IN BLOCKS, PIGS AND SHEETS.

Zinc.

Fiscal Year.	Cwts.	Value.
1880	13,805	$ 67,881
1881	20,920	94,015
1882	15,021	76,631
1883	22,765	94,799
1884	18,945	77,373
1885	20,954	70,598
1886	23,146	85,599
1887	26,142	98,557
1888	16,407	65,827
1889	19,782	83,935
1890	18,236	92,530
1891	17,984	105,023

MISCELLANEOUS.

TABLE 8.

IMPORTS OF ZINC, MANUFACTURES OF.

Fiscal Year.	Value.
1880	$ 8,327
1881	20,178
1882	15,526
1883	22,599
1884	11,952
1885	9,459
1886	7,345
1887	6,561
1888	7,402
1889	7,233
1890	6,472
1891	7,178

MISCELLANEOUS.

Zinc.

MISCELLANEOUS.

TABLE 9.

IMPORTS OF SPELTER.

Fiscal Year.	Cwts.	Value.
1880..	1,073	$ 5,310
1881..	2,904	12,276
1882.....	1,654	7,779
1883.....	1,274	5,196
1884..	2,239	10,417
1885.....	3,325	10,875
1886.....	5,432	18,238
1887..	6,908	25,007
1888.....	7,772	29,762
1889.....	8,750	37,403
1890..... . ..	14,570	71,122
1891...	6,249	31,459

NATURAL GAS.

NATURAL GAS

Ontario.

By H. P. H. BRUMELL, F.G.S.A.,

Assistant to the Division.

During 1891, as in previous years, active operations in search of natural gas were principally confined to Ontario where several large "gushers" were struck. Successful operations during the year were confined to Essex, Welland and Haldimand counties where heavy flows of gas were obtained, while wells sunk at Belleville, Toronto and Kingston afforded very small and short-lived flows. In view of the many failures to obtain gas it cannot be too strongly impressed upon the public that there are certain definite laws governing the production and distribution of gas and that many thousands of dollars are annually spent in futile efforts to obtain gas in ground that is known to be either barren or flooded. Gas is not to be obtained everywhere or anywhere, and before expending many dollars it would be well if investors and promoters of companies should inform themselves as to the district wherein they intend operating. Of course the greater part of the advice possible for the geologist to give is necessarily of a negative character, experiment alone making *absolute certainty* of the productiveness of any gas territory.

Welland County.

Active operations were carried on in this county, notably by the Provincial Natural Gas and Fuel Co., the Erie County Natural Gas Co., and the Mutual Natural Gas Co., several individual wells

having also been sunk, among others, those of Ephraim Morningstar and Geo. Zimmerman of Humberstone, S. Hopkins of Port Colborne, and Murray Kerr of Hamilton, as well as those of local companies at Welland and Ridgeway. NATURAL GAS Ontario.

The Provincial Company during the year finished thirteen new wells, making twenty-six in all, as follows :—

		Cubic Feet.
No.	1 with a daily flow of.....	2,050,000
"	2 "	375,000
"	3 "	600,000
"	4 "	2,200,000
"	5 "	8,500,000
"	6 "	70,000
"	7 "	3,000,000
"	8 "	Abandoned.
"	9 "	3,500,000
"	10 "	4,500,000
"	11 "	300,000
"	12 "	5,500,000
"	13 "	300,000
"	14 "	Abandoned.
"	15 "	500,000
"	16 "	12,500,000
"	17 "	2,500,000
"	18 "	2,000,000
"	19 "	1,500,000
"	20 "	300,000
"	22 "	2,600,000
"	23 "	Abandoned.
"	25 "	500,000
"	26 "	2,750,000
"	27 "	Abandoned.
"	28 "	Nil.
making a total daily flow of.....		56,045,000

NATURAL GAS Ontario.

These flows of gas are, with the exception of that in No. 15, all from the white Medina sandstone, according to the following record which is that of No. 1 well:

Character of Beds.	Thickness.	Formation.
Surface deposits.	2 feet.	Drift.
Dark gray limestone	25 "	Corniferous.
Drab and gray dolomite, black shales and gypsum.	390 "	Onondaga.
Gray dolomite passing into brown	240 "	Guelph and Niagara.
Black shales	50 "	Niagara.
White crystalline dolomite, gray towards bottom	30 "	Clinton.
Red sandstone	55 "	Medina.
Red shale	10 "	
Blue shale	5 "	
White sandstone	5 "	
Blue shale	20 "	
White sandstone	15 "	Gas horizon.

In well No. 15 the gas was struck in the Clinton formation at a depth of 625 feet, or five feet above the summit of the Medina.

This company have now three mains supplying the city of Buffalo and carrying the gas across the river from the Canadian side, near the International bridge, to Black Rock on the American side. From the wells these mains are fed by an eight-inch main extending through the entire length of the field, feeders being run from individual wells throughout. As was stated in last year's report, it was the intention of this company to carry well No. 14 to the Trenton limestone to test the gas-producing properties of that formation in this district this was done, without, however, economic result as the limestone was found to be barren.

The record of the well was as follows :—

Character of Beds.	Thickness.	Formation.
Surface deposits	47 feet.	Drift.
Drab and gray dolomites and shales	293 "	Onondaga.
Gray and brown dolomites	240 "	Guelph and Niagara.
Black shales	50 "	Niagara.
White and gray dolomites	30 "	Clinton.
Sandstones and shales	1,000 "	Medina.
Limestone and shales	865 "	Hudson River & Utica.
Limestone	195 "	Trenton.
Total depth of well	2,720 feet.	

A small flow of gas, 5,000 cubic feet was struck at 750 feet, or 90 feet below the summit of the Medina, at which point the boring would be in the second white sandstone bed. Salt water was struck at 525 feet, and the casing carried to 660 feet, or to the summit of the Medina.

The Erie County Company, an American company, have recently begun active operations and are now supplying gas to a considerable number of consumers in Buffalo. This company purchased several wells, and since their inception have sunk several more. For supplying Buffalo they have two six-inch mains laid across the river to Black Rock. Full particulars regarding this company were not obtained, owing to lack of time and the absence of some of the officials.

NATURAL GAS

Ontario.

Haldimand County.

Two companies have operated successfully in this county, viz. :—The Cayuga Natural Gas Company, Limited, and the Dunnville Natural Gas Company, Limited. The former incorporated with a capital stock of $20,000, drilled one well on lot 19, east side of Ouse Street, in the village of Cayuga. The well attained a depth of 710 feet, in which gas was struck at 563, 603 and 680 feet, the combined flow from these points being 250,000 cubic feet per day. The record of the well is as follows :—

Character of Beds.	Thickness.	Formation.
Surface deposits	23 feet.	Drift.
Limestone	120 "	Onondaga.
Shale bluish	132 "	
Very hard limestone, with salt water	232 "	Guelph and Niagara.
Shale bluish	41 "	
Limestone	15 "	Clinton.
Shale, light blue	5 "	
Sandstone, red	35 "	Medina.
Shale, red	62 "	
Sandstone, white	15 "	
Shale, red	30 "	
Depth	710 feet.	

The mouth of the well is at an elevation of ten feet above the Grand River at Cayuga, and consequently about 600 feet above tide level. Gas is now being supplied to the town, throughout the greater part of which pipes have been laid.

Of the operations of the Dunnville Natural Gas Company less can be said, as owing to lack of time the information was not obtained the record of drilling would, however, be very similar to that at Cayuga or Port Colborne. Three wells were drilled by this company the production of which is now being piped through the town, supply ing many shops and private houses.

Essex County.

The only operations in this county in search of natural gas were those undertaken by the Kingsville Natural Gas and Oil Company

who, during the year, finished their Nos. 3 and 4 wells. No. 3, drilled on lot 4, con. I., township of Gosfield South, was carried to a depth of 1,015 feet, where it was abandoned on account of salt water having been struck at 1,010 feet. The drilling began beneath a surface covering of eighty-three feet and was finished in limestone. Casing was carried to a depth of 573 feet only. In No. 4, however, the company were more successful, obtaining a daily flow of about 2,500,000 cubic feet of gas. This well is located on lot 7, con. I., Gosfield South, and was carried to a depth of 1,063 feet, in which at from 1,030 to 1,035 feet gas was obtained. Water was encountered at 160 feet and the casing carried to a depth of 531 feet, below which no further flows of water were noted. The company have put in place a new regulator for the town supply and a smaller one on the branch main to the Mettawas Hotel, and are now supplying, as well as shops, private houses and hotels, one saw-mill, grist-mill, woollen-mill, foundry, turning shop and sash and door factory in Kingsville. In Ruthven it is their intention to supply a fruit-evaporating establishment, as well as private houses and shops generally. NATURAL GAS Ontario.

Time has not allowed of the examination of the many specimens obtained from the wells of Essex County, but it is expected that the writer will be enabled to make these examinations shortly and make the result known in continuation of the report on gas and oil operations in Ontario now in press.*

York County.

In a well drilled by Messrs. Taylor Bros. on lot 11, con. III., township of York, and near their paper mill (middle mill), a small show of gas was noted in the Trenton limestone at from 700 to 750 feet. The record of the well, kindly furnished by Mr. W. F. Tasker, of Toronto, is as follows:—

Character of Beds.	Thickness.	Formation.
Surface deposits	38 feet.	Drift.
Shale	440 "	Hudson River and Utica.
Limestone, hard	300 "	Trenton.
do soft, with shale	185 "	
do hard	146 "	
"Arkose" beds	10 "	
Granite	8 "	Archæan.
Depth of well	1,127 feet.	

* Annual Report, Geological Survey of Canada, Vol. V., Part Q, 1889-90-91.

NATURAL GAS Ontario.

The well was started at an elevation of about fifty feet above Lake Ontario or 297 feet above mean tide level.

Hastings County.

The Belleville Natural Gas and Oil Company, of Belleville, drilled three wells during the year in search of gas, and in all cases unsuccessfully. The well known as No. 1 was drilled near the Grand Trunk Railway station and reached a depth of 252 feet, the lower 11 feet being in either granite or the "Arkose" beds. No. 2 well, sunk on the bay shore a short distance west of the river, was carried to a depth of 280 feet, and No. 3 on Massagasauga Point to a similar depth. In the latter the boring passed through yellow quartzose sandstone, presumably Potsdam, which rested immediately above the granite in which the boring finished. In No. 2 well a very heavy flow of mineral water was struck, and continues to flow. The water is sulphurous and contains a considerable proportion of sodium chloride.

Frontenac County.

At the Insane Asylum in Kingston, a well was drilled by the Provincial Government, the result being a very small flow of gas. The amount obtained was barely sufficient to burn above the mouth of the casing. The well was shallow, being but 171 feet deep, boring ceasing on the appearance of salt water.

During 1891, the following companies were incorporated under the Joint Stock Companies Act of Ontario, for the purpose of boring for natural gas :—

Name of Company.	Head Office.	Capital Stock.
Belleville Natural Gas and Ore Co.	Belleville	$ 25,000
Canadian Natural Gas Co.	Sherkston	100,000
Dunnville Natural Gas Co.	Dunnville	20,000
Farmers Natural Gas and Oil Co., of Gosfield	Windsor	100,000
Mimico Natural Gas Co.	Toronto	100,000
Mutual Natural Gas Co. of Ontario	Welland	20,000
Superior Natural Gas Co. of Ontario	Sherkston	100,000

Quebec.

QUEBEC.—For many years vague rumours of large flows of gas in the neighbourhood of St. Hyacinthe have been published in the press, and many inquiries have been made of the Geological Survey as to the gas-producing properties of the district. In response to these, Dr. Selwyn, Director of the Geological Survey, as well as the writer

visited the district when it was seen that the operations already carried out have not proved it to be gas-bearing to any economic extent. NATURAL GAS Quebec.

Dr. Selwyn speaks of his investigations in his summary report for 1891, as follows :—

"I proceeded to St. Hyacinthe, and, accompanied by Mr. Beauchemin and Mr. Desaulles, I visited the several sites where gas was reported. The first examined was on the farm of Antoine Laplante, about six miles north of St. Hyacinthe, on the concession St. Amable, two miles south-west of the village of St. Barnabé, and the same distance west of the Richelieu River. Here Laplante had recently, with the aid of a small hand-boring tool, succeeded in reaching the rock at a depth of 90 feet, a continuous, though not large, flow of gas being the result. The material penetrated consisted entirely of clay, with some small stones near the bottom. This boulder clay covers and almost entirely conceals the older rocks, and forms the level surface of the great plain of the Richelieu and Yamaska rivers. A pipe, 1½ inch diameter, has been inserted in the hole, and a continuous, though not powerful, flow of gas was coming from it. On inquiry, I found that, within a radius of 400 yards from this well, there were four places, sites of old wells, where gas is escaping. One of these was sunk 45 years ago, and the gas has been escaping ever since. The others are more or less recent trials for water, and have penetrated to rock through from 85 to 100 feet of clay, and, in all, gas comes from the bottom. In three, an inch and a-half pipe has been inserted, and the escaping gas ignites readily and burns steadily, but the pressure is light. On lot No. 18, parish of St. Hyacinthe, range St. Francis, on the farm of Emile Lorquet, close on the east side of the railway to Farnham, I also found gas escaping in a similar manner from a small pit sunk about two feet into the black soil. Near this, two wells had been sunk, one 150 yards east, 106 feet deep; the other about 500 yards north, 110 feet deep, and in both, I was informed, gas has been encountered at the bottom. The sinking was through clay, like that in the bore-holes on the St. Amable concession, which lies about eleven miles nearly due north, and on the other, or west, side of the Yamaska river."

NORTH-WEST TERRITORIES AND MANITOBA.—It was reported during the year that gas had been encountered at two points in Manitoba and the Territories. At Dominion City, on the Emerson branch of the Canadian Pacific Railway, gas is said to have been found in a well drilled for water, though of its character or quantity no authentic in- N.-W. Territories and Manitoba.

NATURAL GAS

formation is at hand. Gas was also obtained in two or three wells drilled at Medicine Hat, though to what extent is not known.

British Columbia.

BRITISH COLUMBIA.—In British Columbia one company alone was formed, under the title of the Steveston Natural Gas and Development Co., Vancouver, with a capital stock of $50,000. Of its operations, if any, no data are to hand.

NICKEL.

NICKEL.

Production.

The improvements in the economic condition of the nickel industry have greatly enhanced the value of Canada's deposits of nickeliferous pyrrhotite, and the benefit to the country accruing from their exploitation.

PRODUCTION.

These effects are clearly illustrated in the figures of production, given below which show the amount of pure nickel represented in the shipments of nickeliferous material for 1891 to be considerably over three times as great as those of the previous year :—

	Pounds of pure Nickel in matte, &c.		
1890	1,435,742,	valued at $	933,232
1891	4,626,627	"	2,775,976

The proportional increase has not been so great in the value as that shown for the amount, the average price for the metal as far as could be ascertained being 60 cents, or 5 cents per pound lower than the price for 1890.

The figures as above calculated represent, of course, the extreme and final value of Canada's nickel production, but the proportion of this value accruing to the various operators is comparatively small being dependent upon the point to which they follow the process of concentration and extraction. This varies at the different mines, the shipments made including mattes of varying degrees of richness and concentration, whilst some small quantities of raw ore even are included, as in the following statement :—

Total quantity of ore mined.....	85,500	tons.
Quantity of ore treated in production of matte.....	72,558	"
Quantity of ore shipped.....	175	"
do matte shipped.....	10,336	"

The shipments of matte vary considerably in their metallic contents, some small lots running as low as 11 per cent of nickel and 5 per cent

of copper, and others as high as 32 per cent of nickel and 17 per cent of copper. The great bulk of the matte shipped would, however, average about 22 per cent of nickel and 17 per cent copper. NICKEL. Production and values.

The price paid for the metals in this condition is said to be, for nickel, from 13 to 21 cents per pound, and for copper, from 4 to 6 cents per pound, so that taking mean values as below we get the following approximation of the value of the nickeliferous products of the mines in the condition in which it leaves them.

Nickel contents of matte, &c., 4,626,627 lbs., at say 17c. per pound	$786,526
Copper contents of matte, &c., 3,527,217 lbs., at say 5c. per pound	173,361
	$959,887

There were shipped by rail from this district 10,886 tons of nickel matte, &c., figures which closely agree with those obtained by direct returns. The books of the Customs Department give the value of the exports of nickeliferous material as $667,280.

We are indebted to the Engineering and Mining Journal of New York for the undermentioned figures of exports of nickel from the competing foreign countries named, which compared with our own figures illustrate the important place Canada had won even last year in the nickel markets of the world:—

		Lbs.
Canada, production of nickel,	1890.....	1,435,742
New Caledonia*	"	885,300
Norway	"	149,872
United States	"	144,841
Sweden	"	17,632

The value to the Dominion of its nickel deposits has been greatly added to by the inventions facilitating the extraction of the useful metals from the matte. These improvements are a secret in the possession of the Orford Copper Company, of Constable Hook, N.J., by which it is said the nickel is extracted in the form of oxide.

There seems also to be a great likelihood of still further facilities in the immediate future, as soon as the Mond process arrives at the stage of being an industrial success. By this method it is proposed to first bring the nickel in the ore to the state of oxide by roasting and then reduce it to the metallic state by heating in a current of water gas.

*Consular returns of exports.

NICKEL.

The ore containing the reduced nickel is then subjected to the action of carbonic oxide gas at a moderate temperature. The nickel then passes off in combination with the gas, which is then decomposed by subjecting it to a higher temperature in another part of the apparatus, where the nickel is deposited on suitable receptacles.

As it is claimed that any article can be given a coat of the metal equal to that deposited by electrolysis, this process, if commercially successful, will not only be a vast improvement upon the old method of extraction by chemical solution and fractional precipitation of the various metals in the ores, but it may further extend the uses of the metal in plating.

Another bright feature in regard to this industry is to be found in the results of the renewal of the tests of nickel-steel armour plate. These again demonstrated the superiority of this alloy for these purposes, which should assure a growing market for the metal apart from the steadily increasing demand for it in its other and older uses.

DISCOVERY AND DEVELOPMENT.

Discovery and development —New Brunswick.

NEW BRUNSWICK.—During the season the deposits of pyrrhotite near St. Stephen, N.B., were visited by Mr. H. P. Brumell, who gained the following information :

"Throughout the country to the north of St. Stephen are large areas of diorite, associated with which are many more or less extensive deposits of pyrrhotite. These pyrrhotite masses are almost invariably covered with a deposit of gossan resulting from the oxidation of the pyrrhotite.

"Three properties have been located and small development operations begun on them, viz. :—On the Rogers property by W. F. Todd, *et al.*, on a property to the E. S. E. by Messrs. J. A. Carroll and W. F. Best, and at Milltown by Mr. G. W. Ganong.

"*Todd's Location.*—On Todd's location the development consisted of a shaft 22 feet deep and several trenches which exposed the massive pyrrhotite beneath the gossan. In the shaft no distinct vein characteristics were discoverable, the shaft (12 feet by 12 feet) being completely in ore though occasionally masses of country rock were exposed in the sides. The country rock appears to be a very coarse-grained diorite, being in places much slickensided and showing other evidences of movement. The rock in the vicinity of the ore bodies is highly charged with pyrrhotite, and occasionally with chalcopyrite. On the north-west side of the shaft a rock shows which is found to be a very hard semi-crystalline limestone containing very sparsely scattered

grains of pyrite or pyrrhotite. What connection this has with the general 'country' rock could not be ascertained. NICKEL. Discovery and development. —New Brunswick.

"Assays made of the ore show about 1·95 per cent of nickel to the ton. One made for W. F. Todd at the Institute of Technology, Boston, afforded 1·92 per cent nickel, and an average specimen from the trench alongside shaft—surface specimens—gave 1·98 per cent nickel. Both in the shaft and trenches, wherever the ore was exposed the copper contained was apparently of too small a percentage to materially affect the value of the ore.

"*Carroll Property.*—This was the first nickel property opened, and is situated about one-half mile or more to the E. S. E. of Todd's property. The owners, Messrs J. A. Carroll and W. F. Best have sunk a shaft about 14 feet deep, in the bottom of which the ore shows strong and clean. The surface indications were not good, consisting mainly of small scattered patches of pyrrhotite in the 'country' rock. The rocks and characters of this property are in every way similar to those at Todd's. An assay of a picked specimen from bottom of shaft afforded W. F. Best of St. John, 2·62 per cent nickel and 7·92 per cent copper. At the time the property was visited, August, 1891, it was stated that the property was under a four months' bond to American parties for $25,000.

"*Ganong's Property.*—On the north bank of the St. Croix River at Milltown, about two miles above St. Stephen, is a body of pyrrhotite showing in a stripping an exposure of ore about twenty-five feet by three feet. Owing to the somewhat inaccessible position of the deposit and the covering of river detritus, little more could be learned about it. The mining right to the property is held by Mr. G. W. Ganong, who says that an assay made of the ore by Mr. F. W. Smith, State Assayer, Boston, gave 1·10 per cent nickel. An assay of ore said to be from this deposit, was made in the Geological Survey laboratory, Report 18 0–1–2, page 16 H, and afforded 0·923 per cent nickel and 0·394 per cent copper.

"*Moore's Lake, Charlotte Co.*—Here a mining license has been granted to E. H. Barter and Geo. J. Clarke of St. Stephen, covering a property on which are several quartz veins. The most southerly of these are two parallel veins a few inches apart which are twelve and seven inches wide respectively, and carry considerable quantities of pyrites. Strike N. 70° E. dip < about 80°.

"In a shaft sunk on these, and about 15 feet deep, the two small veins come together and form a strong and highly mineralized ore body. An assay of this ore gave W. French Smith, of Boston,

8 lbs. copper.....
12·46 lbs. nickel..... } to the ton.

NICKEL.
Discovery and development.

"The "country" rock appears to be a highly altered schist heavily charged with pyrite or pyrrhotite.

"The rocks of the entire nickel district consist of coarse and finer grained diabases, those about 400 yards north of Ganong's opening being very coarse grained and holding large masses of plagioclase. Water and timber for mining purposes are both plentiful, and from Carroll's and Todd's properties an easy gradient is available to the mouth of the Dennis stream on the St. Croix where direct shipment can be made by either water or rail."

Quebec.

QUEBEC.—In the province of Quebec there is, so far, nothing of commercial importance to note. Pyrite is a very common mineral in the Laurentian rocks of the area north of the St. Lawrence and Ottawa rivers, and some deposits of pyrrhotite have been found. The gneisses of these districts will often be found to carry quite a large proportion of pyrite, but, so far, these have proved to carry too small a proportion of nickel to be of industrial value. As a further contribution to the evidence on this point, quotation is made below of the results of assays of pyritous specimens from these districts, made by Messrs. Ledoux & Co., of New York, as given in the report of Mr. Oblaski, the provincial mining engineer.*

"Magnetic pyrites in gneiss, on lot 1½ West, Range VIII., of Litchfield (Pontiac). This pyrite is rather abundant and is at a short distance from a small hill of diorite.

Nickel	0·28
Cobalt	Traces.
Copper	Traces.
Iron	22·24
Sulphur	9·45
Silver	0
Insoluble matters	57·03

"Iron pyrites in diorite, township of Clarendon (Pontiac county), lot 24½ N.E. range VII.

Nickel	0·55
Silver	0
Insoluble matters	52·41

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* Report of the Commissioner of Crown Lands, province of Quebec, 1891.

"Analysis of another specimen of gneiss :

Nickel..... Traces.

"Iron pyrites in gneiss, Clarendon Range VII... 27

Nickel..... Traces.

Discovery and development.

"Magnetic pyrites in diorite. Calumet Island, Range IX., lots 2 and 3.

Nickel..... Traces."

ONTARIO.—In this province the centre of activity is, as in past years, the Sudbury district. Here there were a number of operators working small gangs of men in proving various properties. Of these, the chief were the operations under the management of Mr. A. Merry, jr., on sundry lots in Levack township for capitalists of London, England, having options on the properties. Others making returns to this office are :—The Inez mine, lot 3, concession V., township of Drury, worked by the Drury Nickel Co., employing 75 men. The work done during the year was confined to the erection of buildings and plant preparatory to the inauguration of mining operations proper. Considerable ore had been mined up to the end of the year, said to run over 3 per cent in nickel. Ontario.

The Algoma Nickel Co. worked a force of 12 men on lot 11, con. V., township of Lorne, and mined some ore, but made no shipments.

A correspondent also writes us that "lot 1, con. II., township of Blezard, is said to be now in process of exploration by Toronto capitalists. The ore from this property is said to be very rich, and is certainly remarkable in appearance, somewhat resembling 15 per cent nickel matte."

Development work was also done on various properties in the vicinity of the Nelson Station, on the Canadian Pacific Railway, in the township of Craig, and at Nickel Mountain, near Wahnapitae Lake.

Mr. A. E. Barlow, of the Departmental Field Staff, furnishes the following notes regarding the district: "During the summer of 1891 very little prospecting was done, on account of the harshness of the Ontario Mining Act. The general condition of the industry is, however, on the whole satisfactory. Had the Customs Smelting Co. been able to get enough capital, the smaller properties would have been developed, but these will receive attention in the near future, and there seems no reason to doubt that the nickel industry has gained a good solid footing.

NICKEL.
Discovery and development. —Ontario.

"At the Worthington Mine a very white nickel ore occurs in the form of circular or oval patches, surrounded by the more common pyrrhotite or rocky matter. An assay of this made for me by Mr. Thos. L. Walker, M.A., late chemist of the Murray Mine, gave 4·5 per cent of nickel. A complete analysis of this ore was very kindly undertaken by Dr. W. F. Hillebrand, through Prof. F. W. Clark, Chief Chemist of the United States Geological Survey, with the following result:—

Iron	38·36
Nickel	4·57
Manganese	·10
Sulphur	45·11
Sulphuric acid	·95
Carbonic acid	1·49*
Calcic oxide	1·91
Magnesia	·41
Insoluble	4·80
Water at 100° C	·55
Water combined	?
Loss and oxygen	?

* Calculated on the supposition that all the calcium exists as carbonate.

"Dr. Hillebrand says: 'The sulphide is certainly not pyrrhotite, it is not magnetic, and there is far too much sulphur; neither is it polydymite. There is almost enough sulphur for a mixture FeS_2 with Ni_3FeS_5—the polydymite of Sudbury, according to Clark & Catlett. On heating in a closed tube a heavy sublimate of sulphur is formed, which is probably from FeS_2.' Prof. Clark says in his letter: 'It seems to me that the mineral is a mixture, not a definite species. Polydymite may be a constituent of it, but of this there is no proof. your Sudbury minerals deserve an exhaustive study, and the work would be well repaid.'

"At the Worthington Mine, also, another sulphide occurs, which is highly nickeliferous. The richer portions occur in the form of more or less rounded patches of various sizes, and are brighter and more crystalline. The clearest and brightest crystals taken afforded Mr. T. L. Walker, to whom I submitted the samples for assay, 30 per cent of nickel. A complete analysis was made of this sample. The portion used contained both the poorer nickel ore and the supposed mixture of millerite with other sulphides, and also a small amount of rocky matter.

NICKEL. Discovery and development. —Ontario.

Sulphur	36·13
Iron	43·43
Nickel	17·48
Insoluble	·50
Moisture, copper and loss	2·46
	100·00

"*Emmons Nickel Co.*—The discovery of gersdorffite and niccolite on lot 12, con. III., township of Dennison, became known early in 1891, these minerals being recognized in a small specimen brought to the Geological Museum by Mr. Eagleson, of Ottawa, who had obtained the specimen from Mr. D. O'Connor, of Sudbury, the owner of the property.

"Mr. T. L. Walker made an analysis of these minerals together, as they were so intimately mixed in the specimen I had given him that the two minerals could not be separated. The results he gives as follows:—

Nickel	20·87
Cobalt	·64
Copper	Trace
Iron	2·43
Sulphur	10·60
Arsenic	26·04
Silica	26·70
	87·28

"'I had intended to make a complete analysis, but time was wanting. The other 12·72 per cent is made up of Al_2O_3; MgO; CaO and Na_2O. Of these, I estimated only Al_2O_3, which is 5·43 per cent. Possibly the iron given above was contained in the rock matter and in part of the nickel ore.'

"Mr. Hoffmann has made a complete analysis of the pure gersdorffite. His samples were procured by me from lot 12, con. III., of Dennison."

The Canadian Copper Company have during the year erected plant similar to that installed last year at the Murray mine for concentrating the low grade matte. The description of this process as given in last year's report*, together with further details kindly furnished by Mr. Barlow from his notes, is as follows:—

*Report of Division of Min. Stat. and Mines, 1890, p. 139 s.

NICKEL.

Discovery and development. —Ontario.

The process is very similar to that followed in Bessemerising iron. The Manhé converters are cylindrical shaped vessels with convex ends measuring usually about eight feet in length with a diameter of about four feet. They are made of boiler plate and lined with a thick layer of clay mixed with quartz. The latter ingredient is obtained by the Murray Mine from the Bruce Mines, where great quantities of *skimpings* are found, resulting from the jigging of the ore of that mine during its operation in past years. This material consists of the crushed quartzose gangue of the vein cleaned of all but a small proportion of the sulphurets of copper constituting the ore. It carries but a slight amount of felspar. The converter rests with its axis horizontal on a carriage running on a track. It is provided on its upper side with a mouth or throat through which it can be charged. The blast is driven through the charge from two parallel series of small tuyere holes, piercing the lining along either side below and along the length of the vessel. Opposite each of these tuyere holes, corresponding holes are pierced through the tubes which run along the outside of the converter to supply them with blast. These holes are closed with wooden plugs, removable to admit an iron bar, which being poked through them successively during the process of blowing keeps the tuyeres clear and the charge stirred.

A gearing enables the converter to be rotated on the car about its horizontal axis, and the throat having been thus lowered, a charge of low grade matte from the well or forehearth of the cupola is run into it. It is then rotated back till the mouth is again vertical and run around underneath a large hood connected with a stack in another part of the smelter house where it is connected with the blower.

The blast having been continued for about an hour, the converter is again rotated about its longer axis and its contents thus poured into moulds. The slag having been removed, a high grade matte remains, containing from 38 to 40 per cent of nickel, with an equal quantity of copper, which forms the product shipped.

The chief operators and those contributing most largely to the output of the district were, as in past years, the Canadian Copper Co., Messrs. H. H. Vivian & Co., and the Dominion Copper Co. The latter company, however, ceased operations in October, pending a change of ownership, but with the intention of starting up again in the spring. The returns show that from seven to eight hundred men find employment directly in connection with mining and exploring in the district, apart from those whose living depends indirectly upon the industry.

A visit was made to the Schreiber deposits by Dr. Selwyn, the Director of the Survey, in regard to which he speaks as follows :— NICKEL. Discovery and development. —Ontario.

"I left Deloraine on the 20th of April, the 22nd was spent at Schreiber in an examination of the cuttings, in the forenoon, four miles west, and in the afternoon, two miles and a half east, and to the openings lately made on a deposit of pyrrhotite precisely like those of Sudbury and occurring on the border of a mass of diabase, associated, as at Sudbury, with schists, breccias and some white granite rock, this latter being well seen near both ends of the first trestle east of Schreiber. The analysis of the samples of the ore that were collected gave only ·003 per cent of nickel, but as in all these deposits the nickel is very unevenly distributed an analysis of a few small samples is of little value as an index of the contents of the whole body. At the date of my visit the snow was still thick in the woods, and I was not able to do more than ascertain that the area over which the pyrrhotite occurred was more than sufficient to constitute a good mine, and was very favourably situated for working. The deposit was, I believe, opened by Messrs. Marks, of Port Arthur, towards the close of 1890. I cannot learn that any work has been done on it since the date of my visit in April last."

During the course of his investigations of the shores of Lake Winnipeg, Mr. Tyrrell, of the Survey staff, made a study of the area of Huronian rocks found on its eastern shore, near the southern end, which he compares with the Sudbury rocks as follows :—

"I also remained for two days at Sudbury for the purpose of comparing the rocks that are there so rich in copper and nickel with those found on the east side of Lake Winnipeg, and it was very gratifying to see the remarkably close similarity between the two sets of rocks."

In view of the importance which this metal is likely to assume in human affairs it would be well for prospectors to direct their attention to the examination of these areas of Huronian rocks, for although the mere presence of these rocks does not assure the existence of nickeliferous deposits, still the chances are good that in many places conditions similar to those accompanying the Sudbury ore deposits will be found to exist with the likelihood of finding similar deposits. These areas, with their extent and position will be found marked on the general geological map of the Dominion issued by the Geological Survey Department.

PETROLEUM.

PETROLEUM.

By H. P. H. BRUMELL, F.G.S.A.

Assistant to the Division.

The year 1891 was one of considerable interest to those operating in oil on account of the discovery of petroleum in Welland and Essex counties in Ontario, and of the further discoveries in the North-west Territories and British Columbia.

Lambton County.

Ontario.

ONTARIO.—In Ontario the most important district is of course that in Lambton county, of which but little can be said beyond the fact that it is still the only district wherein the production is utilized in the manufacture of the various products of petroleum. In the Petrolia and Oil Springs fields there were during the year, according to the *Petrolia Topic*, 5,335 wells producing oil, as follows:—In Petrolia and vicinity in Enniskillen township, 3,525; in Oil Springs, 1,553; in the township of Moore, 70, and in Sarnia township, 187. The usual number of exhausted wells were abandoned during the year and new ones drilled to replace them.

During the past two years there has been a steady decrease in the stocks held by the various tanking companies, as may be seen on reference to the following figures:—

			Bbls.
Stocks on hand,	1st January,	1890	198,219
"	1st February	"	160,621
"	1st March	"	144,149
"	1st April	"	142,223
"	1st May	"	150,665
"	1st June	"	165,018
"	1st July	"	168,454
"	1st August	"	176,318
"	1st September	"	167,071
"	1st October	"	157,283
"	1st November	"	139,449
"	1st December	"	123,593
"	1st January,	1891	96,684
"	1st February	"	89,248
"	1st March	"	78,638
"	1st April	"	64,347
"	1st May	"	53,962
"	1st June	"	52,458
"	1st July	"	61,316

This falling off in stocks may, however, very easily be explained by the fact that the consumption of crude oil is yearly increasing, as may be seen on reference to table 4. The supply of crude oil although not as great as that of many years ago, is still amply sufficient for the market and to-day the Enniskillen fields are yearly producing more by reason of the opening up of new territory and the sinking of new wells in the older portions of the field. Several new and successful wells were drilled west of Oil Springs and outside the recognized limit of that field, and explorations in Moore township to the north-west of the Petrolia field are extending the limits of the field in that direction. There is apparently no fear among the oil producers of any immediate famine, although they all recognize the inevitable falling off and final failure of supply that comes to all oil districts. PETROLEUM. —Ontario.

For any further information regarding this county, the reader is referred to the report of this Division for 1889—part S, vol. IV., Annual Report Geological Survey, 1888–89.

We are again indebted to Mr. James Kerr, of Petrolia, for the following information regarding the prices of crude oil as quoted on the Petrolia Oil Exchange.

PETROLEUM.

TABLE 1.

PETROLEA OIL EXCHANGE, CRUDE PETROLEUM BUSINESS FOR THE YEAR 1891.

1891.	Opening Price.	Highest Price.	Lowest Price.	Closing Price.	Average Closing Price.	Sales. (Barrels.)
January	$1 30	1 30½	1 28½	1 30	1 30	52,655
February	1 29½	1 29½	1 27¼	1 28	1 28½	28,649
March	1 28	1 36½	1 28	1 35	1 31¾	24,979
April	1 35½	1 38½	1 35½	1 38½	1 37	41,173
May	1 38½	1 38¾	1 36½	1 38	1 37½	29,375
June	1 38	1 38	1 36½	1 36½	1 37	19,811
July	1 36½	1 36½	1 32	1 34½	1 33⅝	31,289
August	1 34½	1 35	1 34½	1 35	1 34¾	39,236
September	1 35	1 35½	1 34¾	1 35	1 35	45,095
October	1 35½	1 35½	1 34¼	1 34¼	1 35	30,675
November	1 34¼	1 34¼	1 26½	1 33	1 33¼	17,531
December	1 33	1 33	1 30	1 31	1 31½	16,985
Year 1891	1 30	1 38¾	1 26½	1 31	1 33¾	377,453
" 1890	1 01½	1 37	1 01¼	1 30	1 18	394,924
" 1889	1 21	1 21	80	1 01	92¾	400,932
" 1888	75½	1 23½	71	1 23	1 02¾	516,007
" 1887	92	92	66	76	78	406,203

Essex County.

PETROLEUM. —Ontario.

During 1891 Messrs. Hiram Walker & Sons, of Walkerville, were utilizing, as a lubricant, the crude oil obtained from their No. 2 well, of the Marshfield series. This well was producing daily about four barrels of oil very similar in appearance and gravity to that obtained at Oil Springs. During the fall the well, after being closed down for a short time, was reopened and cleaned out preparatory to having the boring carried to a greater depth.

No use was made during the year of the well at Comber wherein a small flow of oil had been found.

Welland County.

In this county a very interesting discovery was made during the year by the Provincial Natural Gas and Fuel Co., who, in two of their wells, encountered oil. The wells affording the oil are Nos. 20 and 28, located on lots 11 and 12, respectively, of concession III. of Humberstone, where the oil is accompanied in the case of No. 20 by 300,000 cubic ft. of gas per day, that in No. 28 occurring with little or no gas.

The record of these wells is as follows:—

Character of Beds.	No. 20.	No. 28.	Formation.
Surface deposits.	63 feet.	72 feet.	Drift.
Drab and gray dolomites.....	282 "	273 "	Onondaga.
Gray dolomite.....	240 "	240 "	Guelph and Niagara.
Black shale.....	50 "	50 "	Niagara.
White crystalline dolomite.....	30 "	25 "	Clinton.
Red sandstone.....	55 "	55 "	Medina.
Red shale..... ...	10 "	10 "	
Blue shale	5 "	5 "	
White sandstone.....	5 "	5 "	
Blue shale.....	20 "	20 "	
White sandstone	22 "	29 "	
Depth.....	782 feet.	784 feet.	

In well No. 20 salt water was encountered at 540 feet and was cased off, the casing being carried to a depth of 582 feet. Gas was struck in

the second white sand at 761 and 764 feet, in both instances being accompanied by oil which had an estimated daily flow of two barrels from each of these depths, or a total flow from the well of four barrels. In No. 28 the oil was found in the same horizon as the foregoing at a depth of 768 feet, or eight feet below the summit of the second sand, and was accompanied by but a small quantity of gas. The oil produced is equal to about two barrels per day. Salt water was cased off at 580 feet. PETROLEUM. —Ontario.

The oil is of superior quality its gravity being about 45° Baumé; when viewed by transmitted light it is a deep ruby red and by reflected light a dark olive green. As to the limits of the oil territory nothing can as yet be said, as no further explorations for their definition were made.

Gaspé County.

QUEBEC.—As the result of the operations of the Petroleum Oil Trust Co. of Montreal, a non-incorporate body, five wells were sunk in the vicinity of Gaspé Basin, in one of which a small show of light gravity oil was obtained. The oil, which is of about 40° Baumé gravity, is light green in colour and very similar in appearance to the oil found in Welland county, mentioned above. The district was not visited, but on interviewing Mr. James Foley, of Montreal, the president of the company, the following facts were elicited. Quebec.

In one well, that sunk at Seal Cove, the drilling was continued to a depth of 3,000 feet. Of this the first two feet were through surface deposits, beneath which were encountered 850 feet of bluish shale or slate, followed by 1,298 feet of yellow and white sandstone; fresh water, which flowed over the casing, was found at 30 and 70 feet. During the fall the property and operations were examined by an English expert, though with what result has not been made known.

Alberta.

NORTH-WEST TERRITORIES.—During 1891, Dr. Selwyn, Director of the Geological Survey, visited the district to the south of Pincher Creek to make investigations regarding the reported discovery of oil in that vicinity. In his summary report for 1891, he writes as follows:— N. W. Territories.

"I found considerable excitement existed in the village (Pincher Creek), in fact, a decided 'boom' in petroleum claims, and that a company had been formed to put down a boring, the site selected for the experiment being on sec. 21, township 3, range 29, some 18 miles south, a little east of Pincher Creek village.

PETROLEUM. —N. W. Territories.

"On Monday, the 20th of July, I proceeded to the locality named, accompanied by several gentlemen interested in the work. The country traversed is fine farming land, a richly grassed undulating prairie well watered by numerous small tributaries of Pincher Creek and the Waterton River, all of which eventually find their way to the Saskatchewan. The site of the proposed boring was on a small flat on the left bank of one of the tributaries of Waterton River. A gang of men were at work erecting a derrick and preparing to put an engine and boiler, already on the ground, in place.

"The evening of the 20th of July and the whole of the following day was devoted to an examination of the rocks that were exposed in the creek both below and above the site selected for boring. They were ordinary varieties of sandstone and sandy shales of the Cretaceous, with irregular dips from 15° to 20°. The last exposure of these rocks up the creek was about three miles and a quarter, then, for about three miles further there were no exposures up to where the creek emerges from a rocky gorge, all along which there are good exposures of hard flinty red, green and gray shales and sandstones, often gritty and quartzose and dipping to south-south-west at 25° to 30°. These are the Cambrian rocks which here form the base of the eastern spurs and ridges of the Rocky Mountains. It was stated that both in this gorge and at several places in pools on the prairie to the eastward, petroleum had been seen, but no one at the boring camp could show me any of these places.

"The whole country for many miles around and up into the entrance of the South Kootenay pass, nine miles to the south, was marked off with the stakes of the oil claims. On inquiry, I was informed that an 'expert' named Baring had been there and had expressed a favourable opinion as to boring where operations were being commenced. I was unable to learn any other reason for fixing the site. The note I made under date 21st July reads: 'There is nothing whatever to indicate the existence of petroleum in this vicinity. It seems highly improbable that it should be found here, though, of course, not impossible.' I subsequently heard that a copious flow of water had been struck and the boring abandoned. The cost of this very absurd and useless operation must have been considerable.

"On the 22nd of July, I left the boring camp and proceeded about eight miles in a southerly direction, gradually approaching the foot of the mountains, till we struck the Kootenay branch of the Waterton River, which here leaves the South Kootenay or Boundary Pass. This stream was then followed up about two miles and a half, where we camped

on the left bank, opposite a depression in the high range which here borders the pass on its southern side, and divides the waters of the Kootenay branch from those of "Cameron Falls" Creek. An ascent of about two miles by a somewhat rough trail mostly over gray and white heavy bedded dolomites, brought us to the summit of this depression. We then descended into the valley of Cameron Falls Creek. This creek takes its rise in a small lake near Camp Akamina of the boundary survey and flows north-east about seven miles to where we struck it, and where it makes an almost right angle bend and flows south-east into Waterton Lake. PETROLEUM.—N. W. Territories.

Cameron Falls brook is a rapid mountain stream, eight or ten yards wide. After following it up about a mile and a half on the left bank, Mr. Fernie, my guide, remarked that we must be close to where the oil had been found. He had scarcely spoken when, while still in the saddle and on the trail eight or nine feet above the brook, I noticed a powerful odour of petroleum. Descending to the edge of the water and stirring the stones and gravel in the bed of the stream, considerable quantities of oil at once rose to the surface and floated away. Crossing to the right bank it was again seen coming out of the bank, some inches above the then level of the stream. Here, skimming it off the surface of a shallow pool, a wine bottle full was soon collected. This can now be seen in the Geological Survey Museum. Sixty or seventy yards below where the oil was seen, a rocky reef of gray siliceous dolomite crosses the creek and rises into a steep bluff on the left bank; on the right bank, seven or eight feet above the creek, a broad, thickly timbered flat extends for 150 yards to the base of the bordering mountains which culminate six miles to the south-west at the boundary monument, 6,000 feet above sea level.

"No work whatever had been done to test the nature of the oil sources. A comparatively small outlay for some shallow sinking or boring on the flat above described would do this."

BRITISH COLUMBIA.—Continuing his investigations into British Columbia, Dr. Selwyn proceeds with the account of his work in the same report, as follows:— British Columbia.

Kootenay District.

"On the 23rd of July, we proceeded through the pass, crossing the summit and camping on Akamina Brook, about six miles down the western slope in British Columbia. On the 24th we proceeded down the valley and at about four miles north of the 49th parallel, the trail came down to the level of the brook, and here on the edge of a beaver dam pool there were ledges of hard dark blue shale, dipping

PETROLEUM. —British Columbia.

E. 30° N. < 12°. Lifting layers of this at and below the water a quantity of dark green circular patches of oil rose to the surface, and a precisely similar result followed by stirring up the mud in the bottom of the pool. This place is about fifteen miles in a direct line, west 10° south, from the occurrence on Cameron Falls Creek, the main watershed of the Rocky Mountains and Mounts Kirby, Spence and Yarrell intervening. Oil is said by the Indians (the Stoneys) who frequent this region, to occur at other points, in the Akamina Brook valley, both above and below that recorded. The Akamina joins the Flathead River in Montana, about four miles south of the international boundary. The Beaver Dam oil is of a dark greenish-black, and does not apparently differ much from that of Cameron Falls Creek. Preliminary tests might be made here by sinking a shallow shaft in the shales at the Beaver Dam pool, and by a boring on the sandy and gravelly flat country about two miles and a half north of the boundary line.

"On the 24th of July we camped in Montana, on the left bank of the Flathead River, about two miles above the mouth of the Akamina or Kish-e-ne-nah Creek.

"On the 25th we proceeded up the Flathead Valley, the trail passing for the most part along high terraces of sand, clay and gravel. At 8 a.m. we recrossed the boundary on one of these terraces, and then again descended to the river where we off saddled and waited for the pack train. It arrived at 10.30; and we then ascended again to the high level terrace and turning north crossed a number of ridges and gullies into the valley of Sage Creek, camping on the right bank at about nine miles above its mouth.

"At about a mile and a half higher up, the creek leaves the high mountains which border its upper course in a north-easterly direction up to the main watershed, some twelve or fourteen miles distant, and here at the edge of the water, on the left bank, I found hard dark flinty shales like those at the Beaver Dam pool on the Akamina, dipping S. 25°—30° W. <25°. Directly the layers of this rock are raised, the oil rises and spreads over the surface of the water in such abundance that a short time suffices with the aid of a tin cup to collect a bottle full. Here, also a considerable quantity of gas escapes from the cracks and joints in the rock and ignites freely on the application of a match.

"Less than half a mile higher up, on the right bank and on the opposite or west side of the valley, oil was again found issuing from the base of a bank of drift which has here filled the valley and caused the stream to make a sharp bend eastward to the base of the opposite

mountain. No rock was exposed here, but every stone in the bed of the creek, especially on being broken or rubbed, gave out a strong odour of petroleum. The oil collected here, a sample of which can be seen in the Museum, differs entirely in appearance from those of Cameron Falls Creek and Akamina or Kish-e-ne-nah Creek. PETROLEUM. —British Columbia.

"Some of it was of a light lemon yellow, but most of it nearly the colour of pale brandy and with a very powerful petroleum odour.

"The general geological structure, the character of the rocks and the physical aspect of the country in the South Kootenay, the North Kootenay and the Crow's Nest and other passes of the Rocky Mountains have been admirably described by Dr. G. M. Dawson,* and the South Kootenay Pass is also described in his Report on the Geology and Resources of the Forty-ninth Parallel, 1875. For details on the subjects named these works can be referred to. The present is, however, I believe the first recorded instance of the occurrence of petroleum in this region, as well as of its occurrence in Cambrian rocks. Whether the reference of the rocks to this age is correct, is not quite certain; that it is so as regards the somewhat similar siliceous dolomites and quartzose strata of the Kicking Horse Pass has been proved by the discovery of a Cambrian fauna and there seems no reason to doubt that the petroleum-bearing beds of the South Kootenay Pass are of the same age. At present, however, except on the traverses made by Mr. Dawson, little or nothing is known respecting the distribution of the formations in the great block of mountainous country which lies between the 49th and 51st parallels of latitude and the 115th and 117th degrees of longitude, and which comprises the Purcell, Hughes, Macdonald and Galton ranges, and covers an area of about 9,600 square miles, much of it densely wooded and with peaks ranging to eight and nine thousand feet."

STATISTICS.

Statistics.

Production.—During 1891 only ten refineries were working, the Canadian Oil Co. of Hamilton and the Sarnia Oil Co. of Sarnia having suspended operations. Among the refineries operating the only change from last year is that wherein the refinery owned in the past by the Messrs. M. J. Woodward & Co., passed into the hands of Samuel Rogers & Co. of Toronto.

Those operating were: The Imperial Oil Co., S. Rogers & Co., John McDonald; The Petrolea Crude Oil and Tanking Co., The Consumers' Oil Co., McMillan, Kittredge & Co., The Premier Oil Co., and John McMillan, all at Petrolea, and John R. Minhinnick, and W. Spencer & Co., at London.

*Annual Report, Geological Survey, 1885.

PETROLEUM. —Statistics.

From returns made direct to this office there were 27,860,719 gallons or 796,020 barrels of crude oil consumed. Assuming that the stocks carried into and out of the year by the different refineries were the same, and deducting the decrease in stocks held by the tanking companies of 38,715 barrels, there will be found to have been an approximate production of crude oil of 757,000 barrels, an increase over figures obtained in the same way for last year, of 62,000 barrels. At the average price for crude oil of $1.33 per barrel the value of the year's production would be $1,006,810.

As in previous years, however, the production of crude oil, as shown in the summary table of production, is obtained by computation from the inspection returns of the Inland Revenue Department.

The tanking companies operating as such were: The Petrolea Crude Oil and Tanking Co., The Crown Warehousing Co., and the Producers Tanking Co., all of Petrolea, all of whom kindly furnished returns of their operations during the year. These returns afford the following result:—

Stocks, 1st January, 1891.....	96,683$\frac{33}{35}$	barrels.
Quantity of oil received.....	505,646$\frac{25}{35}$	"
" " delivered.....	544.362$\frac{15}{35}$	"
Stocks, 1st January, 1892.....	57,968$\frac{8}{35}$	"
Decrease in stocks during year.....	38,715$\frac{25}{35}$	"

Of the operations of the refineries in the manufacture of the various products of petroleum, the following tables compiled from returns made direct to this office give the necessary information.

PETROLEUM.

TABLE 2.

PRODUCTION OF CANADIAN OIL REFINERIES.

Products.	1890.		1891.	
	Quantity.	Value.	Quantity.	Value.
Illuminating oils..... galls.	11,129,277	$1,264,677	10,427,040	$1,170,241
Benzine and naphtha... "	636,247	37,026	603,971	36,790
Paraffine oils..... "	446,888	64,713	622,287	75,772
Gas oil..... "	4,246,447	84,752	3,373,720	89,267
Lubricating oils and tar. "	2,877,388	130,349	2,500,000	101,752
Paraffine wax..... lbs.	913,730	56,903	741,611	60,687
Totals.....	.....	$1,638,420	.....	$1,534,509

PETROLEUM.

PETROLEUM. —Statistics.

TABLE 3.

CONSUMPTION OF CRUDE OIL AND CHEMICALS.

Articles.	1889.	1890.	1891.
Crude petroleum.....gal'ls.	25,066,275	28,267,746	27,860,719
Sulphuric acid..... .. .. lbs.	3,638,704	4,284,826	4,213,984
Soda..... "	380,487	336,758	319,736
Litharge..... "	477,969	443,922	394,715
Sulphur..... .... "	76,325	85,729	54,032

The data for the compilation of the following figures, and of tables 4 and 5, are taken from the books of the Inland Revenue Department, and show the number of packages of Canadian oil inspected during the calendar year 1891, as well as the total quantity of refined oil, imported and domestic oil, inspected during the fiscal years from 1881 to 1891 inclusive.

During 1891 the packages of Canadian oil inspected were:—

234,824.....at 10 cents inspection fee.
9.....at 5 "
40,553.....at 2½ "

Assuming that these packages contain 42, 10 and 5 gallons respectively there will be found to have been an inspection of

9,862,608 gallons in packages of 42 gallons each
90 " " 10 "
202,765 " " 5 "

or a total inspection of 10,065,463 gallons. This quantity computed at an average percentage of 38 would be equivalent to a consumption of crude oil of 26,435,430 gallons or 755,298 barrels, which at the average price of $1.33 would have a value of $1,004,546.

PETROLEUM —Statistics.

The following table, computed in a manner similar to the above, shows the quantity of crude oil used each fiscal year since 1881.

PETROLEUM.

TABLE 4.

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

Fiscal Year.	Refined Oils Inspected.	Crude Equivalent Calculated.	Ratio of Crude to Refined.
	Galls.	Galls.	
1881	6,406,783	12,813,566	100 : 50
1882	5,910,787	13,134,993	100 : 45
1883	6,970,550	15,490,111	100 : 45
1884	7,656,011	19,140.027	100 : 40
1885	7,661,617	19,154,042	100 : 40
1886	8,149,472	21,445,979	100 : 38
1887	8,243,962	21,694,637	100 : 38
1888	9,545,895	25,120,776	100 : 38
1889	9,462,834	24,902,195	100 : 38
1890	10,121,210	26,634,763	100 : 38
1891	10,270,107	27,026,597	100 : 38

The following table (5) shows the total amount of illuminating oil, both domestic and imported, inspected during the fiscal years from 1881 to 1891, inclusive, and illustrates the market for that product in Canada :—

PETROLEUM.

TABLE 5.

TOTAL AMOUNT OF OIL, IMPORTED AND CANADIAN, INSPECTED.

Fiscal Year.	Imported.	Canadian.	Total.
	Galls.	Galls.	Galls.
1881	476,784	6,406,783	6,883,567
1882	1,351,412	5,910,747	7,262,159
1883	1,190,828	6,970,550	8,161,378
1884	1,142,575	7,656,011	8,798,586
1885	1,278,115	7,661,617	8,939,732
1886	1,327,616	8,149,472	9,477,088
1887	1,665,604	8,243,962	9,909,566
1888	1,821,342	9,545,895	11,367,237
1889	1,767,812	9,462,834	11,230,646
1890	2,020,742	10,121,210	12,141,952
1891	2,022,002	10,270,107	12,292,109

The following tables of exports and imports of oil are compiled from information obtained from the Customs Department and explain themselves :— PETROLEUM —Statistics.

PETROLEUM.

TABLE 6.

EXPORTS OF CANADIAN CRUDE AND REFINED PETROLEUM FROM 1873 TO 1891.

Calendar Year.	Gallons.	Value.
1873	5,869,579	$1,287,576
1874	28,946	2,509
1875	11,836	2,214
1876	2,533,772	583,550
1877	1,431,883	323,013
1878	609,171	85,571
1879	235,171	17,032
1880	3,085	751
1881	501	99
1882	1,119	286
1883	13,283	710
1884	1,098,090	30,168
1885	337,967	10,562
1886	241,716	9,855
1887	473,559	13,831
1888	196,602	74,542
1889	235,855	10,777
1890	420,492	18,154
1891	447,355	18,575

PETROLEUM.

TABLE 7.

IMPORTS OF CRUDE AND REFINED PETROLEUM.

Fiscal Year.	Gallons.	Value.
1880	687,641	$131,359
1881	1,437,475	262,168
1882	3,007,702	398,031
1883	3,086,316	358,546
1884	3,160,282	380,082
1885	3,767,441	415,195
1886	3,819,146	421,836
1887	4,290,003	467,003
1888	4,523,056	408,025
1889	4,650,274	484,462
1890	5,075,650	515,852
1891	5,071,386	498,330

PETROLEUM —Statistics.

Subtracting the quantities of imported oils inspected (Table 5) from those shown in Table 7, there will be found to have been an annual importation of oil, crude and other than illuminating, as shown in the following Table 8 :—

PETROLEUM.

TABLE 8.

IMPORTS OF CRUDE AND MANUFACTURED OILS OTHER THAN ILLUMINATING.

Fiscal Year.	Gallons.
1881	960,691
1882	1,656,290
1883	1,895,488
1884	2,017,707
1885	2,489,326
1886	2,491,530
1887	2,624,399
1888	2,701,714
1889	2,882,462
1890	3,054,908
1891	3,049,384

The imports of paraffine wax and paraffine wax candles are shown in the following tables 9 and 10 :—

PETROLEUM.

TABLE 9.

IMPORTS OF PARAFFINE WAX.

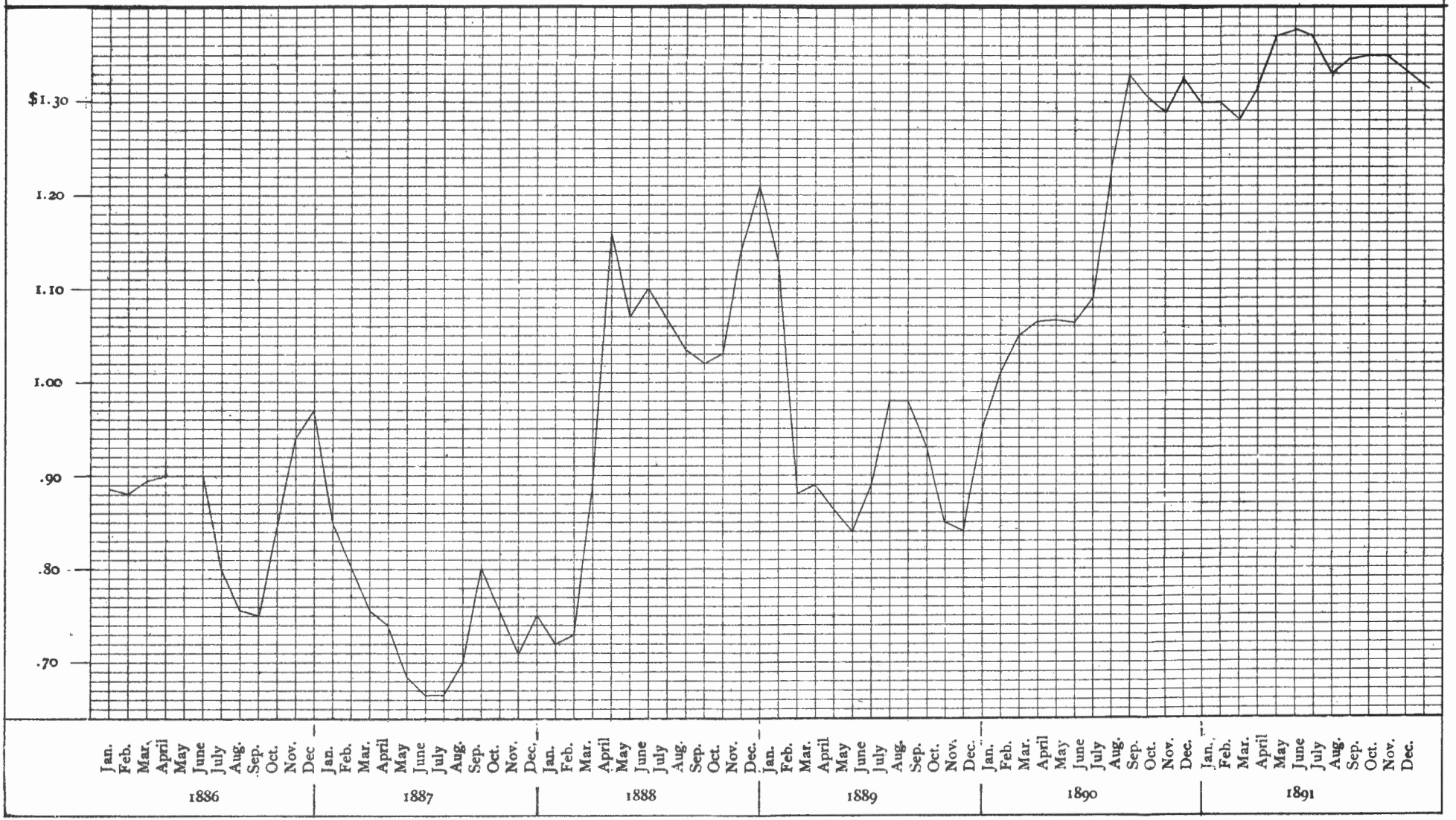
Fiscal Year.	Pounds.	Value.
1883	43,716	$ 5,166
1884	39,010	6,079
1885	59,967	8,123
1886	62,035	7,953
1887	61,132	6,796
1888	53,862	4,930
1889	63,229	5,250
1890	239,229	15,844
1891	753,854	50,275

PETROLEUM

TABLE A

Price

RANGE OF PRICE (AVERAGE CLOSING PRICE) OF CRUDE OIL
DURING 1886, 1887, 1888, 1889, 1890. 1891.



PETROLEUM.

PETROLEUM —Statistics.

TABLE 10.

IMPORTS OF PARAFFINE WAX CANDLES.

Fiscal Year.	Pounds.	Value.
1880	10,445	$2,269
1881	7,494	1,683
1882	5,818	1,428
1883	7,149	1,734
1884	8,755	2,229
1885	9,247	2,449
1886	12,242	2,587
1887	21,364	3,611
1888	22,054	2,829
1889	8,038	1,337
1890	7,233	1,186
1891	10,598	2,116

PHOSPHATE.

PHOSPHATE —Production.

During 1891 there were 23,588 tons of phosphate (apatite) marketed, having a spot value of $241,603, the production being that of the provinces of Ontario and Quebec, as follows:—

Ontario, 2,344 tons, valued at ..... $ 35,187
Quebec, 20,244 " " 206,416

The production for this year shows a marked falling off in comparison with 1890, the decrease in quantity being 8,165 tons, and in value $119,442. For the past six years the production has been as follows:—

1886—20,495 tons, valued at $304,338
1887—23,690 " " 319,815
1888—22,485 " " 242,285
1889—30,988 " " 316,662
1890—31,753 " " 361,045
1891—23,588 " " 241,603

This falling off in production is almost entirely due to the decrease in prices, caused by the entrance into the market of the cheaper and lower grade phosphatic rock of Florida, of which large quantities have been shipped at a comparatively low cost.

The following Table 1 and graphic table A gives all the available information regarding exports of phosphate, the greater part of which goes to Great Britain.

PHOSPHATE.

TABLE 1.

PHOSPHATE —Statistics.

EXPORTS OF PHOSPHATE.

Year.	Ontario.		Quebec.	
	Tons.	Value.	Tons.	Value.
1878.	824	$ 12,278	9,919	$195,831
1879...	1,842	20,565	6,604	101,470
1880..	1,387	14,422	11,673	175,664
1881	2,471	36,117	9,497	182,339
1882	568	6,338	16,585	302,019
1883	50	500	19,666	427,168
1884	763	8,890	20,946	415,350
1885.....	434	5,962	28,535	490,331
1886....	644	5,816	19,796	337,191
1887..... ...	705	8,277	22,447	424,940
1888.....	2,643	30,247	16,133	268,362
1889.	3,547	38,833	26,440	355,935
1890.....	1,866	21,329	26,591	478,040
1891	1,551	16,646	15,720	368,015

In the following table it will be seen that Canadian apatite plays a by-no-means unimportant part in the trade of Great Britain in phosphates:—

PHOSPHATE.

TABLE 2.

GREAT BRITAIN: IMPORTS OF CANADIAN APATITE COMPARED WITH TOTAL IMPORTS OF PHOSPHATES IN THAT COUNTRY.

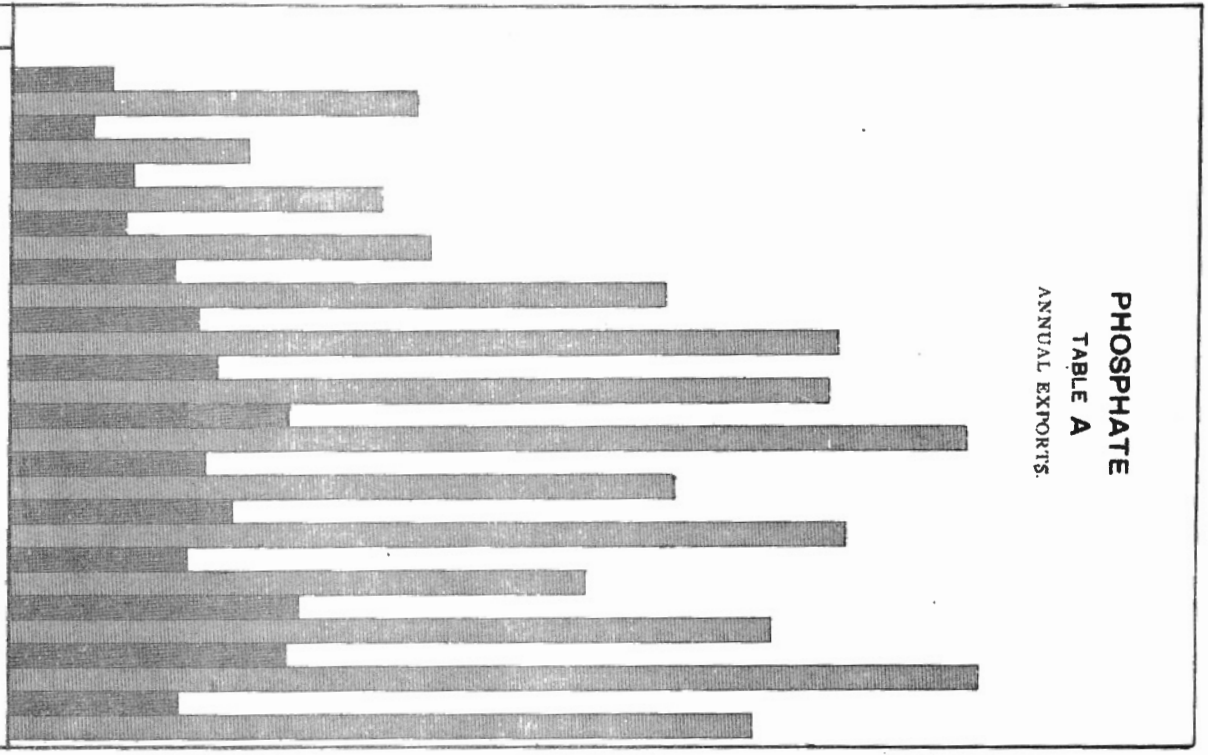
Year.	Canadian Apatite.		Total Phosphates.		Per cent of Value of Canadian Apatite to total Value.
	Long Tons — 2,240 lbs.	£ stg.	Long Tons — 2,240 lbs.	£ stg.	
1882.....	8,187	39,851	199,428	613,198	6·5 per cent.
1883.....	16,531	66,714	246,945	813,825	8·2 "
1884	15,716	52,370	219,225	643,851	8·1 "
1885....	21,484	76,179	238,572	628,027	12·1 "
1886.....	18,069	63,490	223,111	526,885	12·0 "
1887.....	19,194	65,974	283,415	614,088	10·7 "
1888.... .. .	12,423	42,291	257,886	544,919	7·7 "
1889...	23,123	71,037	304,953	703,704	10·1 "
1890..... .	21,089	65,420	343,501	849,452	7·8 "
1891.....	15,918	54,235	256,772	628,395	8·6 "

PHOSPHATE

TABLE A

ANNUAL EXPORTS.

Year	Quantity	Value
	Tons	$
1878	10,743	208,109
1879	8,446	122,035
1880	13,060	190,086
1881	11,968	218,456
1882	17,153	338,357
1883	19,716	427,668
1884	21,709	424,240
1885	28,969	496,293
1886	20,440	343,007
1887	23,152	433,217
1888	18,776	298,609
1889	29,987	394,768
1890	28,457	499,369
1891	17,271	384,661



ANNUAL REPORT FOR 1891; DIVISION OF MINERAL STATISTICS AND MINES.
E. D. INGALL, M. E., IN CHARGE.

THE PRECIOUS METALS.

GOLD.

The production of gold for 1891 was 51,303 oz., valued at $930,614, as compared with 64,046 oz. in 1890, valued at $1,149,776. The details of this production are given in Table 1, which, compared with the figures for last year, shows the following features.

Nova Scotia shows a falling off of 1,204 oz., and British Columbia of 3,801 oz., whilst the estimated quantity for the North-west Territories and Yukon district is less by 7,853 oz. Quebec and Ontario only register a slight increase of 115 oz. on their small production.

The alluvial gold product of British Columbia, added to that resulting from the mining of the auriferous lodes of Nova Scotia, constituted, as in the past, all but a small fraction of the production given above. The deficit in the former province is due to the continuation of the exhaustion of the shallower placer deposits which have hitherto furnished nearly all the gold. The falling off due to this cause is clearly shown in the graphic table A, showing an almost uninterrupted shrinking of the yield from almost four million dollars in 1863, till in 1891 it is but a little over one-tenth of that amount.

Of the other items in the below given Table No. 1, the amount credited to Ontario is due to the working of quartz; that credited to Quebec is a close estimate of the results of the gold washed from the gravels of the Chaudière district.

The amount credited to the North-west Territories, &c., comprises a close estimate of the gold washed out of the bars of the Saskatchewan River, together with the mean of several estimates of the gold washed on the Yukon River in Canadian territory.

GOLD.

TABLE 1.

PRODUCTION BY PROVINCES.

Provinces.	Ounces.	Value.	No. of Men.
Nova Scotia	23,154	$451,503	498
Quebec	90	1,800	
Ontario	100	2,000	19
North-west Territories (including Yukon District)	2,676	45,500	100
British Columbia	25,283	429,811	1,199
Total	51,303	930,614	1,816

THE PRECIOUS METALS. Gold—Production.

BRITISH COLUMBIA.—The statistical details regarding the gold-mining industry of this province, as supplied by the Provincial Department of Mines, have been compiled, and are given in Tables A, B, C and No. 2.

The amounts of gold reported by the banks of the province, as exported during the year, are as follows:—

Bank of British Columbia	$196,588
Messrs. Garesche, Green & Co	144,654
Bank of British North America	16,934
	$358,176
Add one-fifth; estimate of gold carried away in private hands	71,635
Production of gold as estimated by the provincial authorities	$429,811

GOLD.

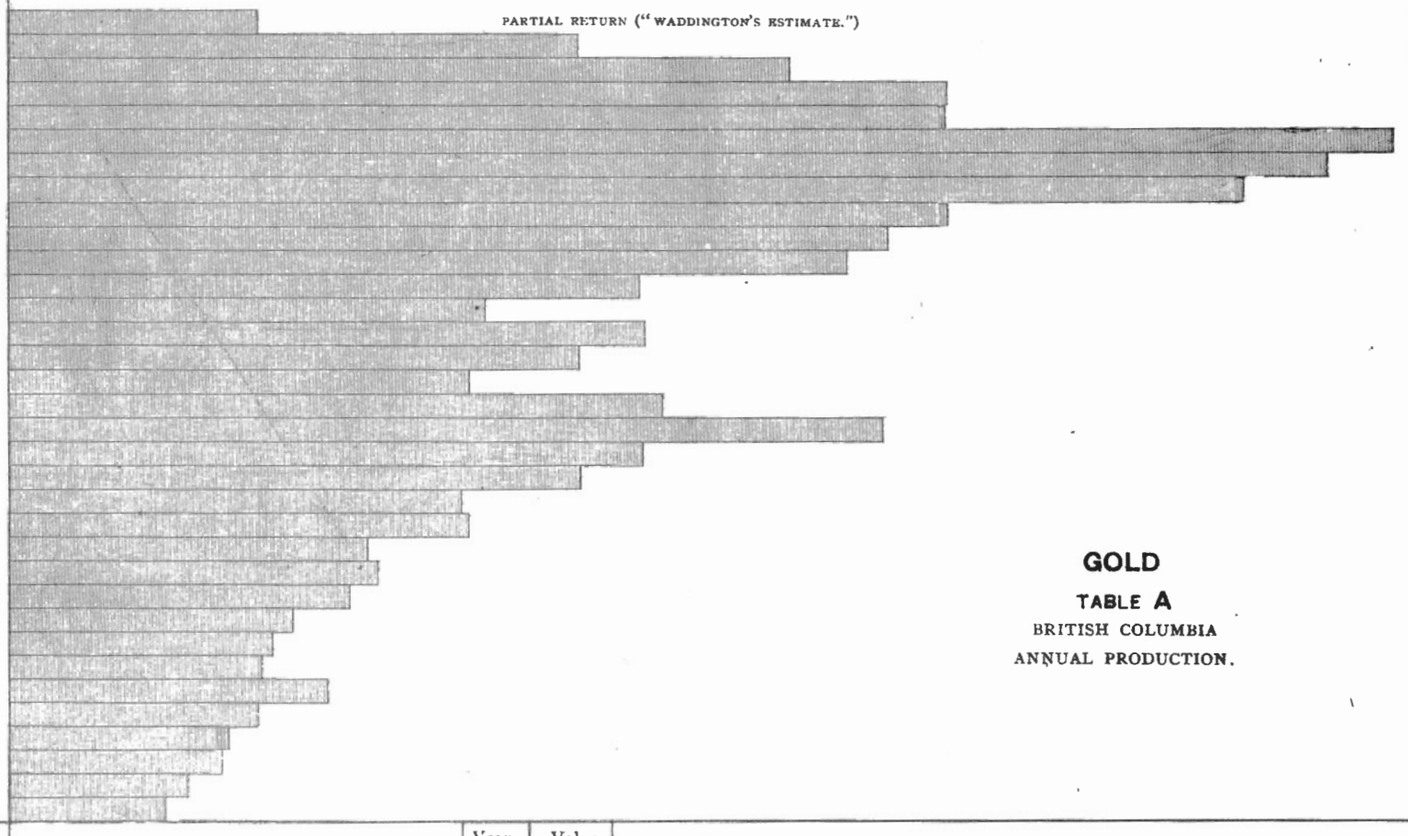
TABLE 2.

BRITISH COLUMBIA.

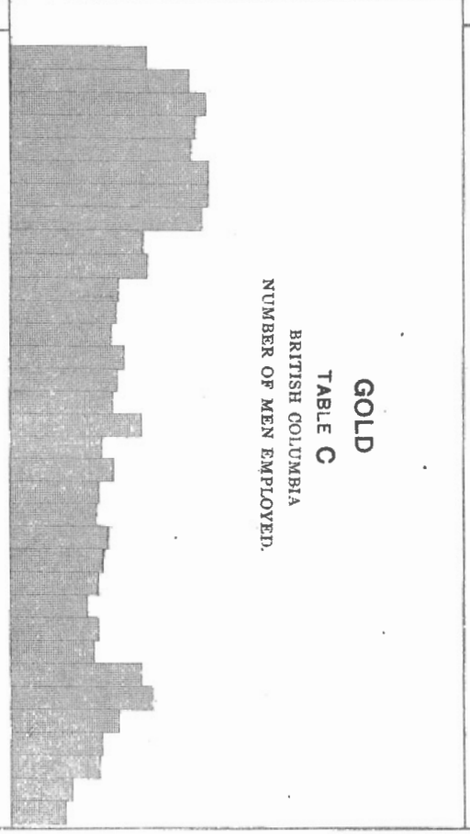
YIELD, ETC., BY DISTRICTS.

District.	Divisions.	Men Employed.		Yield of Gold by Divisions.	Total Yield by Districts.
		Whites.	Chinese.		
Cariboo	Barkerville	77	136	$63,450	
	Lightning Creek	26	111	33,850	
	Quesnelle Mouth	3	97	30,650	
	Keithley Creek	68	261	57,100	
		174	605		$185,050
Cassiar	Laketon			40,000	40,000
Kootenay	Western	35		13,000	
	Eastern	9	48	28,550	
		44	48		41,550
Lillooet		35	60	52,506	52,506
Yale	Osoyoos	62	45	11,000	
	Similkameen	58	68	21,100	
		155	173		32,100
					$351,206
	Total Whites	373			
	" Chinese		826		
	" employed	1,199			

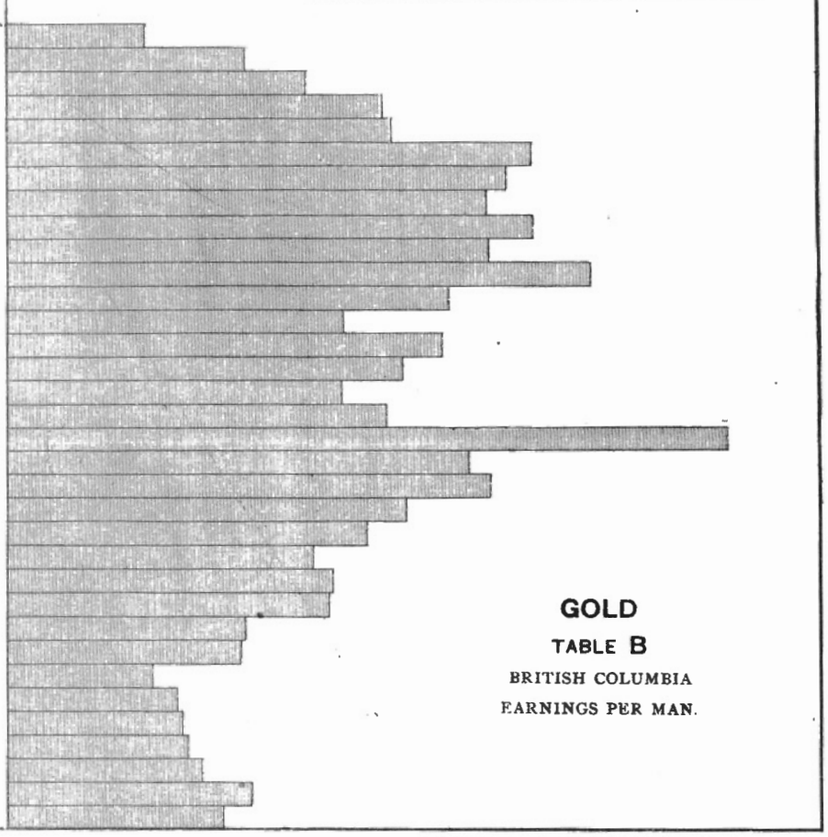
Year	Value
1858	$705,000
1859	1,615,072
1860	2,228,543
1861	2,666,118
1862	2,656,903
1863	3,913,563
1864	3,735,850
1865	3,491,205
1866	2,662,106
1867	2,480,868
1868	2,372,972
1869	1,774,978
1870	1,336,956
1871	1,799,440
1872	1,610,972
1873	1,305,749
1874	1,844,618
1875	2,474,904
1876	1,786,648
1877	1,608,182
1878	1,275,204
1879	1,290,058
1880	1,013,827
1881	1,046,737
1882	954,085
1883	794,252
1884	736,165
1885	713,738
1886	903,651
1887	693,709
1888	616,731
1889	588,923
1890	494,436
1891	429,811

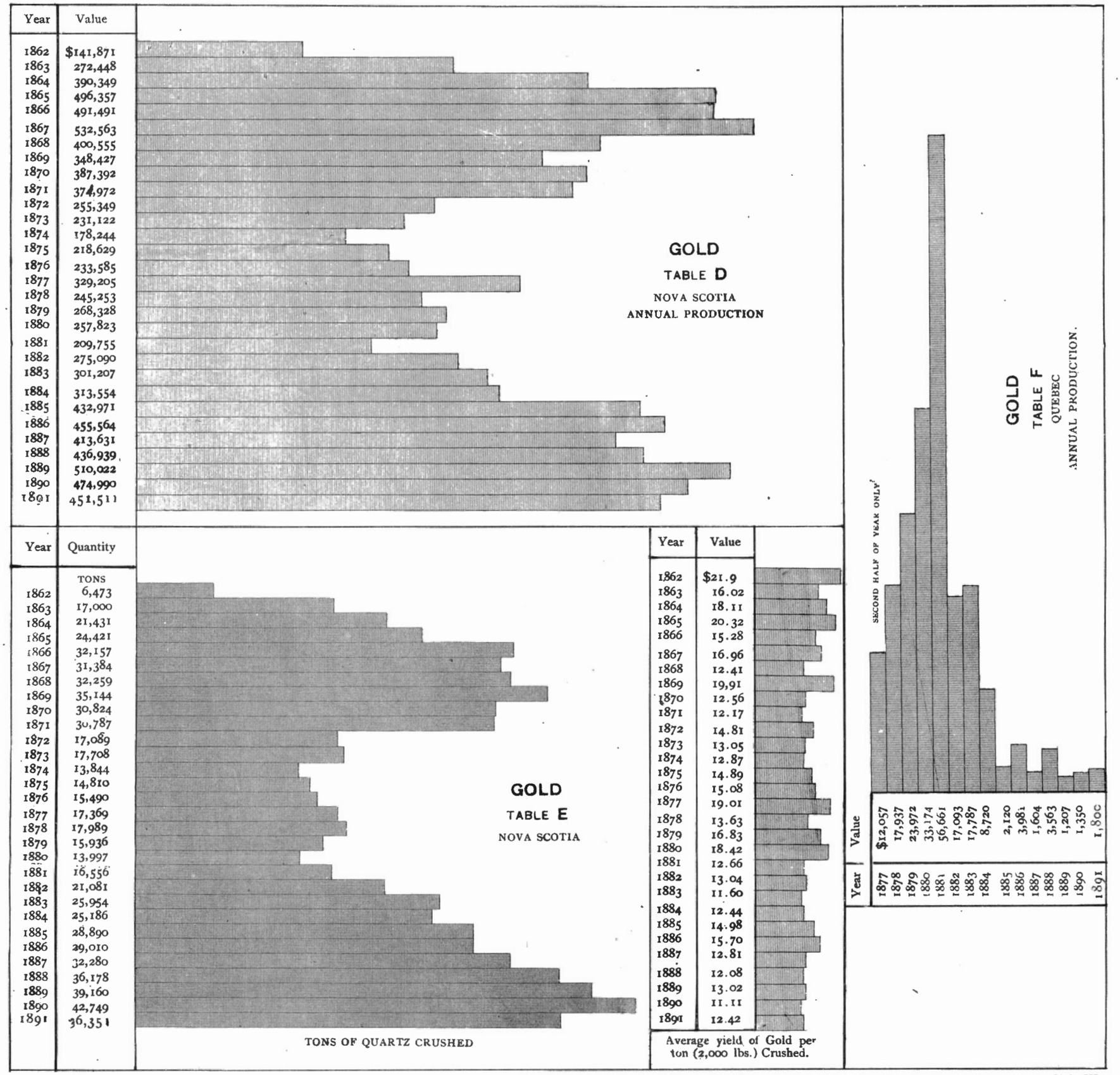


Year	Number
1858	3000
1859	4000
1860	4,400
1861	4,200
1862	4,100
1863	4,400
1864	4,400
1865	4,294
1866	2,982
1867	3,044
1868	2,309
1869	2,369
1870	2,348
1871	2,450
1872	2,400
1873	2,300
1874	2,868
1875	2,024
1876	2,282
1877	1,960
1878	1,883
1879	2,124
1880	1,955
1881	1,898
1882	1,738
1883	1,965
1884	1,858
1885	2,902
1886	3,147
1887	2,342
1888	2,007
1889	1,929
1890	1,342
1891	1,199



Year	Value
1858	$235
1859	403
1860	506
1861	634
1862	648
1863	889
1864	849
1865	813
1866	893
1867	814
1868	992
1869	749
1870	569
1871	734
1872	671
1873	567
1874	643
1875	1,223
1876	783
1877	820
1878	677
1879	607
1880	518
1881	551
1882	548
1883	404
1884	396
1885	246
1886	287
1887	296
1888	307
1889	330
1890	423
1891	358





Year	Value
1862	$141,871
1863	272,448
1864	390,349
1865	496,357
1866	491,491
1867	532,563
1868	400,555
1869	348,427
1870	387,392
1871	374,972
1872	255,349
1873	231,122
1874	178,244
1875	218,629
1876	233,585
1877	329,205
1878	245,253
1879	268,328
1880	257,823
1881	209,755
1882	275,090
1883	301,207
1884	313,554
1885	432,971
1886	455,564
1887	413,631
1888	436,939
1889	510,022
1890	474,990
1891	451,511

Year	Quantity
	TONS
1862	6,473
1863	17,000
1864	21,431
1865	24,421
1866	32,157
1867	31,384
1868	32,259
1869	35,144
1870	30,824
1871	30,787
1872	17,089
1873	17,708
1874	13,844
1875	14,810
1876	15,490
1877	17,369
1878	17,989
1879	15,936
1880	13,997
1881	16,556
1882	21,081
1883	25,954
1884	25,186
1885	28,890
1886	29,010
1887	32,280
1888	36,178
1889	39,160
1890	42,749
1891	36,351

Year	Value
1862	$21.9
1863	16.02
1864	18.11
1865	20.32
1866	15.28
1867	16.96
1868	12.41
1869	19,91
1870	12.56
1871	12.17
1872	14.81
1873	13.05
1874	12.87
1875	14.89
1876	15.08
1877	19.01
1878	13.63
1879	16.83
1880	18.42
1881	12.66
1882	13.04
1883	11.60
1884	12.44
1885	14.98
1886	15.70
1887	12.81
1888	12.08
1889	13.02
1890	11.11
1891	12.42

Year	Value
1877	$12,957
1878	17,937
1879	23,972
1880	33,174
1881	56,661
1882	17,093
1883	17,787
1884	8,720
1885	2,120
1886	3,981
1887	1,604
1888	3,563
1889	1,207
1890	1,350
1891	1,800

THE PRECIOUS METALS. Gold—Production.

NOVA SCOTIA.—The statistical details regarding the gold-mining industry in this province are given in the accompanying tables, graphic D and E and Nos. 3 and 4, which are compiled from data collected by the Provincial Department of Mines. From these it is seen that whilst there is a decrease in the total yield of gold and the number of tons crushed, the yield of metal per ton milled shows a slight increase over last year.

GOLD.

TABLE 3.

NOVA SCOTIA.

PRODUCTION OF THE DIFFERENT DISTRICTS FROM 1862 TO 1891, INCLUSIVE.

Districts	Tons of Quartz Crushed.	Total Yield.				Average yield per ton of 2,000 lbs.
		Ozs.	Dwts.	Grs.	Value at $19.50 per oz.	
Caribou and Moose River	49,760	25,541	17	10	$ 498,066	$10·01
Montague	17,055	33,942	12	16	661,881	38·81
Oldham	40,166	44,151	16	16	860,960	21·43
Renfrew	46,071	31,814	13	2	620,385	13·46
Sherbrooke	166,295	119,767	9	2	2,335,465	14·04
Stormont	23,124	24,266	6	9	473,193	20·45
Tangier	29,492	19,198	8	6	374,369	12·69
Uniacke	39,207	24,896	2	8	485,474	12·38
Waverley	94,692	54,476	3	14	1,062,285	11·22
Salmon River	39,785	12,121	4	0	236,363	5·94
Brookfield	5,663	4,858	4	9	94,735	16·73
Whiteburn	5,875	9,281	2	20	180,981	30·83
Lake Catcha	6,459	7,430	19	3	144,913	22·44
Rawdon	11,389	9,060	14	4	176,683	15·51
Killag	379	354	6	16	6,909	18·23
Wine Harbour	41,798	28,639	6	1	558,466	13·36
Darr's Hill	39,909	18,715	19	19	364,962	9·14
Fifteen Mile Stream	13,363	7,547	2	5	147,168	11·01
Malaga	15,847	12,687	4	18	247,400	15·61
Unproclaimed, etc	53,178	40,950	15	21	798,540	15·01
Totals	739,507	529,702	9	7	10,329,198	13 97

THE PRECIOUS METALS.

Gold—Production.

GOLD.

TABLE 4.

NOVA SCOTIA.

DISTRICT DETAILS.

Districts.	Number of Mines.	Mills.	Tons of Quartz Crushed.	Yield of Gold per Ton.			Total Yield of Gold.		
				Ozs.	Dwts.	Grs.	Ozs.	Dwts.	Grs.
Tangier	2	1	370	0	3	21	71	12	12
Whiteburn	1	2	890	1	0	3	895	7	4
Central Rawdon	1	1	510	0	1	8	342	0	0
Killag	1	1	379	0	18	11	354	6	16
Oldham	2	2	2,019	1	9	0	2,909	10	13
Caribou / Moose River	3	4	5,801	0	5	23	1,723	5	21
Wine Harbour	1	1	1,823	0	7	15	698	9	0
Waverley	3	3	1,611	0	7	11	602	4	0
Lake Catcha	1	1	2,432	0	6	13	800	3	0
Fifteen Mile Stream	2	2	4,862	0	10	12	2,550	10	12
Uniacke	3	4	1,854	1	12	21	3,045	5	4
Montague	2	3	863	1	11	10	1,361	1	0
Stormont	2	4	888	2	1	21	1,025	12	4
Malaga	2	2	4,826	0	19	12	4,827	8	17
Salmon River	1	1	5,210	0	5	9	1,406	0	0
Sherbrooke	4	2	464	0	5	3	119	5	0
Unproclaimed, etc	3	5	1,549	0	5	11	421	18	4
Totals and averages	34	39	36,351	0	12	17	23,153	19	11

Graphic Table F shows the production of Quebec to remain at a very unsatisfactory point, but there is reason to hope for an increased yield for next year in view of the contemplated renewal of work on the Gilbert River under the management of Mr. Arthur Lockwood.

GOLD.

TABLE 5.

EXPORTS.

Gold—Exports.

Provinces.	1887.	1888.	1889.	1890.	1891.
	$	$	$	$	$
Ontario	6,650		2,660		1,000
Nova Scotia	321,379	163,412	191,671	304,521	
Manitoba		50	261		110
British Columbia	592,300	464,696	414,658	402,271	343,582
Totals	920,329	628,158	609,250	706,792	344,692

SILVER.

Silver—Production.

From information obtained directly by the Division, the production of silver in the Dominion during 1891 had a value of $406,233, which at the average market price for the year of 98 cts. =414,523 ozs. This amount represents the calculated silver contents of the argentiferous iron and copper pyrites mined in the Eastern Townships of Quebec, together with the production of the silver mines proper of the Thunder Bay district of Ontario, including also a small amount entered as exported from British Columbia, and the silver contents of a small amount of argentiferous galena mined in the province of Quebec. This amount shows an increase of 13,836 ozs. over the production of last year, but a decrease of $14,489 owing to the considerable depreciation in the value of the metal.

Table No. 1 below shows the progress of the industry for the past five years.

SILVER.

TABLE 1.

PRODUCTION OF SILVER.

YEAR.	ONTARIO.		QUEBEC.		BRITISH COLUMBIA.		TOTAL.	
	Ozs.	Value.	Ozs.	Value.	Ozs.	Value.	Ozs.	Value.
		$		$		$		$
1887.	190,495	190,495	146,898	146,898	11,937	11,937	349,330	349,330
1888.	208,064	208,064	149,388	149,388	37,925	37,925	395,377	395,377
1889. ...	181,609	162,309	148,517	133,666	53,192	47,873	383,318	343,848
1890.	158,715	166,652	171,545	180,122	70,427	73,948	400,687	420,722
1891.	225,633	221,120	185,584	181,872	3,306	3,241	414,523	406,233

Price.

Graphic Table A illustrates clearly the fluctuation in value of the metal during 1891 as per New York quotations, the general depreciation in value having continued almost uninterruptedly since the middle of August last when the metal was quoted as high as $1.19.

THE PRECIOUS METALS. Silver—Exports.

The exports of the ores of this metal as compiled from the books of the Customs Department are given in Table 2 following.

SILVER.

TABLE 2.

EXPORTS OF SILVER ORE.

Province.	1887.	1888.	1889.	1890.	1891.
Ontario	$184,763	$208,064	$203,871	$203,142	$222,071
Quebec	450	5	2,500	900	
Nova Scotia			50		
Manitoba	3,741		5		
British Columbia	17,331	10,939	5,737	100	3,241
Totals	$206,285	$219,008	$212,163	$204,142	$225,312

Discovery and development.—Gold and Silver.

DISCOVERY AND DEVELOPMENT.

GOLD AND SILVER.

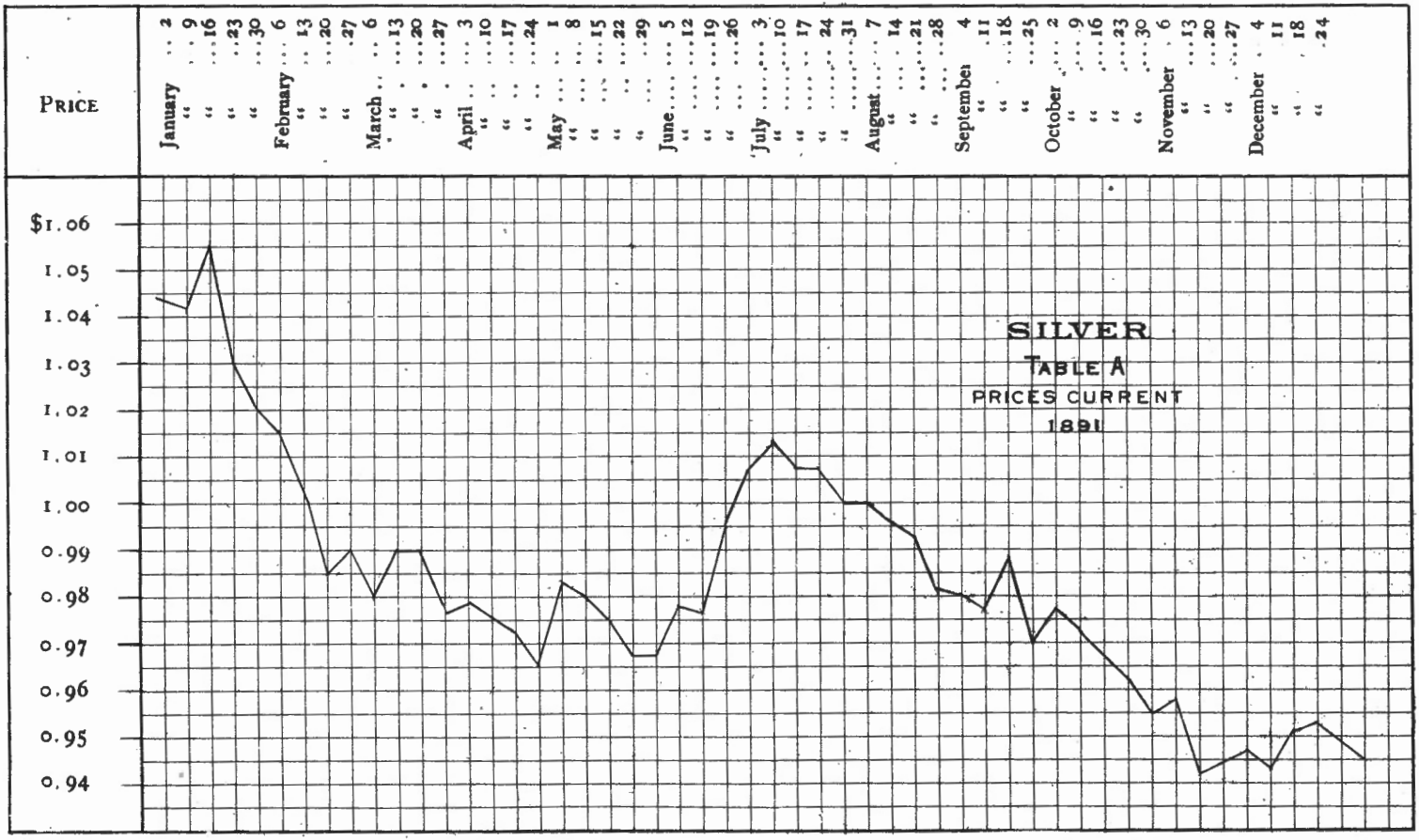
The progress of discovery and development of the mineral resources of the country in respect to gold and silver are best considered together.

Nova Scotia.

NOVA SCOTIA.—Beginning then on the eastern coast with the mining operations of Nova Scotia, operations were continued in developing the numerous gold-bearing quartz leads found in the Cambrian rocks of the Atlantic slope of the peninsular portion. Scattered all along this district, between the centre and the coast, are numerous sub-districts whose names are set forth in Gold table 3, which includes some thirty-four separate mines.

The details of this industry are given in the undermentioned extracts from the report of the inspector of mines for the province, from which it will be seen that mining still continues to be carried on mostly by comparatively small operators, employing forces of men numbering 50 or less, the mills ranging from ten to fifty heads of stamps.

"The various districts were visited by Mr. Maddin, deputy inspector, who reports the mines generally in fair order and safe. With respect to some mines, arrangements have been made for introducing better and safer ladders. The ephemeral system of gold mining which prevails in this province, makes it very difficult for the department to exercise anything like a close and regular supervision over the smaller


PRICE
January 2 9 16 23 30
February 6 13 20 27
March 6 13 20 27
April 3 10 17 24
May 1 8 15 22 29
June 5 12 19 26
July 3 10 17 24 31
August 7 14 21 28
September 4 11 18 25
October 2 9 16 23 30
November 6 13 20 27
December 4 11 18 24
$1.06
1.05
1.04
1.03
1.02
1.01
1.00
0.99
0.98
0.97
0.96
0.95
0.94
SILVER
TABLE A
PRICES CURRENT
1891

mines. A small mine is rapidly opened out and abandoned within a few months. The work being tentative, little attention is paid to points which receive the attention of a manager in larger and more ambitious workings. The enforcement, in all gold mines, of a strict adherence to the letter of the Mines Regulation Act would require the services of a man specially devoted to the work. There should also be some system adopted of keeping a check on the work performed in the mills. At present the returns are received as made; and it is believed that there are annually considerable unaccounted for amounts of gold extracted from rich quartz by hand, on which no royalty is paid.

THE PRECIOUS METALS. Discovery and development. —Nova Scotia

"At Wine Harbour, * * R. McNaughton was working, with Adam McGrath as under-manager. The middle lead was stripped and operations began on the Caledonia lead; twenty men were employed underground, and ten men overground. * * *

"At Goldenville, George Hirschfield was working in the McLean lead, employing four men taking out the roof quartz, allowing the waste to fall down the mine, and making an opening for water. The Sutherland and Chicago mines were idle, but the Blackie mine was at work, employing six men, and things appeared very dull in this mining camp. At Ecum Secum the mine was idle. There are very many complaints against so many trial pits being left open unguarded.

"At Dufferin Mine, Salmon River, South and North leads working, and down from 250 to 300 feet; thirty men are employed. A new twenty stamp mill has been erected, a self-feeding Blake's Rock Breaker is also used at this mill, and all the machinery is run by water power.

"Visited Tangier Mine, and found mining matters very dull. One of the old veteran miners, John Murphy, had four or five men employed on the Strawberry Hill lead, which was all the work that was being done in this vicinity.

"At Oxford Gold Mining Company, East Chezzetcook, J. M. Reade, manager, with thirty-one men employed. This mine is very well equipped with good machinery. Compressed air is utilized in doing a very large amount of the work. * * * John H. Anderson had six men employed erecting a new mill, and N. McMillan had four men employed opening up "Colman lead," or "Annand Mine."

"At Montague Mines, Alex. P. McQuarrie, manager, and W. Collins, under-manager, twenty-eight men employed. They were at work taking down the old mill and preparing to rebuild and put in a new battery, and from the appearance of the mine and the push of the management, with such a body of good practical men as are here, I

THE PRECIOUS METALS. Discovery and development. —Nova Scotia

should think we shall have good accounts of this mine in the near future. In this district there is also the Hay Mine, Wm. Skerry, manager, with fourteen men employed. Here they have had a difficult task to keep the water out, but I am glad to say that, at the date of my visit, Mr. Skerry had almost overcome this difficulty, and was getting his mine timbered and fixed up. T. M. Baker is also at work on the iron lead, so called, employing three men; and Mr. Pratt is working the Sutherland mine, on what is supposed to be the iron lead, employing three men.

"At Lake View Mining Co., Waverley, A. A. Hayward, manager, and Matt. Thompson, under-manager. This mine was idle at the time of my visit, but it is one of the best equipped that I saw. There are seven drills run by compressed air; one of Gates' Rock Breakers, self-feed; thirty stamp mill; boilers, 280 H.P.; mill engine, 230 H. P.; hoisting engine, 130 H.P.; pump engine, 25 H.P.; a compressor engine, 50 H.P.; shaft, 300 feet depth; self-dumping skips. This mine did employ fifty men. The water was out when I was there, affording an opportunity of travelling all through it.

"In this district there is also the West Waverley Mine, John Hardman, manager. Some thirty men employed. The mine was idle, but the men were employed erecting new mill and new hoist. Windsor Junction Mine, Capt. Geo. McDuff, manager. Some sinking has been done here.

"Renfrew Mine, R. S. Turnbull, manager, A. Manning, under-manager. Mine down 400 feet, and in good order and condition.

"At Gay's River Mine, R. R. McLeod, manager, with forty men employed. A fifty stamp mill has been erected; this mill was built by the Truro Foundry Co. The gold is obtained here chiefly from the surface.

"Moose River, Mr. Touquoy, manager; seventeen men employed. A fifteen stamp mill and three pumps run by water power, with plenty water to run as many more. In this district A. McGregor and Wm. Bruce are working on the Moose River property, with ten men employed.

"At Caribou district, L. L. Wordsworth, manager. This mine is down some 400 feet, and at the date visited was very poorly timbered. * * * In this district Mr. Dickson is doing a very good paying work, and his mine was in good shape.

"The mines which I have visited to this date* were all well ventilated and timbered, with one or two exceptions. I may, however, say

* Aug. 15, '91.

that instead of hanging ladders on the foot wall in those mines where the angle is so high, it would be much better to hang them lengthways on the lead—they would then have more slope. At present in many of the mines the ladders are nearly perpendicular, in distance ranging from 50 to 200 feet, and no means provided to save a man if he were accidentally to stumble and fall. I am pleased to say that very few accidents have occurred, but as the shafts are gradually becoming deeper, the time has arrived when such a preventive to accidents as I have suggested should be adopted.

Queen's County.

"Whiteburn district, Rossignol Mine. This mine has been idle for some time, and is just getting fairly started. F. B. Murchy, Esq., manager, says he expects to do well this winter. There are 20 men employed, and have a ten stamp mill running, and everything looks well about the mine.

"Whiteburn Mine, — Partinger, manager, Michael Kelly, undermanager, with forty men employed. The shaft is 200 feet deep, and well timbered. Ten stamp mill. The perpendicular lead or mine is idle; the manager is prospecting close by the old shaft. Everything looks satisfactory around this mine.

"Malaga Gold Mining District, G. A. Wade, manager, John Thornholm, under-manager. Twenty-seven men employed, two shafts working: Main shaft 200 feet deep. The travelling way is the best I have seen; the ladders are at an easy angle, and stages every 20 feet. * * * North of this F. H. Ballou is working, employing some thirty men; his travelling way is very good. I may say all the travelling ways in this county are good. A little east of this, Charles McLeod is working in the Nine Bolder lead, so called, employing eight men. The Caledonia Mine is idle, their mill house was accidentally burned some time ago. The Parker Douglas is also idle, which makes business somewhat dull in this locality.

"I visited Brookfield Mine, G. A. Kenty, manager of the Philadelphia Gold Mining Company; they employ thirty men; three shafts working; the main shaft is down 200 feet. All the mines in this county are in good condition, but have not so many men employed in this district as were last year.

"I may say it has hitherto been the prevailing system in the gold mining industry in this province, when the work arrives at a distance of from 200 to 400 feet, to cease operations, the operator in many cases being unable to go deeper on account of the inadequacy of the machinery to go to any greater depth, and because of the fear that at

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any "greater depth" gold ceased to be found. I have learned that at Goldenville, however, a shaft has been sunk to a depth of some 600 feet, and paid to the last inch. In my opinion there is very great room for the supposition that some of the most valuable properties in this province are being virtually lost, unless some means be adopted to encourage the operators to prospect some property at a depth of from 1,000 feet to 2,000 feet."

Mr. Faribault has been conducting some very interesting geological investigations for the Survey, which will throw much light upon the nature and geological affinities of these veins, and in his preliminary report on the subject makes the following remarks :—

"The section surveyed this season in Nova Scotia lies westward of that surveyed in 1889 and 1890, and extends along the sea-shore from Porter's Lake to Halifax harbour, and northerly to the Shubenacadie and St. Andrew's rivers, covering an area of 305 square miles in Halifax county and 70 square miles in Colchester county.

"The greater part of the region is occupied by the auriferous Lower Cambrian rocks cut by the western end of the belt of granite examined last year, which extends to within two miles east of Waverley, and also by a small granite mass three miles north of Waverley. In the northern portion, the gold-bearing rocks are overlain by the Lower Carboniferous formation along the valleys of the Shubenacadie, Gay's and St. Andrew's rivers and a few of their tributaries.

"Two or three beds of dolomitic limestone from six inches to four feet thick were found at various places at the bottom of the upper graphitic ferruginous slate group, between layers of greenish talcose slate. These beds may contain fossils, but search made for them has so far proved unsuccessful.

"The anticlinal axes were minutely examined and traced, as in former years, on account of their close relation to the auriferous belts. Within the region examined, the geological structure of the gold district of Lawrencetown, Montague, Waverley and Oldham was carefully studied. Lawrencetown has been but little worked.

"Special attention was given to the gold district of Oldham, it being a typical district, worked to a great extent and exposing to great advantage the quartz leads, all of which were prospected by means of surface trenches on account of the small thickness of the drift. A detailed geological map of this district, on a scale of 500 feet to one inch, with sections, was compiled on the ground. It shows the elliptical structure of the anticlinal fold, with all the known quartz veins, both interbedded and transverse; and also the numerous faults affecting them, and proves clearly that the richness of a lead depends altogether

on its position and relation to the structure of the elliptical dome of the fold to which it owes its origin. In this work I am specially indebted to Mr. J. E. Hardman, B.Sc., M.E., manager of gold-mining properties in Oldham and Waverley, for much valuable information which his great experience in gold-mining enabled him to give.

"Auriferous leads have also been prospected at Elmsdale, South-east Passage, and other places along anticlinal axes."

He points out that as the zones containing the rich portions of the veins hold a definite relationship to the structural features of the anticlinal folds of the inclosing rocks, the successful prosecution of deep mining calls for the study of these features in order to locate and trace out these rich zones. He further asserts that as the veins in their extension either in length or depth change their relationship to the axes of the anticlinals their richness is thereby affected. Continuing, he says: "In most of districts the zone of rich leads has the anticlinal axis for its centre, and it is probably the centre of the auriferous zone to a depth practically unlimited. Such is the case in the eastern part of the province, at Seal Harbour, Isaac's Harbour, Goldenville, Harrigan Cove, Salmon River, Fifteen Mile Stream, Killag, Mooseland, Moose River, Caribou, Gold River, Lawrencetown, Waverley and Oldham. In the few other districts where the auriferous zone is worked only on the north or south side of the anticlinal, the zone would, for the same reason, be parallel to the axis of the anticlinal to an inaccessible depth, as in Isaac's Harbour, Wine Harbour, Beaver Dam, Tangier and Lake Catcha.

"The gold district of Gay's River was reopened last spring by the Cole Stream Gold Mining Company, who put up an extensive fifty stamp steam mill and other large buildings. They sank a shaft immediately north of Daniel McDonald's old works, which gave the following section of the Lower Carboniferous:—

	Feet.
Surface drift	20
Conglomerate, containing gypsum, non-auriferous	35
Coarse sandstone	2
Auriferous, irregular conglomerate	8

"This lower auriferous conglomerate is wholly composed of debris of the adjacent Lower Cambrian rocks, apparently in an old river bed, and rests on the lower graphitic ferruginous slate group. Beds of conglomerate similarly situated along the northern boundary of the gold-bearing rocks may prove sufficiently rich to be worked, but the great excitement caused two years ago by exaggerated reports of dis-

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coveries of gold in various places, remote from the gold-bearing rocks, have led a great many to take up valueless ground." (See Summary Report for 1890, page 41.)

Dr. Selwyn expresses concurrence in these conclusions as follows:—

Personal observation enables me to concur in the opinion he expresses both as regards the correspondence of the Quebec gold-bearing rocks with those of Nova Scotia, and also as regards the position of the rich leads and their relation to axial folds. The latter, if correct, must prove of the greatest practical importance if intelligently applied in the further development of gold mining in Nova Scotia and also in directing prospecting for veins in the alluvial fields in Quebec.

New Brunswick.

NEW BRUNSWICK.—In New Brunswick the small amount of work done was altogether of the nature of test explorations. Several of these were visited by Mr. Brumell, who gleaned the following information:

"At the Britton Mine, near Woodstock, when visited on 17th August, it was found that operations were partly suspended owing to an accident to the pump.

"The shaft was down 150 feet, levels running off at 50 feet, 100 feet, 137 feet and 144 feet, the two latter running 25 feet to the north and south and 25 feet N.N.W. respectively.

"The manager claims to have a four-foot vein in the 144-foot level from which came the samples which were shown me. These together with those to be seen on the dump were very poor, containing but slight traces of mineral. Assays of ore said to be from this level are as follows:—

By W. A. Gould, Sussex, N.B.

Gold	3¼ dwts.	Ton 2,240 lbs.
Lead	283 lbs.	
Silver	4¼ ozs.	
Copper	9 lbs.	

By John McVicker, Salt Lake City, U.S.A.

Lead	11·4%	Ton 2,000 lbs.
Silver	$4.62	
Gold	0.58	

Another assay of ore not, however, from the same part of the mine as the above gave Mr. Gould the following result:—

Gold	4¼ dwts.	Ton 2,240 lbs.
Lead	23 lbs.	
Silver	trace.	
Copper	do	

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Discovery and development —New Brunswick.

"At Nauwigewauk, prospecting operations were undertaken during the year by the New Brunswick Mineral Developing Company, of which Mr. J. DeWolfe Spurr, of St. John, is president, and Mr. G. Wetmore Merritt, secretary. The work was done with a view of testing the auriferous character of the Lower Carboniferous conglomerates of the district, and the results are said to have shown the more pebbly portions of the beds to carry as high as four pennyweights in gold to the ton. The gold is free and very fine, and apparently contained in the quartz pebbles which make up a considerable proportion of the rock. The conglomerate beds consist of interstratified coarse sandstones and pebble beds, the pebbles being of quartz, Lower Carboniferous shale and limestone, and have a general strike nearly east and west, the dip being about 80° to the north.

"In the work of prospecting, besides having assays made of many specimens collected at different points, the company drove a tunnel about fifteen feet across the beds with, it is said, encouraging results. The supply of rock is practically inexhaustible, timber plentiful, the situation favourable, being on the Intercolonial Railway, and water may be obtained from the Hammond River, which flows through the property. It is said that negotiations are pending with a New York Company who profess to be able to make the property pay if three pennyweights per ton are available.

"At Moore's Lake, near St. Stephen, Charlotte county, on the property mentioned in the article on nickel, is a vein of pure, white quartz, about two inches wide, striking N. 80° E., and dipping at an angle of 82° to the north, and which is said to carry gold, the ore assaying, it is said, from four to twenty dollars per ton in gold. The lead cuts rocks, which near the vein are dioritic, though they pass imperceptibly into rocks with a marked schistose character. The schistose rocks strike nearly north and south, and dip at an angle of 30° to the east.

"On Sawmill Creek, near Memel, prospecting was being carried on by J. F. Fraser, of St. John, *et al.*, on a band of altered mica-schist, which contains a considerable percentage of pyrites scattered through the mass. The rocks strike N. 70° W. and dip $<$ 55° N.

"At Peck's Creek, Albert county, about two miles west of the Albert mines, similar rocks are met with, and a small amount of prospecting done. These rocks strike N. 30° E. $<$ 55° N. The rock from these beds is said to have yielded as high as 8 dwts. per ton in a mill test.

"Assays of average specimens from both of these places were made by Mr. Hoffmann, of which he furnishes the following :—

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1. From Sawmill Creek, Albert county, N.B., a light gray felsite-schist, through which was disseminated numerous small grains of pyrite.

It contained neither gold nor silver.

2. From Peck's Creek, Albert county, N.B., a gray felsite-schist, through which was disseminated numerous small grains of pyrite.

It contained neither gold nor silver.

"Rocky Brook, Millstream River.—This property—one of several in the neighbourhood—is owned by Wm. R. Payne, of Newcastle, and is situated on Rocky Brook, a tributary of the Nepisiguit Millstream, and about 17 miles from Bathurst. The vein which is 17 ft. wide, shows strong in highly altered slate—'country' rock—strikes N. 70° E. < 65° S., running in from its first exposure on the east bank of Rocky Brook. It consists of a mixture of quartz and argillaceous material, carrying iron and copper pyrites, galena and a small proportion of calcite. Possibly the average of the entire width might be even too low to pay for milling, but through the width of the vein proper are several comparatively wide pay streaks, which consist almost entirely of fine-grained argentiferous galena. The location of the property is very favourable for operations, as water and timber are both plentiful and close to the vein. The developments are as yet but small in extent, and consist of a stripping on the bank of the brook and about 100 yards further east and on the vein, a shaft about 12 ft. deep. In both of these places, the vein shows strong, and between very distinct walls.

"A good trail has been cut in from the road above Ste. Thérèse, and every opportunity is afforded of making a good wagon road.

"The following assays have been made for Mr. Payne by J. T. Donald, of Montreal:—

From stripping on creek:

	Ozs.	Dwts.	Grs.
Gold	2	6	16
Silver	7	7	12
Gold	0	11	16
Silver	11	0	16
Gold	None.		
Silver	40	16	16
Gold	0	11	16
Silver	None.		

"From same (?) vein further east (which point was not visited, however):

	Ozs.	Dwts.	Grs.
Gold	1	15	0
Silver	57	15	0
Gold	1	19	0
Silver	32	14	0
Gold	Trace.		
Silver	60	1	16
Gold	1	10	0
Silver	37	6	16

"An assay made for W. R. Payne by the Geological Survey* gave results as follows:—

"From a vein between Mill Stream and Nigadoo River, parish of Beresford, Gloucester Co.:

Gold ..... trace.

Silver ..... 0·466 ozs. in 2,000 lbs.

"Mr. Ed. Jack, under date of 29th December, 1891, reports that Messrs. Cook & Son, of Newcastle-on-Tyne, made an assay of 100 lbs. sent to them, and found 37½ ozs. silver and 7 per cent lead per ton. They did not estimate the gold."

QUEBEC.—In the province of Quebec there has been but little done. Quebec.

The washing of the alluvials of the rivers tributary to the Chaudière River, in Beauce county, have been carried on irregularly by a few men with the small product already reported, and some little attention was paid to the quartz reefs of the district.

A small force was at work exploring veins carrying argentiferous galena in this vicinity, in speaking of which the report of the Provincial Government Mining Engineer gives the following assays of specimens:—

Armstrong Silver Mine, Marlow, Beauce:—

	Principal vein.	Transversal vein.	
Gold	Traces		Per ton of 2,000 lbs.
Silver	34·04 ozs.	21·46 ozs.	
Insoluble silicious residue	57·36 p.c.	51·80 p.c	

A specimen from the first vein analysed by Mr. Hoffmann, of the Geological Survey of Ottawa, gave:—

Silver ..... 34·757 ozs. per ton.

*Annual Report Geological Survey Dept., vol. IV., 1888-89, p. 29 R.

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Discovery and development —Quebec.

Mr. Faribault visited the Ditton gold district and gives his opinion, in which the Director concurs, that the auriferous rocks of that district are of the same age as those with which his field work has rendered him familiar in Nova Scotia.

"The Little Ditton rocks, like those of Nova Scotia, may be divided into two distinct groups, a lower or quartzite group, and an upper or graphitic ferruginous slate group. They present the same lithological character as the two groups in Nova Scotia, and there are good reasons to believe that the gold of the Ditton alluvial deposits is derived as in Nova Scotia from numerous quartz veins which run along the sharp anticlinal axes into which these rocks have been folded."

Samples were collected by Mr. Giroux from the supposed gold veins of "La Barrière" in the township of Courcelles, county of Joliette, which were alluded to in the last report of the Division* as having been said to have yielded specimens which, assayed by Messrs. Ledoux & Co., of New York, yielded, gold 1·83 ozs. and silver 2 65 ozs. The assays made of Mr. Giroux's specimens, however, by Mr. Hoffmann, chemist to the Survey, showed only a trace of gold and no silver.

The only other production of the precious metals in the province is represented in the silver contents of the shipments of sulphuretted copper ores from the Capelton group of mines, and of the galena of the Temiscamingue mine, already alluded to under the heads of lead and copper.

Ontario.

ONTARIO.—In the Madoc and Marmora gold district more or less work has been done of an exploratory nature, about which Mr. Brumell, who visited the district, gleaned the following information:—

"The Belmont gold mine, located on the E. ½ lot 20, con. I., Belmont, was operated during the summer by the South African General and Exploring Co., and was not visited owing to lack of time; the following information was, however, kindly furnished by Mr. A. W. Carscallen, of Marmora:—

"On the property are several shafts and test pits, the deepest and most important being the Carscallen shaft with a depth of 37 feet. The vein on which this shaft is sunk has widened very materially in descending and has, in the bottom of the shaft, a width of eleven feet six inches and dips to the south-west at an angle of about 80°. The vein throughout shows sulphurets and free gold, an average sample taken from the bottom of the shaft affording $19.11 in gold to the ton of 2,000 lbs. About 500 yards south-east of the above is located the O'Neill shaft with a depth of 14 feet sunk, and a vein running north

*Report Geol. Surv. of Canada, vol. V., part S, pp. 65 and 66.

and south and probably a continuation of the vein exposed in the Carscallen shaft.

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"The other shafts are the Strickland, East and West, sunk 16 and 12 feet respectively, on a six-foot vein running east and west and dipping about vertically, and the Lingham shaft sunk eight feet on the same vein as that in the Carscallen, and distant about seventy yards to the south-east of that shaft.

"The country rock is a syenitic granite in which the veins are very clearly defined. The ore contains no arsenic, and has assayed as high as $573 in gold to the ton of 2,000 lbs. During November, 1891, thirty men were employed. In the fall a commencement was made to erect a plant of a capacity of fifteen tons per day, which it is expected will be finished early in 1892 ready to treat the ore.

"At the 'Fiegle Mine,' lots 16 and 17, con. XI., Marmora, Ont., the Crescent Gold Mining Co. continued active operations in development and erection of suitable buildings. The mining operations consisted in continuing the old shaft to a depth of 80 feet and the sinking of several test pits and open cuts. During the year they also erected a ten stamp mill, which was in operation up to the end of the year. Thirty men were employed in mining and milling.

"A small amount of development work was done at the 'Demarse Mine' on lot 24, range V. of Marmora township, by Emory Demarse, who sank several test pits on veins in the north-west corner of the lot. Encouraging results were obtained, as the veins afforded rich gold-bearing arsenical pyrites and a small proportion of free gold."

Reports of a number of finds of gold-bearing veins come from the district around Sudbury, but of these no further details are available. Mr. A. E. Barlow visited some of the veins in the township of Creighton and collected specimens, which, however, on being assayed in the laboratory of the Survey, were found to contain neither gold nor silver.

Further west, in the Thunder Bay district, the mines opened some years ago on the silver-bearing veins proper, have been operated during the year. Chief among these are the Beaver, the Badger, the Porcupine, the Shuaniah Weachu or East End Silver Mountain, and the West End Silver Mountain mines, all of which made shipments of silver ore and concentrates. Development work was also conducted on the following properties, viz.: The Palisades; Silver Centre; R. 83; Augusta; Murillo; Y. 5; Gopher; Silver Weasel; Silver Bluff; Silver Martin; Lily of the Valley, and others along the range extending W.S.W. from Port Arthur through the Rabbit Mountain groups to the vicinity of Whitefish Lake.

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Some prospecting work was also done on Arrow Lake further west and also down the coast south from Port Arthur in the neighbourhood of Cloud Bay and Cloud Lake.

In the Black Bay region development work has been recommenced on the vein of argentiferous galena which was discovered years ago by Mr. Duncan McEachren.*

It would be unnecessary to go into the details of developments made on these various properties, as there is nothing outside of the ordinary course of opening up by test shafts, drifts and tunnels to record. On seven of the principal of these prospects there were expended over $35,000, and several operators have gone so far as to bring machinery to their aid for hoisting and pumping.

A correspondent, writing from Port Arthur, says:

"By far the most important find was that of the Lily of the Valley in Paipoonge. The discoverer, Henry Parsons, had taken up the property as a homestead and got some residents of Port Arthur to find money to make good his title to mineral rights, &c., by conceding them a half interest. The surface showing of native silver was wonderful, and is still, after development, though this silver changed to argentite at ten feet in depth, which is quite to be expected. The vein is four feet wide, and is in the slate formation. It reminds one of Rabbit Mountain vein, from having swamp land on each side, so that one cannot trace it far. The location is lot 19, concession II. in Paipoonge township. The vein has been found in exploration in lot 20 by F. Guerard and F. E. Gibbs."

The producing mines have employed forces ranging between ten and sixty men, amounting in all, according to the returns, to 154, exclusive, of course, of a large number indirectly connected with these activities.

About the methods of opening up the mines and the extraction of ore, there is nothing novel. The veins not being, as a rule, wide, the drifts take in the entire vein and stoping is done where the ground warrants it. The most extensively exploited and completely equipped mines are the Beaver and Badger, which are the only ones having the shafts fitted with cages running on tracks. The ore is carried in cars direct from the shutes, run into the cage and hoisted to the surface. The other mines hoist simply with a bucket running on skids.

The present system of treatment of the ore is by wet concentration. The ore, as it comes from the stamps, is graded by separators into three grades, coarse, fine and slimes. These three grades pass over

* For map of district see part H, vol. III., Annual Reports, Geological Survey of Canada.

three "Frue" vanners, and thence over three "Hooper" tables, which have a canvas belt twice the width of the rubber belts of the "Frue" vanners, differing also from them in having neither side nor end shake, the necessity for which is got over by an ingenious method of perfect distribution of water and pulp. The pitch of the travelling belt can be readily altered and the machine is said to do excellent work, the cost of treating a ton of ore having been largely reduced by its adoption. The inventor of these tables is Mr. Thomas Hooper, manager of the Beaver Mine, and they are in use both in that mill and in that of the Badger Mine. Besides the six vanners there is also another "Hooper" vanner to treat the slimes very rich in argentite which pass the separators and come direct from the stamps. This does very effective work and the concentrates obtained are very rich.* Though there is much native silver it cannot be economically handled by amalgamation, and there is, therefore, no necessity for pans and settlers such as were first tried in the district. The native silver is all found in the concentrates from the vanner which receives from the coarse separator. The capacity of the mill at the Beaver Mine is twenty to twenty-five tons per day. The product of the mines is shipped in the condition of concentrates produced as above, except a proportion of rich ore requiring no treatment previous to shipment, which, according to returns, amounted this year to from thirty-eight to forty per cent of the whole shipments. Most of this was sold to the smelters in Newark, N.J., a small percentage going to Omaha, Neb.

As to the cost of production, no very close figures can be obtained. The mining cost will, of course, vary with the particular conditions of the various mines, and especially in those veins where the ore is so apt to run in bunches, and where the amount of drifting and sinking to open up any body of ore, varies so much. The cost of concentration is said to be about 90 cents per ton, smelting charges, $12 to $15 per ton of concentrates, and freight of same to Newark, N.J., $14 per ton. From the Rabbit Mountain group of mines to the Canadian Pacific Railway at Murillo costs about $3.75 for cartage. It is said that ore assaying $8 per ton will pay.

The gold-bearing veins of the Thunder Bay district have received but little attention. Discoveries were reported from the Aticokan district. Mr. Smith, of the Geological Survey, during his field work, visited the gold location on the lake west of Manitou Lake and collected some specimens from the veins, of which he says:—

* We are indebted to Mr. Arthur McEwen, Assoc. R. S. M. and manager of the Shuniah Weachu mine, for much useful information about the latest developments in the Port Arthur silver districts about the method of concentrating as at present carried on.

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Discovery and development —N.W. Territories.

"The field appearance is very encouraging; one vein in particular seems to be a very strong one, and in some places is as wide as ten feet, of promising looking quartz, associated with soft, soapy talc schist, in soft chlorite schist."

NORTH-WEST TERRITORIES, &c.—The gold credited to the North-west Territories, &c., resulted from the washing of the gravels of the Saskatchewan River and the Yukon River districts.

For information regarding the former we are indebted to Superintendent A. H. Griesbach, in command of the North-west Mounted Police at Fort Saskatchewan. Some seventeen miners were engaged at times during the three summer months washing the gravels of the River Saskatchewan, between Fort Saskatchewan and Edmonton, and for some distance above and below these two places. There being no means of getting actual figures owing to the desultory nature of the work, a close estimate was obtained by inquiry among the miners and striking an average.

With regard to the Yukon district the same remarks apply. Several estimates were available, and by comparing these, the figures adopted have been arrived at, which, of course, represent only that proportion which there is reason to believe was obtained on Canadian territory, and ignoring that which was obtained from the same river and its tributaries, but over the Alaskan border.

British Columbia.

BRITISH COLUMBIA.—In British Columbia the work of developing the various classes of deposits of the precious metals continued throughout the year in the several districts with varying success.

The yield of gold from shallow placer mining continues to fall off, but more attention is being paid to hydraulic mining of old river channel gravels and prospecting for and working veins.

The chief field of this latter activity is still found in the districts of East and West Kootenay, in the south-east corner of the province, where the numerous discoveries of the last two years, of veins of argentiferous and auriferous galena and copper sulphurets continue to receive attention.

Development work on the claims of the older mining camps such as Toad Mountain, Ainsworth, Trail River, &c., has been continued, and important and promising new discoveries have been made in the district between the Kootenay and Slocan lakes, constituting the new Kaslo-Slocan districts.

Altogether the prospects of these two districts are very bright, the only drawback being the want of a really good railroad and local markets for the ores.

Following the policy adopted in the past, the record of development and discovery is completed by reproducing below, the details given in the report of the Minister of Mines for the province.

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Discovery and development —British Columbia.

Cariboo—(Mr. Bowron's Report.)

"In view of the fact that there has been an actual decrease in the number of men employed, and that several projects of considerable magnitude have been inaugurated, which naturally absorb a portion of the available labour supply, it is satisfactory to note that there has been no decrease in the total gold output of the district for the season.

"Several enterprises of magnitude have been entered upon during the season, from some of which great expectations are anticipated, and, I think, justly so. A visit to the hydraulic claims of the South Fork of the Quesnelle River (to which discovery I referred in my last report) but confirms the impression already expressed, that the finding of a large blind river channel in the hill is one of, if not the most important discovery ever made in placer mining in the province.

"I found the South Fork Company, which is composed principally of working miners, had their large ditch cut some five miles, a large reservoir constructed; also a No. 1 monitor, and some 400 feet of steel pipe (fifteen inches diameter) on the ground, and were prosecuting their work with vigour. Having expended $20,000 in preparation during the summer the company will be ready for piping next season.

"I speak of this company thus particularly to show the confidence reposed in these mines by representative miners.

"I found here also, although unavoidably prevented from visiting personally their mines, that the Victoria Hydraulic Company, under Mr. J. Hepburn's management, had constructed a ditch (having a capacity of 1,500 inches) a distance of seven miles, bringing the water from Spanish Lake to their mines near the South Fork Lake, having during the year expended, including the purchase of plant for saw-mill, $30,000. This company will also be in readiness to commence operations next season. The other companies holding leases of mining ground in this vicinity have so far done but little work, presumably from lack of sufficient capital, although efforts are now being made to secure this necessary acquisition. The new road from the 150-Mile House into the Forks will be a great factor in the development of these mines, as a large quantity of machinery is now lying at the 150 ready to be brought in.

"I am pleased to report the probability of the deep ground on lower Williams Creek being worked next season on an extensive scale, with

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the latest and most approved appliances, by which the gravel will be raised into flumes by hydraulic pressure.

"A London syndicate, at the instance of Mr. A. D. Whittier, of Victoria (who had obtained a lease of ground), sent this spring an expert to examine the property, and whose report appears to have been satisfactory, as Mr. Whittier has since bonded a number of the claims adjoining his leased ground, and is now in England making final arrangements to commence operations.

"The company represented by Mr. Chas. Ramos, who last season obtained a lease of mining ground on Slough Creek, has not as yet commenced operations on the ground.

"It is reported that boring machinery, by which means it is intended to prospect the ground, has been purchased by this company, and is now on its way to Cariboo.

"The introduction of boring apparatus will be a new feature in Cariboo, and one which, it is believed by many who are acquainted with the operating of such appliances, will prove an important factor in the development of our deep diggings.

"Our district was visited this fall by a Monsieur Sampson, at present of Vancouver, but recently from Eastern Canada, the patentee of a machine for saving fine gold. His *modus operandi* is to immerse the appliance in a strong current and allow the sand and gravel containing fine particles of gold to pass over it, the machine catching the gold in transit. Mr. Sampson is very sanguine that there is a "bonanza" in Cariboo for him, but it was too late in the season for him to make a practical test, so he returned to Vancouver for the winter, intending to revisit Cariboo in the spring. Mr. Sampson appears to have good backing, and should his apparatus do half he claims for it, the millions existing in the sand bars and benches of our numerous small streams, to say nothing of the bars of the Fraser, will become a known factor in the general output of the district.

"In the Williams Creek polling division there is but little of especial interest, if I except the proposed working of lower Williams Creek by hydraulic pressure above referred to. At the upper end of Williams Creek, above the old works, Messrs. Taylor and Boyce have opened up a new hydraulic claim, which I understand presents most favourable indications for developing a channel in the hill.

"The Waverly Company, of Grouse Creek, are much gratified at the result of their season's work, the claim having yielded about twice the amount of any previous year, which shows that they are now coming into the paying gravel that the company has so long struggled

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to reach, and there can be no doubt that this claim will give good returns for the next quarter of a century.

"Messrs. Knott, Dibby & Co. obtained a lease of ground on lower Antler Creek, with the purpose in view of again attempting to bottom the deep ground, but so far they have not succeeded in enlisting sufficient interest in the undertaking to warrant them in making a start, but hope to do so during the winter.

"On Lightning Creek a lease of mining ground (which includes within its limits the ground formerly owned by the old South Wales Co.) was obtained by a company of local miners, who have been prosecuting the work of development uninterruptedly during the season.

"Mr. St. Laurent, of Quesnelle, reports the discovery this season of gold in paying quantities, by a party of Chinese miners, on a large creek, a tributary of Quesnelle River, which flows into that stream some 20 miles from its mouth on the north side. The creek is from 20 to 30 miles in length, and five Chinese, working about five miles from its mouth, took out about $2,000 during the season. As this creek has not been visited by whites since this discovery of gold, I cannot speak definitely as to the importance of the find.

"The Blue Lead Hydraulic Mining Company, of Hixon Creek, have prosecuted their works of development during the season, but from last accounts had not reached the bottom of the deep channel in the hill.

"The total gold product of the district, exclusive of Omineca, for the year, I estimate at $195,000, distributed as follows :—

"Barkerville polling division, to 15th Nov., per statistics..	$ 63,450
"Lightning Creek " " " ..	33,850
"Quesnelle mouth " " " ..	30,600
"Keithley Creek " " " ..	57,100
"Estimated product from 15th Nov. to 31st Dec....	10,000
Total.....	$195,000

"Quartz mining during the season has remained almost in *statu quo*. Indeed, a fatality seems to follow every effort made to develop this most important branch of our mining industry in Cariboo. That we have numberless valuable gold-bearing lodes traversing the district in all directions, none, I think, who are acquainted with recent development, will be inclined to doubt; but it now would appear to have become a settled fact that until better means of communication are provided with the outer world, and consequent improved facilities for the reduction of our ores, little real progress will be made.

"A number of instances might be cited where foreign capitalists about to invest largely in our mines, upon learning that they were

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situated some 300 miles from railway or steam-boat communication, at once abandoned the project. The erection of test works by the Government, in this district, it was hoped would be sufficient to give an impetus to quartz mining, and that these works have met expectations in so far as the treatment of ore is concerned, none will deny. Then why have those wealthy persons and companies, non-residents of the district, who hold valuable mineral claims in Cariboo, ceased development work and left it to a few impecunious miners (who have spent their all, perhaps, in the effort) to develop this industry? Because they are awaiting railway connection, when the further development of their mines will be less expensive. This is the only reasonable conclusion when we consider that three companies now hold charters for the construction of railways to or passing through this district. It is, therefore, important that the Government and Legislature, in considering any project affecting the building of a railway to Cariboo, will make construction at the earliest possible moment a *sine qua non* to any concessions granted.

"The Black Jack Quartz Mining Company is the only company which has during the season done anything to further develop our mineral resources. This company has sunk to the depth of 125 feet, and after running 75 feet of a drive through exceedingly hard rock, finally struck the ledge again, but too late in the fall to fully prove its value at the depth mentioned. The vein here, as far as developed, is about five feet in width. As the work during the season was all in bed-rock, their small mill was not started. Having proved the continuance of the ledge downwards, it is probable this company will, in the spring, start on the 70-foot level to take out and work the ore in their small mill, and have the sulphurets worked at the Government test works.

"Messrs. Martin, McArthur & Co. located and worked a mine on Island Mountain this fall, which is likely to prove valuable. The ledge is about 12 feet in width, assays $25 per ton, and is nearly all free gold. The vein has been traced several hundred feet.

"Mr. Perkins, on Burnes Mountain, continues to work his man-power arrastra, and manages to make his living from it while prospecting the mine.

(Mr. Stephenson's Report.)

"The estimated yield of gold for Keithly, Alexandria, and Williams Lake Polling Divisions, Cariboo District, during 1891, is a little less than last year, which can easily be accounted for when we take into consideration the amount of work that has been carried on in this

vicinity in the way of digging ditches, and other work where miners or others, whether whites or Chinese, could get employment at good wages. These works, to my certain knowledge, absorbed a considerable number of the Chinese miners in this section. Also, owing to a light snowfall last winter, the hydraulic claims had a shorter season than usual; still, for other kinds of mining, the low stage of water was advantageous in many cases in this section.

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"Our old mines in the creek bottoms and along the shallow benches are getting about worked out, and it is to hydraulic mining that we will chiefly have to look for our output of gold in placer mining for the future, and there is every reason to believe that the immense gravel deposits which are to be found along the rivers and creeks in this section of Cariboo will amply repay those who have the capital and enterprise to invest in hydraulic mining. So far, every hydraulic mine that has been opened in this section has proved good paying property.

"On the South Fork of the Quesnelle River, there are two companies—the Victoria Hydraulic Mining Company and the South Fork Hydraulic Mining Company—which, during the past season, have been pushing their works ahead as fast as it was possible for them to do, in the way of digging ditches and other work necessary to the opening up of their hydraulic mines, and, owing to the nature of the country they are operating in, both companies have certainly done a great deal of work for the season. The Victoria company has now something over seven miles of ditch, five feet wide on the bottom, seven feet wide on top, by twenty-four inches deep. This ditch brings the water from Spanish Lake upon the ground they are going to work, on Coquet Lake, at the lower end of Quesnelle Lake. This company has other locations, which they intend opening as soon as it is possible to get the necessary work done. During the season they have employed, upon an average, a force of ten whites and fifty Chinese. Their works are well advanced, and early next season they expect to be in full operation. The South Fork company have about five miles of their ditch completed. Their ditch is four feet wide in bottom, six feeet on top, by twenty-two inches deep. This part of their ditch is through a very rough country, a great deal of blasting and rock cutting having been done to avoid fluming. They have also completed a large reservoir, which will enable them to use their hydraulic pipe ten hours out of the twenty-four just as soon as they can get ready. This they expect to be able to do during the coming season. This company, dur ing the season has employed, upon an average, ten whites and thirty-five Chinese, and will continue to push their work as fast as possible

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until they get their mine opened. Both these companies will have an ample supply of water during the whole mining season when their ditches are completed and in working order.

"On Keithley Creek, two Chinese companies have hydraulic claims which are paying them well, although they are only just getting them opened. Two other Chinese companies on the same creek are also preparing for hydraulic workings, thus showing that the banks and benches on Keithley Creek will well pay for hydraulic mining.

"On Snowshoe Creek there are now two good hydraulic claims, the well-known Anderson & Smith claim and the Hayward Company claim, which is principally owned by Messrs. Veith & Borland, on Keithley and Snowshoe creeks. There are still several claims working in the bed of the creek by wing-damming, and getting to the bed-rock at a low stage of water.

"On Snowshoe Creek, there has been a company of whites at work for a year past in trying to get to the bottom of the creek. They have sunk an eighty-foot deep shaft in the bed-rock, and the last time I heard from them they had drifted from the bottom of their shaft one hundred feet in the bed-rock towards the channel, but had not yet broken through. It is to be hoped they will find enough gold to repay them well for the work done. Over this channel lies a great depth of slum, and all attempts to sink a shaft through it have proved failures, but the company now going through the bed-rock will, in all probability, succeed in getting to the bottom of the channel.

"Harvey Creek is now abandoned by white men; the last company left lately, after having worked out what paying ground they could find. There are now three Chinese companies on the creek, working over old ground.

"The company of whites (three) on Spanish Creek still continue to drive their tunnel ahead. They are getting a little gold, but have not yet reached the old channel where they expect to find good pay.

"On the North Fork of Quesnelle River there is very little mining being done at present, only one white man working on the river and a few Chinese. The former is driving a tunnel, and the latter working along the river.

"Kangaroo Creek empties into the North Fork about two miles above the Forks of the Quesnelle. This creek, in former years, paid well on the surface for a distance of two miles up from the river, but it has never yet been bottomed in the deep ground, although several parties have tried to sink shafts upon it. Last year, Mr. Theodore Thermahlon obtained a lease of one-half mile of the creek. He tried

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to sink a shaft, but was driven back by water. He then started a tunnel, and is now in about three hundred feet, and he thinks he will probably have to go three hundred feet more to find bottom. Two men have been employed at this work for over a year. On the main branch of the Quesnelle River, from the Forks down, nothing of any importance is being done; there are only a few Chinese miners scattered along the river engaged in desultory mining.

"On the South Fork River, outside of the two companies previously mentioned (the Victoria and South Fork), there is nothing new to report. The two Chinese hydraulic claims have done as well as usual, considering the very poor supply of water during the season. They depend for their water supply upon the small streams upon which they are located. Other work done on the river has been by Chinese during very low water in the winter and early spring, when they get as far out in the river bottom as they possibly can, sometimes by wing-damming. They also work from a raft, with very long handled shovels, bringing up what little dirt they can and rocking it out upon the raft. Very little work of this kind has been done for the last two years; it is evident they cannot make it pay now, or they would not abandon it.

"On the Horsefly River, in the Harper claim, now worked by Mr. R. T. Ward, some very good paying ground has been discovered during the season, and they have good prospects for the future, but the company will be put to considerable expense to get the ground in working order. Five miles further down the river from the Harper claim the Discovery Company have been operating their hydraulic claim with fair results, although their supply of water was light during the summer. At this place, two other companies have been driving in tunnels to reach the old channel, but have not yet got through the rim-rock.

"Along the Fraser River, in my section, there is nothing new to report for the season. The few hydraulic claims (four) keep working, while the desultory mining has been carried on about as usual.

"As to quartz mining, or even prospecting, I have nothing to report, as there has been nothing whatever done anywhere in this section that I am aware of."

West Kootenay—(Mr. Fitzstubbs's Report).

"The mining industries of West Kootenay district, consisting chiefly of quartz mining, have progressed satisfactorily during the past season, and well-grounded hopes exist of continuous improvement.

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"The following statement of records shows the transactions in the respective divisions :—

"*Revelstoke Division*—

Locations	73
Assessment certificates	25

"*Nelson Division*—

Locations	416
Assessment certificates	75
Transfers	251

"*Trail Creek Division*—

Locations	87
Assessment certificates	33
Transfers	46

"*Ainsworth Division*—

Locations	363
Assessment certificates	113
Transfers	179

"*Goat River Division*—

Locations	
Assessment certificates	
Transfers	

[Not obtainable.]

"*Summary*—

Locations	939
Assessment certificates	246
Transfers	476

"From the above statement it appears that prospecting has been prosecuted vigorously, chiefly in the Nelson and Ainsworth divisions.

"About 200 of the above location records are in portions of the district, namely, on the Slocan and Kaslo streams, which heretofore have been visited only by stray prospectors.

"The above statement shows, also, a satisfactory proportion (considerably larger, I believe, than hitherto) between the number of locations made and the number of assessment certificates issued; and further, that buyers of mineral claim prospects have been unusually active.

"Development work, in the sense of work to prove and not merely to hold the mine, has not been lacking, though no mine in the district is, as yet, fully worked with adequate capital and labour invested in the hope of realizing dividends, but the high offers made, and high prices paid, or agreed to be paid, for promising prospects, together with the steady work undertaken by claim owners, on their own well known

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claims, in the Toad Mountain, Ainsworth, Trail, Goat River, and Illecillewaet camps, indicate that there soon will be in the district mines worked systematically on a large scale, some of which, no doubt, will become dividend-paying properties.

"I regret that I am unable to report any considerable exports of mineral products from the district, though there is a good deal of ore on the dumps. Various circumstances connected with the principal high grade 'shipping ore' claims have prevented the export of their products during the past season.

"Silver lead ore of medium grade constitutes a large proportion of the mines in West Kootenay, and for this class of ore it has been found difficult to obtain a profitable market. The high freight rates and difficulties of transportation, together with the duty of $30 per ton on lead ores, recently imposed by the United States, make unprofitable the shipment of any lead ore that averages less—so the opinion seems to be at Ainsworth—than about $80 per ton. Claim holders, nevertheless, and mining men generally, believe strongly in the future, and have not been slow in spending their money in support of their opinions. There will probably soon be a home market for the above class of ores.

"The lead smelter already existing at Revelstoke, in the northern part of the district, is to be supplemented by the erection in the southern part of an 80-ton smelting and refining plant, with a concentrator of 100 tons a day capacity. These works are now in course of erection at Pilot Bay, on Kootenay Lake. They are owned by a wealthy American company, which already has large mining property in Kootenay. The enterprise will, undoubtedly, have a most beneficial effect on the lead mining of the section. The promoters have planned so as to permit the increase of capacity, and the treatment of all kinds of ores in the works, when required.

"Some of the companies whose claims are what miners call 'concentrating propositions,' propose, in the coming season, to erect concentrators at their mines, to prepare the ore for shipment.

"The above gives a general view of the condition of mining in the district. I have now to state, more particularly, what is being done at the different camps.

"The quartz leads at Big Bend are at present neglected. Two placer companies are at work there, one on French Creek, with four men, and one on the west shore of the Columbia River, above Smith Creek, with five men. Both pay good wages.

"At Illecillewaet, the only continuous work is upon the Lanark claim, which is the property of the Lanark Consolidated Mining and Smelting Company. Their work, it is confidently expected, will be

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successful, and have the effect of aiding the progress of this valuable well placed camp, towards which attention is again directed. Several claims have been located along the upper waters of Fish Creek, above the Falls. Some of the prospectors who have been across the divide, in the neighbourhood of Trout Lake, express themselves in favourable terms as to the mineral appearance of parts of that country. It is a part of the Revelstoke division which may repay further prospecting.

"No important find has been made in the country along the Arrow Lakes during the past season.

"Several mineral claims have been located at Sproat, which have yielded gold and silver, but the assays, so far, have not been very attractive.

"The camp at Trail has advanced this year in public favour. The principal leads are of silver-bearing copper ore, yielding also gold. There is also silver-bearing galena ore. The leads are very extensive, and the quality proves to be higher than was at first supposed. About 30 men have been at work in this camp. The Le Roi Mining Company, an active Spokane concern, has an 82-feet shaft, and a tunnel 130 feet. Assessment, and also some development work, has been done on other claims. The size of the leads and the presence of quantities of ore that will pay to 'matte,' are encouraging facts. Assays and returns have been satisfactory. The return from a ten ton shipment averaged $86 per ton.

"In what is known as the 'free gold belt,' in this camp, several claims yield fine specimens of free gold, and the owners believe that further work will disclose defined ledges of paying gold ore. The supposed superior attractions of Slocan as a newer field, may draw men thither during the coming season, but the camp at Trail, no doubt, has an assured future. On the upper waters of Sheep Creek, which flows southerly across the boundary, several gold-bearing quartz claims have been recorded.

"The prospecting of the 'Whitewater' gold mine, near Rover Creek (south of the River Kootenay, about half-way between Nelson and Robson), has been satisfactory to the owners, and will be continued with more suitable appliances.

"The stamp mill on the 'Poorman' group of gold claims, near 49 Creek has not been actively at work lately, for reasons not adverse, it is believed, to the character of the claims. Assessment, and in some cases additional work, has been done on other gold claims in that neighbourhood. The extensive copper deposit on the north side of the River Kootenay, in this quarter, continues to attract attention.

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"On Toad Mountain, prospecting, also assessment and developing work, have progressed steadily. Ordinary prospect claims have been in demand, generally, at fair prices.

"A high price—it is said over a million dollars—was offered during the autumn for the well known group of claims owned by the Kootenay Bonanza Company, but was not accepted. On one of these claims, the 'Silver King,' the tunnel is now in over 700 feet, and cross-cuts show abundance of fine ore. There appears to be about 500 tons of picked ore, probably worth several hundred dollars a ton, on the dump at this mine. The development work undertaken on the adjacent promising groups of claims, owned respectively by the Stadacona Mining Co. and the Helena and 'Frisco Mining Co., has been steadily prosecuted, I believe, to the satisfaction of these important companies, which are prepared to work their mining properties on an extensive scale, as soon as their value has been thoroughly proved. On a number of claims owned by individuals and private companies, the necessary assessment work, and also developing work, has been done. Confidence in the future of this established camp has been much strengthened during the past season.

"In the Salmon Valley, between Toad Mountain and the boundary, several promising leads exist, on which sufficient work has been done to warrant good hopes for the future.

"I am pleased to be able to report, further, that several gold placer claims on Hall Creek, in the above locality, have yielded, during the summer, good wages to the locators, who propose to continue to work.

"The Ainsworth, or Hot Springs camp, which is essentially a silver lead camp, has much more than maintained its repute. Comparatively few claims have been allowed to lapse, and on nineteen well known claims considerable development work has been done in excess of the required annual expenditure. The transfers represent over a quarter of a million dollars. The Pilot Bay Smelting Works, already mentioned, will help this camp importantly, by affording a needed local market for ores. The largest amount of development work, during the past season, has been done on the properties of the Revelstoke Mining Co., McCune Co., of Salt Lake City, Ashworth & Jevons, of Billings, Montana, Howe & Co., of Duluth, and Dr. Coe, of Seattle. More than 2,000 feet of shafts, tunnels, etc., have been sunk or run during the past season in this camp.

"A shipment of 200 tons of ore produced an average of $150 a ton at Helena, Montana; and another shipment of ten tons realized $600 a ton at Tacoma. Pumping and hoisting plants, chiefly of American manufacture, have been erected at four of the mines. In one case, a

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30-horse power plant was procured in Toronto, with the exception of the pump, which, I am informed, could not be obtained in Canada. It is proposed to erect concentrators at several of these mines during the coming season. There are over 3,000 tons of ore on the dumps, some of it of very high grade.

"The extensive and valuable claims in the Hendryx camp, on Kootenay Lake, opposite Ainsworth, where about seventy claims are located, on some of which a great deal of development work has been done during the past season, will be greatly enhanced in value by the effect of the Pilot Bay Smelting Works, now in course of erection by Dr. Hendryx and his associates.

"Considerable attention has been directed to the twenty or thirty mineral claims which have been located in the vicinity of Goat River and Duck Creek, tributaries to Kootenay River, in the Goat River District. The ore, so far, does not appear to be high grade, but is in sufficient quantity to be regarded as promising. An American company proposes to undertake development work on some of their claims in this locality during the ensuing season.

"About sixteen and twenty-five miles, respectively, north of Ainsworth, on the west side of Kootenay Lake, on Kaslo and Schroeder creeks, valuable discoveries of lead and copper ore have lately been made, and eighty locations recorded. Owing to the lateness of the season, at the altitude of these discoveries, little development work has been done as yet on any of the claims, but the assays generally give a very high percentage of silver. The last advices confirm the existence of large bodies of silver, lead, and copper ores, in this section.

"Some of the prospectors on the Kaslo River, who proceeded westerly across the divide, made further very important discoveries of mineral claims on the Slocan slope, toward the close of the season. These lie, for the most part, from ten to fifteen miles easterly from the Slocan Lake, but claims have been located on the eastern margin of the lake. The existence of minerals in this region has been known for some years. The mines appear to be in the limestone belt, which Dr. Dawson noticed as running south-easterly from about the foot of Upper Arrow Lake. The discoveries were made so late in the fall that I was unable to visit the locality. The ores, so far as known, consist chiefly of silver-bearing galena and carbonates, but some of the ores have copper for a base. The assays on an average run high. Twenty assays ranged from low grade to 2,000 ozs. per ton, the average being about $175 a ton. As the prospectors had only a few weeks available before winter set in, it is difficult for any one at present to give a complete account of these discoveries. No work, of course, has been done on the claims. The

prospectors, however, judging from surface showings, express a very favourable opinion as to the mineral character of the region. They say that large bodies of ore exist, and that access to the region, and the natural mining conditions, are favourable.

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"That this opinion is generally entertained by prospectors, and by mining men generally, is attested by the number of records made, and the number of claims which, without any work being done on them, have been bought by investors. About fifty men, it is said, are wintering in Slocan. Storekeepers, packers, and steam-boat men, have arranged their business for a large influx of persons into the Slocan country in the spring. The people of Nelson have cut out a twenty-five-mile trail from the Columbia and Kootenay Railway to Slocan Lake. The probability is that a large number—possibly a very large number—of miners and others will be attracted to West Kootenay in the early part of the year, by these Slocan discoveries.

"So far as I can judge of a population, which as in all mining districts, is liable to much fluctuation, it probably somewhat exceeds 2,000, nearly all engaged in or dependent on mining. A considerable number of families have settled in the district."

East Kootenay—(Mr. Cummins's Report).

Placer Mining.—"The total value of gold derived from placer mining during 1891 amounted to $28,500.

"The creeks from which the gold was taken all lie in the southern portion of the district.

"The hydraulic workings of Mr. David Griffith on Wild Horse Creek, which yielded last year about $9,000, have, I understand, not been in continuous operation this year, pending negotiations respecting the sale of the property to an English company.

"I am glad to be able to state that it is proposed to test the deep ground on Wild Horse Creek. Some efforts were made in this direction over twenty years ago without success. The scheme has, however, been thought well of by good authorities on placer mining, and there is every reason to suppose that the ground is rich. A lease of one and a half miles of the bed of the creek has been granted to a company of ample means to carry on the work in a most efficient manner.

"The greater part of the placer gold derived from the various creeks, as will be seen by the tabular statement, was taken out by Chinese companies."

Quartz Mining.—"Mineral development in this district has, during 1891, been carried on with more energy than heretofore. Capital de-

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rived from outside sources has been invested in the district, and is being expended in the development of some good prospects, under competent direction, in various localities. Work is going on steadily this winter on several properties, and satisfactory results may be looked for before spring. Assessment work has also been done with greater regularity and intelligence than heretofore. The possibility of now bonding or selling mineral claims has also led the discoverers to make greater individual effort in prospecting their claims. It may now, I hope, be fairly said that mineral development has commenced, and that progress will be more rapid during next year. Search for new discoveries has not been so active, most of the prospectors having been engaged in working on their claims. A few good prospects have, however, been found, especially in the southern portion of the district.

"Another feature to be mentioned is that the assays of mineral obtained from claims throughout the district show a marked increase in richness. As erroneous ideas have in some cases been formed, due to the results published in some of the reports of the Geological Survey, of specimens which happen to have reached Ottawa from time to time,* I add, at the conclusion of this report, a list of assays obtained through the courtesy of Mr. Harvey, of Golden, which are perfectly reliable, and which confirm the fact that the ores of the district are mainly high grade in character, and in some instances run very high in both gold and silver.

"The trails and roads have been kept in a state of efficiency, owing to the liberal appropriations devoted to their improvement and repair last session.

"It is to be regretted that no funds were available during the summer for the collection of samples from the ore deposits of East Kootenay, as a very handsome exhibit could have been collected, at a moderate cost, to represent the mineral of the district for exhibition, the effect produced by the very fine exhibits of West Kootenay having resulted in great advantage to that district, and having been a credit to all concerned.

"The 'Bobby Burns' claim, situated near the head of the Middle Fork of the Spillemechene or McMurdo Creek, mentioned on page 373 of the Report of the Minister of Mines for 1890, has attracted much attention during the season. A five-stamp gold quartz mill was erected on the ground last summer. The water power was, unfortunately, not got into working order before the coming on of the winter. It is, however, expected to be in operation early next season.

*The results so given are accurate, for the *specimens* received by the Survey, but unless these are collected by competent and reliable persons, nothing can be guaranteed as to how far they represent the *average* of the ore body from which they come.

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"Some development done on the lead since the date of last year's report established the existence of a considerable quantity of free milling gold quartz on the surface, the quantity in sight justifying the erection of machinery, To what depth the lead will maintain its free milling qualities has not yet been conclusively tested. It is considered that at a depth a large quantity of gold will be contained in sulphurets, in which case it is assumed that additional plant will be needed. It seems highly probable that the enterprise, with experienced and practical management, will pay handsomely, and prove the forerunner of similar undertakings in the near future on other gold ledges which exist in the immediate neighbourhood.

"Development prosecuted, for a time on a considerable scale, on the property of Messrs. Rand Bros.' Syndicate, on Carbonate Mountain, on the right bank of McMurdo Creek, has been temporarily suspended whilst organizing a larger company, which has lately been registered as the Carbonate Mountain Mining Company, Limited.. It is understood that the company will prosecute development vigorously in the spring. As mentioned in last report, this property was reported on favourably in 1889 by Mr. Giffard, the expert, well known in connection with the undertakings of Messrs. John Taylor & Son, of London.

"On the opposite side of the creek, directly to the north-west of Carbonate Mountain, little more than assessment work has been done. Some of the claims are, however, reported to be showing very favourably.

"But little work has been done on the Copper Creek claims.

"Further to the south-east, on the left bank of Vermont Creek, a tributary of the South Fork of the Spillemechene River, three claims were bonded last autumn to the management of the Golden Smelting and Mining Company. A contract was let in the beginning of the winter to the owners of the claims for two hundred feet of tunnelling and cross-cutting. According to the last information received, a tunnel had been run into the face of the mountain in a north-westerly direction for one hundred feet, and a cross-cut to the right commenced.

"The Vermont claim, one of a block of claims situated on the southern side of Vermont Creek, mentioned on page 374 of last year's report, has been steadily worked all this winter. The greater portion of the ground included in this block was bonded to Messrs. Osler & Hammond, of Toronto, last summer, after being examined in their interests by Mr. George Attwood, the expert and mining engineer, on whose report, and according to whose directions, the present work is being carried on, under the charge of a qualified mining engineer.

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"As stated in last year's report, this property contains a number of veins of silver-bearing galena and grey copper ore on the surface, ten of which, varying from six inches to twenty inches in width, are confined to a comparatively small area on the Vermont claim. A tunnel is being driven to cut those veins in the mountains, at a depth of about two hundred feet from the surface, to test their permanence, and ascertain to what degree they converge or run together to form larger veins at that depth. The tunnel has been driven in three hundred feet up to the date of last reports. At two hundred feet a vein was cut which does not appear in the face of the mountain. It was expected to cut some of the principal veins in the early part of January, and news is now shortly expected.*

"It has been estimated, from the surface showings of the veins, that their strike is about N. 65° W. and S. 65° E., with a dip varying from 50° to 80° southward. The veins all cut the formation in dip, and gain in strength as they attain depth in the mountain, generally pinching as they approach Vermont Creek. Some cannot be traced in the face of the bluff.

"The average of eighteen samples taken indifferently from the surface of the veins by Mr. Attwood, assayed silver, 86.013 ounces; lead, 41.83%; whilst many high assays have been obtained at various times by the owners of the claims, the highest of which I am aware giving 1,169 ounces of silver to the ton.

"The claims on the south-eastern side of the divide between Vermont Creek and Crystal Creek would appear to contain extensions of the Vermont Creek veins. A tunnel of forty feet has been driven this winter on one of these claims, and good concentrating ore found in a vein of some size, which has all the characteristics of a true fissure.

"The mineral claims lying further south in this belt, many of which were noticed in last year's report, have not been developed to any extent beyond doing assessment work last season. There are, however, some promising prospects on Bugaboo Creek, Horse Thief Creek and Toby Creek, which will, it is hoped, attract the attention of those possessing the capital to develop them in the near future, should ventures going on in neighbouring localities prove successful.

"The claims on Jubilee and Spillemechene Mountains, lying near the foot of the Selkirks in the Columbia Valley, near the mouth of the Spillemechene River, have not been worked this year beyond the usual assessment work. Crown grants have been obtained for several claims,

* "Since the above was written, news of a very favourable kind has been received. At about three hundred and twenty feet in the tunnel, a vein reported to be three feet in thickness was cut. This is probably the first of the veins showing on the surface. The assays of the ore are stated to be most satisfactory.

and the issuing of grants for others, delayed through litigation, now happily overcome. It is understood that a considerable amount of capital would be needed to develop the mineral of this locality effectively. Most of the properties are, however, with reason, considered valuable.

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"The work which was being carried out last winter on the Spillemechene claim, alluded to in last year's report, brought to light some fine bodies of galena ore, which were considered to be of too low grade in silver to be profitably worked in the existing state of the lead market. It may, however, be reasonably expected that higher grade ore will be met with, as good assays have been obtained from the same lead.

"Thunder Hill is a large butte situated in the foot-hills of the Selkirk Range, near Findlay Creek, and within about one and a half miles of the Upper Columbia Lake, on which a number of claims have been located.

"This discovery was made by Mr. James Brady, M.E., in 1884. Until this winter, but little development work was done on any of the claims. The work done from year to year was confined mainly to cutting trenches across the butte at various places, in order to locate the lead, which was, to a great extent, covered with soil.

"During the latter part of last summer, Mr. Brady formed a company, registered as the Thunder Hill Mining Company, Limited, of Victoria, to test and operate his claims. Work has been prosecuted in a most energetic manner this winter. The lead is of exceedingly large dimensions, running in a northerly and southerly direction. The country rock of the locality appears to be generally Cambrian slate.

"I have not had the advantage of examining the property since last fall, when the operations of the company were about to commence. The following particulars have, however, been obtained from several reliable sources:—

"The work done this winter consists of an open cut, about one hundred and fifty feet in length, running across the lead. The top width is about twenty feet, the average depth about eighteen feet. This cut has disclosed large quantities of concentrating ore, silver and gold-bearing galena, with some gray copper. The quartz, in some instances, contains a small quantity of free gold. The ore taken out of the cut has been stored for future treatment.

"It is understood that, should developments continue as promising, the proprietors intend to put up concentrating works on a very large scale, as, to judge from present showing, the supply of ore would seem to be almost unlimited.

"The mine is exceptionally situated for operating at an exceedingly low cost. A tramway, not more than two miles in length, will connect

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with the Upper Columbia Lake, and the transportation facilities of the Upper Columbia Navigation and Tramway Co. The mill site would probably be located on or near the lake.

"On Windermere Mountain, situated about four miles north of Windermere, on the Lower Columbia Lake, work has not progressed as rapidly as was anticipated last spring. A ten-ton lot of ore taken from the principal claim was sold in the early part of the summer for $50 a ton to complete a shipment from elsewhere. The Windermere Mining Co., Ltd., was organized at Spokane to work this claim, and a contract for 50 feet of drifting was let last fall.

"The Canal claim, on the east side of the Upper Columbia Lake, has been recently sold for $3,000, but little work had been done on the claim. It is understood to be a very good prospect.

"In the valley of the Kootenay River, and in the adjacent Hughes' Range of the Rockies, a number of claims have been recorded. From reports received, there are sufficient grounds to look forward to this locality receiving more attention in the future.

"On Wild Horse Creek, some claims have been staked on old discoveries in the neighbourhood of the Old Camp.

"The Pass claim, on the mountain above Wild Horse, is, I understand, showing favourably. In the vicinity of this lead a small stringer was discovered last summer. A little pocket in this seam, which is situated on the mountain, far above the action of water, contained over $100 worth of gold. The remainder of the seam, as far as it was explored was barren. This would tend to confirm Dr. Dawson's opinion as to the origin of the Wild Horse placers.

"In last year's report the discovery of a new district was alluded to, on Lost Creek, in the Rockies, about eleven miles in a south-easterly direction from Fort Steele, from whence some high grade samples of ore were obtained. About two miles further down the creek two leads were discovered last summer, containing peacock copper ore of remarkably beautiful appearance. When I visited the claims there was a very fine display of ore in the face of the workings on one of the leads.

"The original discoveries, further up the creek, from which assays of 800 ounces to the ton in silver and $46.60 in gold were obtained, have not been prospected sufficiently yet to determine the permanence of the veins, which are small at the surface. There is, however, a probability that further discoveries will be made in the locality, as the formation is very favourable, and larger leads should exist.

"The Monarch mine, which was being actively worked during the beginning of the year, has closed down for the present. I am not acquainted with the exact reasons which led to this. The other claims near Field have only had the necessary assessment work done this year.

"Some new discoveries, which are stated to be of importance, have been made up the Ottertail Creek. The claims nearer the Canadian Pacific Railway track have not been worked.

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"Howse Pass.—Discoveries were made in the early part of the season in the neighbourhood of the head waters of the Bow River. Doubts exist if they are in British Columbia or the North-west Territories.

"The Golden Smelting Works are now in complete order, and I understand the management intends to make an effort to obtain sufficient ore for a run shortly.

"The following is a statement of a number of assays obtained from claims in different localities in the East Kootenay District previously referred to :—

"LIST OF ASSAYS OBTAINED FROM EAST KOOTENAY ORES IN 1891.*

Date.	Locality.	Mineral.	Assays to the Ton (2,000 lbs.)
1891.			
September.	McMurdo Creek.....	Quartz.	Gold $326.70.
June .. .	do	do	Gold 15.43 oz.
do	do	do	Gold $546.30.
do ...	do	do	Gold $34.35.
do	do . ..	Galena... ..	Silver 41.45 oz., lead 79%.
do	do	do	Silver 177.29 oz., lead 74%.
July.....	Copper Creek.....	do	Silver 102.9 oz., lead 69%.
do	Vermont Creek.. .	Grey copper.	Silver 1169.33 oz.
do	do	.....	Silver 242.39 oz., gold $5.38.
do	do (average of 18 samples from surface of various leads.)	Galena and antimonial copper.	Silver 86.01 oz., lead 41.83%.
do	Crystal Creek.....	.. ..	Silver 50.05 oz.
do	do	.. ..	Silver 1,113 oz.
do	Bugaboo Creek.....	.....	Silver 249.66 oz.
do	do	.. ..	Silver 61.97 oz., gold nil.
do	Jubilee Mountain. ...	Copper ores...	Silver 129.91 oz., gold nil.
do . ..	Howse Pass.....	.. . .	Copper 12.7%, silver 38.23 oz., gold 19 dwt.
June	Windermere..	... .	Lead 46.7%, silver 38.75 oz., gold $23.
May.	Ottertail..	. .....	Silver 19.25 oz., gold $3.25, lead 60%.
do	East Kootenay.....	.....	Silver 111.28 oz., gold $35.15.
do	do	.. ..	Silver 107.79 oz., gold $1.25.
do	North-west of Golden.	Antimonial c'r	Silver 72.01 oz., gold $14.62.
do . .	East Kootenay..	.....-..	Silver 80 oz., gold $50.
do	Windermere..	. . ..	Silver 43.99 oz., gold $1.
do	Lost Creek..	....	Silver 71.16 oz., gold $46.60.
November.	do	Grey copper..	Silver 610.58 oz., gold $7.
do ..	do	do ..	Silver 800.18 oz., gold $19.62.
do ..	Skookum Chuck	Antimonial ore	Silver 523.52 oz.
do ..	Hughes' Range.....	....	Silver 44.50 oz., gold $1.
do ..	North-west of Donald.	Copper ore....	Silver 243.95 oz.

*It is not clear whether the assays made were of picked "*specimens*, of material taken hap-hazard, or of carefully selected *samples* representing the average of some definite ore body. The usefulness of the results as illustrating the mineral capabilities of the district are thus greatly lessened.

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"In conclusion, I beg to state that 253 free miners' certificates have been issued during the year, the number of new claims recorded being 138."

Lillooet—(Mr. Soues's Report.)

"The total yield of gold for the year (ascertained from reliable sources only) is $52,506.

"This shows a decrease of nearly $19,000 as compared with the ascertained yield of last year.

"This decrease does not infer by any means that the sources of supply are exhausted, but is attributable simply to the fact that the Chinese miners, for reasons best known to themselves, have almost deserted this district for the past two years.

"Considering the few miners there are in the district, and with the knowledge that several of the white miners, this year at least, have been non-producers, and the fact that there has been no new or rich strikes, I must confess to being surprised that the returns are so large.

"The various gentlemen to whom I am indebted for courteous information as to the amounts of gold dust bought by them during the year, kept a correct business account of their gold-buying transactions, and knowing them all for many years, I have every confidence that their statements to me are absolutely correct.

"The aggregate of their figures give the above-named total. I make no calculations or allowances from any other source of information.

"Mr. Phair, Mining Recorder at Lillooet, reports to me under date 26th inst.: 'The yield of gold for the season for 1891 in this part of the district is $39,091. This amount was shipped to San Francisco, through the Bank of British Columbia, by the following, viz.:—

'A. W. Smith	$22,399
'C. A. Phair	10,500
'A. McDonald	6,192
	$39,091

"'You will observe the yield is smaller than usual, owing entirely to the departure of nearly all the Chinese to work on the railroad and on the mining ditches on the South Fork of Quesnelle River. The amount taken out by the Lillooet Hydraulic Mining Company, viz., $6,192, is good considering the fact that two months of the working season were lost while enlarging ditches and flumes and opening out a new cut, otherwise they would have taken out considerably more.

The company intend during next season to dig a new ditch four and a half miles to the 4-Mile Creek, and, when completed, it will give them double the water they now have. This mine is splendidly equipped for working by the superintendent, Mr. A. McDonald.

"'This company has also a lease on the South Fork of Bridge River which prospects exceedingly well. They commenced mining this season with a large force of men, but their wing-dam, unfortunately, was carried off by high water. They are replacing it this winter. The Mina Company, on Tyaugton Creek, have completed their flume and ditch and will commence mining in the spring. Their ground shows good prospects. Mr. Jensen, representing a Victoria company, intends to commence active operations under their mining lease on Cadwallader Creek as soon as the season opens.

"'The Vancouver Enterprise Mining Company, on Cayoosh Creek, have their tunnel in now over 500 feet, and expect to have it finished in three months.

"'A scheme is being developed for bringing water from Cayoosh Creek upon the benches on both sides of the Fraser River at Lillooet. If this were accomplished it would add greatly to our prosperity.'

"With regard to the scheme to which Mr. Phair refers, viz., bringing in water for hydraulic mining purposes from Cayoosh Creek, two mining leases have been granted and three more applied for, all dependent on water from this creek. The supply is more than ample for all, and available at all seasons. For hydraulic mining, possibly during the months of December, January and February, at intervals on account of frost, it might be necessary to shut off the water, otherwise work would be continuous, and there is no question as to the results. Were proof wanting as to the mineral value of the various benches in the immediate neighbourhood of Lillooet, we have it in the returns from the Lillooet Hydraulic Mining Company and Messrs, Peters & Ward's mining leases. With a most inadequate supply both of these enterprises are doing very well, and at least settle the question as to what could be done with a powerful and well managed supply of water. Cayoosh Creek is the only source from which this supply can be had, and to bring it in sufficiently high to cover all the available benches will be a most costly undertaking, and I can only trust that the parties interested will carry out the scheme as they propose on a large and substantial plan. Hydraulic mining with any of the other small creeks in that neighbourhood is only time lost, for the inevitable small returns.

"In view of probable extensive hydraulic mining on the various benches of the Fraser River in this district in the near future it is,

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perhaps, not out of place here to refer to a similar method of mining in other lands, notably on the Feather, Yuba and Sacramento rivers in the State of California, where legislative action was invoked to put a final stop to it on account of filling up the rivers named with silt, and the practical destruction and flooding of unnumbered acres of, probably, the best alluvial lands in that state.

"From personal observation, I am clear in saying the same conditions do not exist here, and capitalists investing largely in substantial, permanent works for the conveyance of water for hydraulic mining purposes, in this district at least, need not take into consideration the probability in the near or remote future of being met with legislative enactments or judicial injunctions compelling them to stop work.

"Of the leases issued last year, so far there are no returns, bringing in a sufficient supply of water, being the great and expensive barrier in every case."

Quartz Mining.—"In quartz mining I regret to say that I have absolutely nothing new to report.

"A number of mineral claims recorded in 1889 and 1890 have been practically abandoned, no work or prospecting having been done on them in the past year. On Cayoosh Creek sufficient work was done on the Bonanza Company's property in the early part of the year in compliance with the latter part of clause 73, 'Mineral Act, 1884.' Negotiations for bonding the above-named property, and two other locations on the same creek, by English capitalists have been in progress for some time, but up to the present no satisfactory terms have been concluded.

"Prospecting work on most of the locations on the North Thompson has been done during the year, notably by Messrs. Allingham, Craven and McDonald. The whole of the miners in this part of the district are heavily handicapped by the innumerable natural obstacles in their way—remoteness from all centres of supply, total absence of roads or trails, and dangerous and rapid rivers to cross, all in combination with a very short season.

"The scheme for working Big Bar on the Fraser River, under water, by machinery, referred to in my report of last year, came to an abrupt ending early in the season. The large scow for carrying the dredging plant was jammed in the ice and carried off before any practical work was done.

"I understand the company propose building another scow this winter to be ready for active work at lowest water in the early spring.

Yale—Kamloops Division—(Mr. Tunstall's Report).

"After giving particulars of work and discovery in iron and copper deposits, Mr. Tunstall says:—'Placer mining on the Tranquille River is pursued on so small a scale as not to be worthy of mention, and, I regret to add, I cannot report any operations in the gold or silver-bearing veins in this division of this district.'" THE PRECIOUS METALS. Discovery and development —British Columbia.

Yale—Yale Division—(Mr. Dodd's Report).

"A few of the bars on Fraser River, from Hope to Foster's Bar, have been worked by Chinese in a desultory manner. It is, however, impossible to obtain any reliable data as to their success, as most of their earnings (presumably small) are sold in small quantities to the various traders in the district.

"An English syndicate commenced operations on Hill's Bar Flats in April last, by washing the banks by means of a powerful Merriweather hydraulic pump, and continued work until the end of September, when, expectations not having been realized, work was discontinued for the season, after a large outlay for machinery and labour.

"Yale Creek.—The owners of the Queen Mine have been actively at work all the season. Operations at this mine commenced in 1878, and up to the present time nearly 2,500 feet of tunnels have been driven, the last 100 feet giving indications of a very favourable character.

"Siwash Creek.—Placer Mines.—Rodney & Co. have wing-dammed the creek, laid a flume 450 feet long, 4 feet wide and 2 feet deep. They have also run a race, having expended during the past season, $1,800. They have not reached bed-rock, but are washing a fine body of gravel 16 to 18 feet deep, out of which was washed 20 oz. of gold, including one piece valued at $45.

"Siwash Creek syndicate, composed of a few of the leading men of Vancouver, obtained a lease of the lower end of the creek, and began work in a practical manner about two months ago by constructing a dam and sluice gate across the creek, laying a flume 135 feet long, 5 feet wide and 2 feet deep, blasting down two falls and sluicing to a depth of 22 feet. Very encouraging prospects have been found and I trust to be in a position in a few months to report that very good pay has been discovered.

"Roddick & Co. have also obtained a lease of a portion of the creek near the Forks, on which active operations will be under way as soon as the spring opens.

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"About 20 quartz claims are located on Siwash Creek, on a large portion of which assessment work has been performed, with the exception of the Montrose and Roddick. On the latter several thousand dollars have been expended in driving tunnels, discovering such encouraging prospects of free gold, that a Crown grant has been applied for. This mine will be thoroughly tested by a company of Vancouver capitalists.

"Two leases have been applied for adjoining the Boston Bar farm by the side of the old wagon road. So far, the lessees are busy testing the ground by sinking a series of prospecting shafts on the land.

"Before closing my report I would respectfully submit, for the consideration of the Government, the urgent necessity of constructing a pack trail into Siwash Creek, as the only mode of transporting tools and supplies is packing by Indians, at a cost of four cents per pound. This, of course, would be greatly reduced in the event of a suitable pack trail being constructed."

Yale—Okanagan Division—(Mr. Dewdney's Report).

"Two whites and a few Chinese are still prospecting Cherry Creek, and the Chinese are taking out small wages from the abandoned claims.

"Mr. John Merritt, foreman of the Cherry Creek Mining Company, is still persevering in trying to find the old channel. The tunnel now extends about 800 to 850 feet, with very good indications ahead. He showed me from 4 to 6 oz. of coarse gold, which he took out from his last two or three sets of timbers.

"Mr. L. W. Riske and Donald McIntyre have during the summer been working their quartz mines on the Monashee Mountain, with good results, until compelled to shut down for want of water. They now intend to bring water, as proposed last year, a distance of two and a half miles, by ditch and flume, which will give them an ample quantity to operate the mill during the summer months.

"A very little prospecting on Rock Creek, and at the quartz mines, has been done during the summer, and until better facilities are offered for getting machinery into the province there will still remain a deadlock in mining enterprises.

"The placer and hydraulic mines at the mouth of Rock Creek have not done so well this past season, the output of gold reaching only from $5,000 to $6,000.

"Very encouraging reports come from Fairview Camp, and I am informed that it is a most promising camp, several claims having already

been bonded for large sums, but, for lack of machinery, they have not been thoroughly tested. THE PRECIOUS METALS. Discovery and development —British Columbia.

"There are one or two hill claims on Siwash Creek, the owners of which are developing their prospects by tunnelling."

Yale—Similkameen Division—(Mr. Hunter's Report).

"The yield of gold still continues to decrease, although the yield of platinum has increased considerably, both in quantity and value.

"On Granite Creek the yield of gold has increased, five companies are on fair pay, averaging about $6.50 per day.

"On Newton Creek very little work has been done, the water having given out, although while it lasted fair wages were made.

"On Slate Creek a large amount of work was done, considering the few miners there. In most cases fair wages were obtained. This creek has proved to be rich, though only a small portion of it has been worked, on account of the ground being so deep and miners not being in possession of funds to prospect it.

"On Boulder Creek there is only one Chinese company, and they have obtained small wages.

"On the Tulameen River a large amount of work has been performed, principally mining for platinum, the price of which has increased, making it an object to mine solely for that metal.

"An hydraulic company has been started on the Tulameen, about fifteen miles north-west of Granite Creek. The work is being pushed forward with all speed. A saw-mill, with a capacity of 25,000 feet per day, has been erected on the ground. The company expects to have the machinery in working order this fall, so as to be able to start up in the spring.

"About twenty Indians were mining on this river, with rockers, and obtained small wages.

"On the Similkameen, mining operations have been limited this year, the late season having kept the river high, and a scarcity of hands obliged Mr. Allison to shut down on his claim.

"On Whipsaw Creek very little work was done, on account of the small wages obtained.

"Considerable work has been done this year in quartz mining.

"About nine miles from Princeton, and about five from Friday Creek, a claim has been located, although little work has been done on it as yet.

"On the Bonanza Queen and Nevada, situated on the Tulameen River above Granite Creek, the owners have satisfied themselves with merely performing the necessary work to hold the location."

PYRITES.

PYRITES. Production, etc.

The amount of pyrites or sulphur ore produced in Canada during 1891 was 67,731 tons, valued at $203,193. This was all used in the manufacture of acid. As this ore runs from 35 to 40 per cent of sulphur, it will represent about 25,542 tons of sulphur.

QUEBEC.—As formerly, the whole of the pyrites produced is the result of the working of the Capelton group of mines near Sherbrooke. Of the operations at these points there is nothing new to add to the description given in last year's report.

Messrs. Nichols & Co. have continued to use part of their ore on the spot in the manufacture of sulphuric acid, shipping the bulk of it, however, in the raw state for similar use in their acid works at Laurel Hill. The remainder was also shipped to United States to acid manufacturers, the much enhanced price of sulphur causing a demand for pyrites to replace the more expensive article.

The effect of this demand is visible in the figures of production, which as compared with last year's, viz., 49,227 tons, show a great increase.

There being as yet slight demand for sulphuric acid in Canada the value of the country's resources in the way of pyritous sulphur ores varies with the fluctuations in the price of the competing material, viz., sulphur, and is closely connected with supply and demand in the American markets for this material.

The main feature of the American market would seem to be that the great increase in the price of sulphur has forced upon many acid makers the necessity of altering their works, and replacing their sulphur burners by furnaces suitable for burning pyrites. The effects of this movement will affect also the future policy of those acid makers who have previously adhered to the use of sulphur, even possibly at some disadvantage, rather than go to the great expense of constructing the much more elaborate plant for using pyrites. These, however, having once incurred this expense will for that very reason continue to be users of the pyritous ores.

It must be remembered, however, that whilst these changes will affect the *relative* values of all Canada's pyrite deposits, many will yet be without the pale of profitable working, on account of their inaccessibility and lack of cheap means of transport to the consumers and must await the improvement of these conditions or the creation of a local demand by the erection of acid works in their vicinity.

In regard to this latter point the needs of the phosphate industry may at some future time lead to the manufacture of acid in those min-

ing districts themselves and to a consequent demand for pyritous de- PYRITES.
posits within a reasonable distance.

The subjoined table shows that the home market for sulphur increases slightly but steadily year by year :—

PYRITES.

TABLE 1. Imports of Sulphur.

IMPORTS : BRIMSTONE OR CRUDE SULPHUR.

Fiscal Year.	Pounds.	Value.
1880	1,775,489	$27,401
1881	2,118,720	33,956
1882	2,375,821	40,329
1883	2,336,085	36,737
1884	2,195,735	37,463
1885	2,248,986	35,043
1886	2,922,043	43,651
1887	3,103,644	38,750
1888	2,048,812	25,318
1889	2,427,510	34,006
1890	4,440,799	44,276
1891	3,601,748	46,351

SALT. SALT.

PRODUCTION.

During 1891 there were 45,021 tons of salt sold, valued at $161,179 ; Production, etc.
this production is altogether that of the provinces of Ontario and New Brunswick, and the result of operations carried on by the following producers :—

Courtwright ..... Courtwright Salt Company.
Parkhill ..... Hutchins & Company.
Port Franks ..... Jos. Williams.
Exter ..... Exeter Salt Works Company.
Hensall ..... Geo. McEwen.
Clinton ..... R. & J. Ransford.
" ..... John McGarva.
Goderich ..... N. A. Chemical Company.
" ..... Ogilvies & Hutchison.
" ..... Peter McEwen.
" ..... Jos. Kidd, jr.
" ..... John S. Platt.
Warwick ..... Elarton Salt Works Co.
Wingham ..... Grey, Young & Sparling Co.
Blyth ..... " "

SALT.
Production, etc.

Kincardine.....L. Rightmeyer.
" .....Ontario People's Salt Co.
Brussels .....T. T. Coleman.
Sarnia .....Sarnia Salt Co.

The quantity of salt produced this year is 1,267 tons in excess of last year, while the value has decreased $37,718. According to returns annually received at this office the production for the past five years has been as follows :—

1886—62,359	tons,	valued at.....	$227,195
1887—60,173	"	"	166,394
1888—59,070	"	"	185,460
1889—32,832	"	"	128,547
1890—43,754	"	"	198,897

There is nothing new to report in the industry, beyond the fact that a new company, the Sarnia Salt Company, began operations at a new block erected in Sarnia.

Exports and Imports.

The following tables, 1, 2 and 3, and graphic table A, illustrate the exports and imports during this and previous years, and explain themselves :—

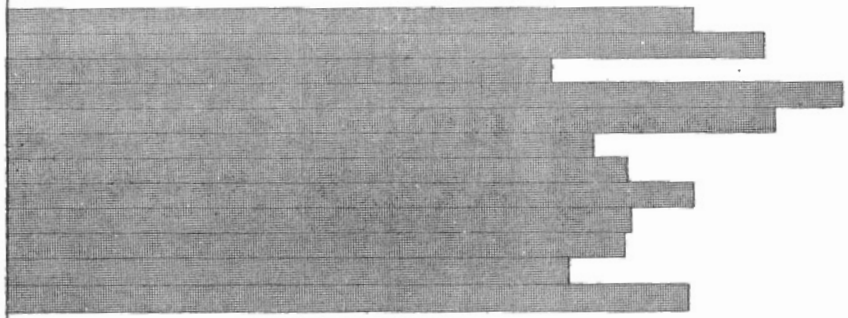
SALT.

TABLE 1.

EXPORTS.

Year.	Bushels.	Value.
1880	467,641	$46,211
1881.	343,208	44,627
1882.....	181,758	18,350
1883.	199,733	19,492
1884.....	167,029	15,291
1885.....	246,794	18,756
1886	224,943	16,886
1887.....	154,045	11,526
1888.	15,251	3,987
1889.....	8,557	2,390
1890.....	6,605	1,667
1891.....	5,290	1,277

Fiscal Year	Tons
1880	106,720
1881	117,115
1882	84,932
1883	129,442
1884	119,081
1885	90,984
1886	96,236
1887	106,728
1888	97,338
1889	96,019
1890	86,813
1891	105,316



SALT

TABLE A

IMPORTS OF SALT: ALL SORTS.

SALT.

SALT.
Exports and Imports

TABLE 2.

IMPORTS: SALT PAYING DUTY.

Fiscal Year.	Pounds.	Value.
1880.....	726,640	$ 3,916
1881.....	2,588,465	6,355
1882.....	3,679,415	12,318
1883.....	12,136,968	36,223
1884.....	12,770,950	38,949
1885.....	10,397,761	31,726
1886.....	12,266,021	39,181
1887.....	10,413,258	35,670
1888.....	10,509,799	32,136
1889.....	11,190,088	38,968
1890.....	15,135,109	57,549
1891.....	15,140,827	59,311

SALT.

TABLE 3.

IMPORTS: SALT NOT PAYING DUTY.

Fiscal Year.	Pounds.	Value.
1880.....	212,714,747	$400,167
1881.....	231,640,610	488,278
1882.....	166,183,962	311,489
1883.....	246,747,113	386,144
1884.....	225,390,121	321,243
1885.....	171,571,209	255,719
1886.....	180,205,949	255,359
1887.....	203,042,332	285,455
1888.....	184,166,986	220,975
1889.....	180,847,800	253,009
1890.....	158,490,075	252,291
1891.....	195,491,410	321,239

STRUCTURAL MATERIALS.

STRUCTURAL MATERIALS.

Building Stone

Building Stone.—According to direct returns received at this office, and estimated to constitute about four-fifths of the total production, there were 187,685 cubic yards produced, having a net value at the quarries of $708,736, showing a decrease, compared with 1890, of $256,047. The production, as returned to this office for the year, by provinces, is shown in the following table:—

STRUCTURAL MATERIALS.
Building Stone.

STRUCTURAL MATERIALS.

TABLE 1.

PRODUCTION OF BUILDING STONE DURING 1891.

Province.	No. of Returns	Cub. Yds.	Value.
Ontario	55	127,548	$426,908
Quebec	26	45,353	202,319
Nova Scotia	10	2,650	28,037
New Brunswick	7	8,767	41,838
British Columbia	1	150	1,600
Manitoba	1	44	600
North-west Territories	3	3,173	7,434
Totals	103	187,685	$708,736

Returns received in a similar manner show the production for the past five years to have been as follows:—

1886—165,777	cubic yards	$642,509
1887—262,592	"	552,267
1888—411,570	"	641,712
1889—341,337	"	913,691
1890—382,563	"	964,783

Of the operations throughout the Dominion, but little need be said, as work was carried on on lines very similar to those of last year. Of the work in New Brunswick, Mr. H. P. Brumell reports on two of the largest quarries there as follows:—

"The Dorchester Union Freestone Co. are carrying on active operations at Rockland, Westmoreland Co., N.B., where they are turning out very large dimension stone. The stone is olive-coloured and the section in the quarry shows about thirty-five feet of red sandstone, breaking into small blocks on account of the jointing. Beneath this is found the olive stone sought for, having a thickness of thirteen feet. This lower bed is very solid and free from fractures or mud planes. All shipments are made by water and about two-thirds the output goes to the United States. Prices are:—Small and random blocks, $4 per ton, F.O.B.; large dimension stone, $8.50 to $9, F.O.B.

"The New York Freestone Quarrying Co. are operating at Wood Point, and from the quarry opened there about five years ago, they obtain a micaceous sandstone which on drying, becomes almost grey, with a reddish tint. The quarry face shows the following section: thin upper beds, three to ten feet in all; lower bed thirty feet, between mud planes. The equipment at the quarry is very complete, consisting of steam drills and hoisting gear and cable tramway to landing,

from whence the stone is taken on scows to Sackville for transportation by rail. STRUCTURAL MATERIALS. Building Stone.

"This and all the larger quarries of New Brunswick are being operated on the 'notch' system, thus ensuring cleaner blocks and less actual dead work."

The following tables of exports and imports explain themselves:—

STRUCTURAL MATERIALS.

TABLE 2.

EXPORTS OF STONE AND MARBLE, WROUGHT AND UNWROUGHT.

Province.	1890.		1891.	
	Wrought.	Unwrought.	Wrought.	Unwrought.
Ontario	$ 7,284	$ 6,474	$1,804	$23,311
Quebec	53	1,613	.....	.....
Nova Scotia	252	16,821	300	12,793
New Brunswick	13,649	11,275	9,105	9,323
Manitoba	.....	9	.....	.....
British Columbia	487	7,419	2,189	735
Totals	$21,725	$43,611	$13,398	$46,162

STRUCTURAL MATERIALS.

TABLE 3.

IMPORTS OF BUILDING STONE.

Fiscal Year.	Value.
1880	$ 35,970
1881	58,149
1882	33,623
1883	35,061
1884	51,088
1885	30,491
1886	41,675
1887	54,368
1888	86,373
1889	100,314
1890	132,155
1891	170,890

Structural Materials. Building Stone.

STRUCTURAL MATERIALS.

TABLE 4.

IMPORTS OF MANUFACTURES OF STONE OR GRANITE, N.E.S.

Fiscal Year.	Value.
1880	$29,408
1881	36,877
1882	37,267
1883	45,636
1884	45,290
1885	39,867
1886	41,984
1887	41,829
1888	47,487
1889	61,341
1890	84,396
1891	61,051

During 1891 Canada afforded a market for about $880,000 worth of building stone, as follows:—

Production	$708,736	
Imports, building stone	170,890	
Imports, stone and granite	61,051	
		$940,677
Less—Exports, wrought stone	13,398	
Exports, unwrought stone	46,162	
		59,560
		$881,117

Marble.

Marble.—The production of marble for 1891 shows a considerable falling off when compared with the year previous, as the amount produced was only 240 tons, valued at $1,752, a decrease of 540 tons. The following figures show the production for the past five years:—

1886—501 tons, valued at		$9,900
1887—242	"	6,224
1888—191	"	3,100
1889— 83	"	980
1890—780	"	10,776

No new developments have come within the knowledge of the Division; the production is that of quarries which have been operated for many years.

The following table 5 shows the imports for the past twelve years and explains itself:— STRUCTURAL MATERIALS. Marble.

STRUCTURAL MATERIALS.

TABLE 5.

IMPORTS OF MARBLE.

Fiscal Year.	Value.
1880	$ 63,015
1881	85,977
1882	109,505
1883	128,520
1884	108,771
1885	102,835
1886	117,752
1887	104,250
1888	94,681
1889	118,421
1890	99,353
1891	107,661

Granite.—There is a slight increase shown in the figures of production of granite, the amount quarried and sold this year being 13,637 tons, valued at $70,056, as against 13,307 tons, valued at $65,985 for 1890. Granite

By provinces the production was as follows:—

Ontario,	3,842	tons	$ 9,451
Quebec,	4,425	"	17,390
Nova Scotia,	1,130	"	3,415
New Brunswick,	4,240	"	39,800

The annual production for the past five years is shown below:—

1886—6,062	tons, valued at		$ 63,309
1887—21,217	"		142,506
1888—21,352	"		147,305
1889—10,197	"		79,624
1890—13,307	"		65,985

STRUCTURAL MATERIALS. Slate.

Slate.—Only one slate quarry was in operation during the year, viz., that owned by the New Rockland Slate Company, whose return on account of its confidential character, is withheld. The only figures available, therefore, are those of exports and imports given below :—

STRUCTURAL MATERIALS.

TABLE 6.

EXPORTS OF SLATE.

Year.	Tons.	Value.
1884	539	$6,845
1885	346	5,274
1886	34	495
1887	27	373
1888	22	475
1889	26	3,303
1890	12	153
1891	15	195

STRUCTURAL MATERIALS.

TABLE 7.

IMPORTS OF SLATE.

Fiscal Year.	Value.
1880	$21,431
1881	22,184
1882	24,543
1883	24,968
1884	28,816
1885	28,169
1886	27,852
1887	27,845
1888	23,151
1889	41,370
1890	22,871
1891	46,104

Flagstones

Flagstones.—The production of flagstones for 1891 amounted to 27,300 square feet, valued at $2,721, an increase over 1890 of 9,435 square feet and $1,078. The production is altogether that of quarries in Wolfe and Richmond counties, in the province of Quebec.

During the past five years the production has been as follows :—

1886—	70,000 (?) feet	$ 7,895
1887—	116,000 "	11,600
1888—	64,800 "	6,580
1889—	14,000 "	1,400
1890—	17,865 "	1,643

No exports of flagstones, as such, were reported. The imports are given in the following table :—

STRUCTURAL MATERIALS.

TABLE 8.

IMPORTS OF FLAGSTONES.

Fiscal Year.	Tons.	Value.
1881	23	$ 241
1882	90	848
1883	10	99
1884	137	1,158
1885	205	1,756
1886	1,602	9,443
1887	1,316	10,966
1888	2,642	21,077
1889	1,669	15,451
1890	5,665	48,995
1891	3,770	36,348

Cement.—The total production of hydraulic cement of all kinds during 1891, was 93,473 barrels, having a value of $108,561, showing in quantity a decrease of 8,743 barrels while the value increased $16,156. Cement.

For the past four years the production has been as follows :—

1887—	69,843 brls	$81,909
1888—	50,668 "	35,593
1889—	90,474 "	69,790
1890—	102,216 "	92,405

But little can be said of the industry beyond that to be found in last year's report of this division. The operators during the year were as follows :—

Imperial Portland Cement Co	Montreal,	Que.
Thos. M. Morgan	"	"
T. A. Gauvreau & Co	Quebec	"
C. B. Wright & Co	Hull	"

STRUCTURAL MATERIALS.
Cement.

Napanee Cement Works Co	Napanee Mills, Ont.
Jas. Marshall	Rymal "
Toronto Lime Co	Limehouse "
John Battle	Thorold "
Isaac Usher & Sons	" "
Irwin, Hopper & Co	Marlbank "
North American Chemical, Mining and Manufacturing Co	Owen Sound, Ont.
Geo. Reid	Hannon "

Regarding some operations in Ontario and Quebec, Mr. H. P. Brumell reports as follows:—

"Messrs. Irwin, Hopper & Co., of Montreal, have during the year erected a plant for the manufacture of Portland cement at Cementville Siding, near Marlbank, Hastings county, Ont. The cement will be produced from marl and clay obtained in the immediate vicinity of the works, which have a capacity of thirty-five tons per day. Careful experiments and trials have been made, with the result that the company feel confident that during the coming year they will place upon the market a very superior and strong cement. Tests made —one hour in air and seven days in water—run as high as 550 pounds. It is the intention to ship the product in cotton bags instead of barrels, by which means it is expected the strength of the cement will be better guarded.

"The North American Chemical Mining and Manufacturing Co., of Owen Sound, have erected a plant for the manufacture of Portland cement, at a lake a short distance from Owen Sound, Ont. Two kilns have been erected and put into commission with a capacity of forty-two tons of clinker per kiln per week.

"The lake has an area of about 600 acres, and is in the fall of the year comparatively dry. A section of the lake deposit shows: Marl, two feet; mixed marl and clay, four feet. The materials in proper proportions are first mixed by means of a 'mixer' or puddler, after which the 'mud' is pumped to wet stones and ground, and from thence pumped to dry pans where the waste heat and gases from the attached kilns dry it. After roasting to clinker, the cement is ground in the usual way.

"Works for the production of Portland cement were erected during 1891 by the Imperial Portland Cement Co. at Pointe Claire, Que. Three kilns were erected, and active operations under the management of Mr. Gordon Kingan, at once begun. The materials used in the manufacture of the cement are found in the immediate vicinity of the works and consist of ordinary blue limestone and clay. The propor-

tions of these requisite for the making of a strong cement have been very carefully worked out with the result that the company are now turning out a very superior quality of cement." Structural Materials. Cement.

The following tables, 9, 10 and 11, illustrate the imports of cement; the exports are included with those of lime in table 14 :—

Structural Materials.

Table 9.

Imports of Cement in Bulk or Bags.

Fiscal Year.	Bushels.	Value.
1880	65	$ 28
1881	579	298
1882	386	86
1883	1,759	548
1884	4,626	1,236
1885	4,598	1,315
1886	6,808	1,851
1887	5,421	1,419
1888	23,919	5,787
1889	32,818	10,668
1890	21,055	5,443
1891	11,281	2,890

Structural Materials.

Table 10.

Imports of Hydraulic Cement.

Fiscal Year.	Barrels.	Value
1880	10,034	$ 10,306
1881	7,812	7,821
1882	11,945	13,410
1883	11,659	13,755
1884	8,606	9,514
1885	5,613	5,396
1886	6,164	6,028
1887	6,160	8,784
1888	5,636	7,522
1889	5,835	7,467
1890	5,440	9,048
1891	3,515	6,152

Structural Materials.
Cement.

Structural Materials.

Table 11.

Imports of Portland Cement.

Fiscal Year.	Barrels.	Value.
1880		$ 55,774
1881		45,646
1882		66,579
1883		102,537
1884		102,857
1885		111,521
1886		120,398
1887	102,750	148,054
1888	122,402	177,158
1889	122,273	179,406
1890	192,322	313,572
1891	183,728	304,648

Roofing Cement.

Roofing Cement.—During the year there was a production of roofing cement of 1,020 tons, valued at $4,810, showing a decrease, when compared with last year, of 151 tons and $1,692.

Lime.

Lime.—The production of lime during 1891 shows a slight decrease when compared with the year previous, the quantity being 1,829,894 bushels, valued at $251,215. Full data cannot be obtained, though all the principal producers are thought to have made returns and it is supposed that the above represents four-fifths of the total production.

The production, by provinces, as well as the totals for the past five years, are given in the following tables:—

Structural Materials.

Table 12.

Production of Lime during 1891.

Province.	No. of Returns	Bushels.	Value.
Ontario	63	1,227,681	$152,286
Quebec	9	506,700	77,462
Nova Scotia			
New Brunswick	6	67,430	15,285
Prince Edward Island	2	6,150	1,482
North-west Territories	3	21,933	4,700
Totals	83	1,829,894	$251,215

STRUCTURAL MATERIALS.

STRUCTURAL MATERIALS. Lime.

TABLE 13.

ANNUAL PRODUCTION OF LIME.

Year.	No. of Returns	Bushels.	Value.
1886	87	1,535,950	$283,755
1887	133	2,269,087	394,859
1888	93	2,216,764	339,951
1889	106	2,948,249	362,848
1890	93	2,501,079	412,308

The exports of lime and cement and the imports of lime are given in the following tables :—

STRUCTURAL MATERIALS.

TABLE 14.

EXPORTS OF LIME AND CEMENT.

Province.	1887.	1888.	1889.	1890.	1891.
Ontario	$ 4,269	$ 12,262	$ 12,877	$17,341	$ 21,924
Quebec	83	398	71	.....	25,729
Nova Scotia	142	278	11,017	17,137	15,451
New Brunswick	77,518	97,318	135,222	130,180	59,318
Prince Edward Island	4	.....	2	5	12
Manitoba	241	.....	2,060	.....	.....
British Columbia	4	.....	.....	4,141	300
Totals	$82,261	$110,256	$161,249	$168,804	$122,734

STRUCTURAL MATERIALS.

TABLE 15.

IMPORTS OF LIME.

Fiscal Year.	Barrels.	Value.
1880	6,100	$ 6,013
1881	5,796	4,177
1882	5,064	5,365
1883	7,623	9,224
1884	10,804	11,200
1885	12,072	11,503
1886	11,021	9,347
1887	10,835	8,524
1888	10,142	7,537
1889	13,079	9,363
1890	8,149	5,360
1891	6,259	4,273

STRUCTURAL MATERIALS. Building Bricks.

Building Bricks.—The production of building bricks during the year and according to direct returns was 176,533 thousand, valued at $1,061,536, a slight decrease from figures obtained in the same way for the year previous. These returns are not complete but are supposed to represent about four-fifths of the total production.

The production by provinces is as follows :—

STRUCTURAL MATERIALS.

TABLE 16.

PRODUCTION OF BRICKS DURING 1891.

Province.	No. of Returns.	Thousands.	Value.
Ontario	225	166,415	$675,719
Quebec	33	35,536	204,192
Nova Scotia	11	8,825	54,755
New Brunswick	11	5,145	35,725
Prince Edward Island	4	830	5,720
Manitoba	2	650	6,100
North-west Territories	5	2,050	23,000
British Columbia	7	7,082	56,325
Totals	298	176,533	1,061,536

The total yearly production for the past five years, as returned to this office, is as follows :—

1886—139,345 M., valued at	$	873,600
1887—181,581 M. "		986,689
1888—165,818 M. "		1,036,746
1889—200,561 M. "		1,273,884
1890—211,727 M. "		1,266,982

The exports of bricks amounted to 246,000 thousand, valued at $1,163, as follows :—

Ontario, 229 thousand	$1,039
Nova Scotia, 14 thousand	94
Prince Edward Island, 3 thousand	30

The following table illustrates the imports of bricks for the past twelve years:— Structural Materials. Building Bricks.

Structural Materials.

Table 17.

Imports of Building Brick.

Fiscal Year.	Value.
1880	$ 2,067
1881	4,281
1882	24,572
1883	14,234
1884	20,258
1885	14,632
1886	5,929
1887	2,440
1888	20,720
1889	24,585
1890	12,500
1891	9,744

Terra Cotta.—There was a production of terra cotta during the year amounting to $113,103, an increase over the year previous of $23,103. Comparisons with years prior to 1890 cannot be made as returns were not made nor asked for. Terra Cotta.

Drain Tiles.—According to returns made to this office, and supposed to represent about two-thirds of the total output, there were produced in 1891, 11,839 thousand drain tiles, valued at $141,399, an increase over the year previous of 1,318 thousand and $522. Drain Tiles.

The production by provinces is shown in the following table 18:—

Structural Materials.

Table 18.

Production of Tiles during 1891.

Province.	Number of Returns.	Thousand.	Value.
Ontario	91	11,597	$136,388
Quebec	1	111	1,665
Nova Scotia			
New Brunswick	4	98	1,346
British Columbia	1	33	2,000
Totals	97	11,839	$141,399

STRUCTURAL MATERIALS.

Drain Tiles.

For the past five years the annual production has been as follows :—

1886—12,416 M,	valued at	$142,617
1887—14,658 M	"	230,068
1888— 7,518 M	"	114,057
1889—10,526 M	"	134,265
1890—10,521 M	"	140,877

The imports, if any, are included with those of sewer pipes in table 19. No exports are reported.

Sewer Pipes.

Sewer Pipes.—The production of sewer pipes during 1891 was $227-300, a decrease, when compared with 1890, of $120,700. No further statistics beyond those of imports are available :—

STRUCTURAL MATERIALS.

TABLE 19.

IMPORTS OF DRAIN TILES AND SEWER PIPES.

Fiscal Year.	Value.
1880	$ 33,796
1881	37,368
1882	70,065
1883	70,699
1884	71,755
1885	69,589
1886	57,953
1887	71,203
1888	101,257
1889	83,215
1890	77,434
1891	87,195

Pottery.

Pottery.—Returns made direct to this office show that there was a production of pottery of all kinds, and earthenware, amounting to $258,844, an increase over last year of $63,602. The returns made to this office are supposed to represent about four-fifths of the total production.

The following table shows the imports for the past twelve years. There were no exports reported :— Structural Materials. Earthenware.

Structural Materials.

Table 20.

Imports of Earthenware.

Fiscal Year.	Value.
1880	$322,333
1881	439,029
1882	646,734
1883	657,886
1884	544,586
1885	511,853
1886	599,269
1887	750,691
1888	697,082
1889	697,949
1890	695,206
1891	634,907

Sand and Gravel.—No returns were asked for nor received, bearing upon the production of sand and gravel in Canada ; the only statistical data available, therefore, are the following tables of exports :— Sand and Gravel.

Structural Materials.

Table 21.

Exports of Sand and Gravel.

Province.	1890.		1891.	
	Tons.	Value.	Tons.	Value.
Ontario	341,656	$64,398	243,294	$58,283
Nova Scotia	170	750	230	805
New Brunswick	210	290	200	400
Manitoba	122	80		
British Columbia				13
Totals	342,158	$65,518	243,724	$59,501

STRUCTURAL MATERIALS.
Sand and Gravel.

STRUCTURAL MATERIALS.

TABLE 22.

EXPORTS OF SAND AND GRAVEL.

Year.	Tons.	Value.	Year.	Tons.	Value.
1877.....	11,998	$ 2,151	1885.....	110,661	$ 22,878
1878.....	50,140	8,381	1886.....	124,865	24,226
1879..... . .	46,999	9,438	1887...	180,860	30,307
1880.....	53,951	11,177	1888.....	260,929	38,398
1881.... , ...	58,693	15,129	1889.....	283,044	52,647
1882.	60.158	16,218	1890...	342,158	65,518
1883..... ...	55,346	14,065	1891.....	243,724	59,501
1884.....	73,741	19,978			

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