GEOLOGICAL SURVEY OF CANADA
ROBERT BELL, M.D., Sc.D., LL.D., F.R.S., ACTING DIRECTOR.

SECTION OF MINES

ANNUAL REPORT

FOR

1902

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ASSISTANT

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No. 835

To the Director,
Geological Survey of Canada.

SIR,—Herewith I beg to hand you the detailed annual report of the Section on the mineral industries of Canada for 1902. The preliminary summary statement for that year, which was completed on Febuary 27, is of course replaced by the revised statement herein contained.

The work of the Section, as in the past, has consisted not only in the preparation of the annual report, but in the collection, recording, &c., of technical information, and in making investigations into a great variety of matters pertaining to the economic mineral resources and the mineral industries of the country, as well as in answering the numerous enquiries on these subjects constantly coming to hand.

Thanks are due to those who, although too numerous to mention individually, by answering our circulars or letters, provided much valuable material. Our acknowledgments are also due to the provincial mining bureaus of Nova Scotia, Quebec, Ontario and British Columbia, as well as to the Dominion Customs and Inland Revenue departments for aid received. Appreciative acknowledgment is made of the important aid in the whole work of the Section rendered by Mr. J. McLeish and Mrs. W. Sparks. Thanks are also due to Mr. Theo. Denis, B.Sc., who, at my request, has compiled from the available facts the special articles on coal, salt and tripolite embodied in the report.

I am, sir,
Your obedient servant,

ELFRIC DREW INGALL,
Mining Engineer to the Geological Survey.

Section of Mines,
October 31st, 1903.

EXPLANATORY NOTES.

YEAR AND TON USED.

The year referred to throughout this report is the calendar year, except for the figures of imports, which refer to the fiscal year ending June 30. The ton is that of 2,000 pounds, unless otherwise stated.

EXPORTS AND IMPORTS.

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.

NOTE.—N.E.S. = Not elsewhere specified.

VALUES ADOPTED.

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 the current year. Spot values have been adopted for the figures of production of the non-metallic minerals.

GENERAL NOTES.

As in the past, care is taken to avoid interference with private interests in the manner of publishing results, and all returns of production of individual mines are treated as confidential, unless otherwise arranged with those interested. The confidence of the mining community, thus gained, has resulted in an increasingly general response to our circulars, although to complete our data, personal application is still necessary in a small number of instances, and a yet more prompt

response on the part of all applied to, will help still further towards an earlier publication of the material.

In view of criticisms of these statistics which have been made recently, and from time to time in the past, it may be well to take this opportunity to explain the working methods adopted, in order to prevent the misunderstandings which underlie such criticisms and suggestions, and to correct the impressions which they might convey to the public, that the reports are in any way unreliable.

The figures given throughout the reports are based, as far as possible, upon returns obtained direct from the various operators, or from official data, and the totals are checked by comparison with railway shipments, exports, and all other available sources of information. It can be therefore fairly claimed, that they are as accurate as it is possible to make such figures.

After investigation of the subject we have, however, found that in the nature of things, export and railway figures can only be taken as approximately correct in most instances. In the case of the export figures, entries are made, as a rule, by those having no technical knowledge of mineral substances, and in the case of the railways, but few of the shipments are actually weighed, so that car-load lots, for instance, may differ considerably from the theoretical load of the car.

The lists of operators given throughout the report are not put forward as complete in every case, only those reporting their production being included. Producers finding their names omitted are invited to communicate with this office that they may be included in the next issue.

CORRECTIONS—ALTERATIONS.

Corrections and alterations have been made throughout this report wherever they seemed to be called for, according to more complete and reliable data available since previous issues.

The tabulated statement given in the folded sheet at the beginning of the report, represents a compilation of all the similar statements found in previous reports, re-modelled and further revised wherever possible.

INTRODUCTORY.

The total value of the mineral production of Canada for 1902 was $63,865,797 showing a falling-off of $2,473,361, as compared with the previous year, equal to 3·73 per cent. As will be seen on examination of the accompanying tables, this is the first time in ten years that a decrease has to be recorded. For many years past the rate at which Canada's mineral assets have been realized has increased very rapidly as shown in the appended folder wherein are given the figures for the past seventeen years. MINERAL PRODUCTION OF CANADA.

YEAR.	CANADA.		UNITED STATES.	
	Increase and decrease per cent in Grand Total.	Production per capita.	Increase per cent in Grand Total.	Production per capita.
	p.c.	$ cts.	p.c.	$ cts.
1902	decr. 3.73	11·67	4·16	15·57
1901	incr. 3·42	12·40	2·60	14·03
1900	" 30·06	11·99	10·10	14·02
1899	" 28·13	9·33	39·86	12·84
1898	" 34·89	7·32	10·61	9·38
1897	" 26·90	5·52	1·33	8·66
1896	" 8·79	4·40	·21	8·73
1895		4·09		8·90
1890	64·00	3·50	38·97	9·89
1886		2·23		7·76

In view of the slight falling-off above shown, a feature to be expected occasionally in a long series of years, it is encouraging to realize the very great aggregate growth that is evident in the period shown. The grand total of 1902 is considerably over six times that of 1896, or even omitting the Yukon gold as an exceptional feature it would still approach $50,000,000, or a growth of 500 per cent. Of

MINERAL PRODUCTION OF CANADA.

course the inflation due to the discovery and exploration of the Yukon placers necessarily diminishes rapidly as the richer portions get worked out and the growth in the output from more systematic mining of the poorer gravels, will in the nature of things be slow. The Yukon was credited with an output of $14,500,000 for 1902 whilst for the previous year it produced $18,000,000, a difference of $3,500,000.

In the following table it will be noticed that there have been heavy decreases in values in all the metallic products except pig iron from both home and foreign ores and in nickel. In copper this was due to the fall in the price of the metal more than counteracting a small increase in the amount. In the other metals the decline is registered also against the output and enhanced by lower values. By reference to the folded table it will be seen that the decrease in the grand total of the metallic products is $6,147,175. Against this we have an increase in the non-metallic products of $3,673,814, leaving still a shortage of $2,473,361. Referring again to the following table, it will be seen that the principal contributors to the increase in the non-metallic class have been the coal, coke and cement industries which account for nearly $3,000,000.

PRODUCTS.	QUANTITY.		VALUE.	
	Increase.	Decrease.	Increase.	Decrease.
	p. c.	p. c.	p. c.	p. c.
Metallic—				
Copper	2·58			26·00
Gold		11·57		11·57
Pig iron (from Canadian ore only)		13·76		13·95
Pig iron (from both home and imported ores)	30·44		20·80	
Lead		55·77		58·47
Nickel	16·37		9·39	
Silver		22·53		31·45
Non-metallic—				
Asbestus and asbestic	·49			8·85
Coal	15·51		20·59	
Coke	37·35		23·69	
Cement	60·42		70·33	
Gypsum	13·02		5·62	
Natural gas				42·27
Petroleum		14·74		5·61

The relative value to the country of the various mineral industries will be made plain by a study of the table given below. Coal and coke, together with gold, stand out prominently as the twc main

GEOLOGICAL SURVEY OF CANADA.

MINES SECTION.

Mineral Production of Canada, Calendar Years 1886 to 1902.

PRODUCTS.	1886.		1887.		1888.		1889.		1890.		1891.		1892.		1893.		1894.		1895.		1896.		1897.		1898.		1899.		1900.		1901.		1902.		PRODUCTS.
	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	Quantity.	Value.	
METALLIC.		$		$		$		$		$		$		$		$		$		$		$		$	1,344	20,000		$		$		$		$	METALLIC.
Antimony ore	Tons.	665	31,490	584	10,860	345	3,696	55	1,100	26½	625	10	60																					Antimony ore.
Copper (*c*)	Lbs.	3,505,000	385,550	3,260,424	366,798	5,562,864	927,107	6,809,752	936,341	6,013,671	947,153	8,928,921	1,149,598	7,087,275	818,580	8,199,856	871,809	7,708,789	736,960	7,771,639	836,228	9,393,012	1,021,960	13,300,802	1,501,660	17,747,136	2,134,580	15,078,475	2,655,319	18,937,133	3,065,922	37,827,019	6,096,581	38,804,259	4,511,383	Copper (*c*).
Gold (*d*)	Oz.	66,061	1,365,496	57,465	1,187,804	53,150	1,098,610	62,658	1,295,159	55,625	1,149,776	45,022	930,614	43,909	907,601	47,247	976,603	54,605	1,128,688	100,806	2,083,674	133,274	2,754,774	291,582	6,027,016	666,445	13,775,420	1,023,620	21,261,884	1,350,176	27,908,153	1,167,320	24,128,303	1,032,253	21,336,667	Gold (*d*).
Pig Iron (*n*)	Tons.																													55,387	583,158	53,100	1,212,113	71,664	1,043,007	Pig Iron (*n*).
Iron ore (*o*)	"	69,708	126,982	76,330	146,197	78,587	174,500	84,181	152,068	75,511	155,380	68,979	142,005	103,248	253,866	125,602	299,368	109,991	225,011	102,797	232,070	91,906	191,557	50,705	130,290	58,343	152,738	74,617	240,542	(*o*) 50,657	126,642	(*o*) 157,033	392,582	(*o*) 278,339	695,847	Iron ore (*o*).
Lead (*e*)	Lbs.			204,800	9,216	674,500	29,813	165,100	6,488	105,000	4,704	58,665	3,857	808,420	33,064	76,636	3,079	5,703,222	187,636	16,461,794	531,716	24,199,977	721,159	39,018,219	1,396,853	31,915,319	1,206,399	21,862,436	977,250	63,169,821	2,760,521	51,900,958	2,249,387	22,956,381	934,695	Lead (*e*).
Mercury	"																			5,431	2,343	4,437	1,940	688	324											Mercury.
Nickel (*f*)	"			1,400	5,600	1,500	6,000	(*l*) 830,477	498,286	1,435,742	933,232	4,626,627	2,775,976	2,413,717	1,390,956	3,382,932	2,071,151	4,907,430	1,870,958	3,838,325	1,360,984	3,397,113	1,188,990	3,997,647	1,399,176	5,517,699	1,820,538	5,744,000	2,067,840	7,080,227	3,327,707	9,183,047	4,594,523	10,693,410	5,025,903	Nickel (*f*).
Platinum	'Oz.			355,083	347,271	437,232	410,998	383,318	1,000 358,785	400,687	2,500 419,118	414,523	10,000 409,549	310,651	3,500 272,130	422,158	1,800 330,128	847,697	534,049	1,578,275	3,800 1,030,299	3,205,343	750 2,149,503	5,553,446	1,600 3,323,395	4,452,333	1,500 2,393,929	3,411,644	825 2,032,658	4,468,225	1,500 2,740,362	5,539,192	457 3,265,354	4,291,317	190 2,238,351	Platinum.
Silver	Lbs.	*210,141	*269,690																							788,000	36,011	814,000	46,805	212,800	9,342			142,200	6,882	Silver.
Zinc	Lbs.																																	Zinc.
Total value, Metallic			*2,118,908		2,073,746		2,628,292		3,251,299		3,614,488		5,421,659		3,698,697		4,630,495		4,685,852		6,087,114		8,030,633		13,780,314		21,741,865		29,282,823		40,521,807		41,939,500		35,792,325	
NON-METALLIC.		(*a*)		(*a*)		(*a*)		(*a*)		(*a*)		(*a*)		(*a*)		(*a*)		(*a*)		(*a*)		(*a*)		(*a*)		(*a*)		(*a*)		(*a*)		(*a*)		(*a*)	NON-METALLIC.
Actinolite	Tons.									25	1,500	20	1,000					7	420																	Actinolite.
Arsenic (white)	"	126	5,460	30	1,200	+30	+1,200			9,880	1,260,240	9,279	999,878	6,082	390,462	6,331	310,156	7,630	420,825	8,756	368,175	12,250	429,856	30,442	445,368	23,785	491,197	25,536	485,849	29,141	22,725	324	4,872	363	22,725	884	41,676	900	48,000	Arsenic.
Asbestus	"	3,458	206,251	4,619	226,976	4,404	255,007	6,113	426,554									1,000	20,000	3,177	41,300	2,342	27,004	2,637	32,474	2,021	24,252	2,010	21,842	2,335	27,000	1,274	16,744	900	13,000	Asbestus.
Chromite	"	762	*945	38	570													3,257,070	7,429,482	3,478,344	6,739,153	3,745,716	7,226,462	3,786,107	7,393,527	4,172,582	8,222,878	4,925,051	10,283,497	5,668,686	13,260,429	6,237,352	12,005,565	7,193,142	14,478,181	Chromite.
Coal	"	*2,116,653	*3,739,840	2,429,330	4,388,206	2,602,552	4,674,140	2,658,303	4,894,237	3,084,682	5,676,247	3,577,749	7,019,425	3,287,745	6,393,757	3,783,499	7,359,020	3,847,070	6,739,153	3,745,716	7,226,462	3,786,107	7,393,527	4,172,582	8,222,878	4,925,051	10,283,497	5,668,686	13,260,429	6,237,352	12,005,565	7,193,142	14,478,181	Coal.
Coke (*g*)	"	*35,396	*101,940	40,428	135,951	45,373	134,181	54,539	155,043	56,450	166,336	57,094	175,592	56,135	160,249	61,078	161,730	58,044	148,551	53,356	143,047	49,619	110,257	60,686	176,457	87,600	236,000	100,820	350,022	157,134	649,140	365,531	1,228,235	502,043	1,515,185	Coke (*g*).
Corundum	"																													3	300	444	55,115	768	84,465	Corundum.
Feldspar	"									700	3,500	685	3,425	175	525	575	4,525													318	1,112	5,350	10,700	7,576	15,152	Feldspar.
Fire-clay	"		(*b*)		(*b*)		(*b*)	*400	*4,800	700	7,000	250	1,661	1,661	4,467	540	5,400	539	2,167	1,329	3,492	842	1,805	2,118	5,759	670	1,630	599	1,295	1,245	4,150	3,979	5,920	2,741	4,282	Fire-clay.
Graphite	"	500	4,000	300	2,400	150	1,200	242	3,160	175	5,200	260	1,560	167	3,763			3	223	230	6,150	139	9,455	436	16,240			1,310	24,179	1,922	31,040	-2,210	38,780	1,095	28,300	Graphite.
Grindstones	"	*4,020	*40,545	154,008	157,277	175,887	179,393	213,273	205,103	226,509	227,519	4,479	42,567	5,283	51,187	4,600	38,379	3,757	32,717	3,475	31,032	3,713	33,310	4,572	42,340	4,935	44,775	4,511	43,265	5,539	53,450	4,581	45,690	6,433	49,118	Grindstones.
Gypsum	"	162,000	178,742	*17,171	*17,500	16,857	16,533	22,122	21,999	18,478	18,381	203,605	226,251	211,048	241,127	192,068	196,150	223,631	226,021	228,178	232,693	247,032	178,691	239,691	244,551	219,256	232,515	244,566	257,329	252,101	265,009	233,799	240,142	332,045	350,277	Gypsum.
Limestone for flux	"											255	11,376	11,547	22,957	21,492	27,797	27,519	35,101	34,347	34,579	32,916	37,462	36,140	31,273	30,258	33,913	31,153	51,826	44,286	52,966	39,332	163,399	185,162	293,594	219,295	Limestone for flux.
Lithographic stone	"																																			Lithographic stone.
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	115	10,250	213	14,578	74	4,180	125	3,464	125½	(*d*) 3,975	154	1,166	50	1,600	1,581	20,004	30	1,800	440	4,820	172	4,062	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		104,745		75,719		45,381		65,000		60,000		76,000		118,375		183,000		166,000		160,000		135,904	Mica.
Mineral pigments—																																				*Mineral pigments.*
Baryta	Tons.	3,864	19,270	400	2,400	1,100	3,850			1,842	7,543			315	1,260			1,091	2,830			145	715	571	3,060	1,125	5,533	720	4,402	1,337	7,605	653	3,842	1,096	3,957	Baryta.
Ochres	"	*350	*2,350	485	3,733	397	7,900			5,125	36,035			390	5,800			611	8,690	1,339	14,600	2,362	16,045	3,905	23,560	2,226	17,450	3,919	20,000	1,966	15,398	2,233	16,735	4,955	30,485	Ochres.
Mineral waters	Gals.		(*b*)		(*b*)		(*b*)																						+ 100,000		75,000		100,000		+ 100,000	Mineral waters.
Molybdenite	Lbs.	150	*156	*160	*800	169	845	170	850	320	1,410	230	1,000	345	1,380	4,370	9,086	6,214	12,428	6,765	13,530	5,739	11,478	5,485	10,931	10,572	21,038	13,724	27,430	6,181	12,316	14,705	29,410	13,352	27,651	Molybdenite.
Moulding sand	Tons.		(*b*)											150,000			376,233		313,754		423,032				276,301		325,873		387,271		417,094		339,476		195,992	Moulding sand.
Natural gas	"																													400	1,200	220	660	475	1,663	Natural gas.
Peat	Tons.																													710,498	1,151,007	622,392	1,008,275	530,624	951,190	Peat.
Petroleum (*h*)	Brls.	584,061	525,655	713,728	556,708	695,203	713,695	704,690	633,600	795,030	902,734	755,398	1,010,211	779,753	864,438	798,406	874,255	820,104	835,322	726,132	1,085,738	726,322	1,155,647	709,857	1,011,546	758,391	1,061,747	806,570	1,202,020	1,415	7,105	1,033	6,280	856	4,553	Petroleum (*h*).
Phosphate (Apatite)	Tons.	20,495	304,338	23,690	319,815	22,485	242,285	30,983	316,662	31,753	381,045	23,588	241,603	11,932	157,424	8,198	70,942	6,861	41,166	1,822	9,565	570	3,420	908	3,984	733	3,665	3,000	18,000							Phosphate (Apatite).
Precious stones											1,000		1,000		1,000		1,500		+1,500																	Precious stones.
Pyrites	Tons.	42,906	193,077	38,043	171,194	63,479	285,656	72,225	307,292	49,227	123,067	67,731	203,193	59,770	179,310	38,542	175,936	40,327	121,581	34,198	102,594	33,715	101,155	38,910	116,730	32,218	122,572	27,687	110,748	40,031	155,164	35,261	130,544	[35,616	138,939	Pyrites.
Quartz	"									200	1,000					100	500					10	50			284	570	600	1,260							Quartz.
Salt	"	62,359	227,195	60,173	166,394	59,070	185,420	32,332	129,547	43,754	193,857	45,021	161,179	45,488	162,041	62,324	195,926	57,199	170,087	52,376	160,455	43,960	169,693	51,348	225,730	57,142	248,639	59,339	254,390	62,055	279,458	59,428	262,328	64,456	292,581	Salt.
Soapstone	"	*50	*400	100	800	140	280	195	1,170	917	1,239			1,574	6,240	717	1,920	916	1,640	475	2,138	410	1,230	157	350	405	1,000	450	1,960	420	1,365							Soapstone.
Structural materials and clay products—																																				*Structural materials and clay products.*
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	202,147	1,251,934	290,000	1,800,000		+1,800,000	308,836	1,670,000		+1,600,000		1,600,000		1,900,000		2,195,000		2,275,000		2,400,000		2,593,000	Bricks.
Building stone	C. yd.	*165,777	*642,509	202,592	552,267	411,570	641,712	341,337	913,691	382,563	964,783	187,685	708,736		609,827		1,100,000		1,200,000		1,095,000		1,000,000		+ 1,600,000		1,300,000		1,500,000		1,520,000		1,650,000		1,900,000	Building stone.
Cement, natural	Brls		(*b*) *69,843	*81,969	50,668	35,593	90,474	69,790	102,216	92,405	93,473	108,561	94,912	88,187 29,221	52,751	126,673 31,924	130,167 63,848	108,142	144,637	128,294	173,675	70,705 78,385	60,500 141,151	85,459 119,763	65,393 209,380	87,125 163,084	73,412 324,168	141,387 255,366	118,398 513,983	125,428 292,124	99,994 562,916	133,338 317,066	96,932 565,615	157,931 594,594	96,932 1,028,618	Cement natural. " Portland.
" Portland	"	*70,000	*7,875	116,000	11,600	64,800	6,580	14,000	1,400	17,865	1,643	27,300	2,721	13,700	1,869	40,500	3,457	152,700	5,298	80,005	6,687		6,710		7,199		4,250		7,600		5,250		4,575	87,300	7,769	Flagstones.
Flagstones	Sq. ft.	*6,062	*63,309	21,217	142,506	21,352	147,305	10,197	79,624	13,307	65,985	13,637	70,656	24,302	92,521	36,326	94,393	16,392	109,936	19,228	84,938	18,717	106,700	10,345	61,934	23,897	81,073	13,418	90,542		80,000		155,000		210,000	Granite.
Granite	Tons.	*1,535,950	*283,755	2,269,087	394,859	2,216,764	339,951	2,948,249	362,948	2,501,079	412,306	1,829,824	212,915	2,220,640	411,270	6,750,000	900,000	590	+900,000	5,225,000	700,000	+	650,000	+	650,000		+650,000		800,000		+800,000		830,000		892,000	Lime.
Lime	Bush.	*501	*9,900	242	6,224	191	3,100	83	980	780	10,776	240	1,752	340	3,600	590	5,100		2,000	200	2,000	224	2,405												Marble.
Marble	Tons.		*112,910		182,150				239,385																											Miscellaneous clay product (*i*).
Miscellaneous clay products (*i*)			(*j*)		(*j*)		*27,750		(*j*)		195,242		258,344		265,811		213,186		162,144		151,588		163,427		129,629		214,675		185,000		200,000		+200,000		+ 200,000	Pottery.
Pottery	"		(*b*)		(*b*)		(*b*)		(*b*)	*1,171	*6,502	1,020	4,810	800	12,000	951	5,441	815	3,978		3,153	86	430												Roofing cement.
Roofing cement	Tons.		*24,226	180,860	30,307	260,929	38,398	283,044	52,647	342,158	65,518	243,724	35,329	329,116	35,329	324,656	86,940	277,162	118,359	224,769	80,110	152,963	76,729	165,954	90,498	242,450	101,640	197,558	101,666	197,302	117,465	159,793	119,120	Sands and gravels (*k*).
Sands and gravels (*k*)	"	*124,865	(*j*)		(*j*)		*266,320		(*j*)		*348,000		227,300		367,360		350,000		250,325		257,045		153,875		164,250		181,717		161,946		221,525		248,115		301,985	Sewer pipe.
Sewer pipe	"						90,689		119,160		90,250	(*l*) 5,000	65,000	5,180	69,070	7,112	90,825		75,550		58,900		53,370		42,800		40,791		33,406		12,100	715	9,980		19,200	Slate.
Slate	Tons.	*5,345	64,675	7,357	89,000	5,314	*49,800	6,335	(*j*)	6,368	*90,000		113,103	15,689	97,239		55,704		65,600		195,123		83,855		155,595		167,602		259,450		278,671		276,241	Terra-cotta.
Terra-cotta	"		(*j*)		(*j*)		*49,800		(*j*)		*90,000		141,399	15,689	190,857		200,000		+200,000	19,200	210,000		225,000	+	225,000		+225,000	+	225,000		+225,000		250,000	+	250,000	Tiles.
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																							Talc.
Talc	Tons.																					664	9,960	15	150	1,017	16,660	1,000	15,000	1,000 336	5,000 1,950	659	842	689 1,052	1,804 16,470	Tripolite.
Tripolite	"	*400	*600	+400	+600	160	240			500	500							500	750																	Whiting.
Whiting	Brls.																																			
Total structural materials and clay products			*2,225,376		2,707,579		2,798,001		3,247,674		3,761,271		3,074,534		3,603,455		5,133,946		5,004,408		4,726,368		4,327,542		4,388,550		5,270,146		6,168,283		6,372,901		6,803,836		7,896,836	Total, structural materials and clay products.
All other non-metallic			*5,627,271		6,290,006		6,842,601		7,264,940		9,137,594		10,230,423		9,076,265		10,020,641		9,990,898		9,585,482		9,976,333		10,242,566		11,385,010		13,832,921		17,423,560		17,295,822		19,876,636	All other, non-metallic.
Total value, non-metallic			*7,852,647		8,997,585		9,640,602		10,512,614		12,898,865		13,304,957		12,679,720		15,154,587		14,995,306		14,311,850		14,303,880		14,631,116		16,655,156		20,001,304		23,796,461		24,099,658		27,773,472	Total value, non-metallic.
" metallic			*2,118,608		2,073,746		2,628,292		3,251,299		3,614,488		5,421,659		3,698,697		4,630,495		4,685,852		6,087,114		8,030,633		13,780,314		21,741,865		29,282,823		40,521,807		41,939,500		35,792,325	" metallic.
Estimated value of products unspecified or not reported (*m*)			*250,000		+250,000		+250,000		+250,000		+250,000		+250,000		+250,000		+250,000		+250,000		+250,000		+250,000		+300,000		+300,000		+300,000		+300,000		+300,000	Estimated value of products unspecified or not reported (*m*).
Grand total			*10,221,255		11,321,331		12,518,894		14,013,913		16,763,353		18,976,616		16,628,417		20,035,082		19,931,158		20,648,964		22,584,513		28,661,430		38,697,021		49,584,027		64,618,268		66,339,158		63,865,797	Grand total.

(*a*) Value at mine, quarry or works.
(*b*) Not reported.
(*c*) Copper contents of ore, matte, &c., at the average market price for the year.
(*d*) Ounces, fine, calculated at value of $20.67 per oz.
(*e*) Lead contents of ore, matte, &c., at average market price for year.
(*f*) Nickel " " " "
(*g*) Oven coke.
(*h*) Crude oil calculated from official inspection returns up to end of 1900; figures for 1901 and 1902 represent sales of crude oil. Values 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*) Railway shipments.
(*m*) Mostly structural materials.
(*n*) Previous to 1900 the production of iron has been entered as ore, the figures for pig iron for these years are given however in the body of the report.
(*o*) Figures for 1900, 1901 and 1902 represent the excess of the total production of iron ore in Canada over the quantity of Canadian ore used in Canadian furnaces.

NOTE.—The above figures represent the summary statements incorporated in the annually issued reports of the Section, those for the earlier years being corrected and revised to make the method of statement conform with that adopted for recent years.
The differing type shows the increases, decreases, &c., as compared with the previous year, as follows:—Heavy faced type, increase; ordinary type, decrease; ordinary type with †, same as previous year; ordinary type with *, neither increase nor decrease to record, the figures for previous year not being available.

mineral assets of the country, accounting for over 58 per cent of the income yielded by its mines. The whole class of metallic products is to be credited with about 56 per cent and the non-metallic and structural class with about 44 per cent, the latter contributing about 12 per cent of the grand total. MINERAL PRODUCTION OF CANADA.

PROPORTIONATE VALUE OF DIFFERENT MINERAL PRODUCTS, 1902.

Products.	Contributing over 10 p. c.	Contributing between 10 and 1 p. c.	Contributing under 1 p. c.	Total.
1. Gold	33·41			
2. Coal and coke	25·05			
3. Nickel		7·87		
4. Copper		7·06		
5. Bricks (estimated)		4·06		
6. Silver		3·51		
7. Building stone (estimated)		2·98		
8. Asbestus		1·80		
9. Cement		1·77		
10. Pig iron (from Canadian ore)		1·63		
11. Petroleum		1 48		
12. Lead		1·46		
13. Lime (estimated)		1·39		
14. Iron ore (difference between production in Canada and quantity used in making pig iron)		1·09		
15. Gypsum			·56	
16. Sewer pipe			·47	
17. Salt			·46	
18. Terra cotta			·43	
19. Sundry under 1 per cent			3·52	
Total	58·46	36·10	5·44	100·00

The relative value of the production of the different provinces is given by the figures tabulated below. In respect of Nova Scotia they will be found to differ from those given in the *Canadian Mining Review*. This is due to the different points of view adopted. In the former figures are included items which could not properly find a place in a government report, such as this, which purports to illustrate the products of Canadian mines. The *Mining Manual* figures include both pig iron and steel made from all ores both Canadian and imported. Following the consistent practice of the past in this report, only those values are included in the grand total which represent products of Canadian minerals. The full data illustrative of the allied metallurgical industries, inclusive of the results of smelting foreign ores, are given, however, in the article on iron farther on in the report.

MINERAL PRODUCTION OF CANADA.

PRODUCTION BY PROVINCES, 1902.

Province.	Value of Production.	Per cent.
Nova Scotia	$ 11,586,479	18·1
New Brunswick	607,129	·9
Quebec	3,743,636	5·9
Ontario	14,486,765	22·7
Manitoba and North-west Territories including Yukon.	16,107,198	25·2
British Columbia	17,334,590	27·2
Total	63,865,797	100·0

In view of the discussions which have taken place at the sessions of the Canadian Mining Institute as to what was the correct way of illustrating the value of Canada's mineral products, it may be as well to mention the standpoint adopted by the Mines Section in its treatment of the subject.

Firstly: it is chiefly essential to correctly ascertain the quantities produced, eliminating all possible errors and checking where possible by railway shipments etc., etc. As, however, the quantities of such very diverse substances cannot be added together, it is manifestly necessary *for the purpose of making up the grand total* to adopt some basis of valuation which shall be definite enough to be easily intelligible and shall be comparable from year to year, so as to rightly illustrate growth. For the metallic ores, whose only uses are as sources of a metal or metals and which are of most varying constitution, the final value of the amounts of these metals contained in the ores is manifestly the only common denominator or standard to which they can be brought. This is the method adopted by the United States Government and in part by that standard publication the *Mineral Industry* issued annually by the Engineering and Mining Journal of New York.

Whilst other reliable authorities may properly adopt other methods equally correct and legitimate, with a view to illustrate the mineral industries from other standpoints, it is believed that this method best meets the needs of this report. It must be borne in mind also that this applies only to the general tabulation of the total mineral production of the country, and that in the Section's full annual report the details relating to the different industries are given in the body of the publication.

For the non-metallic minerals it is manifest that only spot values can be adopted. They are practically all used as such and their value

is a very variable quantity, often made up, as far as the consumer is concerned, mostly of cost of carriage to the point of consumption. Thus the same material would have widely varying values at different points. The only remaining possible basis is evidently to value the material at its point of departure from the producer. This is found still to be only a rough approximation to uniformity and each separate material has to be considered by itself. Where there is some point of shipment or distribution common to a district, a more definite and uniform basis can be arrived at, as with the phosphate of the province of Quebec which was all handled at Montreal and where the price was always quoted f.o.b. at that port. MINERAL PRODUCTION OF CANADA.

It must also be borne in mind that no presentment of data, statistical or otherwise, will meet the very changeful needs of all the people likely to be interested in the subject. The consumer is concerned chiefly with the price he has to pay for the article, the producer in the value he can realize on his products.

The main thing is to have the fundamental data orrect and to adopt a standard so definite and clear that any one can make the allowances necessary for the illustration of the industry from his particular standpoint.

EXPORTS.

MINERALS AND MINERAL PRODUCTS OF CANADA DURING CALENDAR YEAR 1902. Exports.

Products.	Value.	Products.	Value.
Antimony ore	$ 13,658	Manufactures of metals other than iron or steel	$ 347,766
Arsenic	16,192	Mica	391,812
Asbestus	995,071	Mineral pigments	6,182
Barytes	700	Mineral waters	2,787
Bricks	12,786	Nickel	1,607,211
Cement	2,267	Oil crude	40
Chromite	7,535	Oil refined	146
Clay, manufactures of	374	Ores unspecified	78,854
Coal	5,402,225	Platinum	116
Coke	180,920	Phosphate	1,880
Copper	2,476,516	Plumbago crude	23,097
Felspar	13,708	" manufactures of	1,742
Gold	16,921,861	Pyrites	50,178
Grindstones	13,266	Salt	3,798
" rough	11,223	Sand and gravel	119,120
Gypsum crude	295,215	Silver	1,820,058
" ground	5,101	Stone unwrought	124,829
Iron and steel	2,460,781	" wrought	8,632
Iron ore	1,065,019	Other articles	282,735
Lead	457,162		
Lime	116,009		
Manganese ore	4,062	Total	$34,742,634

MINERAL PRODUCTION OF CANADA.

Of the value of the minerals exported by Canada, as shown in the above table, over one-half is represented by gold. This with the other metallic products—copper, nickel, silver, iron and steel—together with coal, coke and asbestus, aggregate about 98 per cent of the whole. From the following table it will be seen that the United States takes nearly 95 per cent of the exported mineral products, the other countries taking only comparatively insignificant amounts.

EXPORTS.

Exports.

DESTINATION OF PRODUCTS OF THE MINE, DURING THE FISCAL YEAR 1901-1902.

Destination.	Value.	Destination.	Value.
United States	$33,145,856	British West Indies	25,301
Great Britain	802,842	St. Pierre	21,528
Belgium	325,191	Cuba	10,235
Newfoundland	288,815	China	6,545
Germany	105,671	Russia	2,310
British Africa	51,842	Hong Kong	930
British Guiana	37,379	Australia	520
France	35,382	Spain	450
Italy	30,896	Mexico	125
Denmark	28,372		
Norway and Sweden	27,384	Total	$34,947,574

The following table illustrates in a rough way the needs of this community in regard to mineral substances and their products which might possibly be met to a greater or less extent in the future with the further discovery and development of our own resources. The most prominent items are coal (whose imports amount in value to over one-fifth of the total) and manufactures of machinery, accounting for over one-third of the whole, or together amounting to about 57 per cent. The items going to make up the latter will be found in their appropriate connection later in the report. Their bearing is rather on the manufacturing than in connection with the mineral industries. In regard to the coal item, 54 per cent represents imports of anthracite of a quality of which we have as yet none mined in this country.

IMPORTS.

MINERALS AND MINERAL PRODUCTS, FOR FISCAL YEAR 1901-1902.

Products.	Value.	Products.	Value.
Alum and aluminous cake.	$ 54,092	Litharge.	$ 47,021
Aluminium	30,496	Lithographic stone	12,272
Antimony	16,821	Manganese, oxide of	5,360
" salts.	22,455	Marble, and mfrs. of	130,424
Arsenic	6,004	Mercury	56,615
Asbestus and mfrs. of.	52,464	Metallic alloys—	
Asphaltum	102,317	Brass, and mfrs. of	1,014,329
Bells and gongs	85,556	Britannia metal	9,879
Bismuth	814	German silver	13,938
Blast furnace slag	1,606	Metals, N.E.S., and mfrs. of	906,617
Borax	73,725	Mineral and bituminous substances, N.E.S.	64,572
Bricks and tiles	172,281	Mineralogical specimens.	1,094
" fire	329,116	Mineral and metallic pigments, paints and colours	1,021,259
Buhrstones	2,559	Mineral waters	91,871
Cement	863,646	Nickel	1,539
Chalk	11,337	Nitrate of soda, &c.	133,663
Clays	140,521	Ores of metals, N.E.S.	727,099
Coal	12,998,547	Paraffine wax	12,750
" tar and pitch	98,551	" candles	5,752
Coke	842,815	Petroleum, and products of	1,107,207
Copper and mfrs. of.	1,507,354	Phosphate (fertilizer).	15,370
Copperas	4,337	Phosphorus	520
Cryolite	8,842	Platinum	19,357
Crucibles, clay or plumbago	28,635	Precious stones	848,731
Earthenware	1,275,093	Pumice	7,254
Emery	38,368	Salt	425,234
Felspar, quartz, flint, &c.	16,256	Saltpetre	61,559
Fertilizers	98,782	Sand and gravel.	58,668
Fuller's earth	3,909	Slate, and mfrs. of	72,601
Gold and silver, and mfrs. of	351,460	Stone and mfrs. of.	213,540
Graphite, and mfrs. of	39,137	Sulphate of copper	67,710
Gypsum, plaster of Paris, &c	4,587	Sulphur	325,307
Iron and steel—		Sulphuric acid	4,626
Pigs, scraps, blooms, &c.	1,565,213	Tin, and manufactures of.	2,293,958
Rolled—bars, plates, &c., including chrome steel.	7,768,332	Whiting	42,136
Ferro-silicon, ferro-manganese, &c.	150,977	Zinc, and manufactures of.	233,467
Manufactures of, machinery, hardware, &c.	22,294,501	Total	61,406,342
Lead, and mfrs. of	273,953		
Lime	17,584		

Abrasive Materials.

ABRASIVE MATERIALS.

Grindstones.

The production of grindstones, &c. in 1902 was 4,633 tons, valued at $44,118, or an average of $9.52 per ton. The output has varied but little from year to year for the past fifteen years and is apparently restricted to supplying a limited local demand in the eastern and maritime provinces and in the New England States.

These abrasives, grindstones, wood pulp stones, scythe-stones, &c., have for many years been made in the eastern provinces of Canada, from the millstone grit of the Carboniferous formation, which occupies a large portion of the surface of the eastern half of the province of New Brunswick and the northern and north-western parts of Nova Scotia.

The grindstones are nearly all shipped in a finished condition and are worth about $10 a ton. At many of the quarries there is a considerable production of foundation and building stone, besides rough stone for breakwater and harbour works.

Statistics of the production by provinces since 1886 are given in Table 1 below.

Table 1.

Abrasive Materials.

Production. Annual Production of Grindstones.

Calendar Year.	Nova Scotia.		New Brunswick.		Total.		Average Value per Ton.
	Tons.	Value.	Tons.	Value.	Tons.	Value.	
1886	1,765	$24,050	2,255	$22,495	4,020	$46,545	$11 58
1887	1,710	25,020	3,582	38,988	5,292	64,008	12 10
1888	1,971	20,400	3,793	30,729	5,764	51,129	8 87
1889	712	7,128	2,692	23,735	3,404	30,863	9 07
1890	850	8,536	4,034	33,804	4,884	42,340	8 67
1891	1,980	19,800	2,499	22,787	4,479	42,587	9 51
1892	2,462	27,610	2,821	23,577	5,283	51,187	9 69
1893	2,112	21,000	2,488	17,379	4,600	38,379	8 34
1894	2,128	16,000	1,629	16,717	3,757	32,717	8 71
1895	1,400	14,000	2,075	17,932	3,475	31,932	9 19
1896	1,450	14,500	2,263	18,810	3,713	33,310	8 97
1897	1,407	17,500	3,165	24,840	4,572	42,340	9 26
1898	1,422	12,350	3,513	32,425	4,935	44,775	9 07
1899	1,378	10,300	3,133	32,965	4,511	43,265	9 59
1900	1,411	12,600	4,128	40,850	5,539	53,450	9 65
1901	358	3,200	4,223	42,490	4,581	45,690	9 97
1902	1,074	8,118	3,559	36,000	4,633	44,118	9 52

Abrasive Materials.

Grindstones.

The localities where operations are being carried on have been known and worked for many years. The principal quarries are situated in the Province of New Brunswick, on the Bay of Chaleur at Clifton and Stonehaven; on Miramichi Bay in the vicinity of Newcastle, and along the shore of Shepody Bay in the Bay of Fundy; while in Nova Scotia the points to which attention has been chiefly directed, are at Lower Cove, Cumberland Basin, and at Woodbourne, Pictou county. A large proportion of the production is exported, chiefly to the United States. Statistics of exports and imports are given in Tables 2 and 3. Almost $25,000 worth of grindstones, &c., were imported in 1902, principally into the provinces of Ontario and Quebec.

TABLE 2.

ABRASIVE MATERIALS.

EXPORTS OF GRINDSTONES.

Exports.

Calendar 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
1892	23,567
1893	21,672
1894	12,579
1895	16,723
1896	19,139
1897	18,807
1898*	25,588
1899*	23,288
1900*	42,128
1901*	29,130
1902*	24,489

* Including stone for the manufacture of grindstones.

ABRASIVE MATERIALS.

Grindstones.

Imports.

TABLE 3.

ABRASIVE MATERIALS.

IMPORTS OF GRINDSTONES.

Fiscal Year.	Duty.	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
1892		1,484	19,761
1893		1,682	20,987
1894		1,918	24,426
1895		1,770	22,834
1896		1,862	26,561
1897		1,521	25,547
1898			22,217
1899			27,476
1900			34,382
1901			39,068
1902 Grindstones not mounted and not less than 36 inches in diameter	15 p.c.		34,496
1902 Grindstones N.E.S.	25 p.c.		6,342
			40,838

Practically the same operators have been engaged in quarrying as in previous years. The list is as follows:—

Nova Scotia.

NOVA SCOTIA—

The Atlantic Grindstone Company, Lower Cove, Cumberland county.

J. W. Sutherland, Quarry Island, Woodbourne, Pictou county.

New Brunswick.

NEW BRUNSWICK—

Henry Tower, Lower Rockport, Westmoreland county.

H. C. Read, Sackville, Westmoreland county.

A. D. Richard, Dorchester, Westmoreland county.

W. B. Deacon, Shediac, Westmoreland county.

C. E. Fish, Newcastle, Northumberland county.

J. B. Read, Stonehaven, Gloucester county.

Messrs. Lombard and Company, Clifton, Gloucester county, and Boston, Mass.

R. W. Knowles, Clifton, Gloucester county.

Corundum.—The discovery of corundum in Ontario was brought to public attention in 1896 and the active mining and milling of the ore has been carried on since 1900. The production has been as follows :— Corundum.

	Quantity.	Value.
1900	3 tons.	$ 300.
1901	444 "	53,115.
1902	768 "	84,465.

The above production is practically all the result of the operations of the Canada Corundum Company, at the Craig Mine in the township of Raglan, Renfrew county, where they have a large and well equipped mill, operated by both steam and water power. The production in detail of the Canada Corundum Company, for the past two years, has been as follows :

	1901.		1902.	
Corundum-bearing rock, treated	4,134	tons.	7,996	tons.
Grain corundum, graded	868,590	lbs.	1,611,200	lbs.
Grain corundum sold in Canada	171,537	lbs.	211,887	lbs.
" exported to England	20,331	"	176,342	"
" " United States	576,402	"	784,947	"
" " Europe	5,320	"	362,554	"
Total sales	773,590		1,535,730	

It will be seen from the above, that the rock treated so far has averaged about 10 per cent of corundum.

The price realized at the mine is about 5½ cents per pound.

The price of corundum in wholesale lots at New York, was in December 1902 as under.

North Carolina corundum	7	cents to	10	cents per pound.
Chester, Mass. "	4½	"	5	"
Barrys Bay, Ontario, corundum	7½	"	9½	"

These prices were practically subject to no variation throughout the year.

Other companies organized for the purpose of conducting operations in corundum in Ontario are :—

The Crown Corundum and Mica Company, Toronto.

ABRASIVE MATERIALS.

Corundum.

The Ontario Corundum Company, Ottawa.

The Ontario Corundum Company are engaged on development work in the township of Carlow, and are said to be erecting a mill and other buildings.

TABLE 4.

ABRASIVE MATERIALS.

Imports of Buhrstones.

IMPORTS OF BUHRSTONES.

Fiscal Year.	Value.	Fiscal Year.	Value.
1880	$12,049	1892	$ 1,464
1881	6,337	1893	3,552
1882	15,143	1894	3,029
1883	13,242	1895	2,172
1884	5,365	1896	2,049
1885	4,517	1897	1,827
1886	4,062	1898	1,813
1887	3,545	1899	1,759
1888	4,753	1900	1,546
1889	5,465	1901	5,762
1890	2,506	1902*	2,559
1891	2,089		

*Buhrstones in blocks, rough or unmanufactured, not bound up or prepared for binding into mill-stones. Duty free.

TABLE 5.

ABRASIVE MATERIALS.

Imports of Emery.

IMPORTS OF EMERY.

Fiscal Year.	Emery. *a.*	Mfrs. of Emery. *b.*
1885	$ 5,066	$ 4,920
1886	11,877	5,832
1887	12,023	4,598
1888	15,674	4,001
1889	13,565	3,948
1890	16,922	5,313
1891	16,179	6,665
1892	17,782	6,492
1893	17,762	5,606
1894	14,433	2,223
1895	14,569	7,775
1896	16,287	11,913
1897	16,318	11,231
1898	17,661	15,478
1899	21,454	22,343
1900	19,312	25,615
1901	16,311	22,190
1902	14,476	23,892

a Emery in bulk, crushed or ground. Duty free.

b Emery wheels and manufactures of emery. Duty 25 p.c.

TABLE 6.

ABRASIVE MATERIALS.

IMPORTS OF PUMICE STONE.

ABRASIVE MATERIALS.

Imports of Pumice Stone.

Fiscal year.	Value.
1885	$ 9,384
1886	2,777
1887	3,594
1888	2,890
1889	3,232
1890	3,003
1891	3,696
1892	3,282
1893	3,798
1894	4,160
1895	3,609
1896	3,721
1897	2,903
1898	3,829
1899	5,973
1900	5,604
1901	5,516
*1902	7,254

* Pumice and pumice stone, ground or unground. Duty free.

Infusorial Earth.—The localities where this mineral occurs have been mentioned in previous reports of the Mines Section. The following very much more complete presentment of the subject has been prepared at my request by Mr. Theo. Denis, B.Sc. This material, known under the various names of tripolite, tripoli, diatomaceous earth, kieselguhr, etc., is a pulverulent silicious material, white when pure, but having often a brownish discolouration. It is derived from the silicious shells of diatoms. The material is rarely pure, but usually mixed with a certain proportion of carbonate of lime, and of magnesia, clay, etc., the silica contents varying between 75 and 90 per cent.

Infusorial earth.

The Diatomaceae are an order of unicellular algae, one of the lowest and simplest forms of vegetable life. They have beautifully sculptured very minute silicious shells or skeletons, called frustules, which are favourite subjects of study with microscopists. Diatoms exist in all parts of the world in immense numbers at the bottom of the sea and of fresh water, and are also found attached to the submerged parts of aquatic plants etc., and among mosses and in other damp localities. There are many genera, and the number of known species exceeds 1,500. They vary greatly in the form and markings of the valves which are often exquisitely sculptured, forming beautiful objects under the microscope and testing

ABRASIVE MATERIALS.

Infusorial Earth.

its highest powers. In some species the lines are found to equal 125,000 to the inch. Extensive fossil deposits of the silicious remains of diatomaceae occur in various localities, as at Bilin in Bohemia, and in Virginia, Nevada and California. They are sometimes used as polishing powder. They are abundant in guano.

Diatomaceous earth is very porous, the specific gravity being 0.25 to 0.30, owing to the numerous interstitial spaces and air cavities between the spicules and shells and within the latter, giving lightness and great absorbent power.

The uses to which diatomaceous earth is put are very varied and are probably capable of greater extension. Formerly, it was widely used in the manufacture of dynamite as an absorbent of the nitro-glycerine, its porosity which allows of its absorbing liquids to the extent of four to five times its own weight, rendering it eminently adapted to tha purpose. But in this connection it has been wholly replaced by cheaper absorbents such as wood pulp, sawdust etc. At present its chief use is as a polishing material, the grains being sharp and cutting, but fine enough not to scratch metal surfaces; it is also used as a boiler covering, its porosity rendering it a good non-conductor of heat. It can be used in the manufacture of bricks when great lightness is required, but owing to the difficulty of manufacture, these bricks are costly and cannot on that account be used for ordinary purposes. Such bricks can be made of one quarter the weight of ordinary bricks. Diatomaceous earth is also used to some extent in the manufacture of certain soaps, and as filtering material, etc.

For the purpose of comparison a few analyses of infusorial earth from various countries are here tabulated.*

Composition.	Hanover.	Germany.	Scotland.	Auvergne, France.	Maryland, U.S.	Virginia, U.S.	New Brunswick, Canada.
Silica	86.4	68.01	92.0	87.2	81.53	75.85	80.487
Ferric Oxide	1.5	6.82	2.5	.....	3.33	2.92	.951
Alumina	1.6	7.13	.....	2.0	3.43	9.88	3.146
Lime	1.3	.....	.....	.....	2.61	0.29	.342
Magnesia	.....	.....	.....	.....	5.63	1.63†	.283
Water	6.9	8.45	.....	10.0	3.47	8.37	13.332
Other volatile and organic matter	2.3	8·17	5.5	.....	.....	.....	
	100.00	98.58	100.00	99.2	100.00	98 95	98.548

*From the Mineral Industry Vol. VII. †Including potash and soda.

A series of experiments as to the applicability of Canadian diatomaceous earths to commercial uses, was conducted by Dr. Hoffmann in the laboratory ofthe Geological Survey of Canada and the results were published at the time in the reports of the Department**. As those publications may not in some cases be easy of access it is thought that a reproduction *in extenso* of these tests would not be out of place here. ABRASIVE MATERIALS. Infusorial Earth.

"The sample, the results of the examination of which are here given, came from Pollet River lake, Mechanic Settlement, King's county, New Brunswick, and was collected by Dr. R. W. Ells. It occurs in considerable quantity in this lake, the deposit, it is stated, being about four feet deep and readily obtainable either by dredging or by draining the lake.....

"In texture it resembled an earthy chalk; it is very fine grained but harsh to the feel; adheres to the tongue; in colour is light greyish white. Heated in a closed tube, it assumes a dark-grey colour, due to the separation of carbon and gives off an abundance of a somewhat ammoniacal, light brownish-yellow coloured water, the material evidently containing nitrogenous organic matter. After ignition with free access of air, its colour is reddish-white; if treated with hydrochloric acid previous to ignition, the colour is white or at most has a just perceptible reddish tinge.

"When digested, either before or after ignition, with a boiling solution of caustic potash or soda, the silica readily passes into solution leaving a small amount of insoluble residue, which after ignition, has a light reddish-brown colour. The insoluble residue readily subsides from the solution. This latter, if the material has been treated before ignition, has a brownish yellow colour; if after ignition, and consequently when free from organic matter, the solution is colourless.

"This sample had been kept in the dry atmosphere of the laboratory for a lengthened period, and was regarded as perfectly air-dried. At 100° C., the oxygen of the air exercises a modifying influence upon this material, so that in order to ascertain the correct loss by water at this temperature, it is necessary that the operation should be conducted in an atmosphere of hydrogen or carbonic acid.

** Reports of Progress 1878-79 and 1879-80.

ABRASIVE MATERIALS.

Infusorial Earth.

"An analysis of the air-dried material gave the following results :—

Silica	80·487
Alumina	3·146
Ferric Oxide	0·951
Lime	0·342
Magnesia	0·283
Carbonic Acid	0·011
Phosphoric Acid	?
Potash and Soda	?
Water—combined and hygroscopic and organic matter	13·321
	98·541

1. Water and organic matter—	
(*a*). Loss on drying over sulphuric acid	6·535
(*b*). Loss (in addition to that of *a*) on drying at 100° C., in a current of pure and dry hydrogen	3·582
(*c*.) Loss (in addition to that of *a* and *b*) on ignition (and after correction for carbonic acid)	3·204
Total	13·321

"The air-dried material left, on treatment with a boiling solution of caustic potash, 7·994 per cent. insoluble residue of a light reddish-brown colour (after ignition).

"As regards the economic value of this infusorial earth, it may be said to constitute an excellent polishing material; and although no experiments have been made to determine its absorbent power, it may reasonably be expected to prove well adapted for the preparation of dynamite. Again, the extreme facility with which it is dissolved by caustic alkalies (potash or soda) would suggest its advantageous employment for the manufacture of what is commonly known as "water glass" or "soluble glass," a preparation which meets with many important applications in the arts, as for instance, as a cement for the manufacture of artificial stone; for the hardening and preserving of building stones; in fixing fresco colours by the process of stereochromy; as an addition to soap in the preparation of the so-called "silicated soaps," etc."

"It has been desirable to ascertain experimentally its suitableness for the manufacture of bricks in imitation of the so-called "light or swimming bricks." These latter, owing to the porous nature of the silica composing the material from which they are made, combine great lightness with infusibility, and are remarkably bad conductors of heat on which account they constitute for many purposes of construction a valuable building material.

"In these experiments the earth was employed alone as well as in admixture, the addition being in the one case clay (a white pipe-clay) and in the other lime, the material from which the test-bricks were prepared consisting— ABRASIVE MATERIALS. Infusorial Earth.

In the case of experiment 1. Of the infusorial earth alone.
" " 2. Of a mixture of infusorial earth and clay 95 parts of the former to 5 of the latter.
" " 3. Of a mixture of infusorial earth and clay: 90 parts of the former to 10 of the latter.
" " 4. Of a mixture of infusorial earth and lime: 99 parts of the former to 1 of the latter.
" " 5. Of a mixture of infusorial earth and lime: 98 parts of the former to 2 of the latter.

"The infusorial earth and clay were in an air dried condition; the lime had been but recently prepared. The amount of dried material and water employed to form the various bricks was in all instances the same. The bricks were all moulded of exactly the same size and measured 76 mm. in length, 28 mm. in breath, and 15 mm. in thickness.

"A small hand press was used in the moulding; the pressure employed however, was not great, and did not very much exceed that which might have been obtained by hand. The freshly moulded bricks having been exposed to a dry atmosphere until they had parted with the greater part of their moisture, were next dried at a temperature of 100° C, after which they were inserted in covered crucibles and placed in an air furnace, the temperature of which was gradually raised until at the expiration of an hour a white heat had been obtained, at which temperature it was maintained for an additional two hours.

The experiments were carried out in duplicate with the following results.

"*Refractoriness.*—The bricks had in all instances retained their form perfectly intact; they had neither warped nor cracked; their edges remained perfectly sharp and showed no indication of having undergone even the most incipient fusion. They were all highly absorbent, adhering strongly to the tongue; exceedingly firm and very tough. Bricks of experiments 1, 4 and 5 appeared to possess this latter property in about an equal degree; they could not be readily broken between the fingers; those of experiment 2 broke only with great difficulty, whilst those of experiment 3 could not be broken in this way. The fracture was uneven; in the case of experiments 1, 2 and 3, somewhat jagged. The bricks of experiments 1, 2 and 3 presented very smooth surfaces and possessed a fine and close texture; when suddenly plunged

ABRASIVE MATERIALS.

Infusorial Earth.

into the flame of a blast lamp they decrepitated strongly; this however was not the case when the heat was gradually applied.

"Bricks of experiments 4 and 5 were looser in texture, and when suddenly plunged into the flame of the blast lamp, stood well; they proved excellent non-conductors of heat; the brick could be held between the fingers without the slightest inconvenience whilst the other end was heated to redness in the blast lamp.

"*Contraction.*—The linear contraction (for the temperature and duration of firing afore-specified) amounted to, in the case of test brick,

Of experiment	1....	9·87 per cent of	the original moulded size,
"	2....	11·18 "	"
"	3....	11·18 "	"
"	4....	9·20 "	"
"	5 . .	7·89 "	"

"From this it will be seen that the contraction was most marked in those bricks containing an admixture of clay, and least so in those containing an admixture of lime.

"*Colour.*—The bricks previous to firing were all perfectly white. After firing those of experiments 1, 2 and 3 were of a uniform cream colour, externally and internally. Those of experiments 4 and 5 were perfectly white; this is in accordance with the fact that the presence of the alkaline earths in ferruginous clays, especially of lime and magnesia, has a singular bleaching power in the kiln, arresting the development of the bright red colour. It has been found that a marl containing six per cent of ferric oxide and thirty-five per cent of carbonate of lime, burned of a greyish-buff, instead of the rich red such a proportion of iron would otherwise have produced. Experiment has shown that so small a proportion as five per cent of caustic magnesia mixed with a red clay entirely destroys its red colour in the kiln. In the case of the yellow brick, manufactured in the neighborhood of London, England, the colour is dependent on the admixture of ground chalk with the brick earth, the latter by itself burning of a red colour.

"*Weight.*—As compared with that of a fire brick.—The fire brick measured 9 inches in length, $4\frac{1}{2}$ inches in breadth and $2\frac{1}{2}$ inches in thickness and weighed 7 pounds.

"From the data obtained in these experiments it was found that a brick of the foregoing dimensions, made under the same conditions and from material similar to that employed in the preparation of the test brick,—

Of experiment	1	would weigh	3 lbs.	6·2	oz.
"	2	"	3 "	10·9	"
"	3	"	3 "	12·4	"
"	4	"	3 "	1·6	"
"	5	"	3 "	1·9	"

" As compared with that of a common brick.—The brick measured 8 inches in length, $3\frac{3}{4}$ inches in breadth and $2\frac{1}{2}$ inches in thickness and weighed 4 pounds 15 ounces.

" In like manner it was here found that a brick of these dimensions, made under the same conditions and from material similar to that from which the test brick,—

Of experiment	1	was prepared, would weigh	2 lbs.	10·5	oz.
"	2	" "	2 "	14·2	"
"	3	" "	2 "	15·4	"
"	4	" "	2 "	6·9	"
"	5	" "	2 "	7·1	"

" The known deposits of importance of diatomaceous earth in Canada are so far confined to the maritime provinces of Nova Scotia and New Brunswick. Deposits of this material are known in other provinces, but the occurrences do not seem to be of economic importance."

Following is an annotated list of deposits, compiled from various sources, but mainly from the reports of the Geological Survey of Canada :—

NOVA SCOTIA.

Nova Scotia.

Cumberland County.—Folly Lake.—The deposit at this place is the largest yet known in Nova Scotia. It occupies the bed and shores of Folly lake, on the Intercolonial railway, at its passage over the Cobequid Mountains. The lake has an area of over 200 acres, two-thirds of which are probably covered with this deposit. Its surface is 600 feet above sea level. The deposit has been worked to a small extent for the manufacture of polishing material and for use as a non-conductor of heat.

Cumberland County.—Fountain Lake.—A valuable deposit of tripolite has been found at this place by Mr. David Grant. It occupies the bed of Fountain lake, on the road to River Philip, West Chester mountains. It is of remarkable purity and the lake is said to be easy to drain. It is eight miles distant from Minas basin at Port au Pic, and about the same distance from the Intercolonial railway. The deposit is worked to a small extent.

ABRASIVE MATERIALS.

Infusorial Earth.

Nova Scotia.

Cobequid Mountains Region.—Other deposits of less extent occur in the numerous lakes of this region.

Pictou County.—Upper Barney River.—In 1886, four tons of infusorial earth were shipped from a deposit at Alex. Sutherland's, in a marsh. The extent of the deposit is not known. The marsh is 50 yards wide and of indefinite length. The deposit of tripolite is two feet thick, and is immediately under the sod.

Cape Breton.—Englishtown.—St. Anns.—A deposit of infusorial earth, said to be of excellent quality, has been largely dug by Mr. F. Torrence. The deposit is in a small lake behind the village.

Inverness County.—River Dennys.—A deposit at this place has had a certain amount of work done on it.

Cumberland County.—Near Castlereagh.—A large deposit of infusorial earth occurs in Bass River Lake. This lake has been drained for the purpose of working the deposit of tripolite.

Victoria County.—St. Anns.—For several years an important deposit of infusorial earth has been worked on a lake near St. Anns. The deposit is from 3 to 4 feet thick and extends over a large area.

Other places at which only preliminary observations have been made and reported as having occurrences of tripolite are :—

Cape Breton County.—Ainsley lake.

Antigonish County.—Lochaber lake.

Pictou County.—Mackay lake.
Black Brook lake.
Garden of Eden lake.
Grant lake.
McLean lake.
Calder lake.
Forbes lake.
Ben lake.
Toney lake.

Colchester County.—Mackintosh lake.
Earltown lake.
Gully lake.

Halifax County.—Grand lake.
Dartmouth lake.

These two lakes supply the city of Halifax with water.

King's County.—Kempt lake.

NEW BRUNSWICK.

ABRASIAE MATERIALS.

Infusorial Earth.

New Brunswick.

Only two important deposits of infusorial earth are known in this province, although there is no doubt that should need arise, other large occurrences would reward careful search.

King's County.—Pollet River lake, Mechanic Settlement.—This deposit covers the bed of the lake and has an average thickness of four feet. A sample from it was the subject of experiments conducted in the laboratory of the Geological Survey, the results of which are given above.

King's County.—Pleasant Lake.—This is situated six miles south-west of Pollet lake. This deposit has not been examined as to its commercial value.

St. John's County.—Lake Fitzgerald.—A very large bed of tripolite occurs at this place. The lake has been drained by the St. John Water Company, exposing a considerable bed of earthy tripolite. According to Mr. Wm. Murdock, C.E., of St. John, the area covered by the deposit is fully fifty acres, and the depth probably reaches fifty feet. The upper layer of this material, about one foot in thickness, is of a light gray colour; on drying it becomes perfectly white. Below this stratum the colour is reddish-brown when fresh, and gray when dry.

QUEBEC.

Quebec.

In the Province of Quebec the deposits of infusorial earth are neither as extensive nor as numerous as in the maritime provinces. The deposits known have not so far been examined very closely as to their economic value, but some may on further investigation prove important

Montmorency County.—Laval Settlement, Range II, Lot 20.—At this place a deposit of infusorial earth occurs, which appears to be extensive. It is found on the right bank of the Bras at its junction with the Montmorency.—The bed is 15 feet thick; is at a height of 40 feet above the river, and is covered by fifty feet of overburden. In colour it is partly yellowish and partly gray.

Portneuf County.—Gosford Township, Range IX. A deposit is known on the east side of the north branch of St. Ann River. This is half an acre in area, four feet thick; the colour of the infusorial earth is a lead gray.

Maskinonge County.—St. Justin, Concession Trompe Souris.—In a sand bank which is sixty to seventy feet high, small quantities of infusorial earth are found a few feet below the surface.

ABRASIVE MATERIALS.

Infusorial Earth.

Quebec.

Montcalm County.—Chertsey Township, Range V, Lot 15. A small deposit of infusorial earth occurs on this lot in the bottom of a marshy bay of Lake Michel. It has an area of three to four acres and a thickness of eighteen inches.

Other deposits are known to occur in the neighborhood of Shawenegan, also on lot 69 of Stoneham, county of Quebec, and another in the valley of the Petawawa river.

In Ontario, a few deposits of infusorial earth are known, but they are unimportant, being small and out of the way.

British Columbia.

BRITISH-COLUMBIA.

Head of Loon Lake.—Interior Plateau of British Columbia. An extensive deposit of this material is said to occur at this place. A sample taken from it was examined by Dr. Hoffmann of the Geological Survey who described it as being * "fine-grained, closely compacted and tough, with a coarse, dull, earthy fracture; is meagre and rough to the feel, adheres strongly to the tongue; colour light reddish. Some slides of this material.. .....showed it to be almost entirely made up of frustules of diatomaceae....." This material has been used by the Indians in the vicinity of Cache creek for making tobacco pipes.

Blackwater River, B.C.—The occurrence of a diatomaceous earth in the Tertiary beds on Blackwater river, just above the bridge is referred to by Dr. G. M. Dawson in the Report of the Geological Survey of Canada, 1875-76, p. 256.

Fraser River, B.C.—A deposit of infusorial earth is reported to occur on the south side of the Fraser river opposite Mission City.

ASBESTUS.

Asbestus.

Asbestus was mined and sold in the Eastern Townships, province of Quebec in 1902 to the extent of 30,219 tons valued at $1,126,688, while the production of the short-fibred asbestic was 10,197 tons, valued at $21,631, making a total output of asbestus products of 40,416 tons valued at $1,148,319.

These figures show that the substantial advance made in this industry in 1901, has been well maintained in 1902.

* Report Geol. Survey of Canada, Vol. V, part R, p. 20.

A considerable amount of prospecting has been undertaken during the year and some new ground opened up, while several companies have been engaged in the erection of new mills which will place them in a position to increase considerably their output during the present year. The Canadian product, of the higher grades, is almost altogether exported, finding a market in the United States, England and on the continent of Europe. ASBESTUS.

Statistics of production, exports and imports are given in Tables 1 2, 3 and 4, following :

TABLE 1.

ASBESTUS.

PRODUCTION.—1896 TO 1902. Production.

	Tons.	Value.	Average Value per ton.
1896—Asbestus	10,892	$ 423,066	$ 38.84
Asbestic	1,358	6,790	5.00
	12,250	$ 429,856	$ 35.09
1897—Asbestus	13,202	$ 399,528	$ 30.26
Asbestic	17,240	45,840	2.66
	30,442	$ 445,368	$ 14.63
1898—Asbestus	16,124	$ 475,131	$ 29.46
Asbestic	7,661	16,066	2.10
	23,785	$ 491,197	$ 20.65
1899—Asbestus	17,790	$ 468,635	$ 26.34
Asbestic	7,746	17,214	2.22
	25,536	$ 485,849	$ 19.03
1900—Asbestus	21,621	$ 729,886	$ 33.76
Asbestic	7,520	18,545	2.46
	29,141	$ 748,431	$ 25.68
1901—Asbestus	32,892	$ 1,248,645	$ 37.96
Asbestic	7,325	11,114	1.52
	40,217	$ 1 259,759	$ 31.32
1902—Asbestus	30,219	$ 1,126,688	$ 37.28
Asbestic	10,197	21,631	2.12
	40,416	$ 1,148,319	28.41

ASBESTUS.

TABLE 2.

ASBESTUS.

Production, etc.

PRODUCTION, ETC.—1880 TO 1895.

Calendar Year.	Production.			Exports, Average value per ton.
	Tons (2,000 lbs.)	Value.	Average value per ton.	
		$	$ cts.	$ cts.
1880	380	24,700	65.00	Exports taken as production.
1881	540	35,100	65.00	
1882	810	52,650	65.00	
1883	955	68,750	71.98	
1884	1,141	75,097	65.80	
1885	2,440	142,441	58.37	
1886	3,458	206,251	59.64	
1887	4,619	226,976	49.14	63.25
1888	4,404	255,007	57.90	70.56
1889	6,113	426,554	69.77	64.44
1890	9,860	1,260,240	127.81	75.52
1891	9,279	999,878	107.75	70.07
1892	6,082	390,462	64.19	69.35
1893	6,331	310,156	49.02	57.24
1894	7,630	420,825	55.15	59.82
1895	8,756	368,175	42.05	56.66

TABLE 3.

ASBESTUS.

Exports.

EXPORTS.

Calendar Year.	Tons.	Value,	Average value per ton.
1892	5,380	$373,103	$69.35
1893	5,917	338,707	57.24
1894	7,987	477,837	59.82
1895	7,442	421,690	56.66
1896	11,842	567,967	47.96
1897	15,570	473,274	30.40
1898	15,346	494,012	32.19
1899	17,883	473,148	26.46
1900	16,993	693,105	39 61
1901	32,269	1,069,918	33.16
1902	31,074	995,071	32.02

TABLE 4. ASBESTUS.

ASBESTUS.

IMPORTS. Imports.

Fiscal Year.	Value.
1885..	$ 674
1886..	6,831
1887..	7,836
1888..	8,793
1889..	9,943
1890..	13,250
1891..	13,298
1892..	14,090
1893..	19,181
1894..	20,021
1895..	26,094
1896..	23,900
1897..	19,032
1898..	26,389
1899..	32,607
1900..	43,455
1901..	50,829
*1902..	52,464

*Asbestus in any form other than crude, and all manufactures of. Duty 25 p.c.

The asbestus production in Canada is confined almost entirely to the province of Quebec, in the district around Black Lake, Thetford and Danville in the Eastern Townships. The asbestus, (or more properly chrysotile) is found in serpentine areas, occurring at intervals along a belt of country extending from the Vermont boundary to the Gaspé Peninsula. The economic occurrences of the mineral, however, are restricted to the districts mentioned above. The mineral is met with in small veins distributed throughout the rock, and mining is conducted in almost every case by open quarrying, some of the workings having now attained considerable depth. The rock mined is submitted to crushing and the asbestus is then separated, sorted and graded according to the length of fibre, by the aid of special machinery.

Asbestus is also found in some serpentines of the Laurentian areas, as for example at Point au Chêne, in Argenteuil county where a mill was formerly erected, but has since been removed, and also in Denholm township, and at other points in the counties of Wright and Labelle.

Following is a list of firms engaged in mining asbestus:

Bell's Asbestus Co., Ltd.—
Geo. R. Smith, Mgr..... Thetford Mines, Que.

King Bros.—
B. Bennett, Mgr ..... " " "

ASBESTUS.

Johnson's Co..... .....Thetford Mines, Que.

Beaver Asbestus Co., Ltd. —
C. H. Van Nostrand, Sec'y..220 Broadway, New York.

Standard Asbestus Co—
R. T. Hopper.....Montreal, Que.

Manhattan Asbestus Co ..... Black Lake, Que.

Canadian Asbestus Co.—
B. Marcuse, Secy.... .....Montreal, Que.

Union Asbestus Mine..... ..Black Lake, Que.

James Reed, M.D..... . ....Reedsdale, Que.

W. R. Kerr & Co..... ....Black Lake, Que.

Asbestus and Asbestic Co. Ltd...Danville, Que.

East Broughton Asbestus
Mining Co..... .East Broughton Sta., Que.

Brompton Lake Asbestus Co.—
B. Greenshields..... ....Montreal, Que.

Ottawa Asbestus Mining Co....Ottawa, Ont.

Chromite.

CHROMITE.

The production of chromite or chromic iron ore in 1902, was 900 tons, valued at $13,000. The output as usual was obtained chiefly from the township of Coleraine, county of Megantic, Quebec, and shipped from Coleraine and Black Lake stations on the Quebec Central railway.

The greater part of the production goes to the United States, and is used in the manufacture of chromic acid and for furnace linings, &c., while small quantities have been used at Buckingham during the past year or two in the manufacture of ferro-chrome. According to returns of railway shipments, 83 tons of ferro-chrome were shipped from Buckingham during 1902, as compared with 182 tons in 1901.

Statistics of production and exports are given in the following tables :

TABLE 1.

CHROMITE.

ANNUAL PRODUCTION.

Production.

Calendar Year.	Tons. (2,000 lbs.)	Average price per ton.	Value.
		$ cts	$
1886	* 60	15 75	945
1887	38	15 00	570
1888 to 1893	no output		
1894	1,000	20 00	20,000
1895	3,177	13 00	41,300
1896	2,342	11 53	27,004
1897	2,637	12 31	32,474
1898	*2,021	12 00	24,252
1899	2,010	10 86	21,842
1900	2,335	11 56	27,000
1901	1,274	13 14	16,744
1902	900	14 44	13,000

* Railway shipments.

TABLE 2.

CHROMITE.

EXPORTS.

Exports.

Calendar Year.	Tons.	Value.
1895	2,908	$ 42,236
1896	2,466	31,411
1897	2,106	26,254
1898	1,683	20,783
1899	1,509	19,876
1900	368	8,259
1901	2,259	25,444
1902	740	7,535

Following is a list of the principal companies interested in the mining of chromite:—

International Chrome Mining and Milling Co. ..... Blac ' Lake, Que.
Coleraine Chrome Co., W. H. Lambly .. Inverness, Que.
Messrs. Nadeau & Topping ..... Black Lake, Que.
Montreal Chrome Iron Co., H. Leonard .. D'Israeli, Que.
American Chrome Co ..... Black Lake, Que.

Coal.

COAL.

The principal coal-bearing areas at present worked in Canada are the Nova Scotia coal fields in rocks of Carboniferous age, the Cretaceous coals of Vancouver island and the more recently opened fields of the Crows Nest Pass B.C., also found in the Cretaceous rocks.* In Alberta, mining is being done in several different areas, Canmore, Lethbridge and Frank being the chief centres of activity. Lignite of good quality is also mined in the Souris river district, Assiniboia, and during the past two years small amounts have been mined in the Yukon district.

The total production of coal in 1902 was 7,193,142 tons (of 2,000 lbs.) valued at $14,478,181, constituted as follows:—

	Tons.
Bituminous and lignite	7,176,592
Anthracite	16,550

The anthracite coal was mined in the Cascade Coal Basin, Alberta, the mine being situated at Anthracite on the main line of the Canadian Pacific Railway.

Compared with the previous year, the production of coal in Canada in 1902 shows an increase of 965,790 tons or over 15 per cent in quantity and $2,472,616 or over 20 per cent in value.

The output is the largest that has yet been attained in Canada and is over twice the production of seven years ago.

Statistics of production are given in Tables 1, 2 and 3, following:—

Table 1.

Coal.

Production by Provinces, 1900, 1901 and 1902.

Production.

Province.	1900.		1901.		1902.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.
		$		$		$
Nova Scotia	3,623,536	8,088,250	4,158,068	6,496,982	5,161,316	9,216,636
British Columbia	1,623,180	4,347,804	1,660,515	4,447,809	1,534,902	4,111,344
North-west Territories including Yukon	351,950	839,375	391,139	1,008,917	478,129	1,110,521
New Brunswick	10,000	15,000	17,630	51,857	18,795	39,680
Total	5,608,666	13,290,429	6,227,352	12,005,565	7,193,142	14,478,181

* A commencement has been made in coal mining in the Nicola district, B.C.

Coal.
Production.

TABLE 2.

COAL.

PRODUCTION. COMPARISON OF 1901 AND 1902.

Province.	Increase or Decrease.			
	Tons.	Per cent.	Value. $	Per cent.
Nova Scotia	*i* 1,003,248	*i* 24·13	*i* 2,719,654	*i* 41·86
British Columbia	*d* 125,613	*d* 7·56	*d* 336,465	*d* 7·56
North-west Territories including Yukon	*i* 86,990	*i* 22·24	*i* 101,604	*i* 10·07
New Brunswick	*i* 1,165	*i* 6·61	*d* 12,177	*d* 23·49
Dominion	*i* 965,790	*i* 15·51	*i* 2,472,616	*i* 20·59

i Increase. *d* Decrease.

TABLE 3.

COAL.

ANNUAL PRODUCTION SHOWING THE INCREASE OR DECREASE EACH YEAR

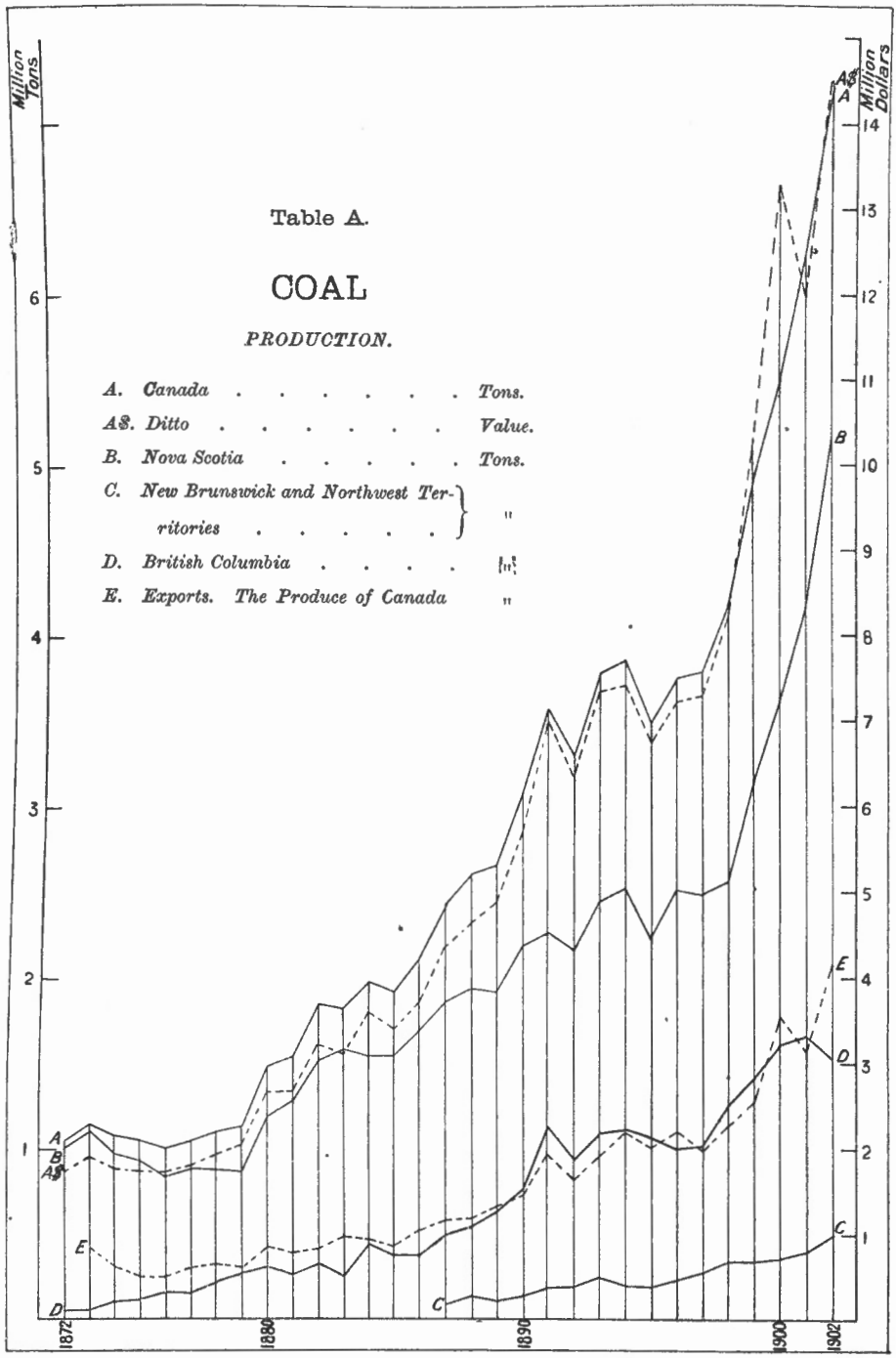
Calendar Year.	Tons.	Value.	Average Value per Ton.	Increase (*i*) or Decrease (*d*) in Tonnage.	Incr. (*i*) or Decr. (*d*) per cent.
1886	2,116,653	$3,739,840	$1 77	.....	.....
1887	2,429,330	4,388,206	1 81	*i* 312,677	*i* 14·8
1888	2,602,552	4,674,140	1 80	*i* 173,222	*i* 7·1
1889	2,658,303	4,894,287	1 84	*i* 55,751	*i* 2·1
1890	3,084,682	5,676,247	1 84	*i* 426,379	*i* 16·0
1891	3,577,749	7,019,425	1 96	*i* 493,067	*i* 16·0
1892	3,287,745	6,363,757	1 94	*d* 290,004	*d* 8·1
1893	3,783,499	7,359,080	1 95	*i* 495,754	*i* 15·1
1894	3,847,070	7,429,468	1 93	*i* 63,571	*i* 1·7
1895	3,478,344	6,739,153	1 94	*d* 368,726	*d* 9·6
1896	3,745,716	7,226,462	1 93	*i* 267,372	*i* 7·7
1897	3,786,107	7,303,597	1 93	*i* 40,391	*i* 1·1
1898	4,172,582	8,222,878	1 97	*i* 386,475	*i* 10·2
1899	4,925,051	10,283,497	2 09	*i* 752,469	*i* 18·0
1900	5,608,666	13,290,429	2 37	*i* 683,615	*i* 13.9
1901	6,227,352	12,005,565	1 93	*i* 618,686	*i* 11·04
1902	7,193,142	14,478,181	2 01	*i* 965,790	*i* 15·51

Table A.

COAL

PRODUCTION.

A. Canada . . . . . Tons.
A$. Ditto . . . . . Value.
B. Nova Scotia . . . . . Tons.
C. New Brunswick and Northwest Territories . . . . . "
D. British Columbia . . . . . "
E. Exports. The Produce of Canada "



The percentage of production to be credited to the several provinces at various periods since 1874 is shown in the following table:— Coal.

Province.	1874.	1880.	1890.	1898.	1899.	1900.	1901.	1902.
	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.	p. c.
Nova Scotia	91	79	71	61·4	63·9	64·6	66·8	71·8
British Columbia	8	20	25	30·3	29·0	28·9	25·7	21·3
Northwest Territories / New Brunswick.	.....	.....	4	8·3	7·1	6·5	6·5	6·9

Statistics of exports and imports are given in the following five tables:

TABLE 4.

COAL.

EXPORTS. Exports.

CALENDAR YEAR.	PRODUCE OF CANADA.	NOT PRODUCE.	CALENDAR YEAR.	PRODUCE OF CANADA.	NOT PRODUCE.
	Tons.	Tons.		Tons.	Tons.
1873.....	420,683	5,403	1888.....	588,627	84,316
1874.....	310,988	12,859	1889.....	665,315	89,294
1875.....	250,348	14,026	1890.....	724,486	82,534
1876.....	248,638	4,995	1891.....	971,259	77,827
1877.....	301,317	4,829	1892.....	823,733	93,988
1878.....	327,959	5,468	1893.....	960,312	102,827
1879.....	306,648	8,468	1894.....	1,103,694	89,786
1880.....	432,188	14,217	1895.....	1,011,235	96,836
1881.....	395,382	14,245	1896.....	1,106,661	116,774
1882.....	412,682	37,576	1897.....	986,130	101,848
1883.....	486,811	44,388	1898.....	1,150,029	99,189
1884.....	474,405	62,665	1899.....	1,293,169	101,004
1885.....	427,937	71,003	1900.....	1,787,777	62,776
1886.....	520,703	78,443	1901.....	1,573,661	53,894
1887.....	580,965	89,098	1902.....	2,090,268	23,453

COAL.

TABLE 5.

COAL.

Exports.

EXPORTS.—NOVA SCOTIA AND BRITISH COLUMBIA.

Calendar 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
1892	181,547	407,980	599,716	2,317,734
1893	203,198	470,695	708,228	2,693,747
1894	310,277	633,398	770,439	2,855,216
1895	241,091	534,479	728,283	2,692,562
1896	380,149	787,270	679,799	2,507,752
1897	307,128	642,754	630,341	2,221,737
1898	309,158	629,363	813,843	2,948,428
1899†	459,260	827,941	781,809	2,947,369

*See foot-note, table 16.

†Since 1899, exports by provinces have not been published in Trade and Navigation Report.

TABLE 6.

COAL.

COAL.

IMPORTS OF BITUMINOUS COAL.

Imports of bituminous.

Fiscal Year.	Tons.	Value.	Fiscal Year.	Tons.	Value.
1880	457,049	$1,220,761	1892	1,615,220	$4,099,221
1881	587,024	1,741,568	1893	1,603,154	3,967,764
1882	636,374	1,992,081	1894	1,359,509	3,315,094
1883	911,629	2,996,198	1895	1,444,928	3,321,387
1884	1,118,615	3,613,470	1896	1,538,489	3,299,025
1885	1,011,875	3,197,539	1897	1,543,476	3,254,217
1886	930,949	2,591,554	1898	1,684,024	3,179,595
1887	1,149,792	3,126,225	1899	2,171,358	3,691,946
1888	1,231,234	3,451,661	1900	2,439,764	4,310,964
1889	1,248,540	3,255,171	1901	2,516,392	4,956,025
1890	1,409,282	3,528,959	1902*	3,047,392	5,712,058
1891	1,598,855	4,060,896			

*Duty, 53c. per ton.

TABLE 7.

COAL.

IMPORTS OF ANTHRACITE COAL.

Imports of anthracite.

Fiscal Year.	Tons.	Value.	Fiscal Year.	Tons.	Value.
1880	516,729	$1,509,960	1892	1,479,106	$5,640,346
1881	572,092	2,325,937	1893	1,500,550	6,355,285
1882	638,273	2,666,356	1894	1,530,522	6,354,040
1883	754,891	3,344,936	1895	1,404,342	5,350,627
1884	868,000	3,831,283	1896	1,574,355	5,667,096
1885	910,324	3,909,844	1897	1,457,295	5,695,168
1886	995,425	4,028,050	1898	1,460,701	5,874,685
1887	1,100,165	4,423,062	1899	1,745,460	6,490,509
1888	†2,138,627	5,291,875	1900	1,654,401	6,602,912
1889	1,291,705	5,199,481	1901	1,933,283	7,923,950
1890	1,201,335	4,595,727	1902*	1,652,451	7,021,939
1891	1,399,067	5,224,452			

*Coal anthracite, and anthracite coal dust. Duty free.

†In Table 7, Imports of Anthracite Coal, a very considerable increase will be noticed in 1888 over 1887, an increase of over ninety-four per cent, the falling off again in 1889 being quite as remarkable. The average values per ton for the three years 1887, 1888 and 1889, were $4.02, $2.47 and $4.03 respectively. Although a duty of fifty cents per ton on anthracite coal was removed May 13, 1887, it is hardly thought this would account for the changes indicated, and unless some error may possibly have crept into the Trade and Navigation Report, no explanation is available.

Coal.

Table 8.

Coal.

Imports of dust.

Imports of Coal Dust.

Fiscal Year.	Tons.	Value.	Fiscal Year.	Tons.	Value.
1880.....	3,565	$ 8,877	1892.....	82,091	$39,840
1881.....	337	666	1893.....	109,585	44,474
1882.	471	900	1894.....	117,573	49,510
1883.....	8,154	10,082	1895.	181,318	52,221
1884.....	12,782	14,600	1896.....	210,386	53,742
1885.....	20,185	20,412	1897.	225,562	59,609
1886.....	36,230	36,996	1898.... ...	229,445	45,556
1887.....	31,401	33,178	1899.	276,547	44,717
1888.....	28,808	34,730	1900.....	330,174	98,349
1889.....	39,980	47,139	1901.....	414,432	275,559
1890.....	53,104	29,818	1902*.....	489,548	264,550
1891.....	60,127	36,130			

*Duty, 20 p. c., not over 13c. per ton.

An approximation of the consumption of coal in Canada sufficiently accurate for purposes of comparison may be made as follows, if we assume the figures of imports for the fiscal year to represent closely enough the importation during the calendar year.

	Tons.	Tons.
Production, Table 3.....	7,193,142	
Exports of coal the produce of Canada, Table 4	2,090,268	
Home consumption of Canadian coal.....		5,102,874
Imports of bituminous, anthracite and coal dust Tables 6, 7 and 8.....	5,189,391	
Exports of coal not the product of Canada....	23,453	
Home consumption of imported coal.....		5,165,938
Total consumption of coal in Canada, home and imported.....		10,268,812

Table 9 embodies similar calculations for each year since 1886. Therein is shown the consumption of Canadian and imported coal and the percentage of each as well as the total production per capita. It will be seen that not only the total consumption, but the consumption per capita also has been steadily increasing.

It will be observed too that the proportion of the consumption mined in Canada was greater in 1902 than in any previous year.

An examination of the relation of the total production in Canada, to the amount of coal consumed in the country shows, that in 1902

the production amounted to over 70 per cent of the consumption as compared with 65.8 per cent in 1901 and 68.5 per cent in 1900. In 1890 the proportion was 62.4 per cent, and in 1886, 60.8 per cent. Coal.

TABLE 9.

COAL.

CONSUMPTION OF COAL IN CANADA. Consumption.

Calendar Year	Canadian.	Imported.	Total.	Percentage Canadian.	Percentage Imported.	Consumption per capita.
	Tons.	Tons.	Tons.			Tons.
1886.....	1,595,950	1,884,161	3,480,111	45·9	54·1	·758
1887.....	1,848,365	2,192,260	4,040,625	45·7	54·3	·871
1888.....	2,013,925	3,314,353	5,328,278	37·8	62·2	1·137
1889.....	1,992,988	2,490,931	4,483,919	44·4	55·6	·946
1890.....	2,360,196	2,581,187	4,941,383	47·8	52·2	1·031
1891.....	2,606,490	2,980,222	5,586,712	46·7	53·3	1·153
1892.....	2,464,012	3,082,429	5,546,441	44·4	55·6	1·133
1893.....	2,823,187	3,110,462	5,933,649	47·6	52·4	1·198
1894.....	2,743,376	2,917,818	5,661,194	48·5	51·5	1·130
1895.....	2,467,109	2,933,752	5,400,861	45·7	54·3	1·066
1896.....	2,639,055	3,206,456	5,845,511	45·1	54·9	1·140
1897.....	2,799,977	3,124,485	5,924,462	47·3	52·7	1·143
1898.....	3,022,553	3,274,981	6,297,534	48·0	52·0	1·200
1899.....	3,631,882	4,092,361	7,724,243	47·0	53·0	1·454
1900.....	3,820,889	4,361,563	8,182,452	46·7	53·3	1·521
1901.....	4,653,691	4,810,213	9,463,904	49·1	50·9	1·761
1902.....	5,102,874	5,165,938	10,268,812	49·7	50·3	1·877

NOVA SCOTIA. Nova Scotia.

Detailed statistics of the production of coal in the province are given in Tables 10, 11, 12 and 13.

The production amounted in 1902 to 5,161,316 tons, being an increase over that of the previous year of over 24 per cent. The average value of the production for the year was about $2 per long ton.

TABLE 10.

COAL.

NOVA SCOTIA:—OUTPUT, SALES, COLLIERY CONSUMPTION, AND PRODUCTION.

Calendar Year.	Output, Tons, 2,240 lbs.	Sales, Tons, 2,240 lbs.	Colliery Consumption, Tons, 2,240 lbs.	Production* Tons 2,240 lbs.	Output, Tons, 2,000 lbs.	Sales, Tons, 2,000 lbs.	Colliery Consumption, Tons. 2,000 lbs.	Production* Tons, 2,000 lbs.	Price per Ton. 2,240 lbs.	Value of production.
1872	880,950	785,914	110,341	896,255	986,664	880,224	123,582	1,003,806	$1 75	$1,568,446
1873	1,051,467	881,106	108,398	989,504	1,177,643	986,839	121,406	1,108,245	1 75	1,731,632
1874	872,720	749,127	119,582	868,709	977,446	839,022	133,932	972,954	1 75	1,520,240
1875	781,165	706,795	124,110	830,905	874,905	791,610	139,003	930,613	1 75	1,454,084
1876	709,646	634,207	113,788	747,995	794,804	710,312	127,443	837,755	1 75	1,308,991
1877	757,496	687,065	98,841	785,906	848,396	769,513	110,702	880,215	1 75	1,375,339
1878	770,603	693,511	88,627	782,138	863,075	776,732	99,262	875,994	1 75	1,368,741
1879	788,271	688,624	84,787	773,411	882,863	771,259	94,961	866,220	1 75	1,353,469
1880	1,032,710	954,659	96,831	1,051,490	1,156,635	1,069,218	108,451	1,177,669	1 75	1,840,108
1881	1,124,270	1,035,014	107,888	1,142,902	1,259,183	1,159,216	120,834	1,280,050	1 75	2,000,079
1882	1,365,811	1,250,179	111,381	1,361,560	1,529,708	1,400,200	124,747	1,524,947	1 75	2,382,730
1883	1,422,553	1,297,523	111,949	1,409,472	1,593,259	1,453,226	125,383	1,578,609	1 75	2,466,576
1884	1,389,295	1,261,650	116,769	1,378,419	1,556,011	1,413,048	130,781	1,543,829	1 75	2,412,233
1885	1,352,205	1,254,510	127,624	1,382,134	1,514,470	1,405,051	142,939	1,547,990	1 75	2,418,735
1886	1,502,611	1,373,666	142,421	1,516,087	1,682,924	1,538,506	159,512	1,698,018	1 75	2,653,152
1887	1,670,830	1,519,684	139,777	1,659,461	1,871,330	1,702,046	156,550	1,858,596	1 75	2,904,057
1888	1,776,128	1,576,692	157,443	1,734,135	1,989,263	1,765,895	176,336	1,942,231	1 75	3,034,735
1889	1,756,279	1,555,107	158,131	1,713,238	1,967,032	1,741,720	177,107	1,918,827	1 75	2,998,167
1890	1,984,001	1,786,111	161,240	1,947,351	2,222,081	2,000,444	180,589	2,181,033	1 75	3,407,864
1891	2,044,784	1,849,945	174,983	2,024,928	2,290,158	2,071,938	195,981	2,267,919	1 75	3,543,624
1892	1,942,780	1,752,934	175,092	1,928,026	2,175,913	1,963,286	196,103	2,159,389	1 75	3,374,046
1893	2,223,042	1,977,543	205,425	2,182,968	2,489,807	2,214,848	230,076	2,444,924	1 75	3,820,194
1894	2,250,631	2,060,920	196,206	2,257,126	2,520,707	2,308,231	219,751	2,527,982	1 75	3,949,970
1895	1,999,756	1,793,098	193,639	1,986,737	2,239,727	2,008,270	216,875	2,225,145	1 75	3,476,790
1896	2,292,675	2,046,828	192,975	2,239,803	2,567,796	2,292,447	216,132	2,508,579	1 75	3,919,655
1897	2,340,031	2,044,672	181,716	2,226,388	2,620,835	2,290,032	203,522	2,493,554	1 75	3,896,179
1898	2,262,656	2,121,126	167,428	2,288,554	2,534,175	2,375,661	187,519	2,563,180	1 75	4,004,970
1899	2,865,443	2,633,989	177,460	2,811,449	3,209,296	2,950,067	198,755	3,148,822	2 00	5,622,898
1900	3,298,791	2,998,737	236,563	3,235,300	3,694,646	3,358,585	264,951	3,623,536	2 50	8,088,250
1901	3,821,033	3,411,127	301,434	3,712,561	4,279,557	3,820,462	337,606	4,158,068	1 75	6,496,982
1902	4,725,480	4,229,120	379,198	4,608,318	5,292,538	4,736,614	424,702	5,161,316	2 00	9,216,636

* This Production is obtained by adding Sales and Colliery Consumption. For sales previous to 1872, see report of the Department of Mines Nova Scotia, 1883, page 68.

Table 11.

Coal.

Nova Scotia :—Coal Trade by Counties.

Calendar Year.	Cumberland.		Pictou.		Cape Breton.		Other counties.	
	Raised.	Sold.	Raised.	Sold.	Raised.	Sold.	Raised.	Sold.
	Tons, 2,000 lbs.	Tons, 2,000 lbs.	Tons, 2,000 lbs.	Tons, 2,000 lbs.	Tons, 2,000 lbs.	Tons, 2,000 lbs.	Tons, 2,000 lbs.	Tons, 2,000 lbs.
1st quarter....	150,993	111,097	126,349	103,482	783,718	567,542	20,043	16,214
2nd "	143,515	126,137	142,015	129,274	950,189	886,849	33,648	22,976
3rd "	163,862	151,087	174,944	164,203	1,088,652	1,106,589	37,050	30,770
4th "	163,421	150,664	191,997	173,181	1,064,344	950,266	57,798	46,283
Total, 1902.....	621,791	538,985	635,305	570,140	3,886,903	3,511,246	148,539	116,243
" 1901.....	538,773	447,616	533,840	460,349	3,116,641	2,888 610	40,303	23,887

Coal.

Nova Scotia.

TABLE 12.

COAL.

NOVA SCOTIA:—OUTPUT BY COLLIERIES DURING THE CALENDAR YEAR, 1902.

Colliery.	Tons, 2,000 lbs.	Colliery.	Tons, 2,000 lbs.
Cumberland County.		*Inverness County.*	
Chignecto	4,607	Mabou	1,120
Joggins	58,580	Pt. Hood	57,188
Jubilee	883	Broad Cove	76,749
Scotia	1,047	*Victoria County.*	
Springhill	554,322	New Campbelton	13,481
Strathcona	2,352	*Cape Breton County.*	
Pictou County.		Dominion Coal Co.	3,555,134
Acadia	357,418	Nova Scotia Steel and Coal Co	296,338
Nova Scotia Steel and Coal Co	35,766	Gowrie and Blockhouse	26,208
Intercolonial	242,122	Sydney	9,223
		Total	5,292,538

TABLE 13.

COAL.

NOVA SCOTIA:—DISTRIBUTION OF COAL SOLD.

Markets.	Calendar Years.			
	1901.		1902.	
	Tons, 2,000 lbs.	Per cent.	Tons, 2,000 lbs.	Per cent.
Nova Scotia, transported by land	757,975	19·8	468,658	9·9
" " sea	533,569	14·0	1,175,644	24·8
Total, Nova Scotia	1,291,544	33·8	1,644,302	34·7
New Brunswick	366,976	9·6	358,664	7·6
Prince Edward Island	78,324	2·1	70,316	1·5
Quebec	1,315,935	34·4	1,492,902	31·5
Newfoundland	124,265	3·3	118,041	2·5
United States	623,390	16·3	1,004,650	21·2
West Indies	....	.....	6,700	·1
Other countries	20,028	·5	41,039	·9
Total	3,820,462	100·0	4,736,614	100·0

New Brunswick.

NEW BRUNSWICK.

The production of coal in this province in 1902 was 18,795 tons valued at $39,680, a slight increase in quantity over the previous year, but realizing a somewhat lower price per ton at the mines.

TABLE 14.

COAL.

NEW BRUNSWICK :—PRODUCTION.

Calendar Year.	Tons.	Value.	Value per ton.
1887	10,040	$ 23,607	$2 35
1888	5,730	11,050	1 93
1889	5,673	11,733	2 07
1890	7,110	13,850	1 95
1891	5,422	11,030	2 03
1892	6,768	9,375	1 39
1893	6,200	9,837	1 59
1894	6,469	10,264	1 59
1895	9,500	14,250	1 50
1896	7,500	11,250	1 50
1897	6,000	9,000	1 50
1898	6,160	9,240	1 50
1899	10,528	15,792	1 50
1900	10,000	15,000	1 50
1901	17,630	51,857	2 94
1902	18,795	39,680	2 11

NORTHWEST TERRITORIES.

One of the main features to record, in connection with coal mining operations in the North-west Territories in 1902 is the large output of coal from the new collieries at Frank, Alberta, on the Crows Nest Pass branch of the Canadian Pacific Railway.

The total product of the Territories for the year has been returned as 478,129 tons valued at $1,110,521 and made up as follows :*—

	Tons.
Estevan and Coalfields	70,400
Lethbridge	153,703
Miscellaneous small mines	15,841
Anthracite and Canmore	107,950
Frank and Blairmore	125,325
Yukon district	4,910
	478,129

Of this amount 16,550 tons is anthracite coal and the balance bituminous and lignite.

* Since writing the above the annual report of the Department of Public Works of the Northwest Territories for 1902 has been received in which the output of the coal mines of the Territories (not including the Yukon) is given as:—

Bituminous and lignite	494,087 tons
Anthracite coal	16,587 "
total	510,674 "

Although the figures of production in the present report represent sales and shipments only, it is still possible that they are incomplete owing to there being so many producers of coal on a small scale in the Territories.

Coal.

North-west Territories.

TABLE 15.

COAL.

NORTH-WEST TERRITORIES :—PRODUCTION.

Calendar Year.	Tons.	Value.	Value per ton.
1887	74,152	$ 157,577	$ 2 13
1888	115,124	183,354	1 59
1889	97,364	179,640	1 85
1890	128,953	198,498	1 54
1891	174,131	437,243	2 51
1892	184,370	469,930	2 55
1893	238,395	598,745	2 51
1894	199,991	488,980	2 45
1895	185,654	414,064	2 23
1896	225,868	606,891	2 69
1897	267,163	667,908	2 50
1898	340,088	825,220	2 43
1899	334,600	811,500	2 43
1900	351,950	839,375	2 38
1901	391,139	1,008,917	2 58
1902	478,129	1,110,521	2 32

British Columbia.

BRITISH COLUMBIA.

The total sales and shipments including colliery consumption and not including coal used for making coke were in 1902 1,370,448 long tons or 1,534,902 short tons, being a decrease from the previous year of about 7·5 per cent. 244,232 long tons were used for making coke during the year, and 26,946 long tons were added to stock, so that the total output of the collieries for the year was 1,641,626 long tons.

Statistics of output, home consumption, quantity sold for export, etc., are shown in Table 16.

TABLE 16.

COAL.

BRITISH COLUMBIA :—PRODUCTION.

Calendar Year.	Output Tons, 2,240 lbs.	Home Consumption, Tons, 2,240 lbs.	Sold for Export, Tons. 2,240 lbs. ‡	PRODUCTION.* Tons. 2,240 lbs.	PRODUCTION.* Tons, 2,000 lbs.	Price per ton, 2,240 lbs	Value.
						$	$
1836-52..	10,000	From 1836 to 1873 inclusive, the output is taken as production.			11,200	4 00	40,000
1852-59..	25,398				28,446	4 00	101,592
1859¶...	1,989				2,228	4 00	7,956
1860.....	14,247				15,957	4 00	56,988
1861.....	13,774				15,427	4 00	55,096
1862.....	18,118				20,292	4 00	72,472
1863.....	21,345				23,906	4 00	85,380
1864.....	28,632				32,068	4 00	114,528
1865.....	32,819				36,757	4 00	131,276
1866.....	25,115				28,129	4 00	100,460
1867. ..	31,239				34,988	4 00	124,956
1868.....	44,005				49,286	4 00	176,020
1869.....	35,802				40,098	4 00	143,208
1870.....	29,843				33,424	4 00	119,372
1871-2-3.	148,459				166,274	4 00	593,836
1874.....	81,547	25,023	56,038	81,061	90,788	3 00	243,183
1875.....	110,145	31,252	66,392	97,644	109,361	3 00	292,932
1876.....	139,192	17,856	†122,329	140,185	157,007	3 00	420,555
1877.....	154,052	24,311	115,381	139,692	156,455	3 00	419,076
1878.. ..	170,846	26,166	164,682	190,848	213,750	3 00	572,544
1879.....	241,301	40,294	192,096	232,390	260,277	3 00	697,170
1880. ...	267,595	46,513	225,849	272,362	305,045	3 00	817,086
1881.....	228,357	40,191	189,323	229,514	257,056	3 00	688,542
1882.....	282,139	56,161	232,411	288,572	323,201	3 00	865,716
1883.....	213,299	64,786	149,567	214,353	240,075	3 00	643,059
1884. ...	394,070	87,388	306,478	393,866	441,130	3 00	1,181,598
1885.....	365,596	95,227	237,797	333,024	372,987	3 00	999,072
1886.....	326,636	85,987	249,205	335,192	375,415	3 00	1,005,576
1887.....	413,360	99,216	334,839	434,055	486,142	3 00	1,302,165
1888.....	489,301	115,953	365,714	481,667	539,467	3 00	1,445,001
1889.....	579,830	124,574	443,675	568,249	636,439	3 00	1,704,747
1890.....	678,140	177,075	508,270	685,345	767,586	3 00	2,056,035
1891.....	1,029,007	202,697	806,479	1,009,176	1,130,277	3 00	3,027,528
1892	826,335	196,223	640,579	836,802	937,218	3 00	2,510,406
1893.....	978,294	207,851	768,917	976,768	1,093,980	3 00	2,930,304
1894.....	1,012,953	165,776	827,642	993,418	1,112,628	3 00	2,980,254
1895.....	939,654	188,349	756,334	944,683	1,058,045	3 00	2,834,049
1896.....	894,882	261,984	634,238	896,222	1,003,769	3 00	2,688,666
1897.....	892,296	290,310	619,860	910,170	1,019,390	3 00	2,730,510
1898.....	1,136,015	374,953	752,863	1,127,816	1,263,154	3 00	3,383,448
1899.....	1,306,324	526,058	751,711	1,277,769	1,431,101	3 00	3,833,307
1900. ...	1,590,178	535,084	914,184	1,449,268	1,623,180	3 00	4,347,804
1901.....	1,691,557	568,440	914,163	1,482,603	1,660,515	3 00	4,447,809
1902.....	1,641,626	593,639	776,809	1,370,448	1,534,902	3 00	4,111,344

*This production is obtained by adding 'Home Consumption' and 'Sold for Export,'

†52,935 of this amount was exported as sales without the division into the 'Home Consumption' and 'Sold for Export.'

‡The figures in the 'Sold for Export' column do not agree as they should with those given in Table 5, the only explanation being that the data in the two cases are from different sources, and it has not been possible to find out the cause of the difference.

¶Two months only.

COAL.

British Columbia.

Statistics of production.

Statistics of coal production in 1902 are given in the Annual Report of the Minister of Mines for the province as follows :

SALES AND OUTPUT FOR YEAR. Tons of 2240 lbs.	Tons.	Cwt.	Tons.	Cwt.
Sold for consumption in Canada	422,466	13		
" export to U.S.A.	775,300	11		
" " to other countries	1,508			
Total sales	1,199,275	04		
Used under colliery boilers &c	171,172	15		
Total sales and colliery consumption			1,370,447	19
Used in making coke			244,232	
			1,614,679	19
Stock on hand first of year	5,704	17		
" " last of year	32,651			
Difference added to stock during the year			26,946	03
Output of collieries for year			1,641,626	02

Statistics of labour and wages.

Statistics of labour and wages are given in the same report as follows :

Number of hands employed, daily wages paid etc.

CHARACTER OF LABOUR.	UNDERGROUND.		ABOVE GROUND.		TOTAL.	
	No. of employees	Average daily wage	No. of employees	Average daily wage	No. of employees	Average daily wage
Supervision and clerical assistance	63	$ 4 30	48	$ 4 85	111	$ 4 57
Whites—						
Miners	1,625	4 30			1,625	4 30
Miners helpers	494	2 40			494	2 40
Labourers	569	2 73	206	2 34	775	2 53
Mechanics and skilled labour	47	2 81	199	3 10	246	2 95
Boys	133	1 42	23	1 15	156	1 28
Japanese	38	1 37	46	1 12	84	1 24
Chinese	132	1 37	388	1 21	520	1 29
Totals	3,101		910		4,011	

In view of the fact that 75 per cent of the production of Vancouver island collieries is exported to California, the following statistics of

receipts of coal in the Californian market are given as illustrating the position which British Columbia coal occupies in this market: COAL.

Whence derived.	1901.	1902.
	Tons, 2,240 lbs.	Tons, 2,240 lbs.
British Columbia	710,330	591,732
Australia	175,959	187,328
England and Wales	52,270	95,621
Scotland	....	1,600
Eastern (Cumberland and Anthracite)	27,370	24,133
Seattle (Washington)	240,574	165,237
Tacoma "	433,817	209,358
Mount Diable, Coos Bay and Tesla	143,318	111,209
Japan and Rocky Mountains	51,147	47,380
Totals	1,834,785	1,445,598

Following is a list of the principal coal producers in Canada.

NOVA SCOTIA:—

Inverness Railway and Coal Company..Broad Cove, C.B.
Gowrie and Blockhouse Collieries, Ltd ..Port Morien, C.B.
Mabou Coal Mining Company, Ltd.....Mabou, C.B.
Port Hood Coal Company, Ltd.....Port Hood, C.B.
Cape Breton Coal Mining Co., Ltd.....New Campbellton, C.B
Dominion Coal Co., Ltd.....Sydney, C.B.
Sydney Coal Company, Ltd.....Sydney Mines C.B.
Acadia Coal Co., Ltd.....Stellarton, N.S.
Nova Scotia Steel & Coal Co., Ltd.....New Glasgow, N.S.
Intercolonial Coal Mining Co., Ltd.....Westville, N.S.
Cumberland Railway and Coal Co., Ltd..Springhill, N.S.
Canada Coals and Railway Co., Ltd....Joggins Mines, N.S.
Minudie Coal Co., Ltd.....River Hebert, N.S.
Strathcona Coal Co.....River Hebert, N.S.
Messrs Ripley and Blenkhorn (Scotia Mine)

NEW BRUNSWICK:—

New Brunswick Coal & Railway Company..Fredericton, N.B.

NORTH WEST TERRITORIES:—

Souris Coal Mining Company, Ltd....R. R. Taylor, Managing Director, Winnipeg, Man.

COAL.

Coal producers.

P. C. Duncan ..... Estevan, Assa.
Frank Gillespie ..... Medicine Hat, Assa.
Joseph Cully ..... " "
Crockford Bros ..... " "
Alberta Railway and Coal Co ..... Lethbridge, Alta.
Alberta Coke and Coal Co., (Martin B. Holway) ..... Cowley, "
R. J. Galbraith ..... " "
E. V. Wilson ..... Livingston, "
Blackfoot Indian Agency, J. A. Markle, agent ..... Gleichen, "
J. T. Cooper ..... Calgary, "
J. A. Bangs ..... " "
F. Barnes ..... Clover Bar, "
Daly and Lindsay ..... " "
Keith Fulton and Fowler ..... " "
E. Chevigny ..... Morinville, "
Wm. Humberstone ..... Edmonton, "
Milner and Blatchford ..... " "
W. J. Baldwin ..... " "
Bishopric, Grierson and Mays ..... " "
Leon Moret ..... Ft. Saskatchewan, Alta
Fishlum and Procter ..... Blairmore, Alta.
The Canadian Am. Coal and Coke Co. ... " "
United Gold Fields of British Columbia. " "
International Coal and Coke Co. ..... " "
The H. W. McNeil Co., Ltd. ..... Anthracite "

YUKON DISTRICT :—

North American Tansportation and Trading Co., Cliff Creek Mines ..... Dawson.
Alaska Exploration Co., Rock Creek Mine. "
R. S. Ames and Geo. Miller, Five Fingers Mine ..... "

BRITISH COLUMBIA :—

Crows Nest Pass Coal Co., Ltd ..... Fernie, B.C.
Western Fuel Co ..... Nanaimo, B.C.
Wellington Colliery Co., Ltd ..... Victoria, B.C.

COKE.

Production.

The sales of coke in 1902 amounted to 502,043 tons, valued at $1,519,185, being an increase over the production of the previous year of 136,512 tons, or 37 per cent in quantity, and $290,960, or over 23 per cent in value. The increase is to be all credited to the province of Nova Scotia, there being a slight falling off in British Columbia.

TABLE 1.

COKE.

ANNUAL PRODUCTION.

Calendar Year.	Tons.	Value.	Value. per Ton.
1886	35,396	$101,940	$2 88
1887	40,428	135,951	3 36
1888	45,373	134,181	2 96
1889	54,539	155,043	2 84
1890	56,450	166,298	2 95
1891	57,084	175,592	3 08
1892	56,135	160,249	2 85
1893	61,078	161,790	2 65
1894	58,044	148,551	2 56
1895	53,356	143,047	2 68
1896	49,619	110,257	2 22
1897	60,686	176,457	2 91
1898	87,600	286,000	3 26
1899	100,820	350,022	3 47
1900	157,134	649,140	4 13
1901	365,531	1,228,225	3 36
1902	502,043	1,519,185	3 03

TABLE 2.

COKE.

PRODUCTION OF COKE BY PROVINCES.

Calendar Year.	Nova Scotia.		British Columbia.	
	Tons.	Value.	Tons.	Value.
		$		$
1897	41,532	90,950	19,154	85,507
1898	48,400	111,000	39,200	175,000
1899	62,459	178,767	38,361	171,255
1900	61,767	223,395	95,367	425,745
1901	222,694	590,560	142,837	637,665
1902	363,330	899,930	138,713	619,255

Coal.

Coke.

Exports.

TABLE 3.

COKE.

EXPORTS OF COKE.

Calendar Year.	Tons.	Value.
		$
1897	2,987	6,078
1898	3,774	8,394
1899	5,557	18,726
1900	41,529	131,278
1901	57,505	176,990
1902	62,568	180,920

TABLE 4.

COKE.

Imports of oven coke.

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
1892	43,499	194,429
1893	41,821	156,277
1894	42,864	176,996
1895	43,235	149,434
1896	61,612	203,826
1897	83,330	267,540
1898	135,060	347,040
1899	141,284	362,826
1900	187,378	506,839
1901	308,786	680,138
1902 Duty free.	267,142	842,815

Following is a list of companies making coke in Canada from Canadian coal :—

Nova Scotia.—Acadia Coal Co., Stellarton, N.S.
Intercolonial Coal Mining Co., Westville, N.S.
Nova Scotia Steel and Coal Co., New Glasgow, N.S.
Halifax Electric Tramway Co. (Ltd.), Halifax, N.S.
Dominion Iron and Steel Co. (Ltd.), Sydney, C.B.

British Columbia.—Crows Nest Pass Coal Co. (Ltd.), Fernie, B.C. COAL.
Wellington Colliery Co. (Ltd.), Victoria, B.C. COKE.

The production of coke in British Columbia is given in the provincial report as follows :

Sales and Output for the Year.	Tons, 2,240 lbs.	Tons, 2,240 lbs.
Sold for consumption in Canada.....	85,071	
" export to United States.....	38,780	
Total sales	.....	123,851
Stock on hand, first of year..... ...	186	
" " last "	4,350	
Diff. added to stock during the year...	....	4,164
Output for year.....	.....	128,015

Peat.—During the past few years many companies have been organized to manufacture peat-fuel from peat bogs in the provinces of Ontario and Quebec. Some of these have met with indifferent success, while others are still in the experimental stage or developing their properties. PEAT.

Sales of peat during the past three years have been reported as follows :—

	Tons.	Value.
Year 1900.....	400	$1,200
" 1901	220	660
" 1902.....	475	1,663

*THE COAL FIELDS OF CANADA.

The following short description of the coal fields of Canada will, in connection with the statistics already given, be found illustrative of

*This article appeared originally in the Annual Report of the Mines Section for 1898, constituting Part S, Vol. XI of the reports of the Geological Survey Department. Mr. Denis in compiling the present article has not only brought the information up to date but has very much extended its scope.

Coal. the coal industry of the country. It has been compiled by Mr. Theo. Denis, B. Sc., chiefly from information to be found throughout the Reports of the Geological Survey, supplemented by data taken from other reliable sources. As a guide for reference a full list of the maps published by the Geological Survey of Canada, covering the areas referred to in the course of this summary description has been added at the end of the article; also a list of references forming a short bibliography of the subject. The maps may be obtained from the librarian of the Survey for the nominal sale prices mentioned in the "List of Publications of the Geological Survey of Canada" and Supplement.

The chief fields are located as follows: In Nova Scotia there are several extensive areas of bituminous coal which have been mined for many years. In New Brunswick is a small area with thin seams, also bituminous. The above are all in rocks of Carboniferous age. In Manitoba and the North-west Territories, very large tracts of the prairie country are underlaid by coal beds, varying in quality from lignite in the east to bituminous in the west, as the foot-hills of the Rocky mountains are approached. In the mountain region itself is a small basin where anthracite is mined. Across the watershed in British Columbia is the Crow's Nest Pass field, now being opened up, and on the Pacific coast are the areas on the east side of Vancouver island, that have long been worked. These coal fields are of Cretaceous age. Coals referable to the same period are also found in the Queen Charlotte islands and in many parts of the interior of the province. These Cretaceous coals are generally bituminous, but anthracite occurs in the Queen Charlotte islands. Tertiary fuels also underlie considerable areas in the interior as well as several tracts along the coast. These are usually lignites or brown coals.

Nova Scotia. NOVA SCOTIA.

The coal-bearing measures of Nova Scotia belong to the Carboniferous, and are practically confined to the one of its subdivisions generally known as the Coal Measures.

The coal mined in this province is all bituminous in quality.

The following sub-divisions into fields is usually adopted:—

1. The Sydney coal field.
2. The Inverness coal field.
3. The Richmond coal field.
4. The Pictou coal field.
5. The Cumberland coal field.

Sydney Coal Field.

Nova Scotia.

This field is situated in the north-east corner of Cape Breton county, and takes in a small portion of Victoria county. It occupies a land area of 200 square miles, about 32 miles long by six wide, and is limited on three sides by the Atlantic Ocean. The conditions for extraction and shipment are very favourable. There is a remarkable absence of faults and the coast affords a number of natural harbours. The greater part of the coal-field is hidden beneath the sea, but the seams can be followed under its bed.

*The measures inclosing the Cape Breton coals are largely composed of argillaceous shales and sandstones, the solidity and coherence of which favour submarine exploitation. As to the general structure, it can be said that the seams appear on the shore, sweep inland, and again enter the ocean, forming segments of ellipses whose centres are out at sea. This structure is observable at Cow Bay, Glace Bay, Lingan and Sydney, these places presenting a series of basins, the seams of which have been correlated, and their equivalence in many cases proved. These basins probably owe their origin to a corrugation of the area by numerous folds which bring the same coal seams repeatedly to the surface along the north-east coast of the island.

The whole coast is deeply indented by bays and channels, approximately coinciding with the axes of these folds, and affording in the sea-cliffs numerous natural sections of the strata and exposures of the coal seams. Some of these bays also constitute excellent harbours, one of which—Sydney Harbour—situated towards the centre of the district, ranks among the finest and most commodious on the Atlantic coast of North America. The cliffs are generally from thirty to eighty feet high, standing perpendicularly, or frequently overhanging the sea. The country inland is of a gently rolling character, the maximum height being about 250 feet.

Such natural advantages, combined with its highly favourable geographical position, point to this district as probably the most important in the Dominion for the supply of fuel to steamships navigating the Atlantic. During the few months of winter, when the more northerly harbours are closed or obstructed by ice, an outlet is afforded by the railway connecting many of the collieries with Louisburg, a fine harbour, open and safe for shipping at almost any season.

*See "Descriptive Note on the Sydney coal-field" by Hugh Fletcher B.A., published by the Geological Survey of Canada 1900.

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The aggregate thickness of coal in workable seams, outcropping on the shore, and for the most part exposed in the bays and cliffs, is from forty to fifty feet; the seams vary from three to nine feet in thickness. They generally dip at very low angles of five to twelve degrees and appear to be very little affected by faults or disturbances. As the strata all dip seaward, much of the coal will be available in the submarine as well as in the land areas. From experience at the Sydney mines it has been fully established that, with due caution and care, these submarine areas may be worked to a large extent.

The coal is of the bituminous or 'soft' variety, with comparatively little diversity in the quality of the different seams; all of which yield a fuel exceedingly well adapted for general purposes, while that of some of them is specially applicable to the manufacture of gas. As compared with the Pictou coal, it is characterized on the whole, by a greater proportion of combustible matter and a smaller proportion of ash; but on the other hand it usually contains a greater amount of sulphur.

The following tabulation, condensed from the work of the Geological Survey shows the equivalency of the different seams of the field at the different places together with the thickness of the intervening strata:

Average thickness.	Cow Bay.	Glace Bay.	Lingan.	Sydney Mines.	Boulardarie.
3 feet.....	.....	....	Seam A.....	.....	Point Aconi.
300 "					
6·5 "	.. ..	....	Carr Seams...	Lloyd's Cove..	Bonar.
190 "					
12 "	....	Hub..... ..	Barrasois.	Seam B.....	Stubbart.
350 "					
7 "	Block House	Harbour.. .	David Head..	Sydney Main.	Seam C.
275 "					
3 "	Seam D....	Bouthillier..	Seam D	Bryant.	Mill Pond.
90 "					
4 "	Seam E....	Back Pit....	North Head..	Edward	Black Rock.
110 "					
7 "	McAulay. ..	Phelan.....	Lingan Main..	Seam F.....	Seam F.
125 "					
3 " ...	South Head.	Ross..	Seam G.....	Collins.	Seam G.
320 "	Spencer	Emery.. ..			
4 "	Long Beach.	Gardiner ...	Seam H.....	.....	.....

The correctness of the above correlation is, however, questioned by some. The aggregate thickness of coal in the workable beds outcropping on the shore, ranges from thirty feet at some places to sixty at others. Most of the Sydney coals are well suited for the manufacture of gas, as the following figures show:—

Mines.	Gas, Cubic Feet per ton.	Candle power.	Coke produced.
Little Glace Bay	9,268	15	40 bush.
" "	9,700	14·75	39 "
International Mine	10,000	16	1,470 lbs.
Sydney Mines	8,200	8	1,295 "
Gowrie "	9,000	15	1,230 "
Caledonia "	8,900	14·25	36 bush.
Reserve "	9,950	13·17	1,500 lbs.

The value of these coals for steam and house purposes is given in the table of analyses at the end of this article, whenever obtainable.

The Sydney coal field was the first one opened in Canada. As early as 1785, work was done on it by the government. This, however, was of a desultory nature. In 1827, systematic and regular mining was begun by the General Mining Association.

The collieries at present in operation in this field are described below. Comparing the descriptions with the tabulation of the seams already given, it will be noted that the greater part of these are not at present under exploitation, although very extensive work has been done at different times on some of them. Should need arise, however, many of these would constitute a very important additional source of supply.

Sydney Mines Colliery.—This colliery was worked by the General Mining Association until 1900, when it was purchased from this corporation by the Nova Scotia Steel and Coal Company. This transaction practically terminated the connection of the General Mining Association with coal mining in Nova Scotia, after a career of nearly three-quarters of a century.

The colliery is situated three miles to the north-east of North Sydney.

Seam, 5 feet 4 inches. Dip 1 in 12.

Shaft, 690 feet deep; 13 feet diameter.

Worked by pillar and stall and longwall. Safety lamps.

Coal produced in 1902, 270,000 tons.*

Average number of persons employed above and underground, 1,000.

North Sydney Colliery.—Operated by the Sydney Coal Company.

Seam, 4 feet.

* These figures of production are only approximate and are here given to illustrate the relative importance of the collieries.

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Worked by slope, 650 yards.

Method, pillar and stall. Naked lights.

Coal produced in 1902, 7,510 tons. Persons employed, 32.

New Campbellton Colliery.—Operated by the Cape Breton Coal Company.

Situated on the Big Bras d'Or Lake.

Seam, 4 feet; dip, 1 in 5

Slope, 600 yards.

Coal-cutting machines. Method of working, pillar and stall.

Naked lights.

Coal produced in 1902, 13,443 tons. Persons employed, 36.

Gowrie and Block House Collieries.—Situated on Port Morien or Cow Bay. Operated by the Gowrie and Blockhouse Colliery, Limited. This company was organized in 1898, acquiring properties which had been idle for some time. The coal area controlled by this company covers five square miles, comprising leases 193, 146, 194, 206 and 235.

McAulay or Gowrie seam, 5 feet 6 inches. Worked by shaft, 205½ feet deep.

Coal-cutting machines. Coal produced in 1902, 20,000 tons.

Persons employed, 81.

Dominion Coal Company.—This company was incorporated in 1893. It holds a number of leases for a period of ninety-nine years in the coal basins of Cow Bay, Glace Bay and Lingan. The collieries which it is operating at present are enumerated below. Besides these it owns others of importance which are not now working, such as the Victoria, Lingan, Cow Bay and Old Bridgeport, etc. The company has concentrated its operations on the Glace Bay basin, which it has developed to a great extent. The production of the Dominion Coal Company for 1902 amounted to nearly 3,306,000 tons, giving employment to 3,454 persons.

Caledonia Colliery, Glace Bay Basin.—Situated one mile from Little Glace Bay. Phelan seam worked; 7 to 8 feet.

Worked by pillar and room.

Underground haulage by endless rope.

Output for 1900, 573,298 tons.

Reserve Colliery, Glace Bay Basin.—On Phelan seam, 8 feet thick. COAL.

Worked by slopes, pillar and room method. Nova Scotia.

Endless rope haulage. Output for 1900, 707,927 tons.

International Mine, Glace Bay Basin.—Seam worked 'Harbour' 6 feet.

Method, pillar and room. Endless and tail rope systems of haulage.

Three compartment shafts. Output for 1900, 249,427 tons.

Dominion No. 1, Glace Bay Basin.—On Phelan seam. Dip, 1 in 14. Worked by pillar and room. Electric underground haulage.

Output for 1900, 602,825.

Dominion No. 2, Glace Bay Basin.—This colliery was opened in 1900. The shaft is a four compartment one, 37′ 11″ down to 410 feet where it strikes the Harbour seam and is reduced to 21′ 11″ down to 850 feet where it strikes the Phelan seam.

Harbour seam 6½ feet, Phelan seam 8 feet.

This mine is equipped for a daily output of 6,000 tons.

Dominion No. 3, Glace Bay Basin.—Opened on Phelan seam in 1900. Mined by pillar and room method.

Entered by slopes two miles from Caledonia Colliery. Endless rope haulage. In 1902, the output of this mine had increased to 1900 tons a day.

Dominion No. 4, Glace Bay Basin.—Slope driven on Emery seam 5 feet thick about three quarters of a mile from the Caledonia colliery.

Beside the above mentioned workings, the Dominion Coal Company has erected a coal washing plant on the Sydney and Louisburg railway about three miles from Morien junction. The operation of coal washing removes 41 per cent of the contained ash and 28 per cent of the sulphur. Water for the coal washers is obtained by gravitation from Morrison lake.

Inverness Coal Field.

This comprises a series of narrow areas on a line extending from Judique to Margaree on the western shore of Cape Breton Island in the county of Inverness. These areas of productive measures form parts of the rim of a basin the greater portion of which has been removed by erosion. Seams of coal of workable size have been found at Port Hood, Mabou, Inverness or Broad Cove and Chimney Corner.

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At Port Hood the strata run parallel to the shore for about two miles. One seam about 7 feet thick is worked. Considerable work on this seam was done thirty five years ago, but the mine was closed in 1878 and resumed on a large scale in 1899.

At Mabou a small coal field shows several seams of good thickness which outcrop there. At Inverness or Broad Cove, north of Cape Mabou is a coal area in which outcrop several seams ranging in thickness from two to twelve feet. The dip is seaward at an angle of about twelve degrees. At Chimney Corner Mines other workable seams occur.

Work on some of these coal areas was carried on as far back as 1866, and in some places the operations were on a large scale, but subsequently very little development was done until three years ago. A great drawback to the development of these areas, was the lack of shipping facilities; the coast does not offer suitable harbours. In 1900 however, a line of railway was completed from Inverness or Broad Cove to Port Hastings, and was subsequently continued to Point Tupper on the Intercolonial. This gives the field a connection with the railway system of the continent; operations on a large scale have been resumed. There are at present three companies at work.

Inverness Railway and Coal Company, Limited.—This company, formerly called the Inverness and Richmond Railway Company, owns coal areas at Inverness or Broad Cove, Port Hood, Chimney Corner and Margaree Island. Its most extensive operations are at Inverness on a seven foot seam, with a dip of one in seven. The company has a shipping pier at Port Hastings.

Coal produced in 1902, 42,934 tons.

Port Hood Coal Company.—This company incorporated in 1899, operates a colliery at Port Hood on a seven foot seam. Worked by a slope 1,150 feet.

Persons employed in 1902, 92.

Coal produced 38,659 tons.

Mabou Coal Company.—Operates at Mabou where work, mostly of a development nature, is proceeding on three seams, 7, 8 and 13 feet respectively.

A railway about 6 miles long is projected, connecting the mine with a shipping place at Mabou Harbour.

Richmond Field.

In the south-western portion of Richmond county, coal occurs in several localities. Nova Scotia.

Extensive explorations have been carried on in this field, and coal has been discovered at Coal Brook, Caribacou, Little River and Sea Coal Bay. Although comparatively large sums were spent between 1863 and 1878, also in 1900 and 1902 on exploration work, very little systematic mining has been done.

Coal Brook.—At this place some exploration and drilling were done in 1902. A bore hole was put down to a depth of 520 feet on the north bank of Coal Brook, near the proved outcrop of a seam. The drill was then moved 800 feet to the west, down stream, and a second boring struck coal 1 foot 8 inches at a depth of 170 feet. The hole was continued to 1,020 feet but did not strike any other seam of importance. The details of the boring are given in the report of the Department of Mines of Nova Scotia for 1902, and in the Summary of the Geological Survey for the year 1902.

Sea Coal Bay.—Here a seam of a thickness of about 11 feet gave, on analysis, such a large proportion of ash as to make it of very little use for ordinary purposes.

In his report on this coal field, Mr. Hugh Fletcher, of the Geological Survey, gives a summary of his own observations and of information gathered from various sources. Rep. of Progress, Geol. Survey, 1879-1880.

Pictou Coal Field.

This field situated almost in the centre of Pictou county, has an area of about 25 square miles. It is 11 miles long, with a maximum width of 3 miles between New Glasgow on the north and Stellarton on the south. The field is therefore small, but the seams are of great size, two being nearly forty feet in thickness.

The district is of a remarkably intricate structure, being cut up by numerous faults of various magnitude, and the productive measures are almost completely surrounded by a girdle of faults. The field is very well situated for railway communication, which advantage, however, is somewhat offset by the physical difficulties encountered due to faulting. It has also been noticed that the seams change to a remarkable degree within short distances. The field was opened in 1798, but the first systematic work was contemporary with the development of

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the Cape Breton field in 1827, when both became the property of the General Mining Association.

The Pictou field is conveniently divided into three districts, viz.:—the Central or Albion, the Western or Westville, and the Eastern or Vale.

In the Albion, four seams have been worked. They are the Main, 38 feet thick, the Deep, 22 to 38 feet, the Third, 10 to 13 feet, and the McGregor, 13 to 20 feet. The measures containing these seams rest conformably on the Millstone Grit. The dip of the coal-bearing measures varies from the horizontal to over 30 degrees. Several other seams have been reported in this section, but none of workable size.

The Westville section is separated from the Albion section by a downthrow fault, estimated at 2,600 feet. The seams of this section are believed to be equivalent to those of the Albion section. The variation in dip and change of character in short distances are similar in both sections.

The Vale section is in the form of a syncline with east-and-west axes. The thicker and more valuable seams appear in the southern outcrop, where they are worked. Two seams of this section, viz., the McBean and the Six Foot have been extensively worked.

The collieries in operation in the Pictou field are as follows :—

Acadia Colliery.—Operated by the Acadia Coal Company. It is situated at Westville, three miles from Stellarton.

Seam worked 10 feet, dip 27°.

Opened by main slope over 4,000 feet.

Safety lamps used exclusively.

Albion Colliery.—Operated by the Acadia Coal Company. Situated at Stellarton on the Intercolonial Railway. This important colliery taps four seams, by shafts and long slopes. Work is now carried on on the Third seam 10 to 13 feet, Deep seam over 20 feet, and McGregor 13 to 20 feet.

Safety lamps are used in this colliery.

Vale Colliery.—Operated by the Acadia Coal Company. This colliery is on a six foot seam which is worked on both slopes of a basin; the dip has an average of 15°. Slope 2,800 feet. This mine was worked with open lights until a couple of years ago, when the management as a measure of precaution, introduced the use of safety lamps.

The Acadia Coal Company in 1902, produced from the three collieries which it controls about 324,800 tons of coal, giving employment to 835 persons. COAL. Nova Scotia.

Drummond Colliery.—Worked by the Intercolonial Coal Mining Company. Three seams are tapped in this colliery. The Main, 17 feet; second seam 12 feet and the third seam 8½ feet. The coal produced in 1902 was nearly 231,840 tons. Persons employed 665.

Marsh Colliery.—Operated by the Nova Scotia Steel and Coal Co. This company has held this property for a number of years past, but only began actual work on it in 1901. It is situated between New Glasgow and Thorburn on the George McKay or Four Foot seam. Worked by slopes now 1,575 feet long. The coal is shipped to New Glasgow by the Vale Colliery railway and thence to Trenton by the Intercolonial railway. This colliery in 1902 produced 25,488 tons of coal, and employed 95 men.

Cumberland Field.

This is the most westerly of the coal districts of Nova Scotia, a part of it being adjacent to Chignecto Bay.

In this field there are two coal producing areas, both in Cumberland county. One situated near the coast, may be called the Joggins area, and the other situated about 15 miles to the east of the first at Springhill. The equivalence of the seams in these two basins has not yet been determined. These two coal-bearing areas are separated by a development of Permian strata, and this intervening space is affected by several faults. The coal measures of the Joggins area form a narrow strip some eighteen miles long.

In the Joggins area the following seams of workable size are known: At Joggins two seams, respectively 4 and 6 feet; at River Hebert one 5 foot seam with two shale partings; at Maccan two seams, the upper 2½ and lower 4½ feet; at Chignecto, a seam 9½ feet, of which 2½ feet are shale partings; at the Styles mine a seam 7 feet 8 inches with a S.W. dip of 40°.

At Springhill three seams are at present worked; in Mr. Scott Barlow's reports these three seams are called in descending order: the North or Thirteen foot seam, the East seam, and the West eleven foot, or Black seam. By courtesy of Mr. J. R. Cowans, the General Manager of the Springhill Collieries, which are operated by the Cumberland Railway and Coal Co. the following section was furnished to the Mines

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Section of the Geological Survey, through Mr. Hugh Fletcher. The section gives the stratigraphical succession at the Springhill mines as revealed by the mine workings. Mr. Fletcher gives the following information in regard to it :—

"This section is original. . . The upper portion is compiled from a horizontal tunnel 502 feet long, between No. 3 and No. 1 seams and another 250 feet long between No. 1 and No. 2. The remainder is from a tunnel cut across the strata underlying No. 2 seam for 1,122 feet, from the 2,600 ft. level of No. 2. The dip varies from 30° to 38°."

Section of Coal Measures at Springhill mines, N.S., in descending order.

		Feet.	Inches.
1	Coal, north or No. 3 seam	9	0
2	Strata	238	0
3	Coal, East or No. 1 seam	10	0
4	Strata	118	0
5	Coal, West or No. 2 seam	10	0
6	Strata	45	5
7	Coal 0 1 Stone 0 8 Coal 2 0 Stone 0 2 Coal 0 3	3	2
8	Strata	44	6
9	Coal 0 9 Stone 0 3 Coal 1 10	2	10
10	Strata	5	4
11	Coal	0	11
12	Strata	85	10
13	Coal	2	2
14	Strata	29	2
15	Coaly shale	0	2
16	Strata	37	7
17	Coaly shale	0	2
18	Strata	7	8
19	Coal	2	1
20	Strata	27	11
21	Coal	1	7
22	Strata	39	4
23	Coaly shale and coal	0	6
24	Strata	25	5
25	Coal	0	6
26	Strata	42	4
27	Coal 0 11 Stone 0 3 Coal 1 5	2	7
28	Strata	10	7

		ft	in
29	Coal 0 3 / Stone 0 7 / Coal 2 0	2	10
30	Strata	11	4
31	Coal	0	4
32	Strata	3	10
33	Coal	0	3
34	Strata	20	1
35	Coal	1	0
36	Strata	11	2
37	Coal and coaly shale and stone	1	1
38	Strata	8	10
39	Coal	0	4
40	Strata	28	5
41	Coal 0 3 / Stone 0 2 / Coal 0 6	0	11
42	Strata	25	0
43	Coal 0 0½ / Stone 1 7 / Coal 0 1 / Coaly shale 0 5	2	1½
44	Strata	35	0
45	Coaly shale 0 2 / Coal 0 2 / Coaly shale 0 2 / Coal 2 6	3	0
46	Strata to face of tunnel	5	8
	Total thickness	963	11½

Joggins Mines—Operated by the Canada Coal and Railway Company. This colliery is situated one mile from the shore of Chignecto Bay. It is connected with the Joggins wharf by a tramway. The nearest railway station is Maccan on the Intercolonial, distant eleven miles, with which it is connected by a standard gauge road.

Seam worked 4 to 5½ feet thick, dip 17°, on which are two slopes, 2,500 and 2,700 feet; only one of these is at present in operation. Underground haulage by tailrope system. Coal produced in 1902, 64,960 tons, giving employment to 276 persons. Besides this comparatively large producing colliery, there are scattered throughout this area, smaller mines operated. In 1902 there are records of four such mines having produced a certain amount of coal. These are the Chignecto Mine which produced 2,512 tons, the Strathcona, 2,352 tons, the Jubilee 1,543, the Scotia about 500 tons; besides these there are others which have been opened and worked for some time.

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Springhill Collieries.—Worked by the Cumberland Railway and Coal Co. On three seams 10 feet wide, dip 30°.—Worked by slopes. This colliery is connected with the Intercolonial Railway by a railway 5 miles long, and by an extension 25 miles long with Parrsboro' on the Bay of Fundy, from where shipments by vessels are made.

This colliery, the most important of the Cumberland field, is well equipped and the surface plant is very complete.—The coal is specially well adapted for steam purposes, and the produce of the mine is largely used by the Intercolonial, Canadian Pacific and Grand Trunk Rail ways.

New Brunswick.

Coal produced in 1902, 538,720 tons. Men employed 1,537.

NEW BRUNSWICK.

Discovery of coal in the Province of New Brunswick. dates back to 1782.—The most important, and so far, only field of economic value in this province being that situated at the head of Grand Lake, Queens county. This deposit has been worked to a limited extent since 1825. Rocks of Carboniferous age have been recognized over a great part of New Brunswick, but according to the conclusions arrived at by investigation and studies the coal seams occurring in t'.em do not belong to the productive measures corresponding to those of Nova Scotia and the conditions under which the known coal occurs in New Brunswick are not very favourable for mining on a large scale. Hopes were entertained that south of the Coastal Range the features more closely resembled those of the Nova Scotia coal basins. Deep borings were undertaken at different places, but results obtained do not seem to be encouraging, for no workable coal seams were encountered. Therefore the coal bearing measures of the province are limited to the Grand Lake Field. The area of this field seems to be about 100 square miles. The quality of the coal is excellent but the seams are thin, from 15 to 20 inches. The total quantity of coal in this district has been estimated at from 100 to 150 million tons.

Although mining operations were begun more than fifty years ago, they are yet conducted in a small way, and the proximity of the Nova Scotia fields, as well as the limited thickness of the seams would hardly justify the expenditure necessary for exp'oitation on a large scale. The beds are flat, lying with a cover varying from 2 to 30 feet, rendering it possible in many places to work them opencast. This enables small seams to be worked profitably for the local market, when the stripping does not exceed 8 feet. Beyond this depth it would be more advantageous to work under ground.

Manitoba and North West Territories.

Manitoba and North-west Territories.

In Manitoba and the North West Territories the coal measures occur in the Cretaceous system or in the Laramie, which may be regarded as its upward continuation. The coal is therefore of more recent age than that of the Atlantic Coast. The quality of the fuel grades from lignite or brown coal as that found in Southwestern Manitoba, to anthracite in the Rocky Mountains. These various grades of coal are found in measures differing little in regard to geological age, but depending more on the amount of alteration and disturbance undergone by the rocks. Therefore as might be expected, the quality of the fuel improves as the Rocky Mountains are approached. The Souris river country and eastern Assiniboia yield only lignites, whereas in western Alberta the character changes to lignite coal, becoming more and more bituminous as the Foot Hills are reached and on the outer range of the Rocky Mountains, steam coal and anthracite are produced.

It is roughly estimated that the coal bearing region of the North West Territory, between the international boundary and the 56th degree of latitude, has an area of some 65,000 square miles, and although the fossil fuel of the greater part of this is lignite, which is not as valuable as the true coals, yet such deposits possess great importance as sources of supply of fuel for the adjacent farming communities.

Several separate coal-bearing districts or basins have been recognized throughout the region, and in the majority of these, some work has been done, either of a prospecting nature or for local wants, while in some places, coal seams are systematically worked and extensive well-equipped collieries are in operation.

Souris River and Turtle Mountain Fields.—The Souris district is situated in the south eastern part of Assiniboia and is underlain by several seams of lignite which constitute an almost inexhaustible supply. The use of this fuel in the districts remote from the sources of supply of better grades of coal, is extending rapidly, and the Souris lignite is now used for the generation of steam.

In the vicinity of Estevan, three seams are recognizable over a great part of the region. The upper is four feet thick and is the most constant. The middle is very variable in thickness, reaching in places a maximum of 6 feet. The lower is more strictly speaking a series of seams separated by partings of clay. The quantity of the lignite of this last seam is superior to that of the upper one.

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Roche Percee and Coalfields mines.—Operated by the Souris Coal Mining Co. This company owns sections 3, 4 and 5, tp. II, range VI, and sections 32, 33 and 34 tp. I, range VI. The seam worked is about 8 feet by adit on the banks of the Souris river. This mode of working presents the objection of considerable upgrade haul to reach the prairie level, and it is probable that work by shaft from the prairie level would decrease the cost of haulage. The mines are well equipped, having air compressors, coal-cutting machines, &c. They are equipped for an output 600 tons a day.

The Turtle Mountain Field is in the south western part of the province of Manitoba and is separated from the Souris field by a synclinal in which no coal has been recognized as yet. Several coal seams were found on the northern flank of Turtle Mountain, a number of years ago but so far have not given rise to very active mining operations. They are only small workings to supply local wants.

Belly River Coal Fields.

This coal-bearing region is situated in the southern part of Alberta. According to the results of Dr. Dawson's explorations in that region the outcrop of the fuels which occur on the Belly river have been traced northwestward as far as the Red Deer river and southwestward to the 49th parallel, a distance of about 150 miles. The thickness and quality of the fuels vary greatly, but on the Belly river and on the lower part of the St. Mary, a length of outcrop of 18 miles may be considered as workable. A list of the principal localities of the region, where natural outcrops of coal and lignite were observed, was published in the report of the Geological Survey for 1882-83-84, Part C.

Outcrops of coal are worked in numerous places, but in the majority of cases to supply only local demand. In Lethbridge, however, on the branch of the Canadian Pacific Railway, an important colliery is in operation.

Lethbridge Colliery.—Operated by the Alberta Railway and Coal Company. Seam worked 5½ feet, with a fire-clay parting of 2 to 6 inches. System of working, room and pillar, with coal-cutting machines and endless rope haulage. The mine is equipped for a production of 1,000 tons a day, but it is not worked to its full capacity. The company owns 66 miles of railway, from Lethbridge to Coutts, Alberta.

Cascade Basin.

This is part of the Bow River valley, which is underlain by Cretaceous coal-bearing rocks. It forms a basin or trough running approximately from the northern part of the Kananaskis range, south of latitude 51°, longitude 115°, in a northwesterly direction. Its total area is some 60 square miles. This area, although small, contains much coal. The rocks here have been much disturbed; in places the seams assume an almost vertical attitude. Most of the coal is bituminous, although some of the seams have been locally converted to anthracite.

At Marsh's mine, near the south end of the field, are two seams, one about 15 feet and the other eight feet. Three miles to the north-west of this are several openings into beds of workable size. At Canmore there are three seams of 4 feet, 12 feet and 16 feet, respectively. At Anthracite three seams are now being worked, two of a thickness of 4 feet each and one of 3 feet. All of these seams are situated very near the main line of the Canadian Pacific Railway.

The measures in this field are often faulted, and the seams dip to the south-west at an inclination varying from 15 to 60 degrees. At Canmore two of the seams are almost vertical. The field was first opened by the Canadian Anthracite Coal Company in 1886 at Canmore and Anthracite.

Canmore Colliery.—This colliery is worked by the H. W. McNeil Company. Four seams worked which vary considerably in thickness from 3 to 6 feet, shaft and room and stall method. The product of the mine is a good bituminous coal.

Anthracite Colliery.—Operated by the H. W. McNeil Company. There are three seams worked which produce anthracite coal. The mine has an output of 100 tons a day. Both the Anthracite and the Canmore collieries are situated on the main line of the Canadian Pacific Railway.

In the Edmonton district there are several small mines operating, supplying the needs of the villages and market centres of that region. This industry, however, will certainly grow as the district becomes thickly settled, and may in time assume great importance.

COAL.

Blairmore–Frank Coal Fields.

Manitoba and North-west Territories.

This coal-bearing area is situated on the eastern slope of the main range of the Rocky Mountains and extends in width from Crow's Nest Lake for a distance eastward of fourteen miles. Its southern limit would be almost latitude 49° 20′ and its northern boundary has not been determined.

In this field a section of the coal measures observed at Cat Mountain gave some 740 feet in which there are present 21 seams of an aggregate thickness of 125 feet 3 inches. Until 1900 very little work had been done in this field, but within the last three years the development of this region has been very active.

Frank Colliery.—This is operated by the Canadian American Coal & Coke Company. It is located on the east flank of Turtle mountain. Seam worked nine to twelve feet, dip 83° west. Worked by a main entry run in some 4,500 feet. Output about 500 tons a day to be increased shortly. The coal produced is an excellent steam coal though high in ash.

Lille Collieries.—Operated by the United Gold Fields of British Columbia. The mine is situated on Gold Creek, three and a half miles above the town of Frank. A railway line connects it with the Crow's Nest branch of the Canadian Pacific Railway.

Recently another important colliery has been added to these two. It is operated by the International Coal and Coke Company, Blairmore, and is said to be shipping, but no particulars are at hand.

Besides these collieries, a great deal of prospecting work has been done in the region, and from all appearances this coal field will probably grow in importance and become a great factor in the question of fuel supply of the mining districts, and smelting centres of British Columbia and adjacent parts of the United States.

British Columbia.

BRITISH COLUMBIA.

In western Canada coal occurs in connection with newer rocks than in the east. Although Carboniferous rocks of great thickness are frequently met in the west, they are all marine deposits, mainly limestones. Swamps and marshes which afford the conditions giving rise to accumulation of vegetable matter, producing coal beds, existed in the Cretaceous and Tertiary times. In character the coals of British Columbia range from anthracite to lignite, showing that the grade depends on conditions of metamorphism rather than on age.

Four recognized coal-fields may be named, but mineral fuels are known in many other places, which have only to be worked in order to receive recognition. COAL. British Columbia.

The Crow's Nest Pass Field.

The Nanaimo Field.

The Comox Field.

The Queen Charlotte Islands Field.

Crow's Nest Pass Field.

This field is situated immediately west of the summit of the Rocky Mountains, which form the boundary between Alberta and the province of British Columbia. It has a length north and south of about thirty five miles and a maximum width of thirteen miles. An east and west line passing through the town of Fernie, divides it into two parts almost equal. On the west it is bounded by the Elk river, and on the east by the main ridge of the Rockies. About 230 square miles are underlain by the coal measures. Coal was discovered in this district many years ago and the first allusion to its existence in the Reports of the Geological Survey dates back to 1883, when Dr. G. M. Dawson approximately defined and examined the field in a preliminary way; however, it was only on the construction of the Crow's Nest Branch of the Canadian Pacific Railway, a few years ago, that it became important from an economic standpoint.

The coal occurs in the Cretaceous rocks; it is bituminous in character, and cokes well; some of the upper seams are said to partake of the character of cannel coal. In a section of the coal measures of the area, in a thickness of 4,700 feet, over 215 feet of coal were observed in beds of from one foot to forty six feet. Of these at least one hundred feet would be workable, and on this assumption, some 22,600,000,000 tons would be available over the total area of 230 square miles.

There are at present three collieries in this field, working and producing actively. They are all operated by the Crow's Nest Pass Coal Co.

Coal Creek Collieries.—The Crow's Nest Pass Coal Co. was incorporated in 1897 and operates these collieries since that time. The workings are situated on Coal Creek, about five miles from its mouth. Seams worked 10 feet, 6 feet and part of a 36 foot seam. They are entered by tunnels. The mine is connected with the Canadian

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Pacific Railway by a spur from the town of Fernie. At this place there are at present over 400 coke ovens of the bee-hive pattern, in operation. Production of this mine in 1902, 267,429 tons of which about one half was used in the production of coke.

Michel Colliery.—These workings are situated on the Crow's Nest branch of the Canadian Pacific Railway. Work has been done on eight seams which cutcrop here, but at present there are three mines in operation and producing while the others are being developed. There are 200 coke ovens in operation, and 200 more under construction. Production of these collieries in 1902, 117,515 tons of which 50,000 were converted into coke.

Morrissey Colliery.—Situated on Morrissey Creek, about four miles from the Canadian Pacific Railway. The colliery is connected with the Great Northern Railway by a branch from Jennings, Montana. Four mines are in operation at Morrissey, and a bank of 200 coke ovens are under construction. Production for 1902, 46,291 tons to be increased greatly in a near future.

West Kootenay, Kamloops.

In the Kamloops district of the West Kootenay, there are several occurrences of coal and lignite in rocks of Tertiary age. The most important of these known outcrops is on the Nicola river, near the Coldwater river. A list of coal outcrops in this district was given in Dr. G. M. Dawson's report on the Kamloops map sheet, Geological Survey Report, part B, vol. VII, 1894. In his report for 1901 the Provincial Mineralogist for British Columbia mentions that work is going on in this basin but detailed information is not available.

North Fork Kettle River.

The following extract from the Summary Report of the Geological Survey for 1901 is interesting as mentioning a new discovery of coal in the West Kootenay District.

"The new coal fields as they are locally called, are situated about twenty-four miles above the forks of the East Branch on the Main North Fork of the Kettle river, or about fifty-two miles from Grand Forks. Here, as above mentioned, a tertiary outlier lies on the granite. The tertiary rocks consist of tuffs, ash rocks, and a little shale overlaid by basalts and other volcanic rocks. The first exposure of coal on the west bank of the river occurs in a coarse tuff filled with

fragments of volcanic rocks, and crystals of minerals belonging to volcanic rocks. Above this tuff is a thick bed of another filled with boulders from the granite of the surrounding country. In the tuff are little lenses of carbonaceous material, the remains of plants of which the form is sometimes preserved and a thin seam (about an inch) of argillaceous material and coal. The tuffs have been somewhat squeezed. The strike is about N. 20°E, angle of dip 45°W. The extent of coal bearing rocks is not large as they are overlaid by the unproductive volcanic flows and immediately underlaid by granite which is exposed on the east bank for the greater part of the distance between the two exposures of coal. Nor have they a wide areal extension, as the granite boulders in the river and tributary creeks testify.

Colonel N. E. Linsley, of Spokane, who examined the district after my visit, reports having discovered four seams of coal on the lower (Gilpin's) claim. Of these the upper (seven inches wide) was the largest and was separated from the lowest by 150 feet of tuffs. He also found the area of coal bearing rocks to be extremely circumscribed. The coal is of very fair quality, coking easily and well.

Nanaimo Coal Field.

This field is situated on the Island of Vancouver, in the south-eastern part. Its area has been estimated at about 200 square miles. Two seams, at least, of workable thickness are known but the measures being much folded and cut up by faults, it is very difficult to correlate the beds in the various parts of the field.

The product of both this and the Comox areas is largely exported to California where it competes successfully with the coals produced in the United States although handicapped by an import duty.

Nanaimo Collieries.—Operated by the Western Fuel Company, who took over the properties of the New Vancover Coal Mining Co. This latter had been formed in 1862 and reorganized in 1889. Its output is the largest of the coal companies operating in Vancouver Island. Figures of production for 1902 are not available, but in 1901, the output amounted to 584,826 tons. The collieries consist of the following workings.

Northfield Colliery.—Situated four miles from Departure Bay. Seam worked 2 to 3½ feet thick; dip, 6 degrees; worked by shaft 440 feet deep, and slope at bottom 2,100 feet. System of working, long-wall. This colliery is at present idle.

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No. 1, Shaft, Esplanade.—Situated half a mile from the wharfs of Nanaimo harbour.

Seam worked the 'Harbour'; thickness, 5 to 12 feet; dip, 6 degrees. System of working, pillar and stall.

Haulage.—For haulage from the levels, which are in about 2 miles from the foot of the shaft, the company uses electric motors.

Ventilation by Guibal fan, 36 feet in diameter and 12 feet wide. Connected with the Protection Island shaft which is used as intake.

Lamps, naked lights.

The workings of this extensive colliery are under the waters of Nanaimo harbour and beneath the surface of Protection Island. The mine is quite safe from invasion by water, being protected by a thickness of rock and earth varying from 400 to 1,200 feet between the workings and the bed of the harbour. The pillars left in place amount to two-thirds of the original seam, this large proportion being thought necessary to insure safety. They will be robbed at a later period.

Protection Island Shaft.—Situated 300 yards from the shipping wharf and half a mile from Nanaimo.

Seams worked, the 'Douglass,' upper and lower. Thickness of upper seam 6 to 8 feet; dip 6 degrees, vertical depth of shaft to seam 670 feet. The lower seam is reached at a depth of 740 feet and is 4 feet thick.

In the upper seam two slopes have been driven, 900 and 600 yards respectively.

System of working, pillar and stall.

Ventilation.—This shaft is the intake of the system of ventilation which takes in Esplanade shaft.

Southfield Colliery.—No. 5. Situated five miles from Nanaimo in the southern part of the area controlled by the Western Fuel Co.

Seam worked varies from 6 to 12 feet in thickness. Dip 6 degrees. Vertical depth of shaft 508 feet.

System of working, pillar and stall.

This part of the field is very much cut up by faults and breaks.

Harewood Mine.—This mine is situated about three and a half miles south west of Nanaimo. This was worked actively some 25 years ago, and subsequently acquired by the New Vancouver Coal and Land Co. who left it idle for some time. In 1901 work was resumed at this place

and the mine produced for a couple of years. The main workings are the Harewood slope on a six foot seam and a shaft which are now connected. Work however, was discontinued in September 1902.

Wellington Colliery, Cranberry District.—Operated by the Wellington Colliery Co.—The colliery is an important producer. The workings consist of No. 1 slope, No. 3 slope, and the Tunnel. The main equipment of the colliery consists of five miles of railway, four locomotives, 350 coal cars, stationary engines, electric power house, &c. The company has wharves and bunkers at Ladysmith, Oyster Harbour. The work is carried on by pillar and stall. No figures of production are available for 1902, but in 1901 the output of the mine was 405,986 tons.

Alexandria Colliery.—This is situated in South Nanaimo District and is operated by the Wellington Colliery Co. Worked by a slope. The colliery is connected by a short railway line with the E & N railway. In 1901 the output of the mine was 68,420 tons. In 1902 no work was carried on, the colliery being allowed to remain idle all year. The Wellington Colliery Co. whose offices are at Victoria employ a staff for prospecting in this and other districts.

Comox Field.

This field is situated on the north-west of the Nanaimo field from which it is separated by the intervention of crystalline rocks. The Comox area has probably a greater extent of productive measures than the Nanaimo field. Mr. Richardson, late of the Geological Survey, estimated it at 300 square miles, without taking into consideration the seaward extension.

In a section on Brown River almost the entire thickness of the productive measures is exposed, amounting to 740 feet. In this section nine seams occur, with an aggregate thickness of 16¼ feet. At the Union mines a section of 122 feet reveals ten seams aggregating to 29¼ feet, the thickest being 10 feet.

Wellington Colliery-Cumberland Town, Comox District.—This mine was formerly designated by the name of Union Mines. It is worked by the Wellington Colliery Co., who also operate two other mines in the Nanaimo field. The main workings consist of one slope and two shafts, worked partly by pillar and stall and partly by longwall. Seams worked, three feet and five feet respectively. The surface plant consists mainly of nearly 12 miles of standard gauge railway to ship-

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ping wharf; 4 locomotives; steam saw mill; coal washers; 200 beehive coke ovens at the mine beside 70 at Union.

This company also carries on the manufacture of fire-bricks, from the fire-clay mined in connection with the extraction of the coal.

Queen Charlotte Island Field.

This field is in that part of the Cretaceous area of the province which extends over parts of Graham and Moresby Islands, on both sides of Skidegate Sound.

The coals are anthracite and bituminous, the former comparing favourably with that of Pennsylvania. In the 'Mineral Wealth of British Columbia' Dr. Dawson speaks of the Cowgitz seams on the Skidegate as follows:

'At Cowgitz, the Queen Charlotte Coal Mining Co. about 1871 constructed a wharf, houses, tramway, &c., and attempted to work the coal seams which have there the character of anthracite, but met with difficulties in following the seams, of which some portions were found to be in a crushed and pulverulent state.

'Though these efforts were not attended with success, the work was not carried far enough to prove that the coal in this vicinity is not of a workable character. Further exploration appears to be fully justified by what is known of the place * * * The beds containing the anthracite are almost vertical, and it is evidently on account of the disturbance and local alteration which it has suffered that the coal has passed into the condition of anthracite. The best seam found had a maximum thickness of a little over 6 feet, while a second outcrop showed 2 feet 5 inches.'

A bed 18 feet thick, of bituminous coal, has been reported on the Ya-Kum River, midway between Skidegate and the head of Masset Inlet.

Means of communication with the coast, however, must be provided before this deposit can be utilized.

In 1892 Mr. H. E. Parrish, C.E. and M.E., late of the staff of the Geological Survey at Pennsylvania examined some coal areas on this island for private parties. After mentioning and describing some prospecting work done at Camp Robertson, section 20, township 5; Camp Anthracite, section 17, township 5; Camp Wilson, section 36, township 9; he concludes with the following remarks:

* "With the knowledge I have of the coal regions of Pennsylvania, acquired there as a mining engineer and on the geological staff of that state it must gratify you to know that in my judgment you have the best coal field I have seen. Until I visited it, I had no conception such a valuable field existed on the Pacific Coast. You possess a number of beds of unusual thickness, containing coals of superior quality suitable for all requirements. You have anthracite, first class steam, gas and coking coals, and a bed over 15 feet thick, excellent for domestic purposes." COAL. British Columbia.

Peace River region.

Of the other localities in British Columbia where coal has been observed, the country in the Peace river region is likely to come into prominence if the projects now being discussed of the building of the Grand Trunk Pacific Railway become a fact. The line as it is now projected would follow part of the Peace river valley and would pass at a not very great distance from the cañon where Dr. Selwyn and Dr. Dawson observed outcrops of coal.

Dr. Selwyn in his report on the Peace river country in 1875, mentions four seams of good lignite coal from six inches to two feet in thickness as occurring on Peace river below the cañon.

As to the coal bearing character of the country, Dr. Dawson expresses himself as follows: "It would thus appear that while in the region lying between the Athabasca and the Peace rivers, no coal seams sufficiently thick to be of great economic value have yet been discovered that coal and lignite of good quality occur in two distinct series of beds. Wherever natural sections of these occur in the valleys of rivers and streams, coal in greater or less quantity is found, and the persistently carboniferous character of the beds, thus abundantly proven. There can be little doubt that beds of a workable character exist in different parts of this district and will be found by further search.

The promising coal bearing belt of rocks supposed to belong to the lower sandstones and shales which run south-eastward from the canon of the Mountain of Rocks to Table Mountain and the lower forks of Pine river, probably extends still further in the same direction, crossing the head waters of the Wapiti and Smoky rivers above the points reached in my explorations, and forming the southwestern side of a synclinal in which the Upper Sandstones and shales lie. In this the coals reported by the Indians to exist on the upper parts of these rivers may occur."

* Report of H. E. Parrish, extracts of which were published in the Report of the Minister of Mines for British Columbia for 1898, p. 1163.

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In support of these views, it is interesting to quote the following section measured recently by Mr. Hugh Campbell up a small creek on the Peace river cañon.*

	Ft.	In.
Blue shale	10	
Shale with hard bands	6	
Sandstones	10	
Gray shale	8	
Impure cannel coal	2	
Coal, good	9	
Soft blue shale	7	
Measures not seen	50	
Limestone	10	
Sandstone	9	
Soft shales	20	
Coal	2	
Shales with bands	30	
Sandstone	10	
Shale	1	3
Cannel coal	1	
Shale	20	
Coal	3	10
Sandstone	3	
Shale	4	
Sandstone	20	
Coal	1	4
Sandstone	10	
Shale	5	
Sandstone	20	
Limestone	4	
Shale	10	
Hard bands	50	
Limestone	4	
Sandstone	15	
Shale	20	
Limestone	3	
Unseen strata	50	
Fossiliferous sandstone	30	
Coal	2	7
Shale	9	0
Coal	0	8
Calcareous shale	12	
Coal	1	4
Hard gray shale	20	
Dark shale	10	
Coal	2	8
Hard rock	2	
Soft dark shale	2	6
Coal	4	2
Soft clay	3	
Shale	6	
Limestone	6	
Coal	3	
Shale	5	
Coal	2	6
Sandstone	8	
Shale with bands	8	
Sandstone	6	
Shale	1	3
Coal	3	
Band	1	
Coal	3	
Dark soft shale	2	

The measures, according to Mr. Campbell, dip S. 30° E. at an angle of about 13°.

Yukon Territory.

Yukon Territory.

Lignites and lignitic coals occur in the Tertiary rocks of the valleys of the Yukon river and of the Klondike river. On Coal creek, a branch of Rock creek, a tributary of the Klondike, a seam occurs in which a tunnel some 400 feet in length has been sunk. These workings are situated about 20 miles from Dawson. The seam worked here consists of an upper part of 3 feet of hard lignite, and a lower part of 2 to 3 feet, separated by a layer of clay about one foot. Outcrops of lignite also occur on Cliff creek, whi h enters the Yukon about 55

* From a private letter communicated by Dr. H. M. Ami.

miles below Dawson. Between these two occurrences other outcrops have been observed at intermediate points, and it has been estimated that this area underlain by lignite exceeds 200 square miles.

On Cliff creek the lignite is worked very actively by the North American Trading and Transportation Company. The workings are situated on both banks of the creek, $1\frac{3}{4}$ miles from its mouth. The coal is shipped to Dawson for heating purposes and is also used by river steamers. The mine is connected with the shipping wharf by a narrow gauge railway.

ANALYSES OF CANADIAN COALS.

SYDNEY FIELD, N.S.

Seam of Mine.	Fast or slow cooking.	Moisture.	Vol. Matter.	Fixed Carbon.	Ash.	Sulphur.	Spec. Gravity.	Theor. Evap. Power.	*Analyst.	†Reference.
		p. c.	p. c.	p. c.	p. c.	p. c.				
Hub seam			29·10	65·50	4·50	3·29			*g*	C
"			28·62	68·14	3·24	2·29		8·59	*k*	D
Block House seam	S	·600	29·48	65·57	4·35	2·63	1·292	8·97	*a*	A
"			31·94	62·79	5·27	3·76		7·67	*k*	D
Harbour seam	S	·80	27·85	67·05	4·30	2·32	1·29	9·19	*a*	A
" Internat. Coll			34·09	62·92	2·99	2·26		7·76	*k*	B
" Glace Bay			30·21	67·78	2·01	·90		9·31	*k*	D
"			37·96	54·84	5·60	4·03			*g*	C
Victoria seam	S	·28	28·61	67·61	3·50	2·84	1·29	9·27	*a*	A
"			38·70	58·40	2·90			8·02	*b*	D
Sydney main	S	3·04	31·14	61·50	4·32	1·24	1·30	8·45	*c*	B
"		3·13	23·81	67·57	5·49			9·25		E
Sydney Colliery	S	1·26	33 84	60·79	4·12	1·71	1·312	8·33	*a*	A
"			32·74	61·54	5·72	3·37		8·49	*k*	B
McAulay seam, Gowrie mine			36·25	58·05	5·70	2·34		7·97	*p*	D
Gowrie Colliery	S	·50	28·13	66·01	5·36	2·71	1·31	9 05	*a*	A
Phelan seam, Caledonia Coll	S	·92	28·63	64·02	6·43	1·11	1·33	8·78	*a*	A
" "			33·00	57·37	9·63			7·88	*d*	B
" "			28·02	68·05	2·19	1·72			*g*	C
" Reserve Coll			32·00	63·93	2 95	1·33			*g*	C
" "			37·26	58·39	4·35	2·06		8·02	*r*	B
" "		1·00	36 26		4·35	2·47			*r*	B
" "			34·50	59·50	6·00				*s*	B
" "		·52	34·21	59·73	5·54	1·25	1·28	8·19	*a*	A
" Dominion No. 1 Coll			25·13	71·22	2·73	1·10			*g*	C

" Old Bridgeport			31·81	63·86	3·09	1·33			*g*	C
" Clyde Coll			32·82	64·33	2·85	2·17		7·88	*k*	C
Lingan seam	S	·75	34·61	61·39	3·25	1·35	1·29	8·42	*a*	A
"			30·03	66·90	3·07	·77		9·07	*c*	D
South Head seam	S	1·77	28·00	62·26	7·97	2·64	1·38	8·53	*a*	A
Emery seam	S	·65	32·21	63·49	3·65	2·41	1·29	8·70	*a*	A
Ross seam, Schooner Pond			38·10	58·46	3·44	1.21		8·03	*r*	B
Collins seam	S	1·98	26·16	66·48	5·40	2·25	1·311	9·10	*a*	A
Gardiner seam	S		31·96	65·22	2·82	1·18			*k*	B
"			34·33	61·97	3·70			8·51	*b*	D
Lorway seam			34·84	55·98	13·28	6·27		8·02	*k*	D
Tracey seam		2·23	30·09	66·61	·98					B
Fraser seam			31·40	62·40	6·20					B
Carroll seam			32·80	61·40	5·80					B
Block House seam			38·80	55·80	5·40			7·67	*d*	B

INVERNESS FIELD, N.S.

Chimney Corner	F	8·19	26·39	57·70	7·72					A
Broad Cove, 7-foot seam	S	4·02	20·17	70·41	5·40				*c*	A
"	S	7·24	25·75	56·86	10·15	1·41		7·61	*t*	A
" 5-foot seam	S	7·78	27·67	52·87	11·68				*a*	E
" 4 "	S	8·45	28·36	56·94	6·25					E
Port Hood	S	2·54	29·82	61·93	5·73	5·54		8·49		A
" 7 foot seam	S	4·02	34·86	53·60	7·52				*a*	E
Port Hood mines, face of slope depth of 1,150 feet,		2·11	38·36	49·25	9 78					B
" " face south level		2·47	38·48	50·39	8·66					B
" " face north "		2·42	37·18	50·96	9·44					B

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ANALYSES OF CANADIAN COALS—*Continued.*

RICHMOND FIELD, N.S.

Seam or Mine.	Fast or slow coking.	Moisture.	Vol. Matter.	Fixed Carbon.	Ash.	Sulphur.	Spec. Grav.	Theor. Evap. Power.	*Analyst.	†Reference.
		p.c.	p.c.	p.c.	p.c.	p.c.				
Sea Coal Bay, 11-foot seam			25·20	44·70	30·10				*b*	A
Little River, 4-foot seam			30·25	56·40	13·25				*b*	A

PICTOU FIELD, N.S.

Main seam, average of 31 analyses*	S		23·65	62·61	13·61				*b*	B
" Ford pit		1·48	24·28	66·50	7·74	·55	1·294	9·13	*c*	B
Albion Mines	S	1·05	26·19	63·41	9·35	1·48	1·31	8·68	*a*	A
Acadia Coal Co.—McGregor pit, slack	S	1·50	26·80	58·00	13·70	1·73			*m*	F
" " Ford pit		1·50	25·90	54·30	18·30	·73			*m*	F
Acadia Colliery	S	2·10	32·27	57·57	7·55	·51	1·320		*d*	B
Drummond Colliery—Top coal		·72	29·93	60·35	9·46	·26	1·309	8·29	*d*	B
" " Fall coal		1·56	31·69	60·32	7·56	·43	1·328	8·29	*d*	B
" " 1st bench		1·80	33·53	55·39	10·50	·58	1·327	7·61	*d*	B
" " 2nd "		1·31	29 97	60·31	8·67	1·05	1·343	8·29	*d*	B
" " 3rd "		1·43	30·76	59·89	8·79	·564	1·335	8·27	*d*	B
" " Coarse bench		1·58	32·81	37·16	31·03		1·765		*d*	B
Deep seam	S	·75	20·34	68·50	10·41	·945	1·330	9·39	*a*	A
"	S	1·30	25·44	61·65	10·25	·861	1·330		*d*	B
"		2·54	20·46	68·50	8·50	1·69	1·345	9·41	*c*	B
McGregor seam			22·50	65·70	11·80		1·334	9·03		B
"			23·30	70·00	6·70		1·301	9·62		B

Intercolonial Mine	S	1·52	29·46	60·19	9·10	1·625	1·330	8·24	*a*	A
Montreal and Pictou Mines		4·40	24·95	61·07	9·58			8·39	*c*	B
" " "		5·47	19·93	68·55	6·05		1·360	9·41	*c*	B
McBean seam, east side of East River		1·57	29·29	52·36	16·76				*f*	B
"		2·67	28·65	49·66	19·42				*f*	B
"		2·67	27·20	54·86	15·27				*f*	B
"		1·94	23·95	57·17	16·94				*f*	B
"	S	·86	20·95	64·95	13·24	·85		8·90	*a*	A
McKay seam, north part	S	1·62	22·86	68·18	7·34	·53		9·35	*a*	A
" south "		·90	22·50	65·28	11.32	1·72		8·97	*a*	A
"		None.	29·72	62·28	8·00					B
"		None.	29·98	62·15	7·87					B
Richardson seam		·76	38·84	55·81	5·09					B
Greener	S	1·22	22·96	65·61	10·21	Trace.		8·99	*a*	A
Pottery		.57	19.24	72·76	7·43	·65		9·97	*a*	A

CUMBERLAND FIELD, N.S.

Joggins	S	2·50	36·30	56·00	5·00				*a*	A
Maccan	S		37·00	59·17	3·83				*a*	A
Styles	S	4·05	33·72	55·83	6·40				*a*	A
"	S	3·72	33·24	52·15	10·89				*a*	A
Springhill—Main seam, 11 feet—										
Band No. 1	S	·98	30·84	60·73	7·45	·85	1.31	8·33	*a*	A
" No. 2	S	·76	32·22	60·91	6·11	·56	1·30	8·40	*a*	A
" No. 3	S	1·21	33·81	63·13	1·85	·79	1·28	8·65	*a*	A
" No. 4	S	·30	29·19	67·95	2·56	1·21	1·27	9·28	*a*	A
" No. 5	S	.63	28·90	65·16	5·31	1·85	1·29	8·92	*a*	A
" No. 6	S	·90	34·56	60·59	3·95	·89	1·28	8·32	*a*	A
" No. 7	S	1·34	33·64	59·86	5·16	1·40	1·29	8·20	*a*	A
" No. 8	S	·56	30·27	60·89	8·28	2·65	1·33	8·35	*a*	A
" No. 9	S	·41	28·54	63·63	7·42	2·25	1·32	8·99	*a*	A

*Average of samples take every foot across the section of the seam.

ANALYSES OF CANADIAN COALS—*Continued.*

NORTH-WEST TERRITORIES.

Locality.	Fast or slow coking.	Moisture.	Vol. Matter.	Fixed Carbon.	Ash.	Sulphur.	Spec. Gravity.	Theor. Evap. Power.	*Analyst.	†Reference.
LIGNITES.		p. c.	p. c.	p. c.	p. c.	p. c.				
Souris River, 7 miles from Roche Percée, seam 6 feet	.....	17·78	29·51	44·36	8·35	.....	.....	.....	.....	.....
La Roche Percée, seam 5 feet	S	21·84	32·15	41.61	4·40	.....	1·417	.....	*t*	B
South Saskatchewan, 10 miles above Medicine Hat, seam 4 feet	S	16·82	29·54	46·34	7·30	.. ....	1·397	9·57	*t*	B
" " "	S	17·70	28·63	49·83	3·84	.....	1·372	.....	*t*	B
South Saskatchewan, 7 miles from Medicine Hat	.....	19·90	30·88	44·03	5·19	.....	.....	.....	*t*	B
North Saskatchewan, 40 miles below confluence of Brazeau river, seam 18 to 20 feet	S	14·78	28·46	58·69	6·07	.. ..	1·434	9·84	*t*	B
North Saskatchewan, below Fort Edmonton, seam 6 feet.	S	12·89	32·19	52·17	2·75	. .....	1·426	9 69	*t*	B
" 1½ miles below ferry at Edmonton, Alta., seam 4 feet	.....	11·47	36·12	48·57	3·84	.....	.....	.....	.....	.....
Red Deer river, mouth of Arrowood, 6-foot seam	S	13·08	31·49	51·35	4·08	.....	1·403	9·95	*t*	B
" 2 miles below Arrowood, 5 feet	S	14·20	30·92	51·21	3·67	.....	1·393	.....	*t*	B
" 7 miles above Hunter's Hill, 3½ feet	S	13·06	29·41	48·51	9·02	.....	1·426	9·36	*t*	B
" 9 " " 1½ "	S	13·63	31·31	41·81	13·25	.....	.....	.....	*t*	B
" 13 " " 1¼ "	S	12·62	32·08	46·72	8·58	.... ..	1·422	....	*t*	B
" Tp. 38, R. 24, W. 4th M., seam 10 feet	.....	7·66	25·90	34·53	31·91	.....	.....	.....	*t*	B
Bow river, Grassy island, seam 4½ feet	S	11·90	31·20	50·97	5·93	.....	1·416	10·19	*t*	B
" Blackfoot crossing, 3 feet	S	11·91	30·04	54·78	3·27	.....	1·397	10·29	*t*	B
" 4 miles below Blackfoot crossing	S	10·72	29·26	46·09	13·93	... ...	.....	.... ..	*t*	B
" Crowfoot creek, seam 6 feet	S	11·25	31·98	50·85	5·92	.....	.....	.....	*t*	B
" Horseshoe Bend, seam 4½ feet	S	11·13	36·52	43·16	9·19	.....	.....	.....	*t*	B
Crowfoot creek, 5 miles from Bow river, Sec. 7, Tp. 22, Range 20, west of 4th M., 9 feet	F	10·35	30·97	43·04	15·64	.....	.....	.....	*t*	B

Belly river, 5 miles below Little Bow river	S	9·18	30·66	53·31	6·85		1·398	10·84	t	B
" coal banks, seam 5½	S	6·50	31·59	54·36	7·55		1·359	11·51	t	B
St. Mary river, 7 miles above junction with Belly river	S	7·02	29·41	57·28	6·29		1·369	11·72	t	B
Yukon District, 7 miles up Coal creek, seam 12½ feet	F	7·24	41·45	48·91	2·40				t	B
COALS.										
Cascade river, 2¾ miles from confluence with Bow river, seam 20 inches	S	2·07	15·84	74·35	7·74				t	B
Cascade river, semi-anthracite, seam 3 feet 10 inches, ¼ mile from C.P.R.	F	1·04	9·15	87·18	2·63				t	B
Bow river, Coal creek seam 4½ feet	S	4 93	27·22	52·54	15·31		1·400	10·93	t	B
Bow river Pass seam 4 feet	S	·71	10·58	81·14	7·57		1·427	14·62	t	B
Coal creek, Bow river, Sec. 22, Tp. 27, R. 5, west of 5th M.	F	2·79	36·90	53·40	6·91				t	B
Marsh's Mine, ½ mile south of Bow river at Gap siding, 2 seams, 10 and 12 feet		·70	11·03	79·78	8·49				t	B
Little Red Deer river, 11-foot seam; foot-hills at base of main limestone range of Rocky mountains	F	1·87	13·74	79·55	4·84				t	B
Little Red Deer river, seam 4 feet	F	1·52	11·65	81·16	5·67				t	B
Sheep creek, Sec. 2, Tp. 20, R. 3, west of 5th M., 4-foot seam	F	3·08	39·37	54·50	3·05				t	B
Near Moose mountain, Sec. 8, Tp. 23, R. 6, west of 5th M., seam 5 feet	F	2·74	18·62	75·52	3·12				t	B
Head waters of Mill and Pincher creeks, Sec. 10, Tp. 5, R. 1, west of 5th M., seam 8 feet		1·99	20·88	61·87	15·26				t	B
Old Man river, north fork, 5 feet	S	1·75	16·35	61·54	19·86		1·530	11.32	t	B
" middle fork, 3 feet	S	3·27	26·41	50·50	19·82		1·432	11·13	t	B
" " 3 "	S	2·36	32·07	56·37	9·20		1·311	13·06	t	B
" south fork 9¾ "	F	1·93	23·23	57·50	17·34				t	B
Anthracite, Alberta Territory, H. W. McNeil & Co.—										
1st vein, raw		·10	13·09	78·94	7·87					F
" washed		·39	14·82	79·98	4·84					F
2nd vein, raw		·42	15·46	75·07	9·05					F
" washed		·40	6·02	89·40	4·18					F
3rd vein, raw		·08	15·12	76·67	8·13					F
" washed		·07	15·30	79·46	5·17					F

*† See page 18 s.

ANALYSES OF CANADIAN COALS—*Continued.*

CROW'S NEST PASS, B.C.

Seam or Mine.	Fast or slow coking.	Moisture.	Vol. Matter.	Fixed Carbon.	Ash.	Sulphur.	Spec. Gravity.	Theor. Evap. Power.	*Analyst.	†Reference.
		p. c.	p. c.	p. c.	p. c.	p. c.				
Marten creek—Peter seam, 14 ft	S	1·79	25·45	69·14	3·62	·51	1·305	14·99	*t*	B
" Jubilee seam, 30 ft.	S	1·89	24·88	68·86	4·37	·48	1·309	14.64	*t*	B
" Four seams, 3, 4, 5 and 6 ft.	S	2·10	44·41	43·63	9·86	.....	.....	....	*t*	B
" Two-foot seam	F	2·12	26·92	43·48	27·48	.....	.....	.....	*t*	B
" Middle seam, 2½ ft	F	1·82	24·55	51·22	22·41	.....	.....	.....	*t*	B
On Elk river seam, 15 feet	.....	.....	21·76	68·20	10·04	.....	.....	.....	*t*	B
Morrissey mine, No. 1—Highest seam worked; 18 ft. thick; dip, N. 21°; strike, E and W; suitable for steam.	.....	·9	22·19	70·99	5·6	.....	·32	14·346	*u*	G
Morrissey mine.—No. 2—Seam, 18 ft.; dip and strike same as above; suitable for steam and household.	.....	·82	11·73	71·5	15·75	·2	.....	12·858	*u*	G
Coal creek mine, No. 1—Seam, 8 ft.; dip, E. 15°; suitable for steam and household.	.....	·84	22·38	73·17	3·15	·46	.....	14·935	*u*	G
" No. 1—Seam, 9 ft.; dip, E. 15°; steam and household	.....	·92	18·85	64·42	15·65	·16	.....	13·757	*u*	G
" No. 2—Seam, 6 ft.; dip, E. 15°; suitable for steam and household	.....	·84	22·38	73·17	3·15	·46	.....	14·935	*u*	G
" No. 3—Same seam as above; samples taken one mile apart	.....	·92	20·63	72·05	6·0	·4	.....	14·284	*u*	G
" No. 4—750 ft. below No. 1; seam, 22 ft.; dip, E.; 10°	.....	·96	13·46	61·92	23·5	·16	.....	12·114	*u*	G
Michel Mine, No. 3—Highest seam worked, 15 to 30 ft.; used for steam and coke	.....	1·0	20·57	72·00	6·15	·28	.....	14·656	*u*	G
" No. 4—80 feet below No. 3; 10 to 30 ft.; used for steam and coke	.....	1·0	18·93	70·13	9·5	·44	.....	13·850	*u*	G

NICOLA VALLEY.

Nicola river, mouth of Coldwater river	...	2·13	27·99	59·66	10·22	...	...	...	*u*	
Coal gully, Iron mountain	...	3·35	26·55	59·30	10·30	...	...	...	*u*	

NANAIMO FIELD, B.C.

Wellington mines, Nanaimo	...	2·75	30·95	59·72	6·58	...	...	...	*t*	B
Upper seam, Nanaimo	S	38·40		51·45	10·15	...	...	...	*t*	B
Newcastle island, Nanaimo	S	1·57	30·95	58·03	8·63	0·82	...	...	*t*	B
" "	...	35·49		52·57	11·94	...	...	...	*t*	B
Esplanade, No. 1 shaft, upper seam	...	1·88	33·27	54·67	9·4	·78	...	12·672	*u*	G
" " lower seam	...	2·86	35·84	54·79	5·5	1·01	...	12·951	*u*	G
Harewood mine	...	1·58	33·84	52·17	11·85	·56	...	12·238	*u*	G
Southfield mine, No. 5	...	2·08	35·78	56·26	5·6	·28	...	13·261	*u*	G
Extension seam, bottom vein	...	1·28	35·26	55·83	7·30	·33	...	13·199	*u*	G
" top vein	...	1·24	36·49	53·72	8·20	·35	...	13·261	*u*	G
Tunnel vein, bottom seam	...	1·52	35·27	57·04	5·85	·32	...	13·416	*u*	G
" "	...	1·44	31·40	46·18	20·65	·33	...	11·401	*u*	G

COMOX FIELD, B.C.

Union Colliery	...	1·34	28.11	67·72	2·83	...	...	...	*t*	B
"	...	1·70	27·17	68·27	2·86	...	...	...	*t*	B
Baynes sound mine	...	1·18	34·13	48·51	16·18	...	...	...	*t*	B
Trent river	S	·97	25·09	66·42	5·95	1·57	...	...	*t*	B
Beaufort mine, Comox	S	29·30		55·75	14·95	...	...	...	*t*	B
Union No. 5 Pit upper seam	...	1·08	29·24	57·03	9·60	3·05	...	13·261	*u*	G
Hamilton lake	...	1·70	22·82	47·72	27·00	·76	...	10·626	*u*	G
No. 4 Slope Comox or lower seam	...	·88	27·34	61·82	8·70	1·26	...	13·881	*u*	G
No. 5 Pit " " "	...	1·32	27·62	63·64	6·70	·72	...	14·191	*u*	G
No. 6 Pit " " "	...	1·26	27·33	63·49	6·80	1·12	...	14·191	*u*	G

ANALYSES OF CANADIAN COALS—*Concluded.*

QUEEN CHARLOTTE ISLANDS, B.C.

Seam or mine.	Fast or slow coking.	Moisture.	Vol. Matter.	Fixed Carbon.	Ash.	Sulphur.	Spec. Gravity.	Theor. Evap. Power.	*Analyst.	†Reference.
		p. c.	p. c.	p. c.	p. c.	p. c.				
Cowgitz (anthracite coal)	F	1·60	6·55	83·09	8·76	.....	.....	.....	*t*	B
" Hooper creek, Skidegate Channel	F	1·99	7·65	80·62	9·74	.....	1·503	.....	*t*	B
Camp Anthracite, Sec. 17, Tp. 5	F	1·52	8·69	80·07	9·72	.....	.....	.....	*t*	B
" "	F	2·85	7·59	68·25	21 31	.....	.....	.....	*t*	B
Camp Robertson, Sec. 20, Tp. 5, Graham island, 6½ miles west of Skidegate inlet	F	·80	23·27	51·39	24·54	.....	.....	.....	*t*	B
Camp Wilson, Sec. 36 Tp. 9	F	1·06	43·48	46·01	9·45	.....	.....	.....	*t*	B
Yakoun river	S	2·65	30·59	61·33	5·43	.....	.....	.....	*t*	B
YUKON TERRITORY.										
Coal creek, or east branch of Rock creek, Klondike river	F	18·31	34·96	40.88	5·85	Coke % 46·73	.....	.....	*t*	B
" " " "	F	19·37	33·85	37·45	9·33	46·78	.....	.....	*t*	B
Cliff creek, tributary of Yukon	F	8·57	42·04	45·77	3·62	49·39	.....	.....	*t*	B
" " " "	F	10·58	40·10	46·74	2·58	49·32	.....	.....	*t*	B
Lewes river, six miles above Rink rapid	F	6·42	36.98	46·03	10·57	56·60	.....	.....	*t*	B
Ten miles west of Drydale station on White Pass and Yukon Ry	F	2·31	5·59	67·20	24·90	92·10	.....	.....	*t*	B
White Horse Coal Co., in tunnel 63 feet	.....	1·76	5·69	68·59	23·96	.....	.....	.....	*t*	
" " " top of mountain	.....	3·83	15·84	47·81	32·52	.....	.....	.....	*t*	

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No. on List of Publications.

Nova Scotia and New Brunswick.

105. Cape Dauphin district.

106. Eastern part of Sydney coal field.

113. Western part of Sydney coal field.

184. Sheet 1 (Cape North Sheet), parts of Inverness and Victoria counties. Scale 1 mile to 1 inch.

185. Sheet 2 (Aspy Bay Sheet), part of Victoria County. Scale 1 mile to 1 inch.

186. Sheet 3 (Pleasant Bay Sheet), parts of Inverness and Victoria counties. Scale 1 mile to 1 inch.

COAL. MAPS.

187. Sheet 4 (Ingonish Sheet), part of Victoria County. Scale 1 mile to 1 inch.

188. Sheet 5 (Head-waters of Cheticamp River Sheet), parts of Inverness and Victoria Counties. Scale 1 mile to 1 inch.

189. Sheet 6 (North Cheticamp Sheet), part of Inverness County. Scale 1 mile to 1 inch.

190. Sheet 7 (North Shore Sheet), part of Victoria County. Scale 1 mile to 1 inch.

191. Sheet 8 (Head-waters Margaree River Sheet), parts of Inverness and Victoria Counties. Scale 1 mile to 1 inch.

192 Sheet 9 South Cheticamp Sheet), part of Inverness County. Scale 1 mile to 1 inch.

193. Sheet 10 (Englishtown Sheet), parts of Victoria and Inverness Counties. Scale 1 mile to 1 inch.

194. Sheet 11 (Margaree Sheet), parts of Inverness and Victoria Counties. Scale 1 mile to 1 inch.

195. Sheet 12 (Baddeck Sheet), part of Victoria County. Scale 1 mile to 1 inch.

196. Sheet 13 (Middle River Sheet), parts Inverness and Victoria Counties. Scale 1 mile to 1 inch.

197. Sheet 14 (Broad Cove Sheet), part of Inverness County. Scale 1 mile to 1 inch.

198. Sheet 15 (Whycocomagh Sheet), parts of Inverness and Victoria Counties. Scale 1 mile to 1 inch.

199. Sheet 16 (Port Hood Sheet), part of Inverness County. Scale 1 mile to 1 inch.

200. Sheet 17 (Loch Lomond Sheet), parts of Richmond and Cape Breton Counties. Scale 1 mile to 1 inch.

201. Sheet 18 (River Denys Sheet), parts of Richmond and Inverness Counties. Scale 1 mile to 1 inch.

202. Sheet 19 (Judique Sheet), part of Inverness County. Scale 1 mile to 1 inch.

203. Sheet 20 (L'Ardoise Sheet), part of Richmond County. Scale 1 mile to 1 inch.

204. Sheet 21 (Saint Peter Sheet), parts of Richmond and Inverness Counties. Scale 1 mile to 1 inch.

205. Sheet 22 (Strait of Canso Sheet), parts of Inverness, Richmond, Antigonish and Guysborough Counties. Scale 1 mile to 1 inch.

206. Sheet 23 (Arichat Sheet), part of Richmond County. Scale 1 mile to 1 inch.

652. Cape Dauphin Sheet, part of Cape Breton and Victoria counties.

653. Sydney Sheet, parts of Cape Breton and Victoria counties.

654. Little Glace Bay Sheet, part of Cape Breton county.

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100. Index map of Springhill coal field.

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British Columbia, Manitoba and North-West Territories. COAL. MAPS.

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COPPER.

COPPER.

Despite the falling off in the price of copper from an average of 16·117 cents per pound in 1901 to 11·626 cents per pound in 1902, the production of this metal in Canada in 1902 shows an increase of over 2·5 per cent as compared with the previous year. The total value of the output, however, is much less, a falling off of 26 per cent.

The total production in 1902 was 38,804,289 pounds, valued at $4,511,383, and made up by provinces as follows :—

	Lbs.
Quebec and New Brunswick	1,760,000
Ontario	7,408,202
British Columbia	29,636,057
Total	38,804,259

COPPER.

Production.

TABLE 1.

COPPER.

ANNUAL PRODUCTION.*

Calendar Year.	Lbs.	Increase or Decrease.		Value.	Increase or Decrease.		Average Price per Pound.
		Lbs.	%		$	%	
				$			Cts.
1886.....	3,505,000	... .	.....	385,550	.....	.....	11·00
1887.....	3,260,424	244,576	6·99	366,798	18,752	4·86	11·25
1888.....	5,562,864	2,302,440	70·60	927,107	560,309	152·70	16·66
1889.....	6,809,752	1,246,888	22·40	936,341	9,234	0·99	13·75
1890.....	6,013,671	796,081	11·69	947,153	10,812	1·15	15·75
1891.....	8,928,921	2,915,250	48·40	1,149,598	202,445	21·37	12·87
1892.....	7,087,275	1,841,646	20·62	818,580	331,018	28·79	11·55
1893.....	8,109,856	1,022,381	14·40	871,809	53,229	6·50	10·75
1894.....	7,708,789	401,067	4·94	736,960	134,849	15·46	9·56
1895.....	7,771,639	62,850	·81	836,228	99,268	13·47	10·76
1896... ..	9,393,012	1,621,373	20·86	1,021,960	185,732	22·21	10·88
1897.....	13,300,802	3,907,790	41·60	1,501,660	479,700	46·94	11·29
1898.....	17,747,136	4,446,334	33·43	2,134,980	633,320	42·17	12·03
1899.....	15,078,475	2,668,661	15·04	2,655,319	520,339	24·37	17·61
1900.....	18,937,138	3,858,663	25·59	3,065,922	410,603	15·46	16·19
1901.....	37,827,019	18,889,881	99·75	6,096,581	3,030,659	98·84	16·117
1902.....	38,804,259	977,240	2·58	4,511,383	1,585,198	26·00	11·626

* The production is altogether represented by the copper contained in ore, matte, &c., produced and shipped valued at the average market price for the year for fine copper in New York.

Note.—In the above table, increases are shown underlined, and decreases in the ordinary way.

TABLE 2. COPPER.

COPPER.

EXPORTS OF COPPER IN ORE, MATTE, ETC. Exports.

Calendar Year.	Pounds.	Value.
		$
1885		262,600
1886		249,259
1887		137,966
1888		257,260
1889		168,457
1890		398,497
1891		348,104
1892		277,632
1893	4,792,201	269,160
1894	1,625,389	91,917
1895	3,742,352	236,965
1896	5,462,052	281,070
1897	14,022,610	850,336
1898	11,572,381	840,243
1899	11,371,766	1,199,908
1900	23,631,523	1,741,885
1901	32,488,872	3,404,908
1902	26,094,498	2,476,516

TABLE 3.

COPPER.

IMPORTS OF PIGS, OLD, SCRAP, ETC. Imports.

Fiscal Year.	Lbs.	Value.	Fiscal Year.	Lbs.	Value.
		$			$
1880	31,900	2,130	1891	107,800	10,452
1881	9,800	1,157	1892	343,600	14,894
1882	20,200	1,984	1893	168,300	16,331
1883	124,500	20,273	1894	101,200	7,397
1884	40,200	3,180	1895	72,062	6,770
1885	28,600	2,016	1896	86,905	9,226
1886	82,000	6,969	1897	49,000	5,449
1887	40,100	2,507	1898	1,050,000	80,000
1888	32,300	2,322	1899	1,655,000	246,740
1889	32,300	3,288	1900	1,144,000	180,990
1890	112,200	11,521	1901	951,500	152,274
1902 Copper, old and scrap or in blocks ....Duty free				109,600	11,878
1902 Copper in pigs or ingots ..... "				1,657,600	213,954
Total, 1902				1,767,200	225,832

COPPER.

Imports.

TABLE 4.

COPPER.

IMPORTS OF 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
1892			422,870
1893			458,715
1894			175,404
1895			251,615
1896			285,220
1897			264,587
1898			786,529
1899			551,586
1900			1,090,280
1901			951,045
1902.	Copper in bolts, bars and rods, in coils, or otherwise in lengths not less than 6 feet, unmanufactured	Duty. Free.	Pounds. 5,509,500	$ 767,315
	Copper, in strips, sheets or plates, not planished or coated, &c	"	2,252,500	307,429
	Copper tubing in lengths not less than 6 feet, and not polished, bent or otherwise manufactured	"	198,212	43,359
	Copper rollers, for use in calico printing, imported by calico printers for use in their own factories	"		13,133
	Copper and manufactures of:—			
	Nails, tacks, rivets and burrs or washers	30 p. c.		7,454
	Wire, plain, tinned or plated	15 "	603,268	93,891
	Wire cloth, &c	25 "		1,932
	All other manufactures of, N.O.P	30 "		47,009
	Total			1,281,522

New Brunswick.

NEW BRUNSWICK:

There was a small production of copper in this province by the Intercolonial Copper Company at Dorchester.

Quebec.

QUEBEC:

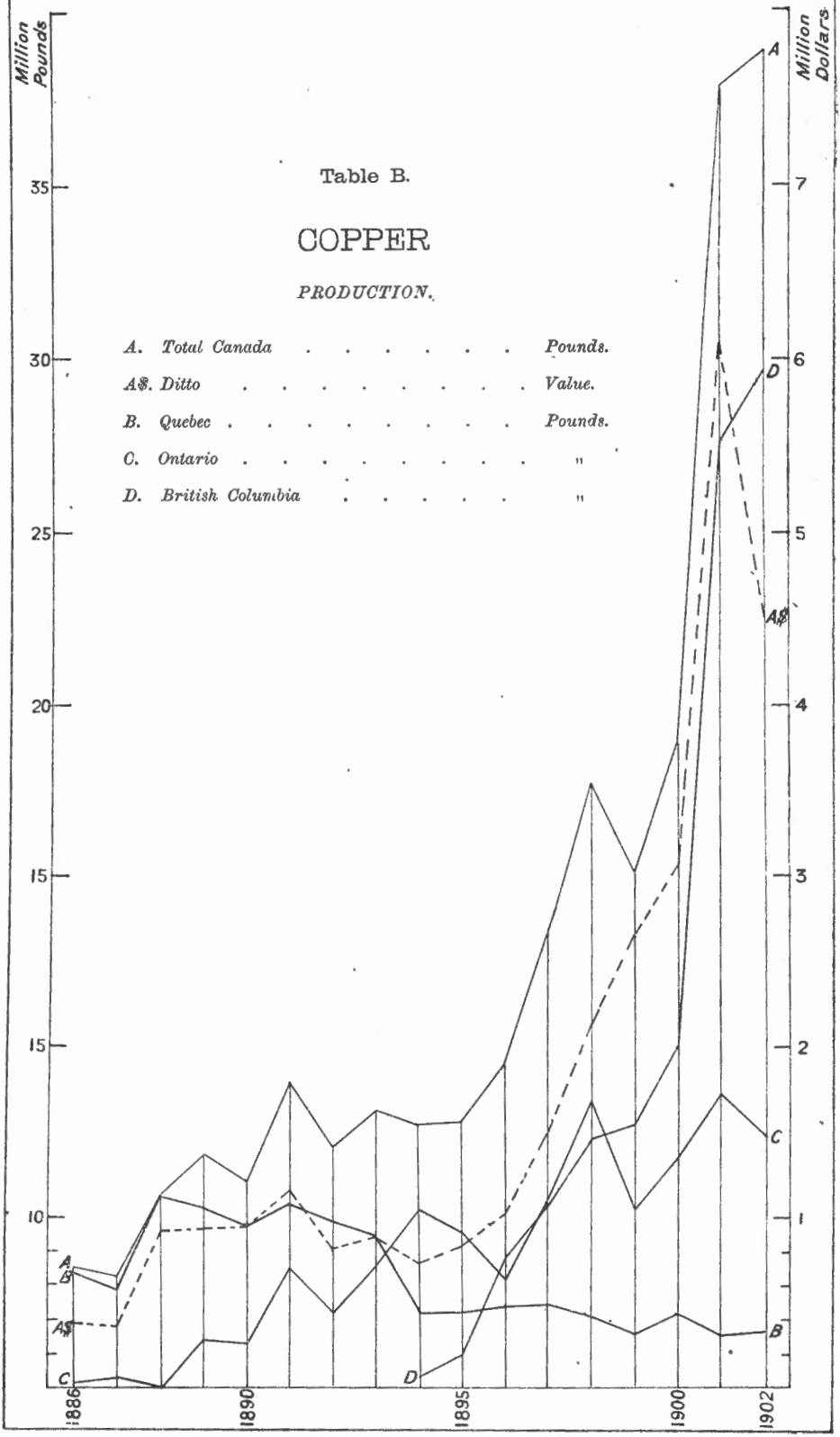
As usual the copper production in Quebec was derived from the pyrites ores of the Eastern Townships. Statistics of production since 1886 are given below.

Table B.

COPPER

PRODUCTION.

A. Total Canada . . . . . Pounds.
A$. Ditto . . . . . Value.
B. Quebec . . . . . Pounds.
C. Ontario . . . . . "
D. British Columbia . . . . . "



COPPER.

Quebec.

TABLE 5,

COPPER.

QUEBEC:—PRODUCTION.

Calendar Year.	Pounds.	Value.
		$
1886	3,340,000	367,400
1887	2,937,900	330,514
1888	5,562,864	927,107
1889	5,315,000	730,813
1890	4,710,606	741,920
1891	5,401,704	695,469
1892	4,883,480	564,042
1893	4,468,352	480,348
1894	2,176,430	208,067
1895	2,242,462	241,288
1896	2,407,200	261,903
1897	2,474,970	279,424
1898	2,100,235	252,658
1899	1,632,560	287,494
1900	2,220,000	359,418
1901	1,527,442	246,178
1902	1,640,000	190,666

Ontario.

ONTARIO:

The nickel copper ores of the Sudbury district are responsible for the major portion of the copper production in Ontario in recent years. The Canadian Copper Company and Mond Nickel Company continued to operate their several properties, while the Lake Superior Power Company carried on extensive development work at the Gertrude and Elsie mines. The total quantity of nickel copper ore mined in 1902 was 269,538 tons, while the quantity treated at the smelters was 211,847 tons. Matte produced at Mining Company's smelters was 23,211 tons of ordinary matte and 2,100 tons of Bessemer matte. Some of the ordinary matte was further treated and Bessemerized at

the Ontario Smelting Company's works at Copper Cliff. A small output of copper was also obtained from the Bruce mines. Copper. Ontario.

The total contents of copper in the ore, matte, etc., shipped, was 7,408,202 pounds, valued at $861,278, being slightly less than the output of the previous year.

Statistics of production since 1886, are given in Table 6 following:

TABLE 6.

COPPER.

ONTARIO:—PRODUCTION.

Calendar Year.	Pounds.	Value.
		$
1886	165,000	18,150
1887	322,524	36,284
1888	.....	.....
1889	1,466,752	201,678
1890	1,303,065	205,233
1891	3,527,217	454,129
1892	2,203,795	254,538
1893	3,641,504	391,461
1894	5,207,679	497,854
1895	4,576,337	492,414
1896	3,167,256	344,598
1897	5,500,652	621,023
1898	8,375,223	1,007,539
1899	5,723,324	1,007,877
1900	6,740,058	1,091,215
1901	8,695,831	1,401,507
1902	7,408,202	861,278

BRITISH COLUMBIA. British Columbia.

The production of copper in British Columbia in 1902 was 29,636,057 lbs. or 14,818 tons, an increase of 7 per cent over that of the previous year, and nearly three times the output of 1900. Owing to the lower

COPPER.

British Columbia.

price of copper in 1902, however the total value of the output for the year was less by over one million dollars than that of 1901.

Copper mining in British Columbia practically dates from 1894, and statistics of production since that year are shown in table 7.

TABLE 7.

COPPER.

BRITISH COLUMBIA—PRODUCTION.

Calendar Year.	Copper contained in ores, matte, &c.	Increase.		Value.
	Lbs.	Lbs.	%	
1894	324,680			$ 31,039
1895	952,840	628,160	193	102,526
1896	3,818,556	2,865,716	301	415,459
1897	5,325,180	1,506,624	39	601,213
1898	7,271,678	1,946,498	36	874,783
1899	7,722,591	450,913	6	1,359,948
1900	9,977,080	2,254,489	29	1,615,289
1901	27,603,746	17,626,666	177	4,448,896
1902	29.636,057	2,032,311	7	3,445,488

The production by districts for the last three years was as follows:

	1900.	1901.	1902.
Cassiar			6,258
East Kootenay	2,147	3,272	8,048
West Kootenay—			
Ainsworth			9,537
Nelson	36,929	1,599,449	491,144
Trail Creek	2,071,865	8,333,446	11,667,807
All other			1,000
Yale—			
Boundary	5,672,177	14,511,787	14,955,582
Ashcroft, Kamloops		39,920	
Coast districts	2,193,962	3,115,872	2,496,681
	9,977,080	27,603,746	29,636,057

The following short report giving the result of an investigation of one of Canada's best known copper districts is reproduced from the Summary Report of the Geological Survey Department for 1902.

COPPER.

Bruce mines district.

GEOLOGY OF THE BRUCE MINES DISTRICT.

At the beginning of June 1902 field work was begun in the Bruce Mines District, Algoma, Ontario. Mr. Theo. Denis accompanied Mr. E. D. Ingall, who had charge of making a study and a detailed map of an area some twenty miles square, embracing a district which is important from an economic standpoint, on account of the attention now being given to its copper deposits, and also from the presence of iron ore. The area comprises the townships of Plummer, Johnson, Tarbutt, Laird, McDonald, Meredith, Aberdeen, Kehoe, McMahon, Chesley additional and a portion of the Garden river Indian reserve. The object was to study, as far as conditions allowed, the relation of the mineral deposits to the inclosing rocks and their modes of occurrence; also to verify and correct the geological mapping as given in the atlas accompanying the Geology of Canada of 1863. Mr. E. D. Ingall undertook the careful study of limited mineralized areas, investigating their lithology, the manner of deposition and the exploitation of their mineral deposits in detail, and to Mr. Denis was assigned the work of the mapping of the general distribution of the rocks of the district and the topography required for the construction of a map. As there were no maps of the district available, on a convenient scale, the greater part of the season was devoted to topographical work. All the roads were surveyed with micrometer and railroad compass, some 250 miles being covered. The rock-exposures along these roads were also located, thus affording a good skeleton of the geology, which however, requires additional work to fill in the gaps before completing the map. Towards the end of the season, Mr. Denis joined Mr. Ingall and assisted in carrying out the investigations at the several points which had been chosen for detailed geological work.

The district under consideration, forms part of the typical Huronian area, studied and mapped out by Alex. Murray in the early days of the Geological Survey of Canada. The map, on a scale of eight miles to the inch, in the atlas which accompanies the Geology of Canada, 1863, gives a good idea of the general distribution of the rocks; but as the material for the construction of the map was gathered at a time when the country was bush-covered and travelling through it difficult, it can be easily understood that the geological lines require correction in places, in the light of later observations carried out under more favourable conditions.

COPPER.

Bruce mines district.

The sequence of the rocks of the Huronian series, as observed by Murray, together with his descriptions, will be found in the Geology of Canada, 1863, but since then, some of the members of the series have been the object of more thorough investigation. One of the prominent features of the formation is the 'slate conglomerate," which has been divided in the Geology of Canada into two members, the lower and the upper. The aggregate thickness of this rock has been estimated by Murray to be over 4,000 feet. It is similar to the 'breccia conglomerate' of the Temiskaming region, which has been the subject of thorough investigation by Dr. Barlow of this department. This is well described in his report on the Temiskaming region. (Ann. Rep. of the Geol. Surv. vol. X. pt. I.) Dr. Barlow believes it to have had a pyroclastic origin. The following is an abstract of his description. 'The rock is composed of a groundmass or matrix in which are embedded pebbles and fragments of biotite granite or granitite, hornblende granite, diabase diorite, &c. These vary greatly in size from small grains to boulders of fifteen inches in diameter and even larger. They are very unevenly distrbuted throughout the groundmass, sometimes in aggregates, the individuals being very close together, whereas in other places they are very sparsely disseminated, leaving between them wide interspaces of the groundmass. The granitite fragments are by far the most abundant. This material is usually of a pink colour and coarse in texture. A thin section prepared from one of the pebbles shows the rock to be greatly decomposed and to consist of orthoclase, which predominates, with plagioclase and microcline. The feldspar is much decomposed, consequently turbid and filled with sericite, epidote and calcite; the bi-silicates are almost entirely altered to chlorite. The quartz is of the ordinary granitic variety; it has a somewhat wavy extinction, but does not show other proofs of having undergone great strain. Hornblende and biotite were probably originally present but have been totally altered to chlorite.'

The other rocks represented by pebbles in the groundmass have also been studied; the diabase fragments are fine-grained and show much decomposition. There are also present fragments of greatly crushed and stretched felspathic quartzite.

The matrix or groundmass in which these pebbles and fragments are embedded was found by Dr. Barlow to consist mainly of granitic debris, the fragments as a rule being simple minerals with angular or irregular outlines, indicating that they were not subjected to the trituration usually shown by constituents of ordinary clastic rocks. The minerals represented, as a rule, are orthoclase, plagioclase, microcline,

with chlorite, sericite, epidote and zoisite, as well as magnetite, ilmenite and pyrite; quartz is also present, frequently showing pronounced uneven extinction. COPPER. Bruce mines district.

This breccia conglomerate is underlain by a series of quartzites, felspathic in character, the textures of which vary considerably from very fine grained, in places vitreous quartzites, to coarse grained, almost conglomeratic in appearance. Overlying the breccia conglomerate is another group of quartzites, the lower members of which are also felspathic. This arkose character gradually disappears and the upper members are vitreous non-felspathic quartzites ranging in colour from dark purple to perfectly white, containing in one case the red jasper pebbles which give rise to the red jasper conglomerate.

This series of quartzites overlying the breccia conglomerate has been divided into several individual members by Murray, who has mapped out their distribution with sharp boundaries. These contacts in the field, wherever observed last summer, were however not found to be very well defined, but seen to be more of the nature of a merging of the rocks into one another, the character of the strata changing gradually.

The district is traversed by belts of igneous rocks which differ greatly in importance, varying from quite small areas to others many square miles in extent. The different areas vary considerably also both in mineral constitution and texture. They are mentioned in the 'Geology of Canada,' but are not defined on the map of the Huronian region which accompanies it. As the mineral deposits of the district seem to be largely connected with these rocks, it would be important to delimit them and study them more closely than could be done in the general examination made of the district. As a beginning towards this, some forty thin sections of specimens collected last summer are being made and will be examined as soon as they arrive.

These igneous rocks are referred to in the Geology of Canada as overflows. Although the definite conclusion as to their being so or not cannot be arrived at without more field investigation, yet the evidence gathered so far would certainly in most cases assign to them an intrusive rather than an overflow character.

The region has received attention chiefly on account of occurrences of copper ores, although some properties have been prospected for iron ores. The copper occurs in the form of sulphides, the common ore being chalcopyrite. Bornite occurs intermixed with the chalcopyrite in the ore, especially in the surface zone.

COPPER.

Bruce mines district.

Within the area examined, the points at which most work hrs been done and which were therefore selected for especial studies of the mode of occurrence of the copper ores were The Bruce, Wellington and Huron Copper Bay, the Rock Lake, the Cameron and the Richardson mines. Besides these, a number of other properties were examined where only surface prospecting had been done.

By far the most extensive developments made are those of the mines in the vicinity of Bruce Mines on the shore of Lake Huron, about thirty five miles east of Sault Ste. Marie, Ontario.

Although these mines were recently reopened, their history dates back over half a century, work having been commenced in 1846. The mines are situated on a group of veins whose outcroppings showing first on the shore at a point about a mile east of the dock at Bruce Mines, have been traced for over a mile and a half in a general north-westerly direction to the limit of the workings of the Huron Copper Bay mine.

The veins are unquestionably fissures in an extensive area of, 'green-stone.' The final decision as to the exact nature of this igneous mass and its relationship to the surrounding sedimentaries is a matter requiring further work in the field and microscopic examinations of the rock specimens brought in. However as the result of a preliminary examination of a couple of thin sections by Dr. A. E. Barlow, petro-grapher to the department, the rock would appear to be uralite dia-base. A number of dykes of a more compact diabase cut both the general mass of the older rock and the series of veins.

The area of diabase above mentioned shows a width in a northerly and southerly line of about a mile from the shore line to where the sedimentary rocks of the series first appear. No boundaries were located to its extension east and west, as it passed outside of the area under study. The large islands closing in the mouth of Bruce Mines bay are also ' greenstone,' but the shores of the western end of the bay being drift covered it could not be determined whether or not they connect with the main area of the mainland to the north. There seems to be a possibility that a belt of quartzite may intervene which has determined the erosion of the hollow now forming the bay.

On the northern side this greenstone is followed by quartzite with which is associated a thin bed of impure limestone. Near the westerly working of the Huron Copper Bay mine this limestone bed seems to be cut off abruptly by the greenstone, although the actual contact must be in the low ground intervening between the exposed

surfaces of the two rocks. The limestone can be traced pretty continuously in a easterly direction to the edge of the area examined. Only at one place however is the actual contact exposed, a wide stretch of drift intervening as a rule. At the point above mentioned the contact seems to be distinctly an intrusive one, tongues of the greenstone cutting the limestone. Much more precise exploration would be required however to decide whether these represented tongues of a dyke cutting both rocks, and younger than both or whether thereby the intrusive nature of the whole mass is to be considered proved. Passing easterly from this point, which is near the road between the village and the Canadian Pacific Railway station, it is found that a comparatively thin bed of red and dark brown quartzites intervenes between the greenstone, and the limestone, the latter showing as a little ridge. Between this ridge and the rock exposures of slate conglomerate along the railroad, about half a mile to the north, the section is practically all drift-covered in the vicinity of the road. Search would have to be made therefore in the bush-covered land east and west of this point for more continous exposures in order to work out the actual succession of the sedimentaries lying to the north of the igneous area in which the mines lie.

COPPER
Bruce mines district.

Without attempting to settle these yet outstanding questions the main features of the economic deposits at this point may be summed up as presenting a series of large fissure veins cutting an extensive mass of 'greenstone,' the latter being bounded on the south by the waters of Lake Huron and on the north by the quartzites, limestone and slate conglomerates of the Huronian series.

In an easterly direction the southern limit of the greenstone is shown toward the bottom of the eastern lobe of Bruce Mines bay, where the white quartzite of Murray's map comes in. The quartzite is continuous along the eastern shore of the bay, where, however, it is seen to be cut by numerous basic dykes.

The sedimentaries of the series are seen everywhere in the vicinity of this group of mines to dip at low angles toward the north. Along the shore of Lake Huron, however, westerly from Bruce Mines bay, the dip is southerly, exhibiting thus the order side of the anticlinal fold described and mapped by Murray.

The veins worked in this group of mines consist, as previously stated, of fissures. They carry the copper in the form of different sulphides, chiefly chalcopyrite, in a gangue of quartz. At places the gangue is partly dolomitic, but the former mineral is very largely predominant as

COPPER.

Bruce mines district.

evidenced by the material of the waste piles around the workings. Near their outcrops, the veins are said to have carried a higher percentage of copper than below, owing to the presence of bornite and other rich sulphides of the metal. The presence of these minerals is probably due, as would elsewhere appear, to secondary enrichment.

A preliminary examination of the lower levels of the Wellington and Huron Copper Bay workings showed chalcopyrite with some pyrite disseminated through a gangue of white quartz. In the Wellington and Huron Copper Bay mines, the veins have been worked out to great widths, excavations often reaching widths of 25 to 30 feet. Of course there are many places where the veins narrowed down to not more than four feet in thickness, but ten feet might perhaps be accepted as an average of the thickness all the way through. At the old Bruce mine the veins are seen to be narrower and in the main workings would not average possibly more than five feet.

The totel length attained in the Bruce workings would measure about 2,000 feet, whilst the combined length of the Wellington and Huron Copper Bay mines would measure nearly 2,500 feet. The workings at the Bruce attained depths of 250 to over 300 feet and at the Wellington the average of the depth attained in the workings would be about the same although Bray's shaft was put down to about 1,060 feet. The area of the veins stoped out, as shown on the old plans, would measure approximately as follows, viz :—At the Bruce Mine about 225,000 square feet which, assuming a depth of 300 feet for the mine, would represent a length of say 750 feet of vein excavated. At the Wellington, etc., a total measurement is shown of about 600,000 square feet, which would represent for a depth of say 300 feet, an equivalent in length of 2,000 feet. In both cases, it must be born in mind that these represent workings on two main veins close together and parallel to each other as worked in these two mines. In the Wellington &c., mines, these were known as the New Lode and Fire Lode. They paralleled each other for about 1,300 feet, but joined together to form a single vein at the east and western ends on the workings.

The westerly part of the Bruce workings are situated on the main lode and its branches for about 1,300 feet, whilst east of this, for about 600 feet, the chief excavations are on two veins, known as the Trial and Dodge veins. A good deal of prospecting work was done on minor veins and branches in the vicinity of these two chief mines, and also in veins which outcrop in the 4,000 feet of distance intervening between the Bruce and Wellington workings, but much more develop-

ment will need to be done before the question as to the practical continuity of the series of fissures and their profitable nature can be settled. An excavation called Taylor's shaft, from which it was said some test drifts were run, was sunk about midway of the distance between the two mines, but no details are available as to the results attained. The particulars given above refer to the work done during the first period of the history of these mines by the West Canada Copper Company and its predecessors. The period ended with the final cessation of work in 1876. When this company was working at its strongest it employed as many as 380 men, and for the period of years from 1858 to 1875 produced about 37,378 long tons of concentrates having a total content of nearly 7,500 long tons of copper, valued at over $2,900,000, The average price received for the copper during this whole period of eighteen years would thus be somewhat over 17 cents per pound. Since 1858, however, the price of this metal has fallen off considerably. In that year the company obtained an average of 21 cents per pound for its copper, whereas the figures for 1875 show an average value for their product of less than 16 cents per pound. When the present company bought the mines a few years ago it reopened them and some further work was done, of which, however, we have as yet no complete data. At present nothing is being done other than to keep the plant and mines in order. In connection with the operations of the present company, the mines have been fully re-equipped with modern machinery for mining and ore-dressing, the mill having a capacity of 400 tons per day. As it is intended to give full particulars of this important group of mines in the complete report to follow later, nothing further need be stated here.

COPPER.

Bruce mines district.

The final failure of the first attempt to work these mines seems to have been due to a variety of causes, many of which have ceased to be operative with the progress of opening up of the district, and it becomes a question as to whether successful work could not again be carried on with careful management and the improved plant and methods available.

The Rock Lake mine is situated some fourteen miles north of Bruce Mines village. It is equipped with a complete mining plant, including hoists, air compressor, drills, etc., and with a mill with a capacity of 100 to 125 tons per 24 hours. The latter is situated on the shore of Rock lake, nearly two miles west from the main shaft with which it is connected by a tramway. Transportation is afforded from the mill by the Bruce Mines and Algoma Railroad, which connects with the Canadian Pacific Railway at Bruce Mines station, with an extension to the lake shore at Bruce Mines village.

COPPER.

Bruce mines district.

The ore consists of chalcopyrite with some bornite, &c., in a gangue consisting mostly of white quartz with which is intermixed at places a good deal of ankerite, the ochreous decomposition product of the latter constituting a marked feature of the outcroppings at places. The developments made are situated along what appears to be a shattered zone at the contact of the red quartzite and the 'upper slate conglomerate' of Murray. The quartzite proper extends for a width across the strike of about a mile southerly, and the 'slate conglomerate,' etc., about an equal distance northerly. The workings are situated along a narrow subsidiary valley about half way up and running lengthwise of the hills of slate conglomerate flanked with quartzite which rise to a height of some 400 or 500 feet above the level of Rock lake. In the vicinity of the mine buildings and main workings the width of the zone of shattered quartzite exposed is from 500 to 700 feet. Passing northward, this is followed by a belt of green schistose rock, showing a width of outcrop of about 400 feet. For about 400 feet further there are no rock exposures until the foot of the northern ridge is reached, where the typical 'slate conglomerate' emerges abruptly from beneath the cover. This belt exhibits the characteristic features elsewhere found of well rounded pink boulders and pebbles of granitic rock, &c., scattered throughout a dark greenish-grey matrix of slaty appearance.

The veins worked in the main shaft and connected workings are in the schistose belt. Other less extensive workings to the south of these are in veins in the shattered quartzite zone. It seems probable that the schistose belt above mentioned represents merely a portion of the 'slate conglomerate' in which schistosity has been developed by the disturbing force that at the same time produced the series of veins and shattered the adjacent quartzite.

The general dip of the formation is southerly about 25° although near the mill there is evidence of a somewhat steeper dip in the flanking quartzite, followed in ascending the hill northward by a flat anticlinal and synclinal fold before reaching the main ridge of slate conglomerate.

A comparatively small dyke of greenstone, measuring from 100 to 150 feet in width runs with a general north-westerly strike roughly parallel with the general trend of the veins. It lies about 100 feet to the south of the main shaft, and at the west end passes close to the north side of the mile. The developments made up to October, 1902, consisted of the main shaft and workings together with a considerable amount of surface development for a distance of some 1,500 feet east and

a number of test pits, &c., along the same general direction westerly for about a mile and a half. At the most of these points ore has been exposed showing chalcopyrite desseminated through a quartz or quartz and ankerite gangue. Of the relationships of the veins to those worked in the main shaft, nothing could be definitely stated without still further detailed mapping and study, owing to the disturbed condition of the formation previously alluded to. COPPER Bruce mines district.

The main shaft, which is practically vertical, at the date of the last visit made had attained a depth of 400 feet. From it, levels had been driven east and west at depths of 100 feet and 200 feet, testing the vein for a length of nearly 600 feet. At the bottom of the shaft a small crosscut to the south reached the main vein at about 35 feet, which had been followed west in a drift for about 30 feet. The ore mined was being taken from above the second level, the stopes exhibiting a width of about 20 feet.

Apart from the small dyke already mentioned, the only intrusive rocks anywhere in the vicinity are represented by two considerable ranges of greenstone traversing the sedimentaries at distances of half a mile north and south of the mine respectively and with a general trend parallel to that of the formation.

About two and a half miles north-east from Desbarats station on the Canadian Pacific Railway (Algoma branch) is the mine known as the Cameron or Stobie. At this place a fissure vein is seen cutting a ridge of red quartzite. On this vein a shaft has been sunk some 150 feet in depth from which, at 100 feet down, have been run drifts east and west totalling in length about 150 feet. The outcropping of the vein to the east of the shaft is not visible, being covered, but it has been stripped west of the shaft for a distance of 150 feet, where it runs under the deep soil of the adjacent farming land of the valley. Seventeen hundred feet further west on the rocky ridges opposite the mine, small surface working have also shown the existence of ore. These are roughly on the strike of the Cameron mine vein, but whether they are to be taken as representing its actual extension or not is doubtful. The outcroppings near the shaft show a composite vein of about four feet in width, the ore being chalcopyrite in a gangue of white quartz. Some specimens show plainly surface change of the chalcopyrite to bornite. The vein in the workings shows a dip of 75° to the south and a width at places of about 12 feet made up of subordinate branches with 'horses' of quartzite.

Following the quartzite ridge southerly for about 700 feet, several small greenstone dykes cut across the quartzite in a direction roughly

COPPER.

Bruce mines district.

parallel to that of the vein. About 600 feet north-easterly from the shaft a coarser greenstone outcrops in one or two places, about on the run of a belt of the same rock visible in the ridges on the other side of the valley, where it shows a width of at least 125 feet. If this belt is actually continuous underneath the soil of the valley, it would thus pass about 400 feet north of the vein and with a course generally parrallel to it, whilst the smaller dykes before mentioned would probably represent tongues connected witn it. The mine is equipped with power drills, hoist and pumps suitable for carrying on development work.

The workings known as the Richardson mine are situated about two miles and half north of Desbarats village near the south-east end of Desbarats lake. These consist of a small prospecting shaft and a number of shallow pits and trenches extending over a distance of about three-quarters of a mile along the strike of a series of greenstone dykes which cut the jasper conglomerate of the sedimentary series. The evidences of the intrusive nature of the greenstone are here very marked, long narrow strips and lenses of the jasper conglomerate being included in the igneous mass. Some of the mining work done here is altogether in the greenstone, as in the case of the before mentioned shaft. Here, as so frequently observable elsewhere in the district, the rock is much decomposed and the resulting ochreous material has stained it, giving a very tempting ferruginous appearance, whilst in the jointing, etc., it has at times consolidated to form fairly good hematite ore. Most of the trenching and test pitting east of this shaft has evidently been done with a view to the examination of the contacts along these inclusions of jasper conglomerate. At all the points uncovered, the ochreous material and stain were much in evidence and at some points a little chalcopyrite with malachite stain show the presence of copper in small quantity.

The Stobie iron mine is amongst the older discoveries of the district. It is situated near the western end of Gordon lake. The openings made consist of a rock-cut in a ridge of white quartzite, run in to catch a small vein of hematite averaging about five feet in width at the outcrop. In the face of the bluff the vein in going upward splits into two branches, each about three feet thick. On the bare rock surface of the top of the ridge it seems to be represented only by a number of small stringers of ore. From the end of the open cut, a tunnel has been run in, but this is now closed by a cave-in at a distance of about 30 feet from the mouth.

It is said that several thousand tons of good ore were shipped from this opening many years ago, a statement which is borne out by the

existence of a stope above the tunnel, measuring about 80 feet in length by 50 feet in height, and having a width varying from 3 to 8 feet. COPPER. Bruce mines district.

The quartzite has a strike at this point of N. 55° W., and dips about 45° to the south at the bottom of the ridge, curving over, however, till the dip flattens out to about 20° on top. About a quarter of a mile to the north, an east and west ridge of greenstone rises up, representing evidently an intrusion through the quartzites.

At a number of other points in the district exploratory work has been done on ferruginous outcroppings of a somewhat similar nature, either in the greenstone or in the inclosing rocks near the contact. These places show all grades of material from ochreous stained rock to the consolidated ochreous product constituting specimens of good hematite. At none of the points visited, however, had any large bodies of iron ore been proved to exist.

GRAPHITE.

GRAPHITE.

The production of graphite in 1902, including crude and manufactured products, was according to returns received 1,095 tons valued at $28,300. This output was derived from the operation of the Canada Paint Co. at their mine near Fairville station, New Brunswick, the North American Graphite Company at Buckingham, Que., and the Ontario Graphite Co. at the Black Donald mine, Brougham township, Renfrew county, Ontario.

Statistics of production, exports and imports are given in the following tables:—

GRAPHITE.

Production.
Exports.

TABLE 1.

GRAPHITE.

ANNUAL PRODUCTION.

Calendar Year.	Tons.	Value.
1886	500	$4,000
1887	300	2,400
1888	150	1,200
1889	242	3,160
1890	175	5,200
1891	260	1,560
1892	167	3,763
1893	nil.	nil.
1894*	3	223
1895	220	6,150
1896	139	9,455
1897	436	16,240
1898		13,698
1899	1,130	24,179
1900	1,922	31,040
1901	2,210	38,780
1902	1,095	28,300

* Exports.

TABLE 2.

GRAPHITE.

EXPORTS.

Calendar Year.	Value.	Calendar Year.	Value.
1886	$ 3,586	1895	$ 4,833
1887	3,017	1896	9,480
1888	1,080	1897	4,325
1889	538	1898	13,098
1890	1,529	1899	22,490
1891	72	1900	46,197
1892	3,952	1901	35,102
1893	38	1902	24,839
1894	223		

		Cwt.	
1902	Crude	17,722	$23,097
	Manufacturers of		1,742
			$24,839

TABLE 3.

GRAPHITE.

IMPORTS OF RAW AND MANUFACTURED GRAPHITE.

GRAPHITE. Imports.

FISCAL YEAR.		Duty.	Plumbago.	Manufactures of plumbago.	
				Black-lead.	Other Manufactures.
1880			$1,677	$18,055	$2,738
1881			2,479	26,544	1,202
1882			1,028	25,132	2,181
1883			3,147	21,151	2,141
1884			2,891	24,002	2,152
1885			3,729	24,487	2,805
1886			5,522	23,211	1,408
1887			4,020	25,766	2,830
1888			3,802	7,824	22,604
1889			3,546	11,852	21,789
1890			3,441	10,276	26,605
1891			7,217	8,292	26,201
1892			2,988	13,560	23,085
1893			3,293	16,595	23,051
1894			2,177	17,614	16,686
1895			2,586	13,922	21,988
1896			2,865	18,434	19,497
1897			1,406	17,863	20,674
1898			1,862	19,638	32,653
1899			4,979	21,334	36,490
1900			4,437	22,078	38,440
1901			2,357	25,646	49,890
1902	Plumbago, not ground, &c.	10 p.c.	$3,649		
	Black-lead	25 "	.....	$20,467	
	Plumbago, ground and manufactures of N.E.S..	25 "	.....	.....	$15,021
	Crucibles, clay or plumbago	.....	.....	.....	28,635
	Total, 1902	.....	$3,649	$20,467	$43,656

GYPSUM.

GYPSUM.

The production of gypsum, plaster of Paris, etc., in Canada in 1902, reached a total of 333,599 tons valued at $379,479, or an average of $1.14 per ton. Compared with the previous year the output shows an increase of 38,246 tons or 13 per cent in quantity and $19,129 or over 5 per cent in value.

GYPSUM.

Production.

The production was made up as follows:—

—	Tons.	Value.	Value per Ton.
Crude gypsum	316,225	$280,662	$ 0 89
Calcined and land plaster	4,841	28,379	5 86
Plaster of Paris and terra alba	12,533	70,438	5 62
	333,599	$379,479	$ 1 14

The province of Nova Scotia is the most important producer, with an output of 206,087 tons which is practically all crude gypsum. New Brunswick ranks next in importance, with an output of 124,041 tons, a large part of which is plaster of Paris. In Ontario and Manitoba the production was 1,917 tons and 1,554 tons respectively, gypsum having been mined in the latter province during the past two years only.

Statistics of production, exports and imports, are given in the following tables:—

TABLE 1.

GYPSUM.

ANNUAL PRODUCTION.

Calendar Year.	Tons.	Value.	Average price per ton.
1886	162,000	$178,742	$ 1 10
1887	154,008	157,277	1 02
1888	175,887	179,393	1 01
1889	213,273	205,108	0 96
1890	226,509	194,033	0 86
1891	203,605	206,251	1 01
1892	241,048	241,127	1 00
1893	192,568	196,150	1 02
1894	223,631	202,031	0 90
1895	226,178	202,608	0 89
1896	207,032	178,061	0 86
1897	239,691	244,531	1 02
1898	219,256	232,515	1 06
1899	244,566	257,329	1 05
1900	252,101	259,009	1 02
1901	293,799	340,148	1 16
1902 Nova Scotia	206,087	181,425	0 88
1902 New Brunswick	124,041	170,153	1 37
1902 Ontario	1,917	7,699	4 02
1902 Manitoba	1,554	20,202	13 00
Total, 1902	333,599	379,479	1 14

TABLE 2.

GYPSUM.

PRODUCTION ACCORDING TO GRADE OF PRODUCT.

CALENDAR YEAR.	CRUDE GYPSUM.			CALCINED AND LAND PLASTER.			PLASTER OF PARIS AND TERRA ALBA.		
	Tons.	Value.	Value per Ton.	Tons.	Value.	Value per Ton.	Tons.	Value.	Value per Ton.
		$	$ c.		$	$ c.		$	$ c.
1897.....	228,416	187,918	0 82	1,956	4,753	2 43	9,319	51,860	5 62
1898.....	208,061	174,445	0 84	1,583	4,574	2 89	9,612	53,496	5 57
1899.....	233,819	198,831	0 85	717	2,246	3 13	10,030	56,252	5 61
1900.....	240,970	200,323	0 83	1,523	4,806	3 15	9,608	53,880	5 60
1901.....	280,286	236,877	0 84	3,139	14,574	4 64	10,374	88,697	8 55
1902.....	316,225	280,662	0 89	4,841	28,379	5 86	12,533	70,438	5 62

TABLE 3.

GYPSUM.

ANNUAL PRODUCTION BY PROVINCES.

CALENDAR YEAR.	NOVA SCOTIA.		NEW BRUNSWICK.		ONTARIO.		MANITOBA.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
		$		$		$		$
1887.. ...	116,346	116,346	29,102	29,216	8,560	11,715		
1888	124,818	120,429	44,369	48,764	6,700	10,200		
1889.....	165,025	142,850	40,866	49,130	7,382	13,128		
1890.....	181,285	154,972	39,024	30,986	6,200	8,075		
1891.....	161,934	153,955	36,011	33,996	5,660	18,300		
1892	197,019	170,021	39,709	65,707	4,320	5,399		
1893.....	152,754	144,111	36,916	41,846	2,898	10,193		
1894.....	168,300	147,644	52,962	48,200	2,369	6,187		
1895 ..	156,809	133,929	66,949	63,839	2,420	4,840		
1896	136,590	111,251	67,137	59,024	3,305	7,786		
1897.....	155,572	121,754	82,658	118,116	1,461	4,661		
1898.....	132,086	106,610	86.083	121,704	1,087	4,201		
1899.....	126,754	102,055	116,792	151,296	1,020	3,978		
1900.....	138,712	108,828	112,294	145,850	1,095	4,331		
1901.....	170,100	136,947	121,595	189,709	1,504	5,692	600	7,800
1902	206,087	181,425	124,041	170,153	1,917	7,699	1,554	20,202

GYPSUM.

Exports.

TABLE 4.

GYPSUM.

EXPORTS OF CRUDE GYPSUM.

Calendar Year.	NOVA SCOTIA.		NEW BRUNSWICK.		ONTARIO.		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	87,720	87,590	4,925	6,616	120	$ 180	92,765	94,386
1877	106,950	93,867	5,030	5,030	.....	.....	111,980	98,897
1878	88,631	76,695	16,335	16,435	489	675	105,455	93,805
1879	95,623	71,353	8,791	8,791	579	720	104,993	80,864
1880	125,685	111,833	10,375	10,987	875	1,240	136,935	124,060
1881	110,303	100,284	10,310	15,025	657	1,040	121,270	116,349
1882	133,426	121,070	15,597	24,581	1,249	1,946	150,272	147,597
1883	145,448	132,834	20,242	35,557	462	837	166,152	169,228
1884	107,653	100,446	21,800	32,751	688	1,254	130,141	134,451
1885	81,887	77,898	15,140	27,730	525	787	97,552	106,415
1886	118,985	114,116	23,498	40,559	350	538	142,833	155,213
1887	112,557	106,910	19,942	39,295	225	337	132,724	146,542
1888	124,818	120,429	20	50	670	910	125,508	121,389
1889	146,204	142,850	31,495	50,862	483	692	178,182	194,404
1890	145,452	139,707	30,034	52,291	205	256	175,691	192,254
1891	143,770	140,438	27,536	41,350	5	7	171,311	181,795
1892	162,372	157,463	27,488	43,623	.....	.....	189,860	201,086
1893	132,131	122,556	30,061	36,706	.....	.....	162,192	159,262
1894	119,569	111,586	40,843	46,538	.....	.....	160,412	158,124
1895	133,369	125,651	56,117	67,593	.....	.....	189,486	193,244
1896	116,331	109,054	64,946	77,535	.....	.....	181,277	186,589
1897	122,984	116,665	66,222	80,485	.....	.....	189,206	197,150
1898	99,215	93,474	70,399	81,433	.....	.....	169,614	174,907
1899	104,795	99,984	96,831	108,094	*½	12	201,626	208,090
1900	.....	.....	.....	.....	.....	.....	188,262	201,912
1901	.....	.....	.....	.....	.....	.....	236,247	231,594
1902	.....	.....	.....	.....	.....	.....	289,600	295,215

*Exported from British Columbia.

TABLE 5.

GYPSUM.

EXPORTS OF GROUND GYPSUM.

Calendar Year.	Nova Scotia.	New Brunswick.	Ontario.	Total.
	$	$	$	$
1890	.....	.....	.....	105
1891	.....	.....	.....	588
1892	.....	.....	.....	20,255
1893	.....	.....	.....	22,132
1894	2,124	17,930	.....	20,054
1895	3,364	18,827	42	22,233
1896	1,270	19,246	751	21,267
1897	1,655	5,024	84	6,763
1898	1,548	4,900	.....	6,448
1899	205	7,898	20	8,123
1900	.....	.....	.....	19,834
1901	.....	.....	.....	15,337
1902	.....	.....	.....	5,101

TABLE 6.

GYPSUM.

IMPORTS OF GYPSUM, ETC.

GYPSUM.

Imports.

Fiscal Year.	Crude Gypsum.		Ground Gypsum.		Plaster of Paris.	
	Tons.	Value.	Pounds.	Value.	Pounds.	Value.
1880	1,854	$3,203	1,606,578	$ 5,948	667,676	$ 2,376
1881	1,731	3,442	1,544,714	4,676	574,006	2,864
1882	2,132	3,761	759,460	2,576	751,147	4,184
1883	1,384	3,001	1,017,905	2,579	1,448,650	7,867
1884	.....	3,416	687,432	1,936	782,920	5,226
1885	1,353	2,354	461,400	1,177	689,521	4,809
1886	1,870	2,429	224,119	675	820,273	5,463
1887	1,557	2,492	13,266	73	594,146	4,342
1888	1,236	2,193	106,068	558	942,338	6,662
1889	1,360	2,472	74,390	372	1,173,996	8,513
1890	1,050	1,928	434,400	2,136	693,435	6,004
1891	376	640	36,500	215	1,035,605	8,412
1892	626	1,182	310,250	2,149	1,166,200	5,595
1893	496	1,014	140,830	442	552,130	3,143
1894	.....	1,660	23,270	198	422,700	2,386
1895	603	960	20,700	88	259,200	1,619
1896	1,045	848	64,500	198	297,000	2,000
1897	.....	772	45,000	123	969,900	4,489
1898	1,147	1,742	35,700	293	329,600	2,025
1899	325	692	33,900	338	496,300	3,120
1900	77	958	6,300	69	849,100	6,492
1901	286	1,125	65,400	1,097	502,200	3,978
1902	541	1,697	*56,700	249	475,300	2,641

*Equivalent to 189 barrels.

Crude gypsum, duty free. Ground gypsum, duty 15%. Plaster of Paris, duty 12½c. per 100 lbs.

IRON.

IRON.

Iron ore.—It is estimated that 404,003 tons of iron ore were mined and shipped from Canadian mines in 1902. The output in 1901 was 313,646 tons shewing an increase in 1902 of 90,357 tons or 28·8 per cent. Increased operations at the Helen mine Michipicoten, is again responsible for the greater part of the increase. ORE.

The production by provinces is given in Table 1 following: In Nova Scotia iron ores were mined at Bridgeville, Pictou county. In Quebec, the bog ores of the counties of Champlain, St. Morice, Joliette, Nicolet, Drummond and Vaudreuil were utilized. In Ontario the Helen mine above mentioned supplied much the greater part of the output, smaller

IRON. Ore.

amounts being obtained along the line of the Kingston and Pembroke and the Central Ontario Railways. British Columbia has not as yet been a large producer of iron ore. Small quantities have been mined at Cherry Bluff, Kamloops, and on Texada Island and chiefly used for fluxing purposes in the smelting of the metalliferous ores.

TABLE 1.

IRON.

Production.

PRODUCTION OF ORE BY PROVINCES.

Calendar Year.	Nova Scotia.	Quebec.	Ontario.	British Columbia.	Total.
	Tons.	Tons.	Tons.	Tons	Tons.
1886	44,388	.....	16,032	3,941	64,361
1887	43,532	13,401	16,598	2,796	76,330
1888	42,611	10,710	16,894	8,372	78,587
1889	54,161	14,533	.....	15,487	84,181
1890	49,206	22,305	.....	.....	76,511
1891	53,649	14,380	.....	950	68,979
1892	78,258	22,690	.....	2,300	103,248
1893	102,201	22,076	.....	1,325	125,602
1894	89,379	19,492	.....	1,120	109,991
1895	83,792	17,783	.....	1,222	102,797
1896	58,810	17,630	15,270	196	91,906
1897	23,400	22,436	2,770	2,099	50,705
1898	19,079	17,873	21,111	280	58,343
1899	28,000	19,420	25,126	2,071	74,617
1900	18,940	19,000	82,950	1,110	122,000
1901	18,619	15,489	272,538	7,000	313,646
1902	16,172	18,524	359,288	10,019	404,003

TABLE 2.

IRON.

NOVA SCOTIA:—ANNUAL PRODUCTION OF ORE.

Nova Scotia.

(Previous to 1886).

Calendar Year.	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

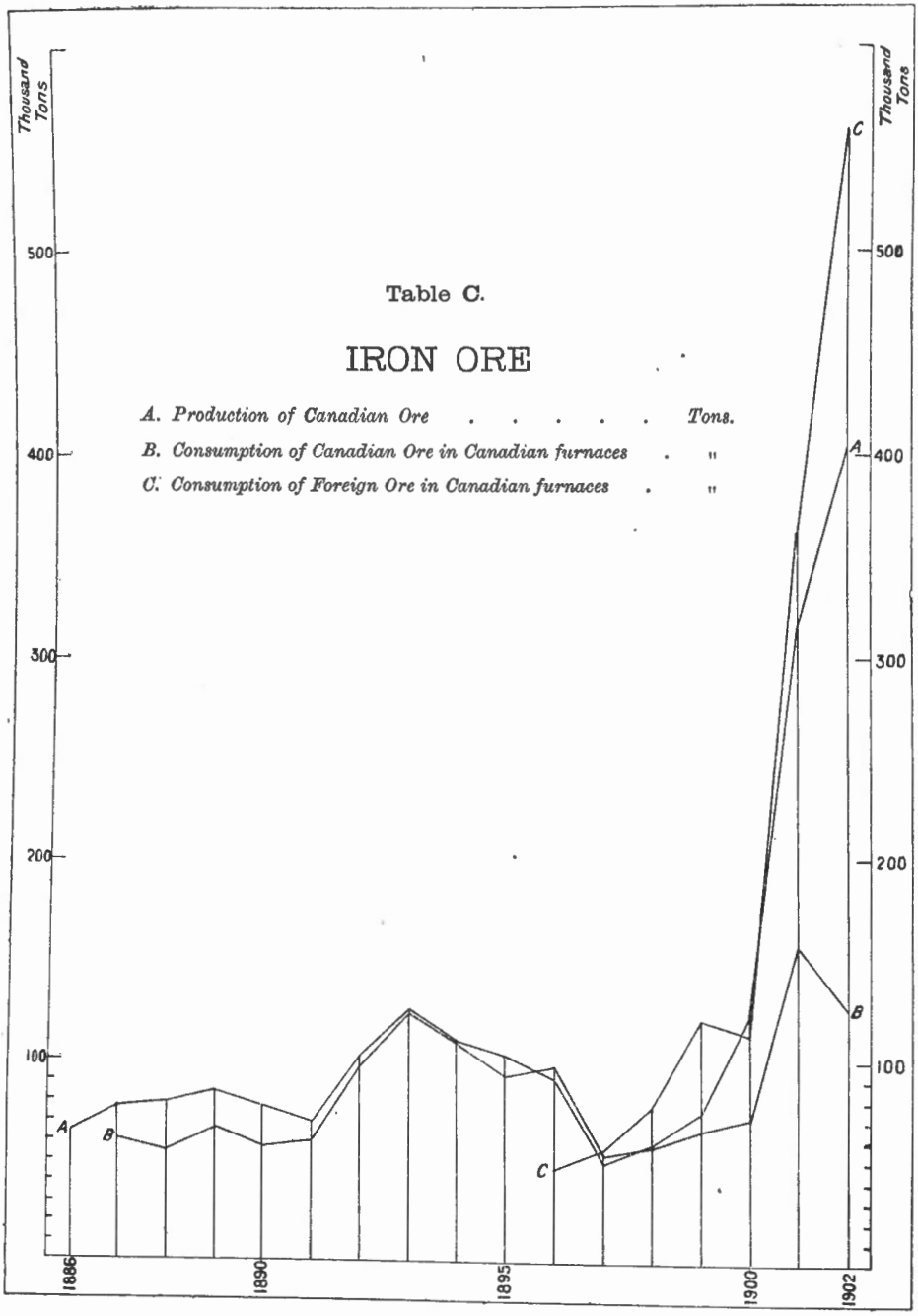
Table C.

IRON ORE

A. Production of Canadian Ore . . . . . Tons.

B. Consumption of Canadian Ore in Canadian furnaces . "

C. Consumption of Foreign Ore in Canadian furnaces . "



IRON.

The exports of iron ore from Canada, as compiled from customs reports, are shown in Tables 3 and 4 for the calendar and fiscal years respectively. In presenting these tables however attention should be called to the past two years 1901 and 1902 in which the figures appear to be too large. In 1902, for example the production for the year estimated from direct returns from mines and otherwise was 404,003 tons while the quantity of Canadian ore used in Canadian furnaces was 125,664 tons, leaving approximately 278,339 tons available for export as compared with 428,901 tons given in the table. Practically all the iron ore exported from Canada goes to the United States but for the fiscal year ending 30th June 1902, the imports of iron ore into the United States from Canada were 276,363 tons* as compared with 525,983 tons exported from Canada according to Canadian customs returns.

TABLE 3.

IRON.

Exports.

EXPORTS OF IRON ORE.

Calendar Year.	Tons.	Value.	Calendar Year.	Tons.	Value.
		$			
1893	2,419	7,590	1898	182	278
1894	.....	21,294	1899	4,145	9,538
1895	1,571	3,909	1900	5,527	13,511
1896	1,033	1,911	1901	306,199	762,283
1897	403	811	1902	428,901	1,065,019

TABLE 4.

IRON.

EXPORTS OF IRON ORE.

Fiscal Year.	Tons.	Value.	Fiscal Year.	Tons.	Value.
		$			$
1879	3,562	7,530	1891	14,648	32,582
1880	30,524	76,474	1892	7,707	36,935
1881	44,677	114,850	1893	7,811	26,114
1882	43,835	135,463	1894	1,859	9,026
1883	44,914	138,775	1895	2,315	5,743
1884	25,308	66,549	1896	14	35
1885	54,367	132,074	1897	1,320	2,492
1886	7,542	23,039	1898	260	402
1887	23,345	71,934	1899	1,849	4,968
1888	13,544	39,945	1900	4,327	7,689
1889	24,752	60,289	1901	58,401	150,657
1890	13,811	31,376	1902	525,983	1,303,901

* The foreign Commerce and Navigation of the United States for the year ending 30th June, 1902.

Table 5.

Iron.

Pig Iron Production: Consumption of Ore, Fuel, &c.

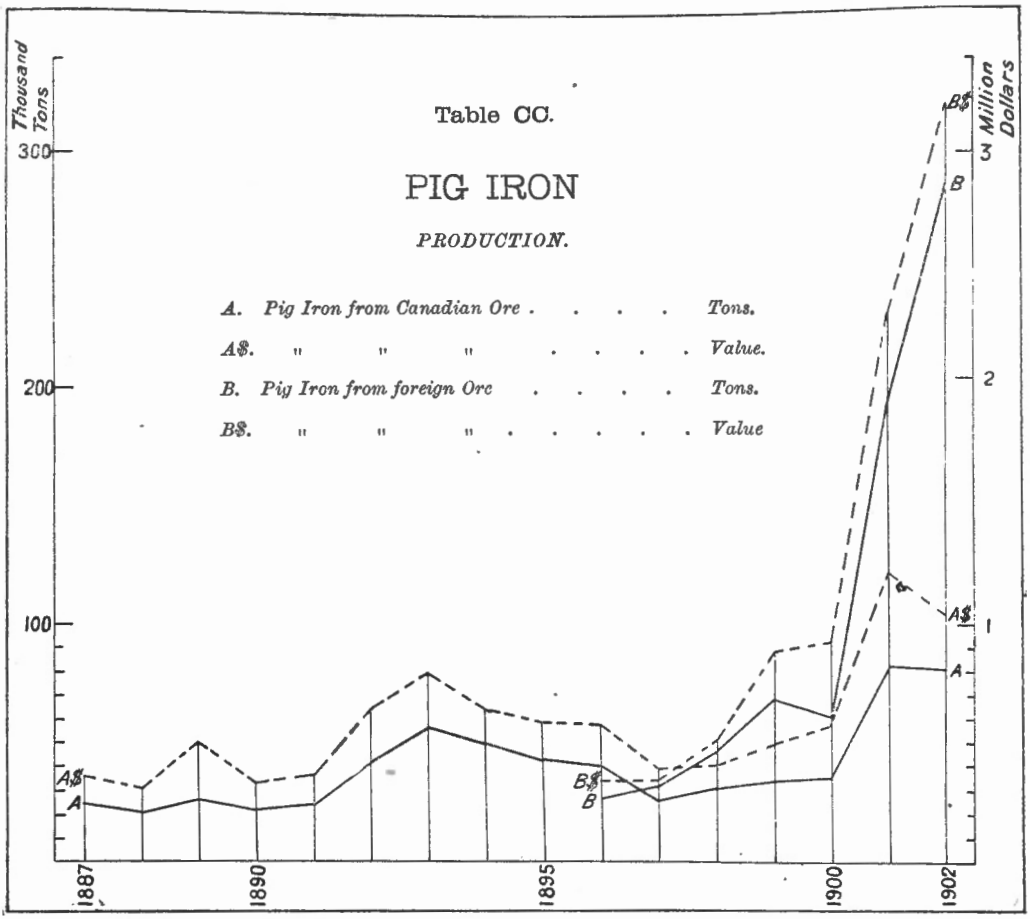
Calendar Year.	Iron Ore Consumed.		Fuel Consumed.						Flux Consumed.		Pig Iron Made.		
			Charcoal.		Coke.		Coal.						
	Tons.	Value.	Bushels.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.	Value per ton.
1887	60,434	$130,808	940,400	$ 48,593	30,248	$ 89,123	3,333	$5,877	17,171	$17,500	24,827	$366,192	$ 14 75
1888	54,956	102,343	804,286	41,800	28,031	82,986	2,197	4,709	16,857	16,533	21,799	313,235	14 37
1889	65,670	126,064	755,800	41,568	33,289	94,791	3,044	6,525	22,122	21,909	25,921	499,872	19 28
1890	57,304	117,880	589,860	29,493	32,832	97,659	1,241	2,638	18,478	18,361	21,772	331,688	15 23
1891	60,935	130,955	441,812	22,091	30,626	98,402	2,170	2,868	11,377	11,546	23,891	368,901	15 44
1892	96,948	250,966	1,121,365	78,291	50,882	152,311	1,740	1,797	22,967	21,687	42,443	637,421	15 02
1893	124,053	296,979	1,302,720	90,976	58,711	163,849	6,621	13,539	27,797	27,519	55,947	790,283	14 13
1894	108,871	223,861	1,173,970	53,958	52,373	142,303	7,653	14,571	35,101	34,347	49,967	646,447	12 94
1895	93,208	218,336	789,561	31,582	48,540	139,475	3,089	5,396	31,585	29,922	42,454	586,736	13 82
1896	(a) 96,560	200,887	756,600	32,256	(a) 48,660	106,939	1,407	2,288	37,462	36,140	67,268	924,129	13 74
	(b) 46,300	100,205			(b) 33,990	109,253							
1897	(a) 53,658	131,705	1,031,800	43,230	(a) 35,800	71,600	.....	.....	31,273	30,258	58,007	738,701	12 73
	(b) 55,722	138,504			(b) 27,810	94,553							
1898	(a) 57,881	151,760	836,400	41,820	(a) 31,952	63,904	.....	.....	33,913	31,153	77,015	912,395	11 85
	(b) 77,107	213,165			(b) 50,407	158,783							
1899	(a) 66,384	216,322	1,928,025	87,858	(a) 44,844	134,532	.....	.....	51,826	44,286	102,940	1,377,306	13 38
	(b) 120,650	402,860			(b) 64,648	193,944							
1900	(a) 71,341	184,191	1,799,737	82,408	(a) 45,021	180,084	.....	.....	52,966	39,332	96,575	1,501,698	15 55
	(b) 113,042	351,382			(b) 59,345	255,892							
1901	(a) 156,613	544,144	1,835,736	100,978	(a) 205,796	539,328	2,039	6,117	169,399	183,162	274,376	3,512,923	12 80
	(b) 361,010	846,398			(b) 115,367	497,386							
1902	(a) 125,664	429,753	2,146,623	118,275	(a) 360,593	898,518	1,615	5,006	293,594	219,295	357,902	4,243,541	11 85
	(b) 559,381	964,979			(b) 112,314	494,433							

(a) Canadian. (b) Foreign.

IRON.

Pig iron.

Pig Iron.—The total quantity of pig iron made in Canada in 1902 from both home and imported ores was 357,902 tons valued at the furnaces at $4,243,541 as compared with 274,376 tons valued at $3,512,923 in 1901, being an increase in quantity of 30 per cent, and in value of over 20 per cent. The total quantity of pig iron made in Canada in 1900 was 96,757 tons and in 1899 102,940 tons.



Statistics of the production of pig iron together with the iron ore, fuel and flux consumed are given in Table 5 for the years 1887 to 1902 inclusive. Previous to 1896 the pig iron manufactured was entirely from Canadian ores. Since that date however, increasing quantities of imported ores have been used which will be found separately stated in the table.

Attention should here be directed to a change in the statement of the production of pig iron for 1895. Owing to an error in a return received from one of the operators, the production for that year was overstated by 10,000 tons. That amount was credited to production which as a matter of fact was sold from stock. IRON. Pig iron.

Of the total output of pig iron for 1902, 339,037 tons were made with coke as fuel and 18,865 tons with charcoal.

As already mentioned, the ores used in Canadian furnaces before 1896, were derived entirely from Canadian mines. Beginning with that year however, imported ores began to be used, chiefly from the United States and Newfoundland, the imported ore in 1902 amounting to nearly 82 per cent of the total used.

In the tabulated statement showing the mineral production of Canada, the production of pig iron from Canadian ore only is given. This has been arrived at by separating the total production at each furnace into two classes, viz. pig iron from Canadian ore, and pig iron from ore imported, the separation being made on the basis of the Canadian and imported ore entering into the production of pig iron at each respective furnace.

The production for the past seven years, separated in this way has been as follows :

Calendar Year.	Pig iron from Canadian Ore.	Pig iron from Imported Ore.
	Tons.	Tons.
1896	40,720	26,548
1897	26,200	31,807
1898	30,553	46,462
1899	34,244	68,699
1900	35,387	61,188
1901	83,100	191,276
1902	71,664	286,238

There were nine furnaces in blast for varying periods during the year operated by the following six companies :

Dominion Iron and Steel Company, Sydney, C.B.
Nova Scotia Steel and Coal Company, New Glasgow, N.S.
Canada Iron Furnace Company, Montreal, Que.
John McDougall & Company, Montreal, Que.
Deseronto Iron Company, Deseronto, Ont.
Hamilton Steel and Iron Company, Hamilton, Ont.

IRON.

An old furnace was being rebuilt by:

Pig iron.

The Londonderry Iron and Mining Company, Limited, Londonderry, N.S.

New furnaces were being erected by:

The Nova Scotia Steel and Coal Company, Limited, at Sydney Mines, C.B.

The Cramp Steel Company, Limited, Collingwood, Ont.

The Algoma Steel Company, Limited, Sault Ste. Marie, Ont.

The statistics of the production of pig iron and steel and of rolled iron and steel in Canada, as well as in the United States, are admirably presented in the Annual Statistical Report of the American Iron and Steel Association, and the following information concerning the production of steel and rolled iron and steel in Canada is taken from the above mentioned report for 1902.

Steel.

Steel.—"The total production of steel ingots and castings in Canada in 1902 was 182,037 gross tons, against 26,084 tons in 1901, an increase of 155,953 tons. Bessemer and open hearth steel ingots and castings were made in each year. Almost all of the open hearth steel reported in 1902 was made by the basic process. The direct castings made in 1902 amounted to 5,288 tons.

"The following table gives the production of all kinds of steel ingots and castings in Canada from 1894 to 1902 in gross tons.

Years.	Gross tons.
1894	25,685
1895	17,000
1896	16,000
1897	18,400
1898	21,540
1899	22,000
1900	23,577
1901	26,084
1902	182,037

"The large increase in the production of steel in Canada in 1902 over 1901, was caused by the starting up of the new open hearth steel plant of the Dominion Iron and Steel Company, Limited, at Sydney, Cape Breton, Nova Scotia, which first produced steel on December 31st, 1901, and of the new Bessemer plant of the Algoma Steel Company, Limited, at Sault Ste. Marie, Ontario, at which steel was first made on

February 18, 1902. The latter company has two 6-gross-ton Bessemer converters, which were operated for a few months in 1902, producing in all 44,537 gross tons of ingots. The company also has a rail mill which first made Bessemer steel rails on May 5, 1902, and which also ran for a few months in that year, producing 32,878 tons. In addition this company produced 1,558 tons of other rolled products in 1902. The Dominion Iron and Steel Company made 99,377 tons of basic open hearth steel ingots, 48 tons of steel castings and 86,424 tons of blooms, billets and slabs. It did not make steel rails. It has ten 50-gross-ton open hearth furnaces. Iron. Steel.

"*Rolled Iron and Steel.*—The production of Bessemer and open hearth steel rails in 1902 amounted to 33,950 gross tons, against 891 tons of open hearth rails in 1901; structural shapes 423 tons against 4,388 tons in 1901; cut nails made by rolling mills and steel works having cut nail factories connected with their plants 114,685 kegs of 100 pounds, against 126,891 kegs in 1901; plates and sheets 2,191 tons against 2,857 tons in 1901; all other rolled products, excluding muck and scrap bars, blooms, billets, sheet bars &c., 119,801 tons against 98,206 tons in 1901. Changing the cut nail production to gross tons, the total quantity of all kinds of iron and steel rolled into finished forms in Canada in 1902 amounted to 161,485 tons, against 112,007 tons in 1901. Rolled iron and steel.

"The following table gives the production of all kinds of iron and steel rolled into finished forms in Canada from 1895 to 1902.

Years.	Gross Tons.
1895	66,402
1896	75,043
1897	77,021
1898	90,303
1899	110,642
1900	100,690
1901	112,007
1902	161,485

"On December 31, 1902, there were 19 completed rolling mills and steel works in Canada and one plant was being erected. Of the completed plants 2 were equipped for the manufacture of steel castings only, 4 for the manufacture of Bessemer or open hearth steel ingots and rolled products, and 13 for the manufacture of rolled products only. The plant in course of construction was being equipped for the manufacture of Bessemer and open hearth ingots and finished rolled products.

IRON.

Rolled iron and steel.

"The Canada Switch and Spring Company, limited of Montreal, has changed its name to the Montreal Steel Works, limited, and has practically discountinued the manufacture of steel castings by the Bessemer process and will hereafter make steel castings by the open hearth process only. Its Bessemer castings were produced in a 3,000 pound modified acid converter, which was first put in operation in 1897. In 1901 the company erected and put in operation, one 15-gross-ton acid open hearth furnace, and in 1903 it built another 15-ton acid furnace. Nearly all the steel castings made by the company in 1902 were produced by the open hearth process.

"The Page-Hersey Iron and Tube Company, limited, is erecting a plant at Guelph, Ontario, for the manufacture of wrought iron pipe. It is the intention of the company to add in the near future a number of puddling and busheling furnaces and 2 trains of rolls (one 12 and one 16 inch) and to manufacture skelp for use in its pipe mill. Small quantities of bar iron may also be made. The plant will have an annual capacity of about 17,000 gross tons of finished rolled material and 15,000 tons of wrought iron pipe.

"The Cramp Steel Company limited, expects to have two 18-gross-ton basic-open-hearth steel furnaces and two trains of rolls (one 10 and one 18 inch) in operation at its new plant at Collingwood, Ontario, late in the spring of 1903. When completed the works will make steel rails, beams, plates, merchant bar iron, rods, shafting, &c.

"The rolling mill formerly located at Guelph, Ontario, and operated by the Guelph Iron and Steel Company, limited, was removed to London, Ontario, in the fall of 1902 and is now being operated at the latter place by the London Rolling Mill Company, limited. A 14 inch roughing mill has been added and the plant can now turn out annually about 15,000 gross tons of merchant bar iron and steel, and 6,000 tons of bolts, nuts and hinges. Operations at London were commenced in March 1903."

Bounties.

Bounties.—Bounties on iron and steel made in Canada were provided for by the Dominion Government in 1897 (chapter 6 of 60-61 Victoria, Statutes of Canada) as follows :—

	Per ton.
On steel ingots manufactured from ingredients of which not less than 50 per cent of the weight thereof consists of pig iron made in Canada	$3 00
On puddled iron bars manufactured from pig iron made in Canada	3 00
On pig iron manufactured from ore—	
On the proportion produced from Canadian ore	3 00
On the proportion produced from foreign ore	2 00

It was also provided that no bounty should be paid on steel ingots made from puddled iron bars manufactured in Canada. IRON. Bounties.

The Act further provided that the above mentioned bounties should cease on April 23, 1902. In 1899, an Act was passed (chapter 8 of 62–63 Victoria, Statutes of Canada, 1899), extending the time for payment of bounties to June 30, 1907, and changing the rates in a manner providing for a gradual extinguishment of the bounties.

The Act of 1899 was amended in 1903 by an act which provided for the payment of bounties on the undermentioned articles manufactured in Canada from steel produced in Canada from ingredients of which not less than fifty per cent of the weight thereof consists of pig iron made in Canada, viz. :—

	Per ton.
On rolled, round wire rods not over three-eighths of an inch in diameter, when sold to wire manufacturers for use in making wire in their own factories in Canada.....	$6 00
On rolled angles, trees, channels, beams, joists, girders, or bridge building or structural rolled sections, and on other rolled shapes not round, oval, square or flat, weighing not less than thirty-five pounds per lineal yard, and also on flat eye-bar blanks, when sold for consumption in Canada.....	3 00
On rolled plates not less than thirty inches in width and not less than one-quarter of an inch in thickness, when sold for consumption in Canada for manufacturing purposes for which such plates are usually required, — not including plates to be sheared into plates of less width.....	3 00

The act of 1903 also provides for the gradual extinguishment of the bounties authorized in 1897 as follows :—

Period.	On steel ingots, puddled iron bars, and pig iron from Canadian ore.	On pig iron from foreign ore.
	Per ton.	Per ton.
From July 1, 1903 to June 30, 1904.....	$ 2.70	$ 1.80
" " 1904 to June 30, 1905.....	2.25	1.50
" " 1905 to June 30, 1906.....	1.65	1.10
" " 1906 to June 30, 1907	1.05	0.70

The payments by the Dominion Government on account of iron and steel bounties during the fiscal year ending June 30, 1902, were as follows, the figures having been compiled from the Auditor General's Report for 1902.

RON.

Bounties.

BOUNTIES ON PIG IRON.

Company.	On Pig Iron from Canadian Ore.		On Pig Iron from Imported Ore.		Total Bounties.
	Tons.	Bounties.	Tons.	Bounties.	
		$ c.		$ c.	$ c.
Canada Iron Furnace Co., Ltd. Midland, Ont	*a* 17,248·44 *b* 1,589·42	56,036 75	*c* 9,595,720 *d* 2,732,190	24,109 37	80,146 12
Radnor Forges, Que.	*a* 4,009·10 *b* 1,316·06	15,580 66	*c* 1,128,575 *d* 258,285	2,722 06	18,302 72
Deseronto Iron Co.	*a* 156·00 *b* 53·00	611 10	*c* 8,920,000 *d* 2,267,000	21,920 60	22,531 70
Dom. Iron & Steel Co.	*a* 129·03 *b* 28·72	464 66	*c* 157,629,528 *d* 43,460,612	393,488 15	[1]393,952 81
Electric Reduction Co., Ltd., Bkhm.	*a* 56·10	168 30	. . . . .	. . . . .	168 30
Hamilton Steel & Iron Co.	*a* 31,516·99 *b* 9,380·97	119,879 59	*c* 17,774,740 *d* 2,386,570	41,645 49	[2]161,525 08
John McDougall & Co., Drummondville.	*a* 702·89 *b* 340·13	3,027 02	. . . . .	. . . . .	3,027 02
N. Scotia Steel & Coal Co.	*a* 5,135·68 *b* 1,438·40	19,290 72	*c* 17,727,320 *d* 3,672,600	42,065 32	61,356 04
	73,100·93	215,058 80	267,553,140	525,950 99	741,009 79

a Bounties paid at the rate of $3 00 per ton.
b " " 2 70 "
c " " 2 00 "
d " " 1 80 "
[1] Withheld in dispute, $46,051.76.
[2] Deducted for previous errors, $1,849 66.

BOUNTY ON PUDDLED IRON BARS.

Company.	Tons.	Bounty.
		$ c.
Hamilton Steel and Iron Co	*a* 5,641·46 *b* 1,342·65	20,549 52

BOUNTY ON STEEL INGOTS.

Hamilton Steel and Iron Co.	*a* 12,858·61 *b* 3,929·99	*49,140 88
Nova Scotia Steel and Coal Co.	*a* 16,479·14 *b* 3,123·60	†57,871 18
		107,012 06

* Withheld, $6,308.97.
† " $23,271·60.

The total amount of bounties on iron and steel paid by the Dominion Government during the fiscal year ending June, 1902, was, therefore, as follows :— IRON. Bounties.

Bounties on pig iron		$741,009 79
"	puddled iron bars	20,549 52
"	steel ingots	107,012 06
		$868,571 37
	Less withheld in dispute and deducted for overpayment	77,481 99
	Total amount paid	$791,089 38

Table 6 following illustrates the extent of the foreign trade of the country in regard to iron and steel products and machinery, &c., made therefrom. Compared with the previous year, increases are shown in all the items with the exception of machinery, hardware and scrap iron and steel.

TABLE 6.

IRON.

EXPORTS OF IRON AND STEEL GOODS, THE PRODUCT OF CANADA. Exports.

Calendar Year 1902.		Quantity.	Value.
			$
Stoves	No	776	8,742
Sewing Machines	"	1,174	24,279
Machinery, N.E.S	$	.....	310,251
Hardware, N.E.S	"	.....	67,108
Steel and Manufactures of	"	.....	1,239,972
Castings, N.E.S	"	.....	186,890
Scrap Iron and Steel	Cwt	133,822	135,463
Pig Iron	Tons	75,195	778,619
Total		.....	2,751,324

The Canadian consumption of iron and steel products is illustrated in the following tables, Nos. 7, 8, 9, 10a, 10b and 11. The first three of these deal with the cruder forms of the metal, the next two with the manufactured articles wholly or largely composed of iron and steel, whilst the last table summarizes all the preceding ones. They all cover the fiscal year ending June 30, 1902.

IRON.
Imports.

TABLE 7.

IRON.

IMPORTS OF IRON, PIG, SCRAP, &c.

Fiscal Year.	Pig Iron.		Charcoal Pig Iron.		Old and Scrap Iron.		Wrought Scrap and Scrap Steel.	
	Tons.	Value.	Tons.	Value.	Tons.	Value.	Tons.	Value.
		$		$		$		$
1880	(a) 23,159	371,956	.....	.....	928	14,042	.....	.....
1881	(a) 43,630	715,997	.....	.....	584	8,807	.....	.....
1882	56,594	811,221	6,837	211,791	1,327	20,406	.....	.....
1883	75,295	1,085,755	2,198	58,994	709	7,776	.....	.....
1884	49,291	653,708	2,893	66,602	3,136	44,223	.....	.....
1885	42,279	545,426	1,119	27,333	3,552	46,275	.....	.....
1886	42,463	528,483	3,185	60,086	10,151	158,100	.....	.....
1887	46,295	554,388	3,919	77,420	17,612	220,167	(b) 79	1,086
	Pig Iron, &c. (c)							
	Tons.	Value.						
		$						
1888	48,973	648,012	.....				23,293	297,496
1889	72,115	864,752	.....				26,794	335,090
1890	87,613	1,148,078	.....				47,846	678,574
1891	81,317	1,085,929	.....				43,967	652,842
1892	68,918	886,485	.....				32,627	433,695
	Pig Iron.		Charcoal Pig Iron.		Cast Scrap Iron.			
	Tons.	Value.	Tons.	Value.	Tons.	Value.		
		$		$		$		
1893	56,849	682,209	5,944	84,358	729	9,317	45,459	574,809
1894	42,376	483,787	2,906	34,968	78	771	30,850	369,682
1895	(d) 31,637	341,259	2,780	31,171	643	4,347	23,390	244,388
1896	(d) 36,131	394,591	917	11,726	93	741	13,607	157,996
1897	(d) 25,766	291,788	2,936	35,373	238	1,362	7,903	93,541
1898	(d) 37,186	382,103	2,250	23,533	1,559	13,251	(e)48,903	534,577
1899	(d) 44,261	452,911	(f) 1,955	19,123	(f) 2,378	22,594	(e)28,352	301,268
1900	(d) 49,767	811,490	(f) 1,816	38,736	(f)13,747	150,681	(e)38,753	638,505
1901	(d) 35,293	548,033	(f) 490	7,121	(f) 4,499	51,032	(e)24,773	242,189
1902	39,978	585,077	(f) 38	726	(f) 3,048	38,958	(e)36,150	520,909

(a) Comprises pig-iron of all kinds.

(b) From May 13 only.

(c) These figures appear in Customs reports under heading 'Iron in pigs, Iron kentledge and cast scrap-iron.'

(d) Includes iron kentledge. Duty $2.50 per ton.

(e) Scrap iron and scrap steel, old, and fit only to be remanufactured, being part of, or recovered from, any vessel wrecked in waters subject to the jurisdiction of Canada. Duty free.

Iron or steel scrap, wrought, being waste or refuse, including punchings, cuttings and clippings of iron or steel plates or sheets, having been in actual use, crop ends of tin plate bars, blooms and rails, the same not having been in actual use. Duty $1 per ton.

(f) Duty $2.50 per ton.

TABLE 8.

IRON.

IMPORTS OF FERRO-MANGANESE, &c.

Fiscal Year.	Tons.	Value.
*1887	123	$ 1,435
*1888	1,883	29,812
*1889	5,868	72,108
*1890	696	18,895
*1891	2,707	40,711
*1892	1,311	23,930
*1893	529	15,858
*1894	284	9,885
†1895	164	5,408
†1896	652	12,811
†1897	426	9,233
†1898	1,418	22,516
†1899	1,160	22,539
†1900	1,149	39,064
†1901	1,512	38,954
†1902 (Duty, 5 p.c.)	6,513	150,977

*These amounts include :—Ferro-manganese, ferro-silicon, spiegel, steel bloom ends, and crop ends of steel rails, for the manufacture of iron or steel.

†Ferro-silicon, spiegeleisen and ferro-manganese.

TABLE 9.

IRON.

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

Fiscal Year.	Cwt.	Value.	Fiscal Year.	Cwt.	Value.
1880	195,572	$244,601	1892	64,397	56,186
1881	111,666	111,374	1893	65,269	58,533
1882	203,888	222,056	1894	50,891	45,018
1883	258,639	269,818	1895	78,639	67,321
1884	252,310	264,045	1896	128,535	110,757
1885	312,329	287,734	1897	56,560	48,954
1886	273,316	248,461	1898	162,891	122,426
1887	522,853	421,598	1899	124,311	103,198
1888	110,279	93,377	1900	255,145	362,463
1889	80,383	67,181	1901	234,925	206,975
1890	15,041	45,923	1902*	401,306	419,543
1891	41,567	38,931			

*Iron or steel ingots, cogged ingots, blooms, slabs, billets, puddled bars, and loops or other forms, N.O.P., less finished than iron or steel bars, but more advanced than pig-iron, except castings. Duty $2 per ton.

IRON.

Imports.

TABLE 10*a*.

IRON.

IMPORTS OF IRON AND STEEL GOODS.—1901-1902.

Fiscal Year, 1902.		Duty.	Quantity.	Value.
				$
Bar iron or steel rolled, whether in coils, bundles, rods or bars, comprising rounds, ovals, squares and flats and rolled shapes, N.O.P.	Cwt.	$7 per ton.	525,114	946,836
Castings, iron or steel, in the rough, N.E.S.	$	25 %	.....	198,074
Canada plates, Russia iron, flat galvanized iron or steel sheets, terne plates and rolled sheets of iron or steel coated with zinc, spelter or other metal, of all widths or thicknesses, N.O.P.	Cwt.	5 "	466,464	1,214,045
Iron or steel bridges or parts thereof, iron or steel structural work, columns, shapes or sections drilled, punched, or in any further stage of manufacture than as rolled or cast, N.E.S.	"	35 "	46,841	108,402
Malleable iron castings and iron or steel castings, N.E.S.	"	25 "	1,411	5,511
Mould boards, or shares or plough plates land sides and other plates for agricultural implements, cut to shape from rolled plates of steel but not moulded, punched, or otherwise manufactured	"	5 "	46,721	178,704
Iron or steel railway bars or rails of any form, punched or not punched, N.E.S., for railways, which term for the purposes of this item shall include all kinds of railways, street railways and tramways, even although the same are used for private purposes only, and even although they are not used or intended to be used in connection with the business of common carrying of goods or passengers	Tons.	30 "	8,285	206,908
Railway fish-plates and tie plates	"	$8 per ton.	4,094	122,840
Rolled iron or steel angles, tees, beams, channels, joists, girders, zees, stars or rolled shapes, or trough, bridge, building, or structural rolled sections, or shapes not punched, drilled or further manufactured than rolled, N.E.S., and flat eye-bar blanks not punched or drilled	Cwt.	10 "	560,233	789,644
Rolled iron or steel hoop, band, scroll or strip, 8 inches or less in width, No. 18 gauge and thicker, N.E.S.	"	$7 per ton.	36,296	68,541
Rolled iron or steel hoop, band, scroll or strip, thinner than No. 18 gauge, N.E.S.	"	5 %	40,782	94,114
Rolled iron or steel angles, tees, beams, channels, girders and other rolled shapes or sections, weighing less than 35 lbs. per lineal yard, not punched, drilled or further manufactured than rolled, N.O.P.	"	$7 per ton.	250,540	356,237
Rolled iron or steel plates or sheets, sheared or unsheared, and skelp iron or steel, sheared or rolled in grooves, N.E.S.	"	$7 "	216,030	333,892
Rolled iron or steel plates, not less than 30 inches in width and not less than $\frac{1}{4}$ inch in thickness, N.O.P.	"	10 "	390,008	571,291
Carried forward		.....	.....	5,195,039

TABLE 10*a*—*Continued.*

IRON.

IRON.

IMPORTS OF IRON AND STEEL GOODS.

Imports.

Fiscal Year, 1902.		Duty.	Quantity.	Value.
				$
Brought forward				5,195,039
Rolled iron or steel sheets No. 17 gauge and thinner, N.O.P.	Cwt.	5 p. c.	243,430	619,759
Rolls of chilled iron or steel	"	30 "	2,126	7,591
Skelp iron or steel, sheared or rolled in grooves, imported by manufacturers of wrought iron or steel pipe for use only in the manufacture of wrought iron or steel pipe in their own factories	"	5 "	323,915	496,130
Swedish rolled iron and Swedish rolled steel nail rods under half an inch in diameter for the manufacture of horse-shoe nails	"	15 "	13,900	27,300
Switches, frogs, crossings and intersections for railways	"	30 "	7,037	20,221
Steel—chrome steel	"	15 "	4,217	35,218
Steel plate, universal mill or rolled edge bridge plates imported by manufacturers of bridges	"	10 "	71,861	101,682
Steel in bars, bands, hoops, scroll or strips, sheets or plates, of any size, thickness or width when of greater value than 2½c. per lb., N.O.P.	"	5 "	135,496	594,766
Hoop iron not exceeding ⅜ of an inch in width and being No. 25 gauge and thinner, used for the manufacture of tubular rivets	"	Free.	110	308
Iron or steel beams, sheets, plates, angles, knees and cable chains for wooden, iron, steel, or composite ships or vessels	"	"	35,735	70,707
Locomotive and car wheel tires of steel, in the rough	"	"	36,388	79,045
Steel for saws and straw cutters cut to shape, but not further manufactured	"	"	13,365	111,261
Crucible sheet steel, 11 to 16 gauge, 2½ to 18 inches wide, imported by manufacturers of mower and reaper knives for manufacture of such knives in their own factories	"	"	6,886	30,360
Steel of No. 20 gauge and thinner, but not thinner than No. 30 gauge, for the manufacture of corset steels, clock springs and shoe shanks imported by the manufacturers of such articles for the exclusive use in the manufacture thereof in their own factories	"	"	1,788	6,643
Steel valued at 2½ cents per lb. and upward, imported by the manufacturers of skates, for use exclusively in the manufacture thereof in their own factories	"	"	2,058	9,921
Steel, under ½-inch in diameter, or under ½ inch square, imported by the manufacturers of cutlery, or of knobs, or of locks, for use exclusively in the manufacture of such articles in their own factories	"	Free.	4,020	8,783
Carried forward				7,414,734

IRON.

Imports.

TABLE 10*a*—*Concluded.*

IRON.

IMPORTS OF IRON AND STEEL GOODS.

Fiscal Year, 1902.	Duty.	Quantity.	Value.
			$
Brought forward			7,414,734
Steel, No. 12 gauge and thinner, but not thinner than No. 30 gauge, for the manufacture of buckle clasps, bed fasts, furniture casters and ice creepers, imported by the manufacturers of such articles, for use exclusively in the manufacture thereof in their own factories Cwt.	"	825	2,614
Steel of No. 24 and 17 gauge, in sheets sixty-three inches long, and from 18 inches to 32 inches wide, imported by the manufacturers of tubular bow sockets for use in the manufacture of such articles in their own factories "	"	2,258	7,483
Steel for the manufacture of bicycle chains, imported by the manufacturers of bicycle chain for use in the manufacture thereof in their own factories "	"	267	1,060
Steel for the manufacture of files, augers, auger bits, hammers, axes, hatchets, scythes, reaping hooks, hoes, hand rakes, hay or straw knives, windmills and agricultural or harvesting forks imported by the manufacturers of such or any of such articles for use exclusively in the manufacture thereof in their own factories "	"	66,114	153,114
Steel springs for the manufacture of surgical trusses imported by the manufacturers for use exclusively in the manufacture thereof in their own factories "	"	245	3,923
Flat spring steel, steel billets and steel axle bars, imported by manufacturers of carriage springs and carriage axles for use exclusively in the manufacture of springs and axles for carriages or vehicles other than railway or tramway, in their own factories "	"	73.624	119,309
Spiral spring steel for spiral springs for railways, imported by the manufacturers of railway spring for use exclusively in the manufacture of railway spiral springs in their own factories "	"	34,047	61,671
Malleable iron or steel castings, in the rough for the manufacture of scissors, and hand shears when imported by manufacturers of scissors and hand shears to be used in making such articles in their own factories, O.C $	"		2,394
Steel for the manufacture of cutlery when imported by manufacturers of cutlery to be used in their own factories in the manufacture of such article, O.C Cwt.	"	757	2.030
Total			7,768,332

TABLE 10*b*.

IRON.

IMPORTS OF IRON AND STEEL GOODS.

Fiscal Year, 1902.		Duty.	Quantity.	Value.
				$
Agricultural implements, N.E.S., viz:				
Binding attachments	No.	20 %	103	9,991
Cultivators	"	20 "	2,755	22,863
Drills, grain seed	"	20 "	2,012	50,092
Farm, road or field rollers	"	25 "	216	3,127
Forks, pronged	"	25 "	13,930	7,816
Harrows	"	20 "	2,470	36,730
Harvesters, self binding and without binders	"	20 "	9,288	900,179
Hay tedders	"	25 "	115	3,028
Hoes	"	25 "	3,406	1,010
Horse rakes	"	20 "	9,741	180,658
Knives, hay or straw	"	25 "	446	246
Lawn mowers	"	35 "	1,193	6,466
Manure spreaders	"	20 "	91	2,356
Mowing machines	"	20 "	17,643	599,050
Ploughs	"	20 "	10,092	214,193
Post hole diggers	"	25 "	541	489
Potato diggers	"	25 "	118	1,780
Rakes, N.E.S	"	25 "	5,028	1,139
Reapers	"	20 "	755	36,329
Scythes and snaths, sickles or reaping hooks	Doz.	25 "	2,952	11,970
Spades and shovels and spade and shovel blanks, and iron or steel cut to shape for the same	"	35 "	5,407	28,993
Parts of agricultural implements	$	20 "	.....	489,827
All other agricultural implements, N.E.S.	$	25 "	.....	47,136
Anvils and vises	"	30 "	.....	27,621
Cart or wagon skeins or boxes	Lbs.	30 "	38,806	2,459
Springs, axles, axle bars, N. E. S., and axle blanks and parts thereof of iron or steel, for railway or tramway or other vehicles	Cwt.	35 "	40,937	107,442
Butts and hinges, N.E.S.	$	30 "	.....	29,220
Cast iron pipe of every description	Cwt.	$8 per ton	29,463	44,691
Chains, coil chains, chain links and chain shackles of iron or steel 5-16 of an inch in diameter and over	"	5 %	37,487	138,349
Chain, malleable sprocket or link belting, for binders	$	20 "	.....	14,462
Chains, N.E.S.	"	30 "	.....	62,221
Tacks, shoe	Lbs.	35 "	51,815	3,882
Cut tacks, brad sprigs, or shoe nails, double pointed, and other tacks of iron and steel, N.O.P.	"	35 "	154,070	11,188
Engines, locomotives for railways, N.E.S.	No.	35 "	80	611,925
Fire engines	"	35 "	4	2,376
Fire extinguishing machines	"	35 "	25,968	19,327
Steam engines and boilers	"	25 "	849	382,022
Fittings, iron or steel, for iron and steel pipe	Lbs.	30 "	3,898,368	232,428
Carried forward				4,345,081

IRON.

Imports.

TABLE 10*b*—*Continued.*

IRON.

IMPORTS OF IRON AND STEEL GOODS.

Fiscal Year, 1902.		Duty.	Quantity.	Value.
				$
Brought forward				4,345,081
Forgings of iron or steel, of whatever shape or size, or in whatever stage of manufacture, N.E.S., and steel shafting, turned, compressed or polished, and hammered iron or steel bars or shapes, N.O.P	Lbs.	30 %	2,801,773	93,272
Hardware, viz:				
Builders', cabinet-makers', upholsterers', harness-makers', saddlers' and carriage hardware, including currycombs and horse boots, N.E.S	$	30 "		653,361
Horse, mule and ox shoes	"	30 "		5,796
Locks of all kinds	"	30 "		146,889
Machines and machinery, &c.:				
Fanning mills	No.	25 "	271	4,555
Grain crushers	"	25 "	43	1,619
Windmills	"	25 "	483	20,373
Ore crushers and rock crushers, stamp mills, cornish and belted rolls, rock drills, air compressors, cranes, derricks and percussion coal cutters	$	25 "		52,527
Portable machines:				
Fodder or feed cutters	No.	25 "	16	60
Horse powers	"	25 "	62	6,590
Portable engines	"	25 "	271	261,188
Portable saw mills and planing mills	"	25 "	7	5,163
Threshers and separators	"	25 "	678	147,634
All other portable machines	"	25 "	889	49,691
Parts of above articles	$	25 "		122,647
Sewing machines and parts of	No.	30 "	12,819	246,400
Slot machines	"	25 "	448	8,030
Machines, type-writing	"	25 "	2,402	129,949
All other machinery composed wholly or in part of iron or steel, N.O.P	$	25 "		3,468,923
Nails and spikes, composition and sheathing nails	Lbs.	15 "	44,313	7,118
Nails and spikes, wrought and pressed, trunk, clout, coopers, cigar box, Hungarian horseshoe and other nails, N.E.S.	"	30 "	170,310	9,516
Nails and spikes, cut, and railway spikes	"	½c. per lb.	1,457,275	32,725
Nails, wire of all kinds, N.O.P	"	¾c. "	372,591	12,862
Pumps, N.E.S	$	25 %		187,285
Safes, doors for safes and vaults	"	30 "		21,330
Screws, iron and steel, commonly called "woodscrews," N.E.S	Lbs.	35 "	119,835	14,124
Scales, balances, weighing beams and strength testing machines	$	30 "		102,692
Skates of all kinds and parts thereof	Pairs	35 "	50,896	19,105
Stoves of all kinds and parts thereof, N.E.S.	$	25 "		172,791
Stove plates, and sad or smoothing, hatters' and tailors' irons, plated wholly or in part or not	"	25 "		10,215
Carried forward				10,359,511

TABLE 10*b*—*Continued.*

IRON.

IRON.

IMPORTS OF IRON AND STEEL GOODS.

Imports.

Fiscal Year, 1902.		Duty.	Quantity.	Value.
Brought forward				10,359,511
Sheet iron or steel corrugated, galvanized	Cwt.	25 "	1,683	5,696
Sheet iron or steel corrugated not galvanized	"	30 "	12,104	17,053
Tubing:				
Boiler tubes of wrought iron or steel, including flues and corrugated tubes for marine boilers	Lbs.	5 %	8,628,283	324,042
Tubes of rolled steel, seamless, not joined or welded, not more than 1½ inches in diameter	"	10 "	164,313	8,475
Tubes, seamless steel, for bicycles	"	10 "	227,275	16,550
Tubing, wrought iron or steel, plain or galvanized, threaded and coupled or not, over 2 inches in diameter, N.E.S.	"	15 "	8,794,898	281,140
Tubing, wrought iron or steel, plain or galvanized, threaded and coupled or not, 2 inches or less in diameter, N. E.S.	"	35 "	3,308,697	107,395
Other iron or steel tubes or pipes, N.O.P.	"	30 "	347,575	24,309
Ware, galvanized sheet iron or of galvanized sheet steel, manufactures of, N.O.P.	$	25 "	.....	23,827
Ware, agate, granite or enamelled iron or steel hollow ware	"	35 "	.....	28,714
Ware, enamelled iron or steel ware, N. E.S., iron or steel hollow ware, plain black, tinned or coated, and nickel and aluminium kitchen or household hollow ware, N.E.S	"	30 "	.....	101,147
Wire cloth or wove wire and netting of iron or steel	Lbs.	30 "	710,944	31,713
Wire screens, doors and windows	$	30 "	.....	10,660
Wire fencing, woven, buckthorn strip and wire fencing of iron or steel, N.E.S.	Lbs.	15 "	385,670	13,825
Wire, single or several, covered with cotton, linen, silk, rubber or other material, &c., N.E.S.	"	30 "	2,269,407	315,706
Wire of all kinds, N.O.P.	"	20 "	7,051,024	190,422
Wire rope, stranded or twisted wire, clothes lines, picture or other twisted wire and wire cables, N.E.S.	"	25 "	1,612,206	130,565
Iron or steel nuts, washers, rivets and bolts with or without threads and nut bolt and hinge blanks, and T. and strap hinges of all kinds, N.E.S	"	¾ c.p. lb. and 25 %	2,289,930	92,031
Pen-knives, jack-knives and pocket knives of all kinds	$	30 %	.....	107,109
Table cutlery, all kinds, N.O.P.	"	30 "	.....	214,076
All other cutlery, N.E.S.	"	30 "	.....	206,502
Guns, rifles, including air guns and air rifles, (not being toys) muskets, cannons, pistols, revolvers, or other firearms	"	30 "	.....	257,135
Bayonets, swords, fencing foils and masks	"	30 "	.....	2,716
Needles of any material or kind, N.O.P.	"	30 "	.....	58,553
Carried forward				12,928,872

IRON.

Imports.

TABLE 10*b*—*Continued.*

IRON.

IMPORTS OF IRON AND STEEL GOODS.

Fiscal Year, 1902.		Duty.	Quantity.	Value.
				$
Brought forward	...	....	....	12,928,872
Tools and implements :				
Adzes, cleavers, hatchets, wedges, sledges, hammers, crow bars, cant dogs and track tools, picks, mattocks and eyes or poles for the same	$	30 %	.....	29,041
Axes	Doz.	25 "	10,379	50,148
Saws	$	30 "	.....	120,323
Files and rasps, N.E.S.	"	30 "	.....	93,668
Tools, hand or machine, of all kinds, N.O.P	"	30 "	.....	603,190
Knife blades, or blanks, and forks of iron or steel, in the rough not handled, filed, ground or otherwise manufactured	"	10 "	... .	452
Manufactured articles or wares not specially enumerated or provided for, composed wholly or in part of iron or steel, and whether partly or wholly manufactured.	"	30 "	.....	1,434,062
Anchors	Cwt.	Free	5,372	19,766
Iron or steel, rolled round wire rods, in the coil not over $\frac{3}{8}$-inch in diameter, imported by wire manufacturers for use in making wire in the coil in their factories	"	"	1,103,641	1,522,792
Iron or steel masts, or parts of	"	"	29	380
Rolled iron tubes not welded, or joined, under $1\frac{1}{2}$ inch in diameter, angle iron 9 and 10 gauge, not over $1\frac{1}{2}$ inch wide, iron tubing lacquered or brass covered, not over $1\frac{1}{2}$ inch diameter, all of which are to be cut to lengths for the manufacture of bedsteads, and to be used for no other purpose, and brass trimmings for bedsteads imported for the manufacture of iron or brass bedsteads	"	"	29,023	96,309
Steel bowls for cream separators and cream separators	$	"	....	487,834
Steel rails weighing not less than 45 lbs. per lineal yard for use only in the tracks of railways which are employed in the common carrying of goods and passengers, and are operated by steam motive power only	Cwt.	"	2,447,356	2,746,222
Steel strip and flat steel wire imported by manufacturers of buckthorn and plain strip fencing, for use in their own factories in the manufacture thereof	"	"	7,900	10,554
Steel wire, Bessemer soft drawn spring of Nos. 10, 12 and 13 gauge respectively, and homo steel spring wire of Nos. 11 and 12 gauge, respectively, imported by manufacturers of wire mattresses, to be used in their own factories in the manufacture of such articles	"	"	4,015	11,561
Carried forward	.....	.....	....	20,156,174

TABLE 10*b*—*Concluded.*

IRON.

IRON.

IMPORTS OF IRON AND STEEL GOODS.

Imports.

Fiscal Year, 1902.		Duty.	Quantity.	Value.
				$
Brought forward				20,156,174
Machinery and structural iron for beet root sugar factories	$	Free.		655,781
Flat steel wire of No. 16 gauge or thinner imported by the manufacturers of crinoline, corset wire and dress stays, for use in the manufacture of such articles in their own factories	Cwt.	"	5,351	19,138
Wire, crucible cast steel	Lbs.	"	1,166,422	88,377
Galvanized iron or steel wire Nos. 9, 12 and 13 gauge	Cwt.	"	297,084	548,185
Barbed fencing wire of iron and steel	"	"	329,391	826,846
Total				22,294,501

TABLE 11.

IRON.

IMPORTS OF PIG IRON, IRON AND STEEL GOODS, &C., FISCAL YEAR, 1901-1902.

Recapitulation of Tables, 7, 8, 9, 10*a* and 10*b*.

——	Tons.	Value.
Pig iron and iron kentledge	39,978	$ 585,077
Pig iron, charcoal	38	726
Scrap iron, cast	3,048	38,958
Scrap steel, wrought	36,150	520,909
Ferro-manganese, &c	6,513	150,977
Iron in slabs, blooms, puddled bars, &c	20,065	419,543
Iron and steel goods partially manufactured		7,768,332
Iron and steel goods more highly manufactured*		22,294,501
Total		$31,779,023

*Machinery, &c., classed under iron and steel goods in Customs report.

LEAD.

LEAD.

The production of lead in Canada in 1902, was 22,956,381 pounds valued at $934,095, or an average of 4·069 cents per pound, the average monthly price for refined lead in the New York market for the year. Compared with the previous year the output for 1902 shows a decrease of over 55 per cent in quantity and a little more than one third the production in 1900. Ninety eight per cent of the production in 1902 was mined in the province of British Columbia and the falling off in output is due very largely to the suspension of operations in the East Kootenay lead mines. The average price for the year was less by over 6 per cent than in 1901.

TABLE 1.

LEAD.

ANNUAL PRODUCTION.

Production.

Calendar Year.	Pounds.	Price per Pound.	Value.
		cts.	
1887	204,800	4·50	$ 9,216
1888	674,500	4·42	29,812
1889	165,190	3·93	6,488
1890	105,000	4·48	4,704
1891	88,665	4·35	3,857
1892	808,420	4·09	33,064
1893	2,135,023	3·73	79,636
1894	5,703,222	3·29	187,636
1895	16,461,794	3·23	531,716
1896	24,199,977	2·98	721,159
1897	39,018,219	3·58	1,396,853
1898	31,915,319	3·78	1,206,399
1899	21,862,436	4·47	977,250
1900	63,169,821	4·37	2,760,521
1901	51,900,958	4·334	2,249,387
1902	22,956,381	4·069	934,095

In 1901 the Dominion Parliament passed an act providing for the payment of bounties on lead refined in Canada from materials produced in Canadian smelters from Canadian lead ores. This Act however has been repealed during the present session (1903) and is replaced by another providing for the payment of bounties on lead contained in lead-bearing ores mined in Canada.

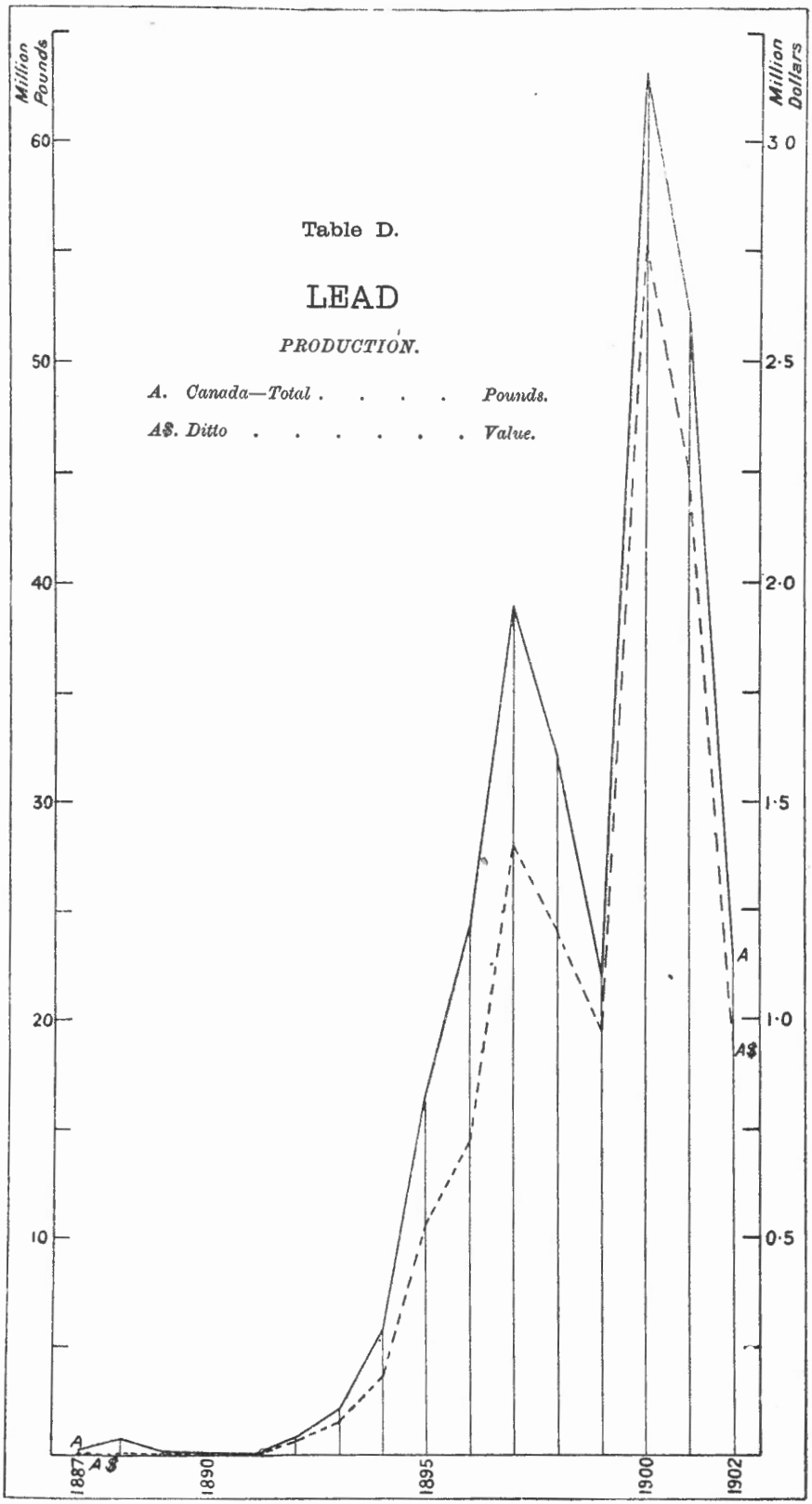


Table D.

LEAD

PRODUCTION.

A. Canada—Total . . . . Pounds.

A$. Ditto . . . . . Value.

LEAD. BILL.

The new bill is as follows:

No. 239] BILL. [1903.

An Act to provide for the payment of bounties on lead contained in lead-bearing ores mined in Canada.

His Majesty, by and with the advice and consent of the Senate and House of Commons of Canada, enacts as follows:—

Bounties on lead refined in Canada.

1. The Governor in Council may authorize the payment of a bounty of seventy five cents per one hundred pounds on lead contained in lead bearing ores mined in Canada, such bounty to be paid to the producer or vendor of such ores: Provided that, the sum to be paid as such bounty shall not exceed five hundred thousand dollars in any fiscal year: Provided also, that when it appears to the satisfaction of the minister charged with the administration of this act that the standard price of pig lead in London, England, exceeds twelve pounds ten shillings sterling per ton of two thousand two hundred and forty pounds such bounty shall be reduced proportionately by the amount of such excess.

Limitation.

Reduction if price of pig lead rises.

Mode of payment.

2. Payment of the said bounty may be made from time to time to the extent of sixty per cent upon smelter returns showing that the ore has been delivered for smelting at a smelter in Canada. The remaining forty per cent may be paid at the close of the fiscal year, upon evidence that all such ore has been smelted in Canada.

Reduction of rate if production excessive.

2. If at the close of any year it appears that during the year the quantity of lead produced, on which the bounty is authorized, exceeds thirty-three thousand three hundred and thirty-three tons of two thousand pounds, the rate of bounty shall be reduced to such sum as will bring the payments for the year within the limit mentioned in section 1.

Bounty in certain cases on lead in ore exported.

3. If at any time it appears to the satisfaction of the Governor in Council that the charges for transportation and treatment of lead ores in Canada are excessive, or that there is any discrimination which prevents the smelting of such ores in Canada on fair and reasonable terms, the Governor in Council may authorize the payment of

bounty at such reduced rate as he deems just, on the lead contained in such ores mined in Canada and exported for treatment abroad. LEAD. Bill.

4. If at any time it appears to the satisfaction of the Governor in Council that products of lead are manufactured in Canada direct from lead ores mined in Canada without the intervention of the smelting process, the Governor in Council may make such provision as he deems equitable to extend the benefits of this act to the producers of such ores. Bounty when ore is not smelted.

5. The said bounties shall cease and determine on the thirtieth day of June, one thousand nine hundred and eight. Duration of Act.

6. The Governor in Council may make regulations for carrying out the intentions of this Act. Regulations.

7. Chapter 8 of the Statutes of 1901, intituled *An act to provide for the payment of bounties on lead refined in Canada*, is repealed. Repeal of 1901, c. 8.

The value of the exports of lead in ore, etc., is shown in Table 2, while the imports are given in Tables 3 and 4, and of litharge in Table 5. Imports of dry white and red lead are shown in Table 6. In the latter table since 1890, the imports of zinc white have been included with the lead oxides.

TABLE 2.

LEAD.

EXPORTS. Exports.

Calendar Year.	Value.	Calendar Year.	Value.
1873	$1,993	1888	18
1874	127	1889	
1875	7,510	1890	
1876	66	1891	5,000
1877	720	1892	2,509
1878		1893	3,099
1879	230	1894	144,509
1880		1895	435,071
1881		1896	462,095
1882	32	1897	925,144
1883	5	1898	885,485
1884	36	1899	466,950
1885		1900	1,917,690
1886		1901	1,804,687
1887	724	1902	457,170

LEAD.

Imports.

TABLE 3.

LEAD.

IMPORTS OF LEAD.

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
1892	97,375	254,384	11,299	32,368	108,674	286,752
1893	94,485	215,521	12,403	32,286	106,888	247,807
1894	70,223	149,440	8,486	20,451	78,709	169,891
1895	67,261	139,290	6,739	16,315	74,000	155,605
1896	72,433	173,162	8,575	23,169	81,008	196,331
1897	65,279	158,381	10,516	29,175	75,795	187,556
	OLD, SCRAP, PIG AND BLOCK.*		BARS AND SHEETS.†		TOTAL.	
1898	88,420	$260,779	22,214	$39,041	110,634	$299,820
1899	114,659	283,432	44,796	39,833	159,455	323,265
1900	62,361	207,819	15,493	53,506	77,854	251,325
1901	(a)85,321	97,011	16,295	78,316	101,616	175,327
1902	(a)122,279	104,672	18,596	49,261	140,875	153,933

* Duty 15 p. c.

† Duty 25 p. c.

(a) Includes Canadian lead ore sent to the United States for refining, imported at price of refining only.

TABLE 4.

LEAD.

IMPORTS OF LEAD MANUFACTURES.

Fiscal Year.	Value.	Fiscal Year.	Value.
1880	$15,400	1891	23,893
1881	22,629	1892	22,636
1882	17,282	1893	33,783
1883	25,556	1894	29,361
1884	31,361	1895	38,015
1885	36,340	1896	50,722
1886	33,078	1897	60,735
1887	19,140	1898	63,179
1888	18,816	1899	91,497
1889	16,315	1900	104,736
1890	25,600	1901	107,260

		Duty.	
1902	Lead Tea	Free.	$59,947
	" Pipe	35 p. c.	8,018
	" Shot and bullets	35 "	3,760
	" Manufactures, N.E.S.	30 "	48,295
	Total		$120,020

TABLE 5.

LEAD.

IMPORTS OF LITHARGE.

Fiscal Year.	Cwt.	Value.	Fiscal Year.	Cwt.	Value.
1880	3,041	$14,334	1892	10,384	34,343
1881	6,126	22,129	1893	7,685	24,401
1882	4,900	16,651	1894	38,547	28,685
1883	1,532	6,173	1895	11,955	32,953
1884	5,235	18,132	1896	10,710	32,817
1885	4,990	16,156	1897	12,028	34,538
1886	4,928	16,003	1898	11,446	32,904
1887	6,397	21,865	1899	9,530	32,518
1888	7,010	23,808	1900	9,139	29,176
1889	8,089	31,082	1901	11,132	51,944
1890	9,453	31,401	1902....Duty free	13,002	47,021
1891	7,979	27,613			

LEAD.

Imports.

TABLE 6.

LEAD.

IMPORTS OF DRY WHITE AND RED LEAD AND ORANGE MINERAL.

Fiscal Year.	Pounds.	Value.
		$
1885	5,404,753	198,913
1886	6,703,077	213,258
1887	6,998,820	233,725
1888	6,361,334	216,654
1889	7,066,465	267,236

IMPORTS OF DRY WHITE AND RED LEAD, ORANGE MINERAL AND ZINC WHITE.

Fiscal Year.	Pounds.	Value.
		$
1890	10,859,672	381,959
1891	8,560,615	337,407
1892	10,288,766	351,686
1893	10,865,183	364,680
1894	10,958,170	353,053
1895	8,780,052	282,353
1896	11,711,496	367,569
1897	10,310,463	347,539
1898	12,682,808	448,659
1899	14,507,945	514,842
1900	14,679,920	634,492
1901	10,241,601	461,368
1902 Duty, 5 p.c.	15,584,164	603,582

BRITISH COLUMBIA :—

LEAD.

The production of lead in British Columbia is shown in Table 7 below.

British Columbia.

Production.

TABLE 7.

LEAD.

BRITISH COLUMBIA : PRODUCTION.

Calendar Year.	Pounds.	Price per Pound.	Value.
		cts.	
1887	204,800	4·50	$ 9,216
1888	674,500	4·42	29,813
1889	165,100	3·93	6,488
1890	Nil.	....	....
1891	"	....	....
1892	808,420	4·09	33,064
1893	2,131,092	3·73	79,490
1894	5,703,222	3·29	187,636
1895	16,461,794	3·23	531,716
1896	24,199,977	2·98	721,159
1897	38,841,135	3·58	1,390,513
1898	31,693,559	3·78	1,198,017
1899	21,862,436	4·47	977,250
1900	63,158,621	4·37	2,760,031
1901	51,582,906	4·334	2,235,603
1902	22,536,381	4·069	917,005

The various mining districts have contributed to the output for 1900, 1901 and 1902 as follows :—

TABLE 8.

LEAD.

BRITISH COLUMBIA : PRODUCTION BY DISTRICTS.

——	1900.	1901.	1902.
	Pounds.	Pounds.	Pounds.
East Kootenay—			
Fort Steele	38,494,077	29,129,128	3,017,756
Other districts	81,354	775,016	204,652
West Kootenay—			
Ainsworth	3,366,962	3,788,412	3,083,039
Nelson	1,485,899	2,470,350	1,680,948
Slocan	19,365,743	15,025,759	13,651,144
Trail Creek	1,045	....	....
Other districts	363,439	391,844	885,734
Yale	102	2,397	13,108
	63,158,621	51,582,906	22,536,381

MANGANESE.
Production.

MANGANESE.

Returns of the production of manganese for 1902 were incomplete and the figures of exports have been given as the closest approximation to the output. The exports were 172 tons valued at $4,062.

The production since 1886 is shown in Table 1 below :

TABLE 1.

MANGANESE.

ANNUAL PRODUCTION.

Calendar Year.	Tons.	Value.	Value per ton.
1886	1,789	$41,499	$23 20
1887	1,245	43,658	35 07
1888	1,801	47,944	26 62
1889	1,455	32,737	22 50
1890	1,328	32,550	24 51
1891	255	6,694	26 25
1892	115	10,250	89 13
1893	213	14,578	68 44
1894	74	4,180	56 49
1895	125	8,464	67 71
1896*	123½	3,975	32 19
1897*	15¼	1,166	76 46
1898	50	1,600	32 00
1899	1,581	20,004	12 65
1900	30	1,800	60 00
1901*	440	4,820	10 95
1902*	172	4,062	23 62

* Exports.

TABLE 2.

MANGANESE.

MANGANESE.

Exports.

EXPORTS OF MANGANESE ORE.

CALENDAR YEAR.	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	30,854	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
1892	84	6,180	59	2,025	143	8,205
1893	123	12,409	10	112	133	12,521
1894	11	720	45	2,400	56	3,120
1895	108	6,348	3/16	3	108 3/16	6,351
1896	123½	3,975	.....	.....	123½	3,975
1897	15¼	1,166	.....	.....	15¼	1,166
1898	11	325	.....	.....	11	325
1899	67	2,328	3	82	70	2,410
1900	.....	.....	.....	.....	34	1,720
1901	.....	.....	.....	.....	440	4,820
1902	.....	.....	.....	.....	172	4,062

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

TABLE 3.

MANGANESE.

IMPORTS: OXIDE OF MANGANESE.

Imports.

Fiscal Year.	Pounds.	Value.	Fiscal Year.	Pounds.	Value.
1884	3,989	$ 258	1894	101,863	$4,522
1885	36,778	1,794	1895	64,151	2,781
1886	44,967	1,753	1896	108,590	4,075
1887	59,655	2,933	1897	70,663	2,741
1888	65,014	3,022	1898	130,456	5,047
1889	52,241	2,182	1899	141,356	5,539
1890	67,452	3,192	1900	126,725	4,155
1891	92,087	3,743	1901	272,134	8,176
1892	76,097	3,530	1902 Duty free	476,331	5,360
1893	94,116	3,696			

MANGANESE.

The manganese deposits of Canada were described in a previous annual report of the Mines Section. The present more extended article, bringing our information up to date, has been compiled by Mr. Theo. Denis from all the available published information.

Uses of manganese.

Although Canada has not so far taken a very prominent place among the manganese producing countries of the world, the reason for this is not due to the lack of deposits of the ores of this metal. By far the greater proportion of the world's production, some 90 per cent of it, is used for the manufacture of ferro-manganese and spiegeleisen. These two alloys of iron and manganese differ from each other only in the proportion of manganese which they contain; up to 30 per cent of manganese the admixture is called spiegeleisen, whereas, when containing greater proportions it is called ferro-manganese, the standard of the latter containing 80 per cent of manganese. These alloys are manufactured to contain all degrees of proportions of the two metals, some spiegeleisen holding as little as two per cent of manganese, whereas high grade ferro-manganese contains as much as 90 per cent. They are used exclusively by steel manufacturers for the production of certain steels of great toughness used for stamp mill dies and shoes, crushing rolls, car-wheels, etc.

The extension of manganese production depends greatly on the development of steel manufacture, and as Canada is now making great strides in that direction, its deposits will probably assume before long a much greater importance than heretofore.

Besides the manufacture of steel, manganese ore has several other very important uses, the main one of which is its use as an oxidizing agent in the manufacture of certain chemicals, such as bromine, chlorine manganates and permanganates; it is also one of the elements of the Leclanché cells; it is also used as a decolorizer of glass; as a coloring material in dyeing and in the manufacture of pottery and of paints, etc.

When the manganese ore is used as an oxidizing agent in the manufacture of chemicals, certain requirements of purity and composition are necessary which are not needed in the ore consumed for spiegeleisen and ferro-manganese, and it has therefore a value three to four times greater than that used for the latter purpose. Pyrolusite is the ore of manganese which has the greatest oxidizing power, and as the ore of some of the Canadian deposits contains a large proportion of this mineral, it is specially well adapted to that use. In Canada the ores represented comprise pyrolusite, manganite, psilomelane and wad or bog manganese ore. The principal deposits of the crystalline ores of manganese of the eastern provinces are referred by Dr. Gilpin to a

horizon low down in the Carboniferous marine limestones, in most cases underlying the lowest beds of gypsum, yet that these ores have a wider distribution is shown by the fact that wad or bog manganese is found in superficial deposits connected with every geological formation known in Nova Scotia and New Brunswick; moreover, occurrences of pyrolusite have been noticed in the quartzites of lower Cambrian age and in granites, also in quartzites and slates of presumably Silurian age, and in Triassic trap rocks. MANGANESE.

Dr. Penrose* ascribes the origin of manganese deposits to secondary action and contends that the source of the manganese ores found in the Palæozoic and later sedimentary rocks, is to be traced to the underlying archæan rocks and various igneous rocks of all ages. The fact that the largest manganese deposits in the United States and Canada are in the neighbourhood of such rocks is in itself suggestive; but when it is found that large areas of bog manganese ore occupy basins in the decayed surface of the pre-Palæozoic rocks, and that the river pebbles in areas of these rocks are frequently encrusted with a black coating of oxide of manganese, other facts are encountered which at once suggest a possible pre-Palæozoic source for manganese deposits. Moreover, when it is observed that volcanic breccias are sometimes cemented by manganese, that segregated masses of oxide of manganese are sometimes found in lava, and that the manganese nodules dredged up from the sea bottom are in intimate association with volcanic debris, the possible source of manganese in igneous rocks claims attention. When these two classes of rocks, pre-Palæozoic and igneous, especially the former are examined in their more minute details, and it is found that of the minerals composing them, those containing manganese, are among the most common, the probability of their being the source of manganese in the younger rocks becomes established. The different steps of the formation of manganese deposits begin as follows: Origin of manganese deposits.

1. The derivation of the manganese from the decay of the Archæan and other pre-Palæozoic rocks and from the products of igneous action.

2. The solution and transportation of the manganese in the form of soluble organic and inorganic salts of the metal.

3. The precipitation of the manganese as oxide or carbonate.

4. The conversion of the carbonate into oxide.

5. The subsequent decay of the rocks which were deposited with the ore and an accompanying change in the nature of the ore and sometimes in its physical condition. That is to say, that the stages

* Penrose.—Geol. Surv. of Arkansas, 1890.

MANGANESE. in the history of the manganese deposits involve first, a decay of the rocks in which manganese is originally present as a constituent; secondly, a series of chemical reactions leading to a redeposition, and thirdly, a decay of the rocks of those newly formed deposits. As Dr. Penrose remarks very appropriately, the various stages in the formation of manganese deposits are similar in many respects to those known usually to have gone on in the formation of certain iron ores, but differ in minor details. Both metals have their origin in the same rocks; they go into solution in the same manner; but in the mode of redeposition, though they sometimes resemble each other, they often differ considerably in the chemical changes which go on in the subsequent alteration of the oxides. Hence manganese is often associated with iron ore deposits and sometimes is comparatively free from such accompaniments.

In the following description of the known deposits of manganese ore in Canada, the localities will be taken, as far as possible, in their geographical order from east to west, and not in the order of their relative economic importance.

Nova Scotia. NOVA SCOTIA.

This province possesses some of the most important deposits of manganese known in Canada, and as the iron and steel industries in that region are fast developing, these may, in the near future, become important sources of ore.

In Cape Breton, manganese ore is found in the western part of the county of that name. The most important belt of manganese-bearing ore crops out in the district of the head waters of the Salmon river and Loch Lomond. The rocks are of lower Carboniferous age and are met with in a valley between the felsites of the Mira and East Bay hills.

From personal observations and from notes furnished by Mr. Hugh Fletcher, of the Geological Survey of Canada, Mr. Edwin Gilpin describes the general conditions of the occurrence of the ore as follows* :—"The felsites of the Mira hills form a series of bays along which are exposed Carboniferous limestones, conglomerates, shales and grits as they were accumulated, subject to the varying conditions of the winds and currents of the period under consideration. At some points the limestones rest on the felsites; at other localities, grits and shales intervene; elsewhere, the basal conglomerates are covered directly by the millstone grit. The manganese ores were discovered

* Gilpin.—Manganese ores of Nova Scotia.—Trans., R.S.C., Vol. II.

two years ago in one of these recesses where the felsites were succeeded by shales and grits, and finally by limestones, the latter apparently extending from point to point of the ancient bay. The ores at the western mine are found in irregular bedded layers in a soft arenaceous reddish-coloured shale, which is in some places calcareous and coated with films of manganese oxide. The layers vary in thickness up to eighteen inches, and are frequently connected by cross stringers of ore. The shales when weathered present the ore in small nodules, and the disintegration of the former by water probably indicates the source of the beds of gravel manganese ore found lying on them. The ore at the eastern mine occurs as a bed immediately underlying a layer of black manganiferous limestone, with red and greenish shales and coarse grit. The thickness of the ore and limestone varies from two to eight inches, the average thickness of the two being about eight inches. The ore also occurs in this vicinity as lenticular pockets and irregular nests in conglomerate, &c., and sometimes forms the cementing material. The latter mode of occurrence is similar to that shown by the red hæmatites (sometimes highly manganiferous) found at various points in the Lower Carboniferous conglomerates of the island near their junction with older strata."

This deposit was first opened in 1880 by the Hon. E. T. Mosely, of Sydney, and has been worked at two places about three-quarters of a mile apart, near the head of Loch Lomond, eight miles south of the village of Big Pond on East bay. At the most easterly of these, the workings are on a vein about seven inches thick, dipping at an angle of 25° "in red fine sandstone overlying reddish and greenish grit with grains of quartz about the size of wheat, and red marly limestone, red and greenish shale, conglomerate and other rocks, blotched with calc-spar. It is in lenticular layers and also intimately mixed with the limestone, being probably of the same nature and origin as the hæmatite, and forming at times a covert for the pebbles of the conglomerate." *

At the western workings the ore is found in the bedding planes of a bright red argillaceous shale overlaid by calcareous argillaceous shale and limestone, and underlaid by conglomerate. The rocks have here a dip of 32°. Although these steep dips show the result of a general disturbance of the region, yet the rocks have not been as minutely shattered as might be expected. The ore is found both crystalline and massive, a great proportion being pyrolusite; it is very free from iron and remarkably pure, and is well adapted to chemical manufacture. Besides the ore mined from the two workings above mentioned, a large quantity was obtained as drift nodules in the rock beds. These

* Fletcher, Hugh.—Geol. Survey Rep., 82-83-84.

MANGANESE. Nova Scotia.

nodules have been washed out of the original decayed rock, and on the outside are earthy, but on breaking, the interior shows the bright black surface of fresh ore.

On Boulardarie island, in the vicinity of Big harbour, a deposit of wad or bog manganese occurs. The deposit is stated to be several feet thick and extensive, but there is a great lack of uniformity in the composition of the ore in different parts of the bed.

There are other occurrences of manganese ores in Cape Breton county. In a limestone quarry at Salem road some pockets of manganese were encountered and mined in 1897. The rocks are of Lower Carboniferous age.

Some samples of wad received at the laboratory of the Geological Survey are said to have been obtained from a deposit situated at the head of Lewis bay.

Hants County.—On the south shore of Minas Basin there is a development of Lower Carboniferous limestone which from the Shubenacadie river extends westward for a distance of about forty miles, as far as the estuary of the Avon. This belt contains a limestone band some 300 feet thick in which are found the most important deposits of manganese of the region, the largest and best known of which are the Tenny Cape mines. It underlies the gypsiferous horizon, and Mr. Fletcher says of it that "next to the gypsum, the most interesting member of this formation is the red basal limestone, along which the manganese ores are found. It is of considerable thickness, concretionary, brecciated and associated in places with red conglomerate and grit." About fifteen miles south of Tenny Cape, near Windsor and at Douglas, the manganiferous limestone reappears. The occurrence of manganese, however, is not confined to the limestone, but it has also been noticed in the Devonian sandstone which is found below the Carboniferous marine limestone, and in places it occurs in large enough quantities to be worked. In this class of deposits which are not in the immediate vicinity of the limestone, the ore occurs in veins, joints or blotches, from one-quarter of an inch to five inches, in Devonian quartzites and shales. The important manganese veins of the district, however, are in the limestone above mentioned, lying at the base of the Carboniferous formation. Work on a comparatively large scale has been performed at Tenny Cape, Walton and Cheverie.

Tenny Cape Mines.—These are the most important workings of the region, and have been worked since 1861. The quantity of ore produced is not very gr at but has been described as the purest and

most beautifully crystallized pyrolusite found in America. It has of course been chiefly used in the manufacture of chemicals, glass decolorizing, etc. Of the deposit Mr. H. Fletcher writes as follows: "The rock, a twisted, reddish, shaly or brecciated dolomite is sometimes separated by two to four inches of hard red clay from the Devonian sandstone or quartzite which forms the foot-wall or floor of the mine. The ore occurs in veins, strings, nodules and masses. One of the latter is said to have yielded one thousand tons associated with calcite, selenite, barite, and limonite but in some places almost entirely free from foreign matter, It occupies the lines of jointing and bedding, breaks apart the fragments of the breccia and replaces the shale and limestone. The latter dips S. 20°E. at a variable angle, beneath a mass of gypsum; it has been worked for about 200 yards on the strike and the whole distance tested is probably less than 500 yards." The workings, as may be inferred from the wavy nature of the deposit, are scattered and irregular; they consist of open cuts, tunnels and shafts, the deepest of which a few years ago was 170 feet

MANGANESE. Nova Scotia.

The Parker Mine.—This is situated to the north of the Tenny Cape mine, about three-quarters of a mile from it. The deposit is in a much disturbed limestone, forming apparently an outlier of the Carboniferous basal beds among rocks of Devonian age. In 1881 some thirty tons of excellent pyrolusite were mined, but since then the work has been mostly of a prospecting and development nature.

The Churchill or Walton Mine.—This is on the west bank of Walton river immediately above the bridge, on the shore road some twelve miles north-east of Cheverie. The deposit worked here is also in an outlier of red and gray limestone filling a hollow in red Devonian quartzite and shale. The ore is mainly pyrolusite with some manganite and is associated with calcite crystals and barite. Some large masses of very high grade ore have been mined from this deposit.

In this vicinity, the main development of the manganiferous limestone is encountered a short distance south of the outlier on which is the Walton mine, and these two bear to each other the same relation as the Parker mine deposit does to the Tenny Cape mines. The limestone crosses the Walton river south of Walton, and on both sides of the river extending some distances east and west, it has been subjected to a great deal of prospecting and preliminary work. One of the more important properties is the Stephens mine.

The Stephens Mine.—Of this deposit Mr. Willimott of the Survey, as the results of observations made in 1883, writes as follows: "This mine is situated near the village of Walton, in Hants county, and

MANGANESE. Nova Scotia.

consists of an excavation of about thirty feet in depth, in a reddish shaly limestone, striking E. and W. with a southerly dip. Pockets and irregular veins of manganite and pyrolusite can be traced along the strike for about 400 yards.

Nothing beyond the preliminary prospecting work, scarcely sufficient to develop this promising mine, had been done at the time of my visit. Mr. Stephens informed me that about ten tons of fair grade ore had been taken out during the progress of their investigations. The limestone belt is perhaps continuous to Hibernia where a quantity of ore was found in reddish calcareous grit interstratified with concretionary limestone."

Sturgis Mine.—At this place which is about two miles west of Walton, manganese ore occurs in somewhat large quantities, as stringers, veins and films, or impregnations and stains in large masses of both the limestone and of the underlying flinty sandstone, in both of which shafts have been sunk and tunnels driven.

Tomlinson Mine.—This is situated west of the above mine and consists of openings made in the reddish and grey quartzite which underlies the limestone. These openings show masses of pyrolusite and hæmatite, sometimes mixed, sometimes separated.

Lantz Mine.—Several shallow pits have been opened in limestone, and from these workings some fine specimens of pyrolusite were obtained.

The Cheverie Mine.—This is situated near the village of Cheverie and the deposit here worked underlies the gypsum of the Cheverie quarries. The ore, a mixture of pyrolusite and manganite, occurs in a reddish and grey concretionary limestone, and is associated with white calcite in a network of small veins, from an eighth of an inch to three or four inches in thickness. Frequently the calcite associated with the manganese is in long crystals standing at right angles to the wall of the veins and forming a comb structure on both sides of the manganese.

According to observations made by Mr. H. Fletcher, at Cheverie, the ore is found near the top of the manganiferous band of limestone, at Walton it is found at the base of it near the contact with the underlying quartzite, and at Tenny Cape the best development of ore is met with at some thirty-seven feet from the bottom.

Minasville or Moose Brook Mines.—This mine is situated some four miles northeast of Tenny Cape. The occurrence of manganese ore here is not in the limestone, but in the underlying Devonian quartzites, where it is found in joints, veins and blotches, varying from a quarter

of an inch to five inches in thickness. A certain quantity of ore has been shipped from these workings. MANGANESE. Nova Scotia.

The same geological conditions are observed at Bear brook and at a deposit east of Noel river, where some preliminary work yielded small quantities of pyrolusite.

In Hants county other occurrences of crystalline manganese ores, more or less important have been noticed at Douglas, Rawdon, Goshen and other places. Bog manganese occurs near Goshen, south of Cheverie, at the head of Bass creek.

Colchester County, East Onslow.—At this place is the most important deposit of manganese now known in Colchester county. The ore occurs in the joints and bedding planes of old Devonian quartzite. In some places the ore which consists mainly of pyrolusite, is a foot thick; some manganite and psilomelane are also encountered. Operations were begun on this deposit in 1886 or 1887 and have since been carried on intermittently. The principal workings consist of a shaft fifty-five feet deep, and a large irregular cut.

Valley, Manganese Mines.—At Manganese mines near Valley, a quantity of black oxide of manganese is found in irregular veins cutting a reddish, slaty rock, which underlies the Carboniferous limestone.

Farham's Mill brook.—From the appearance of the occurrence of manganese at this place the deposit is a contact deposit between grey, rusty, concretionary, massive Carboniferous limestone and Devonian rocks. The ore occurs mostly in pockets in the limestone which also contains disseminated hæmatite, giving the rock a mottled weathering appearance.

Other occurrences of manganese ores have been noted on both shores of Minas basin in Colchester county. At Black Rock mine, near Clifton, at the mouth of the Shubenacadie river some work was done on a deposit in limestone. The ore which was of a ferruginous and magnesian nature was found in small quantities.

On the north shore of Minas basin at Lower Economy several barrels of fine crystalline pyrolusite were obtained in 1891. The occurrence is similar to those of East Onslow.

Besides the above occurrence, manganese is also found in large quantities associated with the important deposits of iron ores of Londonderry iron mines. The iron ore is found as veins of brown hæmatite accompanied by ochre, ankesite and sideroplesite. In places secondary

MANGANESE. Nova Scotia.

changes have enriched the iron ore with manganese peroxide to the extent of fourteen per cent of its total constituents.

Other localities in Nova Scotia where occurrences of manganese ores have been observed, are as follows :—

In Cumberland county, Minudie, some small quantities of soft fine-grained pyrolusite were obtained from the Lower Carboniferous limestone. At Amherst (Cumberland) some manganese ore occurs in the same formation.

At Springhill (Cumberland) and Parrsboro', wad is met with in superficial deposits.

At New Ross, in Lunenburg county, a few shipments of ore are said to have been made from the college grant. The ore appears to be a mixture of psilomelane and manganite occurring in veins sometimes three feet in thickness. Wad is reported to occur at La Have and Chester, Lunenburg.

In Pictou county deposits of manganese ore are met with in connection with the iron ore deposits at Bridgeville and at Springhill, where boulders and concretions of psilomelane, manganite and wad are found.

In Antigonish county, near the head of the Ohio settlement, large pieces of pyrolusite were found in the drift on a hill, and in the same county occurrences of wad have been noticed near Afton; in Pomquet river; in Sutherland's brook and on a hill west of Piedmond station.

In King's county, near Wolfville, pyrolusite is found in small masses and stringers, in slates of Devonian age.

In Halifax county, at Musquodoboit and Ship Harbour, pyrolusite occurs as veinlets in granite, and at Jeddore, wad is found in the superficial deposits.

New Brunswick.

NEW BRUNSWICK.

The geological characters of the manganese deposits in New Brunswick resemble those of Nova Scotia. They are found in rocks of pre-Carboniferous age as well as in Lower Carboniferous measures, besides the superficial deposits of wad. The most important deposits, from an economic standpoint, are, however, those found in the Lower Carboniferous limestone.

Gloucester County.—In the vicinity of Tête à Gauche Falls, some eight miles from Bathurst, a deposit of pyrolusite occurs, in the red slates of the district which are probably of Cambrian age. The ore is found in numerous small veins, some of which are said to be as wide

as eight inches; and detached masses of it are often found in the superficial deposits in the neighbouring fields. This occurrence was the first to attract attention to the manganese ores of the province; it was worked a number of years ago, and a certain quantity of ore is said to have been shipped from this place. As a result of personal examination, Dr. Bailey is of opinion that the district is worthy of closer examination than it has yet received. Unfortunately, the conditions are not very favourable to easy prospecting, as the district is flat and deeply covered with clayey soil.*

King's County.—In this county are the deposits of Markhamville, which are the most important ones of the province. The ore deposits were examined by Dr. Penrose in 1890, and as a result of his visit he describes them as follows:

† "The Markhamville mine is situated at the village of Markhamville near the head of Hammond river in Kings county about forty miles north-east of St. John, about fifteen miles north of the shore of the Bay of Fundy, and about eight miles south of Sussex on the Intercolonial railway. The existence of manganese was noted at the head waters of the Hammond river many years ago by Mr. Geo. F. Matthew, of the Geological Survey of Canada, but the property was first opened about 1864 under the management of Major A. Markham. Major Markham was the first to attempt to develop in a systematic manner the manganese deposits of this province, and it is due to his energy and perseverance that the ores have been introduced into the market

"The ore occurs either as crystalline pyrolusite and manganite, or in a compact, massive, nodular or bedded form, sometimes containing psilomelane.

"The ore-bearing limestone is generally of a gray colour, but at times is pink or buff, and is associated with shaly strata. It contains veins of crystalline calcite in which masses of pyrolusite are frequently found, but the principal ore deposits are lenticular bodies interstratified with the limestone. These ores occur as irregular pockets or as flat layers more or less continuous for considerable distances, and becoming thin and thick at intervals. In some places such deposits widen out into pockets from which several hundred tons of ore have been taken and in one opening 3,000 tons are said to have been mined. Though in places the pockets do not always adhere strictly to the bedding of the rock, yet in a general way they follow it. Sometimes

* Annual Report Geol. Surv. of Can., Vol. X. (N.S.), 1897. Part M.

† The Manganese deposits of U. S. and Canada, by Dr. Penrose. Geol. Survey of Arkansas, vol. I., 1890.

MANGANESE. New Brunswick.

veins and pockets cut directly across the bedding, but these are generally smaller than the others and are probably due to a secondary chemical action by which they have been derived from the bedded ores.

"The surface of the limestone has often been decomposed, and a red residual clay, frequently mixed with surface gravel, has collected in considerable quantities. The ore that was originally in the part of the limestone which has decayed, is now found buried in the clay; and therefore deposits of ore-bearing clay or gravel, overlying the partly decomposed surface of the limestone, are of frequent occurrence. Such deposits are rarely more than from eight to twenty feet in thickness, but the ore in them is cheaply worked and they have supplied a large part of the output of the Markhamville mine. Frequently the decomposition of the limestone has spread downward more rapidly along the outcrop of a body of ore than elsewhere, causing somewhat abrupt hollows filled with residual clay and manganese ore and containing in the bottom the outcrop of the ore in situ in the rock.

"Not only has decomposition taken place on the surface but it has also gone on to a considerable extent underground frequently causing subterranean cavities and passages. When these have intersected bodies of manganese the floors are covered with loose fragments of ore, brought there in the same way as that in the residual clay on the surface. Kidney-shaped masses of glossy, black limonite are frequently found with the cave deposits, and these also have doubtless come from the limestone.

"Though a large amount of manganese has been taken from the surface clay beds and the caves, yet the deposits of ore in the limestone have also been extensively worked, and in many places the rock is honeycombed with a network of shafts and drifts, following the erratic courses of the ore bodies in all their intricacies.

"The thickness of the limestone varies considerably: in one of the pits a depth of twelve feet was found, and a diamond drill boring in another part of the property showed a thickness of fifty-five feet. Probably a greater thickness will be found elsewhere. The bed is much disturbed and is folded into small anticlines and synclines, but at Markhamville it has a general dip to the northwest and a strike of northeast and southwest. In many places it contains fossils, and sometimes the carbonate of lime of these has been partly replaced by manganese, which has subsequently been oxidized and now exists as a black, more or less calcareous mass.

"The Hammond river rises near Markhamville and flows south-west, parallel to the coast of the Bay of Fundy, until it finally turns south

and empties into the bay about eight miles south east of St. John. In the region of Markhamville, and for some miles down the river, the Lower Carboniferous limestone occupies the centre of the valley; but it is only locally that manganese occurs in it, and only at the Markhamville mine that it has yet been found in large quantities. MANGANESE. New Brunswick.

"The limestone area is bordered on the south by a range of hills which forms the southern barrier of the Hammond river valley. According to information kindly furnished by Mr. G. F. Matthew, of the Geological Survey of Canada, these hills are composed largely of the underlying pre-Cambrian rocks, and the Carboniferous rocks dip away from them. To the north of the river the limestone is cut off in many places by an abrupt escarpment of Carboniferous conglomerate, which according to the same authority, probably belongs above the manganese-bearing limestone.

"The ore from this mine is mostly used for chemical purposes. It is prepared for market by crushing, washing and sizing with screens. Certain quantities of the lower grades, however, are shipped without previous preparation, under the name of "furnace ore" and are used in the manufacture of spiegeleisen and ferro-manganese."

The importance of the Markhamville mines may be realized by the fact that between 1868 and 1894, the total exports of manganese ore from New Brunswick amounted to over 23,000 tons representing a value of nearly $410,000, almost the whole of which, was derived from the Markhamville deposits. (Dr. Bailey, Mineral Resources of New Brunswick.)

King's County, The Glebe mine.—The deposit of the Glebe Mine is situated some three miles N.N.E. of the Markamville vein, and seven miles from Sussex station on the Intercolonial Railway.

Dr. Penrose in his bulletin on the manganese ores of America describes this occurrence as follows:—"The ore is found in a limestone resembling that at Markhamville, though it is much less disturbed than at that place and dips gently to the west. The manganese ore occurs in the limestone in nodules and thin layers, frequently associated with calcite and following the general direction of the stratification. Several shafts and tunnels have been made, the deepest shaft being 85 feet."

King's County, Jordan Mountain.—This deposit is situated on the south-eastern side of Jordan mountain, about seven miles from Sussex station on the Intercolonial Railway. According to Dr. Bailey, the

MANGANESE. New Brunswick.

geological relations here are similar to those of Markhamville; the ore is found in strata of Lower Carboniferous age near their contact with older metamorphic rocks. But instead of occurring as in the last-named locality, in limestone, it is found in connection with shales and shaly conglomerate, the brecciated character of which is in contrast with the rocks at Markhamville. Work was begun on this deposit in 1882 and some good ore is said to have been extracted from an open cut. The ore is a mixture of pyrolusite and manganite occurring in lenticular interbedded masses. There are also small veins and stringers of manganese oxide penetrating the surrounding rocks.

King's County, Hillsdale.—Some fine surface indications of manganese ore are said to have been observed at Hillsdale about five miles south-east from Elgin corner. No particulars of this deposit are available.

St. John County, Quaco Head mine.—This is situated on the north shore of the Bay of Fundy on a promontory which forms the southern boundary of Quaco Harbour. The mine is about one mile south of the village of St. Martins. The following description of the deposit is taken from the bulletin by Dr. Penrose who examined it in 1890 when it was being worked by the Brunswick Manganese Company. "The manganese is sometimes crystalline representing pyrolusite and possibly also manganite, while at other times it is hard and massive, possibly representing psilomelane, and still again it is in porous honeycombed form. These ores are found in Lower Carboniferous shales and limestones, associated with a large conglomerate bed.

"The rocks are greatly disturbed and have been much shattered and broken by igneous intrusions. They now stand at steep angles sometimes almost vertically, exposing in different parts of the headland areas of limestone, shale, and coarse conglomerate. Masses of igneous material protrude into these beds at different points and on either side of the headland are beds of Triassic sandstone and fine conglomerate lying unconformably on the upturned edges of the older rocks.

"The manganese occurs as nodules and irregular discontinuous veins, in both the shale and the limestone, though the larger quantities are in the former. The nodules vary from a fraction of an inch to several inches in diameter, and the thickness of the veins is equally variable. The disturbed character of the rocks renders it somewhat difficult to determine the thickness of the main ore-bearing bed but it is probably not over thirty feet though smaller quanties of manganese are found in the rocks on either side. The ore is scattered through this thickness in very variable quantities. . . . . .

"The igneous rock is a hard light gray, close-grained material of a texture somewhat like trap. The limestone is like that of Markhamville, though it is much reddened at the contact with the igneous rock. The conglomerate bed is composed of coarse pebbles of metamorphic rocks. It dips steeply to the south and forms a bold bluff on which the lighthouse of Quaco Head is situated. The sandstones and conglomerates at each end of the section are of a brick red colour and vary from coarse sandstone to a fine conglomerate, with pebbles from a quarter of an inch to one inch in diameter, both sand and pebbles being composed of white quartz stained by a ferruginous cement. Sometimes these beds contain small irregular seams or nodules of manganese ore, which, however, are in very limited quantity, and have doubtless been derived during the deposition of the beds, from the erosion of the Lower Carboniferous rocks. MANGANESE. New Brunswick

"The ore-bearing rocks can be traced back on the promontory at intervals for almost a mile, to a place where an opening has been made on the farm of Mr. Molaskey. On the north side of the head, small scattered nodules of manganese ore are found in the gravel drift that lines that part of Quaco Harbour, and extends inland over the Lower Carboniferous rocks. They have doubtless been derived from the latter rocks during deposition of the gravel, in the same way that the red sandstone just mentioned obtained its manganese contents at an earlier date."

Subsequent to Dr. Penrose's visit the Brunswick Manganese Company erected a well-equipped mill, consisting mainly of a crusher, rolls, screens, two jigs, etc. The mine is exceptionally well situated for shipping by water. Operations have, however, been discontinued for several years.

Albert County, Shepody mines.—Shepody mountain is one of the highest eminences in southern New Brunswick. The lower part of this mountain is composed of chloritic hydro-mica schists, and the upper part consist of Lower Carboniferous strata; at the contact between these two sets of rocks are found the manganese occurrences.

Dr. Ells in his report for 1885* writes as follows:—"Shepody mountain, 1,050 feet high, is a rugged peak which forms a prominent landmark for many miles in all directions, and was one of the signal stations for the Admiralty survey of the Bay of Fundy. It is composed largely of red conglomerates, which are well exposed on the east flank in Robertson's brook and its branches. A deposit of reddish

* Geol. Surv., Can., Report of Progress, 1885.

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impure limestone has been opened up at this place for a marble quarry, but the rock was found to be too much shattered to be of great value. The limestone contains a small quantity of manganese. The rocks of the mountain rest upon a small outlier of the talco-chloritic schists which show on the road to the north, leading to Curryville, and are flanked on the east by the gray sandstones of the millstone grit. On the north-west side a large deposit of manganese was worked for some years, a tunnel being driven into the mountain along the contact with the underlying schists for nearly 1,000 feet. The ore, which consisted of pyrolusite and psilomelane occurred at the base of the conglomerate in irregular pockets."

The Shepody mountain mines were first opened in 1860, and it is said that 500 tons of ore was extracted. This were a compact black oxide, less crystallized than the ores of Markhamville, but of high grade. It was found both in veins and in interbedded masses.

Albert County, Elgin.—Gowland Mountain.—On the north-east side of the mountain some exploratory work revealed occurrences of pyrolusite and psilomelane in a very broken and decomposed granite of pre-Cambrian age.

In the same county, on the east side of Salisbury bay, a small deposit of manganese occurs near a contact of Lower Carboniferous and Triassic sandstones. This deposit was worked many years ago but shortly abandoned.

Albert County, Dawson Settlement.—At this place occurs a very important deposit of wad or bog manganese. Dr. Bailey, who visited the deposit in 1899, gives the following description, which is the latest and fullest available :—

"This very remarkable deposit is located about five miles and a half from the town of Hillsborough, on the slope of a hill inclining northeasterly at a low angle towards a small brook, flowing thence to the Petitcodiac river, and whose opposite slope is occupied by the settlement above named. The upper part of the first ridge is wooded, but between the edge of the latter and the brook the ground is cleared and upon removal of a thin coating of vegetable matter, usually not more than two inches in depth, is found to be everywhere covered with a very fine black powdery deposit consisting essentially of manganese oxide.

"The property, as leased, embraces an area of about 150 acres, and upon about eighteen or twenty acres, or as far as searched for, the ore has been found, the deposit varying in depth from a few inches to

thirty feet. In a survey recently made by a Crown land surveyor, seventy-three borings were made, in squares of 100 feet, over a space of seventeen acres, showing an average depth of six feet seven and three-quarter inches, equal to 1,900 pounds to the cubic yard. There is accordingly already in sight and available for use :— MANGANESE. New Brunswick.

	Tons.
In situ on hillside, 17 acres	173,176
In drying-house and sheds	400
Total	173,576

According to the statements of the manager of the property Mr. R. P. Hoyt, to whom I am indebted for assistance and valuable information, the iron rods used in the above borings, in many of the deepest places, failed to go down over twenty-five or thirty feet, and then struck what was apparently hard manganese ore, so that the above results indicate the minimum quantity. These ores are, in comparison with those of Markhamville, low grade ores and would be of little or no value for the uses to which the latter are chiefly put, nor in their natural condition would they have commercial value of any kind. It is, however, proposed to subject them to a bricquetting process whereby the pulverulent and absorbent mass shall be rendered solid, non-absorbent, and capable of easy handling, in which condition it may be advantageously used in the manufacture of spiegeleisen and ferro-manganese. For this purpose an extensive plant embracing drying furnaces compressors, bricquetting machines, etc., has been erected close by the manganese deposits, and also near to the track of a branch railway one mile and a half in length, built by the company, and connecting with the Harvey and Salisbury Railway at a point eleven miles from Salisbury, whence, over the Intercolonial Railway the product may be readily shipped to all Canadian and United States points. The shipping point by sea is five miles and a half by rail from the mine to Hillsborough, with direct landing at wharf for vessels of 800 to 1,000 tons capacity." This company, "The Mineral Products Company of New York," sent the bricquettes to Bridgeville, Nova Scotia, where the smelting plant of "The Picture Charcoal Iron Company" had been secured for the manufacture of ferro-manganese. For some unknown reason, after a period of apparently successful operations this company have discontinued work.

Besides this deposit of wad, other deposits have been noticed at different places, among which are Queensbury, York county; north branch of S. W. Miramichi; in gravelly bank near government house

MANGANESE. New Brunswick.

at Fredericton; near Harvey, Albert county; Bull Moose Hill, Kings county; Moore's Mills, Charlotte county and other places.

As to the probable origin and mode of formation of the deposits of wad or bog manganese, Dr. Chalmers* assigns it to the action of springs.

In the case of the Dawson Settlement deposit, the bed of wad lies in a valley at the northern base of a hill, and springs are trickling down the hillside; doubtless the process of formation of bog manganese is still going on. Dr. Bailey on the same subject writes as follows:

"An interesting question in connection with these deposits is that of their probable origin. Upon this point the locality throws very little light, there being absolutely no exposures of rocks anywhere in the vicinity or any visible source from which the manganese may have come. The nearest rocks are indeed those of the millstone grit, though these are doubtless underlain, as at Hillsborough and about the Albert mines by Lower Carboniferous rocks, including limestones. None of these however, are markedly manganiferous. It is also a little singular that the deposit should have such a decided slope instead of being, as usual with bog ores, nearly horizontal. Finally, the abruptness with which the deposits end along the line of the brook referred to above, towards which it inclines while no such material is to be found on the opposite slope, is also remarkable, and seems to suggest that the ores are the result of deposition from springs originating on the one slope but wanting on the other, while the brook has carried off the excess of the solvent water. In support of this view it may be observed that the hillside on which the ore beds rest, is remarkable for the number of springs which issue from its surface, in the waters of which both iron and manganese may be readily detected."

Quebec.

QUEBEC.

In this province the only occurrences of crystalline manganese ore are those of the Magdalen islands in the Gulf of St. Lawrence. From an examination of these islands Mr. Jas. Richardson in the report of the Geological Survey for 1879-80 writes as follows: "Immediately under Demoiselle hill, on Amherst island, numerous blocks charged with peroxide of manganese or pyrolusite, occur among the debris of the fallen cliffs. They are in pieces varying from one pound to ten or fifteen pounds in weight. There can be little doubt that they are derived from a deposit more or less regular in the hill side, but which

* Annnal Report Geol. Surv. Can., Vol. VII, (N.S.), 1894, Part M.

is now completely concealed by the fallen debris. At a place bearing nearly due west from Cap aux Meules, at the distance of about a mile, and close to the English Mission church, similar pieces to those above described are very frequently picked up." These deposits have lately attracted some attention, and in 1903 were purchased by a syndicate which intend working them. MANGANESE Quebec.

Wad or bog manganese has been observed at a great number of points in this province but the quality is poor as a rule, and of small commercial value. Of these deposits one of the most considerable is in the township of Stanstead, lot 9, range X; This deposit is stated to cover an area of about twenty acres with a maximum thickness of about twelve inches. Some of this ore after undergoing a washing to free it from the sand, gave 37 per cent of peroxide.

Another deposit of several hundred square yards in extent with a maximum thickness of six inches was observed in the township of Bolton, lot 20, range XII.

Mr. A. P. Low, mentions the occurrence of wad on the St. Louis road some four miles and a half from Quebec. The deposit here is about sixty yards by five with a maximum observed thickness of twelve inches.

The following other occurrences were compiled from the reports of the Geological Survey. The majority are of limited extent.

On the road from Lambton to St. Francis, Beauce county, near the eastern boundary of the township of Tring; on the west side of the Chaudiere river, opposite the mouth of the Famin river; in the seignory of the Mesy; in the seignory of Ste. Anne de la Pocatiere in rear of the church; in Cleveland township, county of Richmond, on lot 16, range XIII; in St. Sylvester lot 9, range St. Charles; in Gaspe seignory, half a mile west of St. Apollinaire church.

UNGAVA TERRITORY.

Ungava Territory

In his report on the east coast of Hudson bay, Dr. Bell mentions the occurrence of very important deposits of spathic iron ore in the Nastapoca chain of islands. These ores are in places very rich in carbonate of manganese; an average specimen from Flint island yielded 25·44 per cent metallic iron and over 24 per cent of carbonate of manganese. These deposits are very accessible and may some day be worked profitably. The high contents of manganese in these ores would render them valuable in the manufacture of spiegeleisen.

ONTARIO.

Ontario.

There are very few occurrences of ores of manganese in this province, and none of these has been worked. One of the first discoveries

MANGANESE. Ontario.

is that of Bachewanung bay on Lake Superior, which is described as follows in the "Geology of Canada 1863."

"At Bachewanung bay, near the southwest end of the Upper Canada Mining Company's location, and not far from the shore is a large vein of manganese ore, running north and south, and from fifty to sixty feet wide. It is described as presenting the aspect of a succession of small knobs, in which, mixed with a reddish trappean rock, are numerous strings of the ore, associated with quartz and calc-spar, and occasionally with octahedral crystals of fluor. The ore, which is massive with small geodes of crystals, is described by Prof. Hadley as manganite or hydrous sesquioxide of manganese, which for manufacturing purposes is inferior to the peroxide. A specimen was found by assay to be equal to sixty per cent of peroxide of manganese."

In the Rainy lake district manganese has been discovered associated with the iron ore deposits to the north of Gunflint lake; an occurrence is described as follows by Mr. Conmee in the second report of the Ontario Bureau of Mines; "This range (iron ore) is near Sand lake, four miles from the Port Arthur, Duluth, and Western railway. The deposit has been found to be a large one. A pit has been sunk about 15 feet, and as far as the pit has shown up the vein, it seems to be very much decomposed. The ore assayed 65½ per cent. of iron and carried also a good percentage of manganese. The manganese appears to be dispersed among the iron, but it also occurs in pockets; they have taken out small quantities of manganese almost pure."

Wad or bog manganese occurs at several places in Ontario but has not attracted any attention, so that very little is known about them. An extensive deposit is said to occur in Hastings county, Madoc tp., lot 4, range V.

North-west Territories.

NORTH-WEST TERRITORIES.

In Assiniboia a deposit of manganese ore is reported to occur on the north bank of the north fork of Willow creek. Tp. 5, R. 1, west of 4th Mer.

Mr. Pearce gives the following description of the deposit: "The manganese is found in pockets in a honeycombed formation four or five feet thick, composed of clay and sand with no sulphur or lime. Taking the deposit as a whole, manganese is estimated to run 5 per cent."

British Columbia.

BRITISH COLUMBIA.

The only record available of discovery of ores of manganese in British Columbia, is that of important occurrences of bog manganese in Nicola

ANALYSES OF CANADIAN ORES OF MANGANESE.

Locality.	Manganese peroxide.	Manganese sesquioxide.	Manganese metallic.	Manganese monoxide.	Oxide of iron.	Iron sesquioxide.	Iron metallic.	Phosphorus.	Phosphoric acid.	Sulphur.	Calcium.	Lime carbonate.	Magnesia.	Baryte.	Alumina.	Oxygen.	Water (moisture.)	Water of composition.	Silica.	Insoluble.	Vegetable matter.	Ore.	Analyst.	Reference.
NOVA SCOTIA.																								
Cape Breton County.																								
Grand Mira, Head of Lewis Bay	44·99																			12·25		Wad'	E. B. Kenrick	Geol. Surv. of Can., 1886, pt. T.
Mira Hills, two miles east of Loch Lomond.	81·52																					Pyrolusite	F. D. Adams	" 1879–80 " H.
" " "	88·98					·21														2·91		"	"	" " " H.
Morrison Mine, near Loch Lomond	91·84					·12														10·00		Wad	Ed. Gilpin	Trans. Roy. Soc., Can., Vol. II.
Boularderie Island	44·33					35·50											33·52					"	F. D. Adams	Geol. Survey of Canada.
"	25·42																			57·76		"	"	" "
"	11·04					12·49																		
Colchester County.																								
Londonderry	67·10		10·67*	4·09							2·49		Trace.		·67		9·37		4·08				H. Louis	Mineral Res., U.S., 1885.
Cumberland County.																								
Amherst	97·04																0·61					Pyrolusite	Dr. How	Edinb. and Dublin Phil. Mag., 1866.
Halifax County	56·00																					Wad	"	Nova Scotia Inst. of Sc., 1865.
Hants County.																								
Tenny Cape	85·54					1·18			·34					·89		51·54	8·54			3·27			Dr. How	Trans. Roy. Soc., Can., Vol. II.
"	95·00																					Pyrolusite	"	Nova Scotia Inst. of Sc., 1865.
"	92·69																					"	"	" "
"	88·01																					"	"	" "
Cheverie	90·15		56·97			2·55		0·45	1·029			Trace.		1·12			2·05			2·80		"	Ed. Gilpin	Trans. Roy. Soc., Can., Vol. II.
"	86·81													2·05†		47 73	10·00			1·14		"	"	" "
"	47·73																					Manganite	Dr. How	Nova Scotia Inst. of Sc., 1865.
Douglas	84·62		53·47			·603								·724		7·035	1·660	3·630		1·728		Pyrolusite	H. Poole	Trans. Roy. Soc., Can., Vol. II.
Pictou County.																								
Springville	14·410		9·106			48·223		·020		·480	·015				Trace.		12·530			25·130			Ed. Gilpin	Trans. Roy. Soc., Can., Vol. II.
"		62·950	43·810			10·848					7·280		1·630	·670	2·880		1·450			2·731			"	" "
NEW BRUNSWICK.																								
Albert County.																								
Hillsborough	47·00				‖18·00																34·0	Wad	W. F. Best, St. John	Geol. Surv. Rep., 1890, Part S.
Dawson Settlement (average of 12 samples)			45·81				9·55	·05		·03						31·01			5·36					Mineral Res., U.S., 1896.
Edgett's Landing		18·37	12·79			1·31														71·85		Manganite	G. C. Hoffman	Geol. Surv. Rep., 1888–89.
Elgin County.																								
Gowland Mountain	50·21					3·06														33·78		Psilomelane	F. D. Adams	Geol. Surv. Rep., 1885.
King's County.																								
Markhamville	98·70						·75							Trace.					·55			Pyrolusite		Mineral Res., U.S., 1888.
"	97·25					·85								§·95			Trace.					"		" "
"	96·62					·78								§·85			"					"		" "
"	52·74					3·75				·02		13·40							9·50			"		" U.S., 1885.
Jordan Mountain	86·08		54·57		·87														2·86				P. B. Wilson, Baltm'r	Mineral Res. of N. Brunswick.
"			52·88			1·18		·014											9·70				Otto Wirth, Pittsb'rg	" "
"			57·37					·015		0·61									0·23				PennsylvaniaSteelCo	" "
St John.																								
Quaco Head	71·54		58·20			2·19		0·02		·00	Trace.									8·37		Pyrolusite	Dr. A. M. Comey	Rep. to Bruns'ck Mfg. Co., 1889.
"	65·00		57·15			1·75		0·04		·00	"									6·66		"	"	" "
QUEBEC.																								
Amherst Island, Magdalen Islands	45·61																·10					Manganite	F. D. Adams	Geol. Surv. of Can., 1878–80–81, part H.
One of the Magdalen Islands			64·62		‡1·55			Nil.		Nil.						31·63	·80		1·40				Torrey & Eaton, N.Y	Rep. to W. G. Tait.

* Contains also small proportins Ni., Co. and Cu. † Iron peroxide and baryta. ‡ Oxides of iron and aluminum. § Baryta and silica. ‖ Also trace of Cu. and Co.

valley, but only a comparatively small part of the province has been thoroughly prospected, and it is very probable that rich deposits exist which have not yet been found. MANGANESE. British Columbia.

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MICA.

MICA.

The production of mica in 1902 in the provinces of Ontario and Quebec, according to the statistics published by the mining bureaus of these provinces was as follows : Production.

Quebec.....	132,822 lbs.	$ 34,304
Ontario.....	1,986,000 "	101,600
	2,118,822 "	$135,904

The above figures make the total production of mica in Canada of a value of $135,904. As the statistics of production published for 1901 and previous years were compiled on a different basis, being esti-

Mica. Production.

mated from export returns and home consumption, it is inadvisable to draw comparisons between the above figures and those of previous years. The export returns have not been used as a basis for estimating the production in 1902, for the reason that it is believed they include for that year, large quantities of material manufactured from mica, such as mica boiler covering, etc.

TABLE 1.

MICA.

ANNUAL PRODUCTION.

Calendar Year.	Value.	Calendar Year.	Value.
1886	$ 29,008	1895	$65,000
1887	29,816	1896	60,000
1888	30,207	1897	76,000
1889	28,718	1898	118,375
1890	68,074	1899	163,000
1891	71,510	1900	166,000
1892	104,745	1901	160,000
1893	75,719	1902	135,904
1894	45,581		

TABLE 2.

MICA.

Exports.

EXPORTS.

Calendar Year.	Value.	Calendar Year.	Value.
1887	$ 3,480	1895	$ 48,525
1888	23,563	1896	47,756
1889	30,597	1897	69,101
1890	22,468	1898	110,507
1891	37,590	1899	153,002
1892	86,562	1900	146,750
1893	70,081	1901	152,553
1894	38,971	1902	(a) 391,812

(a) Probably includes some material manufactured from mica.

The monthly exports of mica to Great Britain and other countries and the United States in 1902 are shown below in Table 3, the statistics being compiled from the unrevised monthly statements of imports and exports of the Customs Department :

TABLE 3.

MICA.

MICA.

EXPORTS TO GREAT BRITAIN AND OTHER COUNTRIES AND TO THE UNITED STATES.

Expor s.

Months.	To Great Britain and other countries.		To the United States.		Total Exports.	
	Pounds.	Value.	Pounds.	Value.	Pounds.	Value.
January.....	2,925	$ 1,092	196,787	$ 42,909	199,712	$ 44,001
February	1,329	464	146,908	22,938	148,237	23,402
March.	2,400	865	84,572	15,768	86,972	16,633
April	6,207	1,491	56,454	12,106	62,661	13,597
May.	9,235	4,967	129,108	26,296	138,343	31,263
June	7,890	4,249	92,885	21,889	100,775	26,133
July.	5,000	660	22,711	5,003	27,711	5,663
August	7,780	3,818	118,547	25,060	126,327	28,878
September....	3,000	1,800	133,645	26,308	136,645	28,108
October.....	53,240	7,416	23,850	5,949	77,090	13,365
November....	2,810	725	73,101	34,231	75,911	34,956
December....	418,956	111,721	51,562	14,087	470,518	125,808
	520,772	139,268	1,130,130	252,544	1,650,902	391,812

British Columbia.—In the Summary Report of the Director of the Geological Survey for 1898, Mr. McEvoy mentions the occurrence of mica in the vicinity of Tete Jaune Cache, B.C., and describes some of the workings. Development in the district, however, has been hindered by the lack of proper trails, and the expense of transport. With regard to the work accomplished in 1902 the gold commissioner of the Golden Mining Division, B.C., reports as follows :—

"*Big Bend Mica Claim.*—A force of about twenty men were employed a portion of the summer in opening up the various claims but in order to get in supplies about 20 miles of new trail had to be built from the end of Timbasket Lake, on the east side of the Columbia river; consequently there was not as much work done on the claims as was anticipated, but the showing is said to be very encouraging.

"On the Bennison Group work has again been resumed and a force of six men were employed until late in the fall. It is the intention of the owners to recommence operations as soon as supplies can be got in." (Report of the Minister of Mines B. C., 1902, p. 133.)

Mineral Pigments.

MINERAL PIGMENTS.

Under this heading is included the production of ochres and baryta.

Ochres.—The output of ochres has been as usual derived chiefly from the deposits near Three Rivers, Champlain county, Quebec. The total production in 1902, according to returns received from producers was 4,955 tons valued at $30,495. The firms engaged in this production are: The Canada Paint Co., Montreal; The Champlain Oxide Co., Three Rivers; Thos. H. Argall, Three Rivers, Que., and the Ontario Mineral Paint Works, Kilbride, Ontario.

Statistics of production, imports and exports are given in tables 1, 2 and 3.

TABLE 1.

MINERAL PIGMENTS.

Production.

ANNUAL PRODUCTION OF OCHRES.

Calendar Year.	Tons.	Value.
1886	350	$ 2,350
1887	485	3,733
1888	397	7,900
1889	794	15,280
1890	275	5,125
1891	900	17,750
1892	390	5,800
1893	1,070	17,710
1894	611	8,690
1895	1,339	14,600
1896	2,362	16,045
1897	3,905	23,560
1898	2,226	17,450
1899	3,919	20,000
1900	1,966	15,398
1901	2,233	16,735
1902	4,955	30,495

TABLE 2.

MINERAL PIGMENTS.

IMPORTS OF OCHRES.

MINERAL PIGMENTS.

Imports.

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
1892		1,708,645	22,908
1893		1,968,645	23,134
1894		1,358,326	18,951
1895		793,258	12,048
1896		1,159,494	16,954
1897		1,504,044	18,504
1898		2,126,592	26,307
1899		2,444,698	31,092
1900		2,474,537	32,017
1901		2,092,067	27,267
		Duty.	
1902	Ochres and ochrey earths and raw siennas	20 p. c.	978,095	$ 8,982
	Oxides, dry fillers, fire-proofs umbers and burnt siennas N.E.S.	25 "	1,552,648	24,927
	Total, 1902		2,530,743	$33,909

TABLE 3.

MINERAL PIGMENTS.

EXPORTS OF MINERAL PIGMENTS, IRON OXIDES &C.

Exports.

Calendar Year.	Tons.	Value.
1897	512	$7,706
1898	283	4,227
1899	308	5,408
1900	651	7,154
1901	401	8,233
1902	352	6,182

Baryta.—The production of baryta in 1902 was 1,096 tons valued at $3,957. This production was obtained from Cape Rouge, Inverness county, Cape Breton, and Hull township, Wright county, Quebec. Baryta.

MINERAL PIGMENTS.

Baryta.

The output is used almost entirely in the manufacture of paint. Statistics of production and imports are given below in Tables 4, 5, 6.

TABLE 4.

MINERAL PIGMENTS.

Production.

ANNUAL PRODUCTION OF BARYTA.

Calendar Year.	Tons.	Value.
1885	300	$ 1,500
1886	3,864	19,270
1887	400	2,400
1888	1,100	3,850
1889	...	...
1890	1,842	7,543
1891	...	...
1892	315	1,260
1893	...	...
1894	1,081	2,830
1895	...	...
1896	145	715
1897	571	3,060
1898	1,125	5,533
1899	720	4,402
1900	1,337	7,605
1901	653	3,842
1902	1,096	3,957

TABLE 5.

MINERAL PIGMENTS.

Imports.

IMPORTS OF BARYTA.

Fisca 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

TABLE 6.

MINERAL PIGMENTS.

MISCELLANEOUS IMPORTS, FISCAL YEAR, 1902.

MINERAL PIGMENTS.

Imports.

—		Duty.	Quantity.	Value.
				$
Paint, ground or mixed in, or with either japan, varnish, lacquers, liquid dryers, collodion, oil finish or oil varnish	Lbs.	25 p. c.	67,443	5,224
Paints and colours, rough stuff and fillers, anti-corrosive and anti-fouling paints commonly used for ship hulls, N.E.S.	"	25 "	393,445	18,638
Paris green, dry	"	10 "	655,085	80,818
Paints and colours ground in spirits, and all spirit varnishes and lacquers	Galls.	$1.12½ par gallon	708	2,148
Putty	Lbs.	20 p. c.	155,338	2,615
Total				109,443

MINERAL WATER.

MINERAL WATERS.

Mineral springs are known to occur at many places throughout Canada, and at a number of them the water is being utilized, either bottled for sale throughout the country, or used for drinking or bathing purposes at the places where it is found. At several points hotels have been erected, at which the guests have the privilege of using the mineral water. In view of this, it is difficult to obtain statistics giving any intelligent idea of the extent or value of the industry. These facts should be kept prominently in mind when using the figures of production given in Table 1 below, as these are more or less approximations.

TABLE 1.

MINERAL WATERS.

ANNUAL PRODUCTION.

Production

Calendar Year.	Gallons.	Value.	Calendar Year.	Gallons.	Value.
1888	124,850	$ 11,456	1896	706,372	$111,736
1889	424,600	37,360	1897	749,691	141,477
1890	561,165	66,031	1898	555,000	100,000
1891	427,485	54,268	1899	.....	100,000
1892	640,380	75,348	1900	.....	75,000
1893	725,096	108,347	1901	.....	100,000
1894	767,460	110,040	1902	.....	100,000
1895	739,382	126,048			

MINERAL WATERS.

Imports.

TABLE 2.

MINERAL WATERS.

IMPORTS.

Fiscal Year.			Value.
1880			$41,797
1881			55,763
1882			57,953
1883			49,546
1884			48,613
1885			55,864
1886			47,006
1887			52,989
1888			54,891
1889			66,331
1890			71,521
1891			$15,721
1892			17,913
1893			27,909
1894			28,130
1895			27,879
1896			32,674
1897			22,142
1898			33,314
1899			38,046
1900			30,343
1901			40,802
1902	Mineral waters, natural, not in bottle	Duty free	$ 492
	Mineral and aerated waters	" 20 p.c.	91,379
	Total		$91,871

NATURAL GAS.

NATURAL GAS.

The total value of the natural gas sold in Canada in 1902 was $195,992. This output is practically all derived from the wells in southern Ontario, although at Medicine Hat, Alberta, a small quantity is used for the burning of lime, etc. The large falling off in the amount of gas sold is doubtless due in a large measure to the action of the Ontario Government in ordering the suspension of the export of natural gas across the St. Clair river to Detroit. The falling off in supply of the gas had become quite marked, and the local Canadian consumers petitioned the government to put a stop to the export, which request, after an investigation was acceded to.

This restriction, however, does not apply to the Welland field, from which gas is still being exported to Buffalo.

TABLE 1.

NATURAL GAS.

ANNUAL PRODUCTION.

NATURAL GAS.

Production.

Calendar Year.	Value.
1892	$ 150,000
1893	376,233
1894	313,754
1895	423,032
1896	276,301
1897	325,873
1898	322,123
1899	387,271
1900	417,094
1901	339,476
1902	195,992

NICKEL.

NICKEL.

Nickel is one of the most important of the metallic minerals mined in Canada, not only on account of the size and value of the industry, but also because its product constitutes such an important feature in the nickel market of the world. The output, which is derived from the well known nickel-copper ores of the Sudbury district of Ontario, has been increasing very rapidly during the past few years, and has almost doubled since 1899. The total production of nickel in matte in 1902 amounted to 10,693,410 pounds or 5,346 tons valued at $5,025,903 or 47 cents per pound as compared with 9,189,047 pounds or 4,594 tons valued at $4,594,523 or 50 cents per pound in 1901. The increase for the year was 1,504,363 pounds or over 16 per cent. The price of refined nickel at New York, as reported in the Engineering and Mining Journal of that city, ranged during a period from January to July from 50 to 60 cents per pound and from August until the end of the year, quotations were from 40 to 47 cents per pound with small lots selling as high as 60 cents.

The total quantity of nickel-copper ore mined in 1902 was 269,538 tons, while the quantity smelted was 211,847 tons. From the smelted ore there was produced 23,211 tons of ordinary matte, carrying an average of about 19.39 per cent nickel and 11.65 per cent copper, and 2,100 tons of Bessemer matte averaging 40.27 per cent nickel

NICKEL. Production.

and 40.34 per cent copper. A portion of the ordinary matte above mentioned was further treated at the Works of the Ontario Smelting Co. at Copper Cliff before shipment to the refining plants in the United States.

Besides the product sold by the Canadian Copper Co. and Mond Nickel Co., a considerable tonnage of ore was mined by the Lake Superior Power Co., the greater part of which was sent to roast heaps and a small portion to reduction works at Sault Ste. Marie.

The nickel contents of this ore has not been included in the above statement of the production of nickel in matte etc. for the year.

The companies operating in the Sudbury District are:—

The Canadian Copper Company,

The Mond Nickel Company,

The Lake Superior Power Company,

The Nickel Copper Company of Ontario.

The first two are provided with smelting plants producing nickel copper matte, while the operations of the last two companies may be still said to be in the development stage, so far as the production of matte is concerned.

TABLE 1.

NICKEL.

ANNUAL PRODUCTION.

Calendar Year.	Pounds of Nickel in Matte.	Final Average Market Price per lb. at New York.	Value.
1889	*830,477	60c.	$ 498,286
1890	1,435,742	65c.	933,232
1891	4,626,627	60c.	2,775,976
1892	2,413,717	58c.	1,399,956
1893	3,982,982	52c.	2,071,151
1894	4,907,430	38½c.	1,870,958
1895	3,888,525	35c.	1,360,984
1896	3,397,113	35c.	1,188,990
1897	3,997,647	35c.	1,399,176
1898	5,517,690	33c.	1,820,838
1899	5,744,000	36c.	2,067,840
1900	7,080,227	47c.	3,327,707
1901	9,189,047	50c.	4,5 4,523
1902	10,693,410	47c.	5,025,903

*Calculated from shipments made by rail.

TABLE 2.

NICKEL.

EXPORTS.*

NICKEL.

Exports.

Calendar Year.	Value.	Calendar Year.	Value.
1890	$ 89,568	1897	723,130
1891	667,280	1898	1,019,363
1892	293,149	1899	939,915
1893	629,692	1900	1,031,030
1894	559,356	1901	751,080
1895	521,783	1902	1,007,211
1896	658,213		

*Practically all the nickel-bearing ore and matte produced in Canada is exported, the apparent discrepancy between Tables Nos. 1 and 2 being due to the different basis of valuation adopted in the two instances. Table 1 represents the total final values of the nickel produced in Canada, for the years represented. In Table 2 the worth of the product shipped is entered at its spot value to the operators, and depends upon the particular stage to which they happen to carry the process of extraction at the time, *e.g.*, whether the shipments made are raw ore, low grade matte or high grade matte, &c.

TABLE 3.

NICKEL.

IMPORTS.

Imports.

Calendar Year.		Duty.	Value.
1890			$ 3,154
1891			3,889
1892			3,208
1893			2,905
1894			3,528
1895			4,267
1896			4,787
1897			4,737
1898			5,882
1899			9,449
1900			6,988
1901			12,029
1902	Nickel anodes	10 p. c.	13,909
	Nickel*	Free.	1,539
			$ 15,448

*Classified under the general heading of minerals in the Trade and Navigation Report.

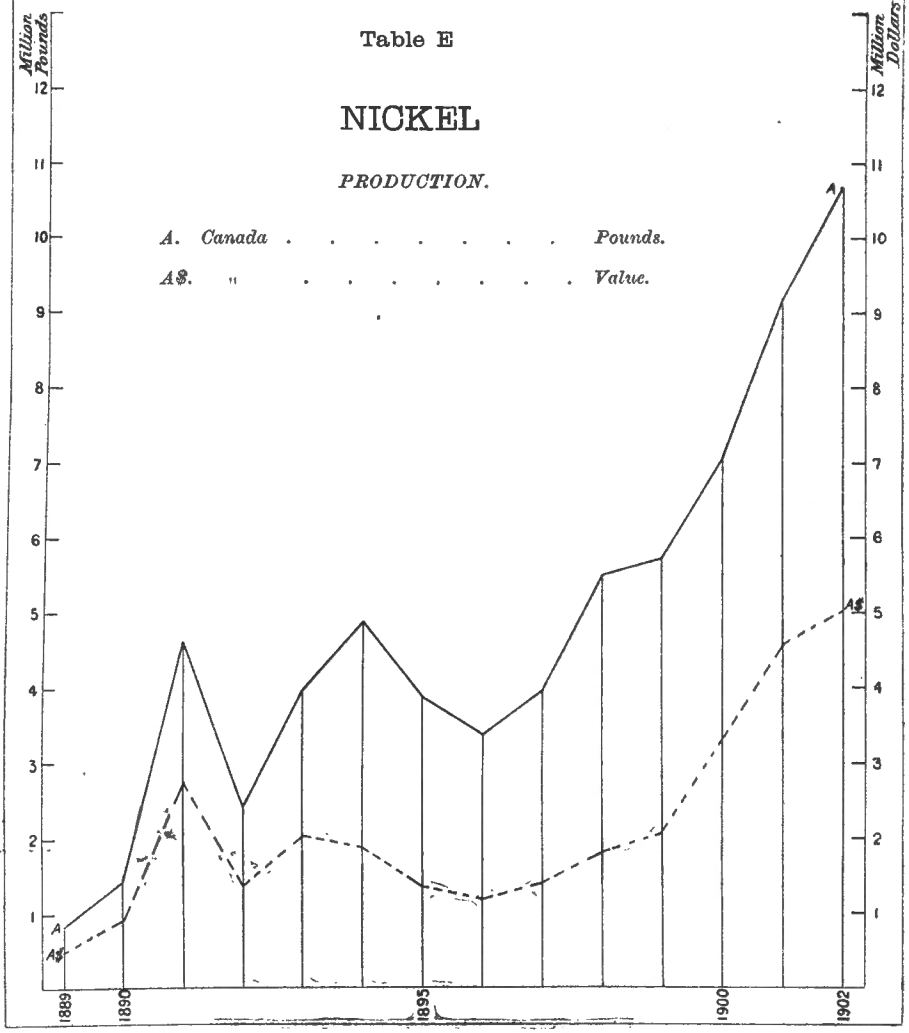
Table E

NICKEL

PRODUCTION.

A. Canada . . . . . Pounds.

A$. " . . . . . Value.



PETROLEUM.

Production.

Although numerous attempts have been made during recent years to find petroleum in workable quantities in Gaspé, Quebec, and in Albert and Westmoreland counties, New Brunswick, nevertheless the oil fields at Petrolia and adjacent districts in the southern peninsula of Ontario continue to be the only sources of the Canadian output, and in this field a tendency towards decreased production has been evident during the past couple of years. The greater part of the Canadian product is sent to the refineries at Sarnia and Petrolia, although quite an important quantity is now used for various industrial purposes, such as for fuel, for making gas, &c., returns having been received from nine companies selling crude petroleum for these purposes.

The total production for 1902 has been estimated at 530,624 barrels valued at $951,190, or an average of $1.79¼ per barrel, made up as follows :—

	Barrels.
Receipts at refineries	443,333
Direct sale for industrial purposes	87,291
Total sales of crude oil, 1902	530,624

The above estimate is, of course, a minimum, as there may be other firms selling crude oil for industrial purposes from whom returns were not received, however the probabilities are that these would not increase the total very much.

The production for 1901, estimated on a similar basis, was 622,392 barrels valued at $1,008,275, or an average of $1.62 per barrel.

	Barrels.
Receipts at refineries	508,677
Direct sales for industrial purposes	113,715
Total sales of crude oil, 1901	622,392

The decrease in production, therefore, was 91,768 barrels, or a little over 14 per cent. In this connection, however, attention may be called to the fact that the decrease in Canadian refined oils inspected in 1902 as compared with 1901 was over 17 per cent. (See Table 3.) For the year 1900 and previous years, the production of crude oil was estimated from inspection returns by assuming a ratio of crude to refined, and the statistics of production on this basis will

PETROLEUM.

be found in Table 1. The method, however, was open to objection owing to the possible incorrectness of the ratio assumed.

Statistics of the quantities of Canadian and of imported oils inspected, the exports and imports of petroleum and its products and monthly prices of crude oil are shown in the following tables :—

TABLE 1.

PETROLEUM.

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

Calendar Year.	Refined Oils Inspected.	Crude Equivalent Calculated.	Ratio of Crude to Refined.	Equivalent in Barrels of 35 Gallons	Average Price per Barrel of Crude.	Value of Crude Oil.
	Gallons.	Gallons.				
1881	6,457,270	12,914,540	100:50	368,987	.....	.....
1882	6,135,782	13,635,071	100:45	389,573	.....	.....
1883	7,447,648	16,550,328	100:45	472,866	.....	.....
1884	7,993,995	19,984,987	100:40	571,000	.....	.....
1885	8,225,882	20,564,705	100:40	587,563	.....	.....
1886	7,768,006	20,442,121	100:38	584,061	$0 90	$525,655
1887	9,492,588	24,980,494	100:38	713,728	0 78	556,708
1888	9,246,176	24,332,042	100:38	695,203	1 02⅜	713,695
1889	9,472,476	24,664,144	100:38	704,690	0 92¾	653,600
1890	10,174,894	26,776,037	100:38	795,030	1 18	902,734
1891	10,065,463	26,435,430	100:38	755,298	1 33¾	1,010,211
1892	10,370,707	27,291,334	100:38	779,753	1 26¼	984,438
1893	10,618,804	27,944,221	100:38	798,406	1 09½	874,255
1894	11,027,082	29,018,637	100:38	829,104	1 00¾	835,322
1895	10,674,232	25,414,838	100:42	726,138	1 49⅜	1,036,738
1896	10,684,284	25,438,771	100:42	726,822	1 59	1,155,647
1897	10,434,878	24,844,995	100:42	709,857	1 42½	1,011,546
1898	11,148,348	26,543,685	100:42	758,391	1 40	1,061,747
1899	11,927,981	28,399,955	100:42	808,570	1 48⅜	1,202,020
1900	13,428,422	24,867,449	100:54	710,498	1 62	1,151,007

TABLE 2.

PETROLEUM.

VALUE OF THE PRODUCTION OF CANADIAN OIL REFINERIES.

Calendar Year.	Value.	Calendar Year.	Value.
1887	$1,288,109	1895	1,806,237
1888	1,401,459	1896	1,876,913
1889	1,414,184	1897	1,672,429
1890	1,638,420	1898	1,825,265
1891	1,534,509	1899	1,490,870
1892	1,782,365	1900	1,620,705
1893	1,675,784	1901	1,251,373
1894	1,567,134	1902	1,222,641

TABLE 3.

PETROLEUM.

TOTAL AMOUNT OF OIL INSPECTED, CANADIAN AND IMPORTED.

Fiscal Year	Canadian.	Imported.	Total.	Canadian.	Imported.
	Gallons.	Gallons.	Gallons.	Per cent.	Per cent.
1881	6,406,783	476,784	6,883,567	93·1	6·9
1882	5,910,747	1,351,412	7,262,159	81·4	18·6
1883	6,970,550	1,190,828	8,161,378	85·4	14·6
1884	7,656,001	1,142,575	8,798,586	87·0	13·0
1885	7,661,617	1,278,115	8,939,732	85·7	14·3
1886	8,149,472	1,327,616	9,477,088	86·0	14·0
1887	8,243,962	1,665,604	9,909,566	83·2	16·8
1888	9,545,895	1,821,342	11,367,237	84·0	16·0
1889	9,462,834	1,767,812	11,230,646	84·3	15·7
1890	10,121,210	2,020,742	12,141,952	83·4	16·6
1891	10,270,107	2,022,002	12,292,109	83·6	16·4
1892	10,238,426	2,429,445	12,667,871	80·8	19·2
1893	10,683,806	2,641,690	13,325,496	80·2	19·8
1894	10,824,270	5,633,222	16,457,492	65·8	34·2
1895	10,936,992	5,650,994	16,587,986	65·9	34·1
1896	10,533,951	5,807,991	16,341,942	64·5	35·5
1897	10,506,526	6,248,743	16,755,269	62·7	37·3
1898	10,796,847	6,880,734	17,677,581	61·1	38·9
1899	11,005,804	7,232,348	18,238,152	60·3	39·7
1900	13,014,713	*8,216,207	21,230,920	61·3	38·7
1901	12,674,977	*9,232,165	21,907,142	57·9	42·1
1902	10,494,874	*10,916,396	21,411,270	49·0	51·0

* Item (*a*) Table 5.

TABLE 4.

PETROLEUM.

EXPORTS OF CRUDE AND REFINED PETROLEUM.

Calendar Year.	Crude Oil.		Refined Oil.		Total.	
	Gallons.	Value.	Gallons.	Value.	Gallons.	Value.
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	446,770	$ 18,471	585	$104	447,355	18,575
1892	310,387	12,945	1,146	100	311,533	13,045
1893	107,719	3,696	2,196	394	109,915	4,090
1894	53,985	2,773	5,297	513	59,282	3,286
1895	22,831	1,044	10,237	2,023	33,068	3,067
1896	601	101	7,489	999	8,090	1,100
1897			342	49	342	49
1898	96	4	12,735	3,001	12,831	3,005
1899			3,425	859	3,425	859
1900	40	2	8,559	2,394	8,599	2,396
1901	14,168	691	375	66	14,543	757
1902	400	40	626	146	1,026	186

PETROLEUM.

Imports.

TABLE 5.

PETROLEUM.

IMPORTS OF PETROLEUM AND PRODUCTS OF.

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
1892	5,649,145	475,732
1893	6,002,141	446,389
1894	6,597,108	439,988
1895	7,577,674	525,372
1896	8,005,891	735,913
1897	8,415,302	697,169
1898	9,074,311	724,519
1899	10,394,208	763,303
1900	9,633,647	864,833
1901	11,082,822	982,640

1902		Duty.	Gallons.	Value.
	Oils :—			
	Mineral :			
	(*a*) Coal and kerosene, distilled, purified or refined, naphtha and petroleum, N.E.S.	5c. p. gall.	10,916,396	$878,087
	(*b*) Products of petroleum	5c. "	491,106	52,285
	(*c*) Crude petroleum, fuel and gas oils (other than naphtha, benzine or gasoline) when imported by manufacturers (other than oil refiners) for use in their own factories, for fuel purposes or for the manufacture of gas	2½c. "	591,328	40,568
	(*d*) Illuminating oils composed wholly or in part of the products of petroleum, coal, shale or lignite, costing more than 30 cents per gallon	25 p. c.	7,256	2,541
	(*e*) Lubricating oils composed wholly or in part of petroleum, costing less than 25 cents per gallon	5c. p. gall.	1,213,919	133,726
	Total		13,220,005	1,107,207

TABLE 6.*

PETROLEUM.

IMPORTS OF CRUDE AND MANUFACTURED OILS, OTHER THAN ILLUMINATING.

Fiscal Year	Gallons.	Fiscal Year.	Gallons,
1881	960,691	1892	3,047,199
1882	1,656,290	1893	1,481,749
1883	1,895,488	1894	1,860,829
1884	2,017,707	1895	1,106,993
1885	2,489,326	1896	1,079,965
1886	2,491,530	1897	802,286
1887	2,624,399	1898	1,047,026
1888	2,701,714	1899	1,017,278
1889	2,882,462	1900	1,406,700
1890	3,054,908	1901	1,838,966
1891	3,049,384	1902	2,296,353

* The figures for the years from 1881 to 1894, inclusive, represent the total imports of petroleum and products, less the quantity of imported illuminating oils, inspected by the Inland Revenue Department. For 1895 and subsequent years, the Table is composed of items (*b*), (*c*) and (*e*) of Table 5.

TABLE 7.

PETROLEUM.

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
1892	733,873	48,776
1893	452,916	38,935
1894	208,099	15,704
1895	163,817	11,579
1896	150,287	10,042
1897	138,703	7,945
1898	103,570	5,987
1899	92,242	4,025
1900	47,400	3,529
1901	118,848	9,639
1902...(Duty, 30 p. c.)	225,885	12,750

PETROLEUM.

Imports.

TABLE 8.

PETROLEUM.

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
1892	9,259	1,952
1893	8,351	1,735
1894	10,818	1,685
1895	19,448	2,541
1896	25,787	4,072
1897	25,114	2,929
1898	60,802	4.427
1899	62,331	5,856
1900	27,663	3,671
1901	44,562	3,588
1902..(Duty, 30 p.c.)	51,120	5,752

TABLE 9.

PETROLEUM.

Prices.

AVERAGE MONTHLY PRICES FOR CRUDE OIL AT PETROLIA DURING YEAR 1902.

Month.	Price.	Month.	Price.
January	$1 61 to $1 68	July	$1 76 to $1 83
February	1 61 to 1 68	August	1 76 to 1 83
March	1 61 to 1 68	September	1 76 to 1 83
April	1 63½ to 1 70½	October	1 82 to 1 89½
May	1 66 to 1 73	November	1 92 to 2 01½
June	1 68½ to 1 78	December	1 96 to 2 04½
		The Year	1 79½

PHOSPHATE.

The production of phosphate in 1902 according to returns received from operators, was 856 tons valued at $1,953. About 530 tons of this was high grade ore (80 per cent) and used for the manufacture of phosphorus the balance being sold as a fertilizer. The output is practically all obtained as a by-product in the mining of mica in the counties of Wright and Labelle near Ottawa.

TABLE 1.

PHOSPHATE.

ANNUAL PRODUCTION.

Production.

Calendar Year.	Tons.	Average Value per ton.	Value.
1886	20,495	$14 85	$304,338
1887	23,690	13 50	319,815
1888	22,485	10 77	242,285
1889	30,988	10 21	316,662
1890	31,753	11 37	361,045
1891	23,588	10 24	241,603
1892	11,932	13 20	157,424
1893	8,198	8 65	70,942
1894	6,861	6 00	41,166
1895	1,822	5 25	9,565
1896	570	6 00	3,420
1897	908	4 39	3,984
1898	733	5 00	3,665
1899	3,000	6 00	18,000
1900	1,415	5 02	7,105
1901	1,033	6 07	6,280
1902	856	5 79	4,953

PHOSPHATE.

Exports.

TABLE 2.

PHOSPHATE.

EXPORTS.

Calendar Year.	Ontario.		Quebec.		Totals.	
	Tons.	*Value.	Tons.	*Value.	Tons.	*Value.
1878	824	$12,278	9,919	$195,831	10,743	$208,109
1879	1,842	20,565	6,604	101,470	8,446	122,035
1880	1,387	14,422	11,673	175,664	13,060	190,086
1881	2,471	36,117	9,497	182,339	11,968	218,456
1882	568	6,338	16,585	302,019	17,153	308,357
1883	50	500	19,666	427,168	19,716	427,668
1884	763	8,890	20,946	415,350	21,709	424,240
1885	434	5,962	28,535	490,331	28,969	496,293
1886	644	5,816	19,796	337,191	20,460	343,007
1887	705	8,277	22,447	424,940	23,152	433,217
1888	2,643	30,247	16,133	268,362	18,776	298,609
1889	3,547	38,833	26,440	355,935	29,987	394,768
1890	1,866	21,329	26,591	478,040	28,457	499,369
1891	1,551	16,646	15,720	368,015	17,271	384,661
1892	1,501	12,544	9,981	141,221	11,482	153,765
1893	1,990	11,550	5,748	56,402	7,738	67,952
1894	1,980	10,560	3,470	29,610	5,450	40,170
1895	.....	.....	250	2,500	250	2,500
1896	1	5	299	2,990	300	2,995
1897	70	450	165	400	235	850
1898	21	240	702	8,000	723	8,240
1899	215	1,850	93	1,725	308	3,575
1900	.....	.....	.....	.....	Nil	Nil
1901	.....	.....	.....	.....	6	120
1902	.....	.....	.....	.....	70	1,880

*These values do not compare with those in Table 1 above; the spot value is adopted for the production whilst the exports are valued upon quite a different basis.

PLATINUM.

PLATINUM.

There was a small production of platinum in 1902, valued at $190, and obtained entirely from the Similkameen district of British Columbia. This is the only locality where the metal is saved.

For a description and list of occurrence of platinum in Canada, reference may be made to the report of this Section for 1901, pages 97-110.

TABLE 1. PLATINUM.

PLATINUM. Production.

ANNUAL PRODUCTION OF PLATINUM.

Calendar Year.	Value.	Calendar Year.	Value.
1887	$ 5,600	1895	3,800
1888	6,000	1896	750
1889	3,500	1897	1,600
1890	4,500	1898	1,500
1891	10,000	1899	825
1892	3,500	1900	Nil.
1893	1,800	1901	457
1894	950	1902	190

TABLE 2.

PLATINUM.

IMPORTS OF PLATINUM. Imports.

Fiscal Year.	Value.	Fiscal Year.	Value.
1883	$ 113	1893	14,082
1884	576	1894	7,151
1885	792	1895	3,937
1886	1,154	1896	6,185
1887	1,422	1897	9,031
1888	13,475	1898	9,781
1889	3,167	1899	9,671
1890	5,215	1900	57,910
1891	4,055	1901	20,263
1892	1,952	1902*	19,357

* Platinum wire and platinum in bars, strips, sheets or plates, platinum retorts, pans, condensers, tubing and pipe, imported by manufacturers of sulphuric acid for use in their works. Duty free.

Some additional information concerning the occurrences of platinum in British Columbia has been published in the Annual Report for 1902 of the Minister of Mines of that province, and is quoted hereunder.

"It has long been recognized as a fact that platinum and sometimes its related metals, occur associated with the placer gold of the various parts of the province. With an idea of locating the source of these metals the Provincial Mineralogist secured a number of samples of black sands from various parts of Cariboo, and these have been analysed by the Provincial Assayer, whose results will be found embodied in the table following, in which the locality from which the samples

PLATINUM.

British Columbia.

were derived is also given. From this it will be seen, that the distribution of the metals is wide, a fact which has so far defeated the attempt to locate their source, but the investigation will be continued.

Locality of samples of black sand.	Assay value per ton.			
	Gold, oz.	Silver, oz.	Platinum, oz.	Osmiridium, oz.
Head of Harvey Creek	.....	.....	None	.....
Upper Cunningham Creek	.. . .	....	"	.....
Fraser Creek, Horsefly	.....	... .	" . ..	.....
Eureka Creek, Horsefly	. . ....	... .	"	....
Cottonwood Creek	.....	.....	"	.. . .
Keithley Creek, (Hayward claim) black sand and pyrites.	5.9..	2.0 ...	" . .	....
Quesnel River, 82 miles above mouth	3.8..	Not determined	1	.....
Quesnel River, 40 miles above mouth	1.0..	"	2.8.....	.....
Quesnel River, 40 miles above mouth	0.06.	"	0 14..	.....
Quesnel River, 25 miles from mouth	0.2..	"	0.4.....	.....
Quesnel River, 13 miles above Quesnel	4.7..	"	7.8.....	.. . .
†Quesnel River, 30 miles above Quesnel	.....	"	6.4.....	....
†Fraser River, 2 miles above Quesnel	.....	"	2.4.....	....
Quesnel River, 25 miles below Forks	1.0..	Trace.....	0.5.....	....
Quesnel River, 25 miles below Forks	2.5.	"	2.5.....	....
Three miles above Quesnel	0.85.	Not determined	0.25....	3.2
*Quesnelmouth (concentrates)	7.1%	"	71%	3.1%
Consolidated Cariboo Hyd. Mg. Co	....	.....	70%	3.5%
‡Horsefly River, Harpers Camp	.....	... .	25%	4.5%
Fraser River, 15 miles above Quesnel	121.8..	Not determined	3.9. ...	....
Cobeldick dredge, Quesnel Fraser River	913....	"	165.7.....	....

† Mostly platinum. Other metals not assayed.

* $\frac{7}{10}$ oz. of mineral giving:—Gold, 0.05 oz. troy; platinum, 0.5 oz. troy; osmiridium, 0.022 oz. troy.

‡ Mr. Hobson says that this platinum is found in the proportion of one ounce platinum to 100 ounces gold.

"From this it will be noted that platinum occurs throughout the drainage area of the Quesnel river, but that it is also found on the Fraser above Quesnelmouth, and that it follows the Fraser down to Lytton. The samples obtained do not indicate its presence in the Barkerville district, though samplings from this section may reveal it."

PRECIOUS METALS.

Precious Metals.

The precious metals, gold and silver, following the custom of past years, are considered together.

GOLD.

Gold.

The value of the gold mined in Canada in 1902 was $21,336,667. This is less than the production in the two preceeding years, the decrease from the output in 1901 being $2,791,836 or 11·5 per cent. The maximum production of gold in Canada was obtained in 1900, when the total was $27,908,153.

The increase in production from 1896 to 1900 was very rapid due to the larger output from the Yukon placers. The falling off in the production for 1901 and 1902 is also to be ascribed to a decreasing output from the same district which had reached its maximum in 1900.

Of the total production in 1902, $15,588,213, that is, over 73 per cent was placer gold, of which nearly 70 per cent represents the Yukon output. The balance, $5,748,454, or nearly 27 per cent, was derived from lode mines, and of this, nearly 23 per cent was contributed by British Columbia. British Columbia and the Yukon district together produced about 96 per cent of the total output.

Statistics of the total production in Canada and the various provinces are shown in the following tables.

TABLE 1.

PRECIOUS METALS.

GOLD.—ANNUAL PRODUCTION IN CANADA.

Production.

Calendar Year.	*Ounces. Fine.	Value.	Calendar Year.	*Ounces. Fine.	Value.
1887	57,465	$ 1,187,804	1895	100,806	2,083,674
1888	53,150	1,098,610	1896	133,274	2,754,774
1889	62,658	1,295,159	1897	291,582	6,027,016
1890	55,625	1,149.776	1898	666,445	13,775,420
1891	45,022	930,614	1899	1,028,620	21,261,584
1892	43,909	907,601	1900	1,350,176	27,908,153
1893	47,247	976,603	1901	1,167,320	24,128,503
1894	54,605	1,128,688	1902	1,032,253	21,336,667

* Calculated from the value at the rate of $20.67 per ounce.

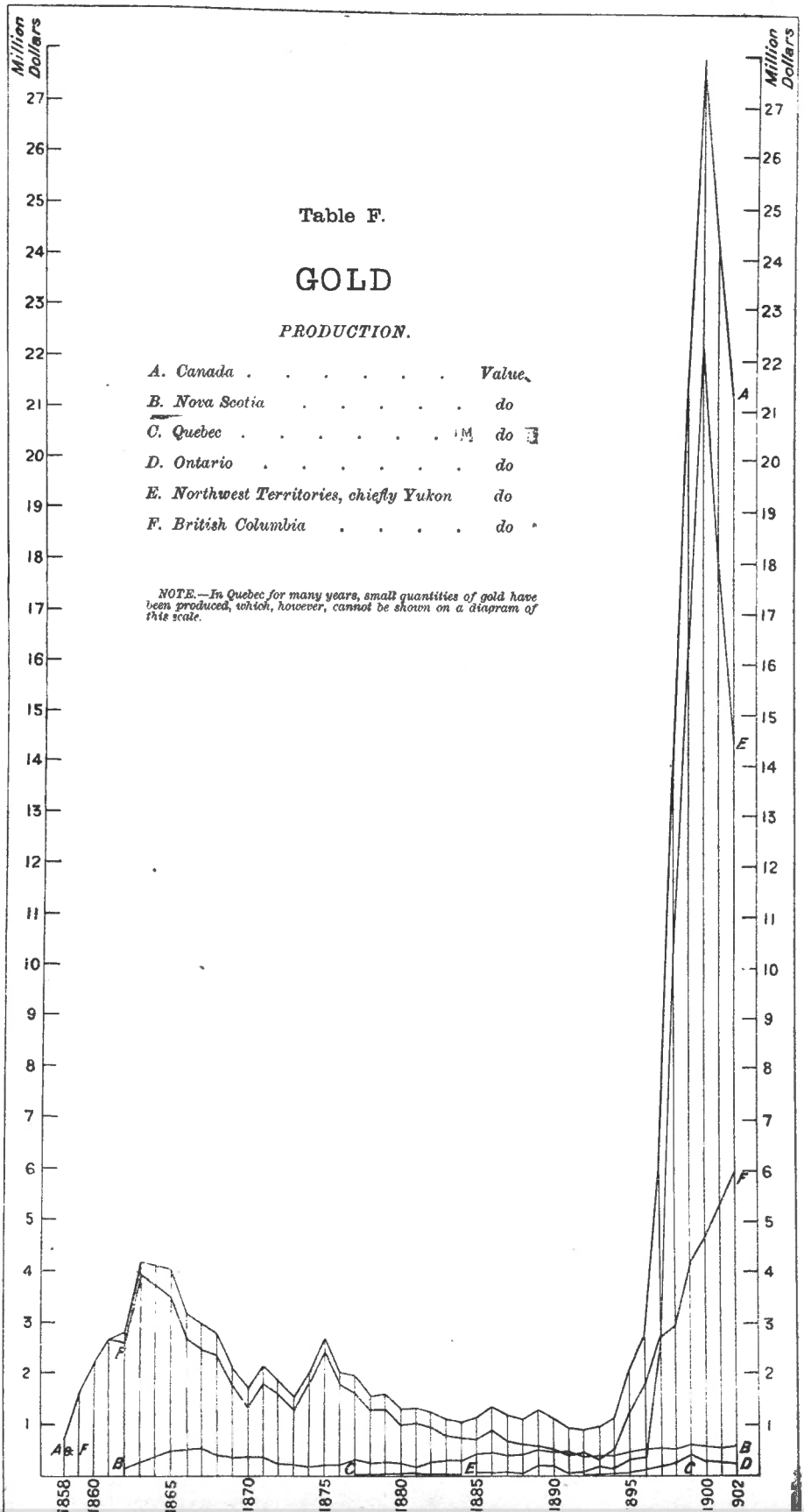


Table F.

GOLD

PRODUCTION.

A. Canada	*Value.*
B. Nova Scotia	*do*
C. Quebec	*do*
D. Ontario	*do*
E. Northwest Territories, chiefly Yukon	*do*
F. British Columbia	*do*

NOTE.—In Quebec for many years, small quantities of gold have been produced, which, however, cannot be shown on a diagram of this scale.

TABLE 2.

PRECIOUS METALS.

GOLD.—PRODUCTION BY PROVINCES AND DISTRICTS, CALENDAR YEAR 1902.

PRECIOUS METALS. Gold. Production.

Provinces.	*Ounces. Fine.	Value.
Nova Scotia	(b) 30,351	$ 627,357
Quebec	(d) 390	8,073
Ontario	(b) 11,119	229,828
North-west Territories—		
Yukon District	(a) 701,500	14,500,000
Saskatchewan river	(a) 484	10,000
British Columbia	(c) 288,409	5,961,409
Total	1,032,253	$21,336,667

* Calculated from the value at the rate of $20.67 per ounce.

(a) Placer gold.

(b) Gold from vein mining.

(c) As follows: Gold from placer mining $1,073,140
" vein " 4,888,269
$5,961,409

(d) As follows; Gold from placer mining . . . . . $ 5,073
" vein " 3,000
$ 8,073

NOVA SCOTIA.— Nova Scotia.

The gold output of Nova Scotia is obtained entirely from quartz veins. In 1902 there were mined and crushed 93,842 tons of ore containing 30,679 oz., 15 dwts. of gold valued at $627,357 an average of 6 oz., 13 dwts. or $6.68 per ton. This is the largest output recorded in the tables.

The statistics of production are given in Tables 3, 4, 5 and 6 following. Table 3 shows the annual gold output, Table 4 the tons of quartz crushed, and the average yield per ton. Table 5 shows the total product of each district from 1862 to the end of 1902 as well as the average yield per ton, and Table 6 shows the amount of ore crushed and the yield per district for 1902.

PRECIOUS METALS.

Gold.

Nova Scotia.

TABLE 3.

PRECIOUS METALS.

GOLD.—NOVA SCOTIA:—ANNUAL PRODUCTION.

Calendar Year.	Value.	Calendar Year	Value.
1862	$141,871	1883	$301,207
1863	272,448	1884	313,554
1864	390,349	1885	432,971
1865	496,357	1886	455,564
1866	491,491	1887	413,631
1867	532,563	1888	436,939
1868	400,555	1889	510,029
1869	348,427	1890	474,990
1870	387,392	1891	451,503
1871	374,972	1892	389,965
1872	255,349	1893	381,095
1873	231,122	1894	389,338
1874	178,244	1895	453,119
1875	218,629	1896	493,568
1876	233,585	1897	562,165
1877	329,205	1898	538,590
1878	245,253	1899	617,604
1879	268,328	1900	598,553
1880	257,823	1901	546,963
1881	209,755	1902	627,357
1882	275,090		

TABLE 4.

PRECIOUS METALS.

GOLD.—NOVA SCOTIA: ORE TREATED AND YIELD OF GOLD PER TON.

Calendar Year.	Tons Treated.	Yield of Gold per Ton.	Calendar Year.	Tons Treated.	Yield of Gold per Ton.
1862	6,473	$21·91	1883	25,954	$11·60
1863	17,000	16·02	1884	25,186	12·44
1864	21,431	18·21	1885	28,890	14·98
1865	24,421	20·32	1886	29,010	15·70
1866	32,157	15·28	1887	32,280	12·81
1867	31,384	16·96	1888	36,178	12·08
1868	32,259	12·41	1889	39,160	13·02
1869	35,144	19·91	1890	42,749	11·11
1870	30,824	12·56	1891	36,351	12·42
1871	30,787	12·17	1892	32,552	11 98
1872	17,089	14·94	1893	42,354	8·99
1873	17,708	13·05	1894	55,357	7·04
1874	13,844	12·87	1895	60,600	7·47
1875	14,810	14·76	1896	69,169	7·13
1876	15,490	15·08	1897	73,192	7·68
1877	17,369	18·95	1898	82,774	6·50
1878	17,989	13·63	1899	112,226	5·50
1879	15,936	16·83	1900	87,390	6·85
1880	13,997	18·42	1901	91,948	5·32
1881	16,556	12·66	1902	93,842	6·68
1882	21,081	13·04			

TABLE 5.

PRECIOUS METALS.

GOLD.—NOVA SCOTIA:—PRODUCTION OF THE DIFFERENT DISTRICTS FROM 1862 TO 1902 INCLUSIVE.

Districts.	Tons of Ore Crushed.	Total Yield.				Average Yield per Ton of 2,000 lbs.
		Oz.	Dwt.	Grs.	Value at $19.00 per oz.	
					$	$ c.
Brookfield	66,949	33,018	2	23	627,344	9·37
Caribou	147,995	48,633	8	11	924,035	6·24
Central Rawdon	13,340	10,121	11	21	192,310	14·42
Fifteen Mile Stream	40,280	18,132	13	5	344,521	8·55
Lake Catcha	17,810	14,473	19	21	275,006	15·44
Malaga	24,737	17,486	2	4	332,236	13·43
Montague	25,979	40,045	7	11	760,862	29 29
Oldham	50,309	53,908	10	22	1,024,262	20·36
Renfrew	50,965	43,541	12	1	827,291	16·23
Salmon River	1 3,602	33,898	6	21	644,068	6·22
Sherbrooke	279,653	153,263	1	13	2,911,998	10·41
Stormont	279,479	84,500	15	3	1,605,515	5·74
Tangier	38,257	22,498	5	2	427,467	11·17
Uniacke	61,256	41,979	—	5	797,601	13.02
Waverly	148,079	68,961	8	7	1,310,267	8·85
Wine Harbour	58,674	36,302	5	6	689,743	11·76
Other districts	108,441	74,541	15	6	1,416,294	13·06
	1,515,804	795,306	6	14	15,110,820	9·97

TABLE 6.

PRECIOUS METALS.

GOLD.—NOVA SCOTIA:—DISTRICT DETAILS, CALENDAR YEAR, 1902.

Districts.	Mines.	Mills.	Tons of Ore Crushed.	Total Yield of Gold.			Average Yield of Gold per Ton.		
				Oz.	Dwt.	Grs.	Oz.	Dwt.	Grs.
Brookfield	1	1	6,475	4,962	9	1	..	15	8
Caribou	4	3	10,959	2,674	15	14	..	4	21
Lake Catcha	2	2	792	553	11	23	..	14	..
Malaga Barrens	1	1	120	224	19	..	1	13	8
Montague	2	1	101	39	17	11	..	7	15
Oldham	3	1	772	614	17	12	..	15	22
Renfrew	2	1	1,020	1,672	15	13	1	12	19
Sherbrooke	3	2	15,521	4,785	16	..	..	6	4
Stormont	5	3	34,070	5,749	18	6	..	3	9
Uniacke	3	2	3,064	1,990	4	21	..	13	0
Waverly	2	1	9,089	2,848	18	16	..	6	6
Wine Harbour	2	2	3,339	879	12	..	..	5	6
Other districts	8	6	8,520	3,681	19	3	..	8	14
Total	38	26	93,842	30,679	15	..	..	6	13

Precious Metals.

Gold.

Quebec.

QUEBEC.—

The production of gold in the province of Quebec in 1902 was about $8,073, made up of $5,073 obtained from the placer workings in the county of Beauce, and $3,000 recovered from the pyrites mined primarily as sulphur ores in the Eastern Townships.

The Gilbert River Gold Fields Co. operated on lot 14 DeLery range, and has introduced an underground haulage system with cage and cars. The company reports the ground worked as being very pockety the gold being found only in vicinities where quartz veins were present in bed rock, while most of the gold was recovered from the dirt overlying a blue vein of quartz.

TABLE 7.

PRECIOUS METALS.

GOLD.—QUEBEC :—ANNUAL PRODUCTION.

Calendar Year.	Value.	Calendar Year.	Value.
1877	$12,057	1890	$1,350
1878	17,937	1891	1,800
1879	23,972	1892	12,987
1880	33,174	1893	15,696
1881	56,661	1894	29,196
1882	17,093	1895	1,281
1883	17,787	1896	3,000
1884	8,720	1897	900
1885	2,120	1898	6,089
1886	3,981	1899	4,916
1887	1,604	1900	Nil.
1888	3,740	1901	3,000
1889	1,207	1902	8,073

Ontario.

ONTARIO—

The production of gold in Ontario in 1902, according to the figures published by the Ontario Bureau of Mines, was $229,828, a slight falling off from the production of the previous year. Over $100,000 of this output was obtained from three mines in the townships of Marmora and Belmont in eastern Ontario, the balance being derived from about six or seven mines in the north-western part of the province.

Statistics of production since 1887 are given below.

Precious Metals.

Gold.

Ontario.

TABLE 8.

PRECIOUS METALS.

GOLD.—ONTARIO:—ANNUAL PRODUCTION.

Calendar Year.	*Ounces. Fine.	Value.
1887	327	$ 6,760
1888		
1889		
1890		
1891	97	2,000
1892	344	7,118
1893	708	14,637
1894	1,917	39,624
1895	3,015	62,320
1896	5,563	115,000
1897	9,158	189,294
1898	12,864	265,889
1899	20,395	421,591
1900	14,392	297,495
1901	11,845	244,837
1902	11,119	229,828

* Calculated from the value at the rate of $20·67 per ounce.

NORTH-WEST TERRITORIES.

North-west Territories.

The production of gold from the placer workings of the Yukon district in 1902 estimated as it was during the past few years, on the basis on the receipts of Canadian Yukon gold at United States mints was $14,500,000.

This is somewhat higher than the value on which royalty was paid, and also more than the Customs department have record of as being exported.

The exports from Dawson and White Horse of which returns were received, amounted to a total of about $12,128,415, while royalty was collected on an output of $12,018,561. Due allowance must be made however for gold which escapes the payment of royalty, and it must also be remembered that for the purposes of the royalty the gold is given a nominal value of $15 an ounce which is probably somewhat less than the average value of the gold obtained.

PRECIOUS METALS.

Gold.

North-west Territories.

TABLE 9.

PRECIOUS METALS.

GOLD.—NORTH-WEST TERRITORIES:—PRODUCTION.

Calendar Year.	Yukon District.		Saskatchewan River.	
	*Ounces. Fine.	Value.	*Ounces Fine.	Value.
		$		$
1885 } 1886 }	4,838	100,060	.....	.....
1887	3,387	70,000	102	2,100
1888	1,935	40,000	58	1,200
1889	8,466	175,000	968	20,000
1890	8,466	175,000	194	4,000
1891	1,935	40,000	266	5,500
1892	4,233	87,500	508	10,506
1893	8,515	176,000	466	9,640
1894	6,047	125,000	725	15,000
1895	12,095	250,000	2,419	50,000
1896	14,514	300,000	2,661	55,000
1897	120,948	2,500,000	2,419	50,000
1898	483,793	10,000,000	1,209	25,000
1899	774,069	16,000,000	726	15,000
1900	1,077,649	22,275,000	242	5,000
1901	870,827	18,000,000	726	15,000
1902	701,500	14,500,000	484	10,000
Total	4,103,217	84,813,500	14,173	292,946

*Calculated from the value at the rate of $20.67 per ounce.

A statement compiled in the Timber and Mines branch, and published in the report of the Department of the Interior showing the total gold production, the total exemption, the total amount upon which the royalty was collected and the amount of royalty paid, as shown by returns from May 1st, 1898, to June 30th, 1901, is given below. Comparison with Table No. 9 will show that quite a large proportion of the Yukon output escaped the royalty dues.

MONTH.	Total Gold Production.	Total Exemption.	Royalty Collected on.	Royalty Paid.
1898.	$ cts.	$ cts.	$ cts.	$ cts.
May	45,277 00	10,850 00	34,427 00	3,442 70
June	3,027,496 20	342,550 00	2,698,501 20	269,850 12
Two months	3,072,773 20	353,400 00	2,732,928 20	273,292 82
July	928,818 00	135,000 00	793,818 00	79,381 80
August	395,045 50	140,000 00	255,045 50	25,504 55
September	251,547 70	64,540 00	187,007 70	18,700 75
October	13,669 65	2,496 00	11,173 65	1,117 37
November	4,851 56	2,912 00	1,939 56	193 95
December	8,719 55	624 00	8,095 55	809 55
Six months	1,602,651 96	345,572 00	1,257,079 96	125,707 97
1899.				
January	6,552 76	4,784 C0	1,768 76	176 94
February	4,868 29	624 00	4,244 29	424 41
March	15,431 40	3,952 00	11,479 40	1,147 93
April	43,889 57	15,400 00	28,489 57	2,848 92
May	844,606 18	180,703 00	663,903 18	66,390 28
June	5,064,282 86	1,148,622 02	3,915,660 84	391,565 92
Six months	5 979,631 06	1,354,085 02	4,625,546 04	462,554 40
July	664,205 72	208,380 82	455,824 90	45,582 49
August	1,521,708 96	311,740 16	1,209,968 80	120,996 88
September	924,907 09	187,413 99	737,493 10	73,749 31
October	371,947 82	63,863 02	308,084 80	30,808 48
November	176,599 48	29,088 48	147,511 00	14,751 10
December	84,531 76	31.976 26	52,555 50	5,255 55
Six months	3,743,900 83	832,462 73	2,911,438 10	291,143 81
1900.				
January				
February	42,179 62	19,333 22	22,846 40	2,284 64
March	96,968 23	42,500 33	54,467 90	5,446 79
April	59,839 70	21,667 80	38,171 90	3,817 19
May	796,866 25	313,642 65	483,223 60	48,322 36
June	5,069,710 01	1,272,137 91	3,797,572 10	379,757 21
Six months	6,065,563 81	1,669,281 91	4,396,281 90	439,628 19
July	2,346,440 64	410,399 99	1,936,040 65	193,707 36
August	1,354,543 88	137,500 00	1,219,148 10	121,914 81
September	1,012,731 48	91,100 00	921,630 90	92,163 09
October	378,991 50	40,000 00	338,990 17	31,772 73
November	63,591 79	38,500 00	25,091 79	2,509 15
December	14,595 47		14,595 47	1,459 54
Six months	5,170,894 76	717,499 99	4,455,497 08	443,526 68

PRECIOUS METALS.

Gold.

North-west Territories.

MONTH.	Total Gold Production.	Total Exemption.	Royalty Collected on.	Royalty Paid.
1901.	$ cts.	$ cts.	$ cts.	$ cts.
January	28,486 81	10,000 00	18,486 81	1,832 65
February	34,923 53	10,000 00	24,923 53	2,492 34
March	13,651 91	2,500 00	11,151 91	1,115 23
April	65,156 32	5,000 00	60,156 32	6,015 63
May	183,953 75	40,833 33	143,119 67	10,728 39
June	3,665,015 71	1,141,833 30	2,523,182 41	126,950 06
Six months	3,991,188 03	1,210,166 63	2,781,020 65	149,134 30

The totals of the above items for the fiscal years are as follows :—

Fiscal Year.	Total Gold Production.	Total Exemption.	Royalty Collected on.	Royalty Paid.
	$	$	$	$
1898	3,072,773	339,845	2,732,928	273,292
1899	7,582,283	1,699,657	5,882,626	588,262
1900	9,809,464	2,501,744	7,307,720	730,771
1901	9,162,082	1,927,666	7,236,522	592,660
1902	9,566,340	1,199,114	8,367,225	331,436

British Columbia.

BRITISH COLUMBIA.—

The total value of the gold produced in this province in 1902 was $5,961,409, being an increase over the production in 1901 of about 12 per cent. Nearly $1,073,140 or 18 per cent of the whole was obtained from the placer workings and $4,888,269 or 82 per cent from the lode mines.

Statistics of the yearly production of this province since 1858 are given in Table 10, and detailed statistics of the production by districts are shown in Table 11.

The Provincial Mineralogist in his report to the Minister of Mines for the Province, gives the following summarized description of the progress made in gold mining in 1902.

Placer Gold Mining.—The placer gold output for 1902 was $1,073,140, an increase of $103,040 over the preceding year. It is to the small partnerships and individual miners that is due, not only the present increase, but the prevention of what promised to be a serious deficit, inasmuch as the large companies have this year made compara-

tively poor outputs, for reasons explained later. As an illustration of this fact, the Gold Commissioner of Atlin reports that out of a total sum on which royalty was collected of $261,985, some $190,652 was produced by the small or individual concerns, and only some $71,162 was produced by the larger companies. This statement is even stronger than appears on the face of it, inasmuch as it far easier to collect royalty from companies, and it is highly probably that as much as $100,000 produced by individuals escaped taxation. PRECIOUS METALS. Gold. British Columbia.

"This is also equally true of the Cariboo District, for in the Omineca division only small concerns were at work this past year of 1902, yet the output of gold was about double that of 1901. In the Cariboo division there were produced some $60,000 over the previous year, and this amount is certainly due to the small concerns, as the big companies made little production during 1902. There is in this division, however, a number of small companies or partnerships, the efforts of which have been very successful during the past year. In the Quesnel division in which the yearly output is chiefly made up from the product of one or two large companies, there has been this year a decrease of about $80,000, due to the falling off in production of these companies, while the product of the individual miner remains about constant."

TABLE 10.

PRECIOUS METALS.

GOLD. BRITISH COLUMBIA:—ANNUAL PRODUCTION.

Calendar Year.	Value.	Calendar Year.	Value.
1858	$ 705,000	1881	1,046,737
1859	1,615,072	1882	954,085
1860	2,228,543	1883	794,252
1861	2,666,118	1884	736,165
1862	2,656,903	1885	713,738
1863	3,913,563	1886	903,651
1864	3,735,850	1887	693,709
1865	3,491,205	1888	616,731
1866	2,662,106	1889	588,923
1867	2,480,868	1890	494,436
1868	2,372,972	1891	429,811
1869	1,774,978	1892	399,525
1870	1,336,956	1893	379,535
1871	1,799,440	1894	530,530
1872	1,610,972	1895	1,266,954
1873	1,305,749	1896	1,788,206
1874	1,844,618	1897	2,724,657
1875	2,474,904	1898	2,939,852
1876	1,786,648	1899	4,202,473
1877	1,608,182	1900	4,732,105
1878	1,275,204	1901	5,318.703
1879	1,290,058	1902	5,961,409
1880	1,013,827		

PRECIOUS METALS.

Gold.

British Columbia.

TABLE 11.

PRECIOUS METALS.

GOLD:—BRITISH COLUMBIA.—PRODUCTION BY DISTRICTS—1902.

DISTRICTS.	GOLD, PLACER.		GOLD, LODE.	
	Ounces.	Value.	Ounces.	Value.
		$		$
Cariboo:				
Cariboo division	17,000	340,000	19	393
Quesnel "	8,000	160,000	.....	.....
Omineca "	2,000	40,000	.....	.....
Cassiar:				
Atlin Lake division	20,000	400,000	.....	.....
All other divisions	800	16,000	474	9,797
East Kootenay:				
Fort Steele division	1,650	33,000	.....	.....
Other divisions	.....	.....	16	331
West Kootenay:				
Ainsworth division	.....	.....	5	103
Nelson "	.....	.....	25,116	519,148
Slocan "	.....	.....	353	7,297
Trail Creek "	.....	.....	162,146	3,351,558
All other divisions	100	2,000	652	13,477
Lillooet	1,372	27,440	193	3,989
Yale:				
Grand Forks &c	250	5,000	42,745	883,539
Similkameen division	135	2,700	.....	.....
Yale "	2,350	47,000	6	124
Coast and other districts	.....	.....	4,766	98,513
Total	53,657	1,073,140	236,491	4,888,269

"As to the placer gold output of the remainder of the province it is almost exclusively produced by partnerships or individuals.

"*Hydraulicing.*—The past year has not been a successful one for the hydraulic miner, from causes entirely beyond the control of man. For instance, the largest hydraulic company in the province, the Consolidated Cariboo, this past year had only water sufficient to run 66 days and to move 690,442 cubic yards of earth producing $61,395 in gold; while the previous year there was water for 104 days, and 2,420,288 cubic yards were moved, producing $142,274 in gold. The watershed from which this water was collected was the same as in the previous year, and it is simply a case of insufficient rainfall. The rainfall for some three or four years past has been getting less each year, although it must be pointed out that this state of affairs is not expected to con-

tinue, for it seems that such occurrences run in cycles, and that a period of greater rainfall is now almost due. The output then, of such a company as this, with a given plant, seems to be very nearly in direct proportion to the precipitation on the watershed.

"In the Atlin district, the report of the Gold Commissioner as to gold produced, indicates that the hydraulic companies have not yet really settled down to business, and the hope entertained of a large output from this quarter is again deferred for another year. The Thibert creek company's property, in the Liard mining division, gave promise this year of being a considerable producer, but this hope was frustrated by a tremendous clayslide, which practically buried the pit. This slide has now been removed, and the gold should be recovered next year.

"The auriferous black sands found on the coast at various points, have not been productive this year, for reasons unknown.

"*Dredging.*—Dredging for gold has not received the usual amount of attention this past year, only two or three dredges having been at work. On the Quesnel a prospecting dredge was operated for a portion of the year with good results but made only a small output. Another dredge is reported to have been prospecting on the Thompson river, with what results has not been learned. At Lytton the old Cobeldick dredge has been working. Here Mr. Turner, the director who was sent out from England to investigate for the company the working of the dredge, made the discovery that, of the gold dredged up from the bottom less than 10 per cent was recovered on the tables, the remaining 90 per cent going off again with the tailings, although the gold-saving appliances on this machine were about the most complete of any in British Columbia. It certainly appears as though here is the point of failure in most of the dredging operations in British Columbia, and the realization of this fact should soon lead to the removal of the difficulty, when, only, will this industry become the success which the conditions seem to warrant.

"*Lode Gold Mining.*—Lode gold mining has this year made a production of $4,888,269, being an increase of $539,666 over the previous year, or about 12½ per cent. This increase is attributable to the greatly increased tonnage of the mines of Trail Creek and the Boundary. The increased tonnage has brought with it lower values per ton of ore mined, but this has been more than compensated for by the cheaper smelting, mining and transportation rates thus rendered possible. Gold is the only metal which may hope to escape the fluctuations of the market, and it is the gold contents of the ore that has enabled most of

PRECIOUS METALS.

Gold.

British Columbia.

our copper mines to continue production in the face of a 27 per cent drop in the price of the latter metal.

"The product of lode gold mining in British Columbia has shown the steadiest and most regular increase, and this product is the most valuable which the province has. It can, however, not be classed as a separate branch of the industry of mining, inasmuch as the gold is mostly found in combination with other metals, such as copper or silver. A certain amount of this production is derived from stamp milling, &c. but it is chiefly due to smelting."

"Approximately the gold has been derived as follows :—

Direct smelting of copper-gold ores	$4,232,948
Combined amalgamation and concentration	655,321
	$4,888,269"

The following tables show the production of the Rossland mines and illustrate the average results attained during the past nine years.

NET PRODUCTION PER SMELTER RETURNS.

Year.	Ore, tons, 2,000 lbs.	Gold, oz.	Silver, oz.	Copper, lbs.	Value.
1894	1,856	3,723	5,357	106,229	$ 75,510
1895	19,693	31,497	46,702	840,420	702,459
1896	38,075	55,275	89,285	1,580,635	1,243,360
1897	68,804	97,024	110,068	1,819,586	2,097,280
1898	111,282	87,343	170,804	5,232,011	2,470,811
1899	172,665	102,976	185,818	5,693,889	3,229,086
1900	217,636	111,625	167,378	2,071,865	2,739,300
1901	283,360	132,333	970,460	8,333,446	4,621,299
1902	329,534	162,146	373,101	11,667,807	4,893,395
Total	1,242,905	783,942	2,118,973	37,345,888	22,072,500

AVERAGE NET SMELTER RETURNS OR ACTUAL YIELD PER TON.

PRECIOUS METALS.

Gold.

British Columbia.

Year.	Gold.	Silver.	Copper.	Value.
	Ounces.	Ounces.	Per cent.	$ cts.
1894.....	2·00	2·89	2·85	40.69
1895.....	1·60	2·41	2·10	35.67
1896.....	1·45	2·34	2·08	32.65
1897.....	1 42	1·60	1·32	30.48
1898.....	·78	1·54	2·35	22.10
1899.....	·596	1·07	1·65	18.70
1900.....	·513	769	·476	12.58
1901.....	·467	3·424	1·470	16.31
1902.....	·492	1·132	1·770	14.85
Average 1,242,905 tons....	·631	1·705	1·502	17.76

SILVER.

Silver.

Silver ores are mined in Canada in the provinces of Quebec, Ontario and British Columbia, and a certain quantity is also recovered from the placer gold found in the Yukon district. The total production in Canada in 1902 was 4,291,317 ounces, valued at $2,238,351, or a decrease from the output of 1901 of 1,247,875 ounces, or over 32 per cent.

Statistics of the production of silver since 1887 are shown in Table No. 12.

TABLE 12.

PRECIOUS METALS.

SILVER.—ANNUAL PRODUCTION.

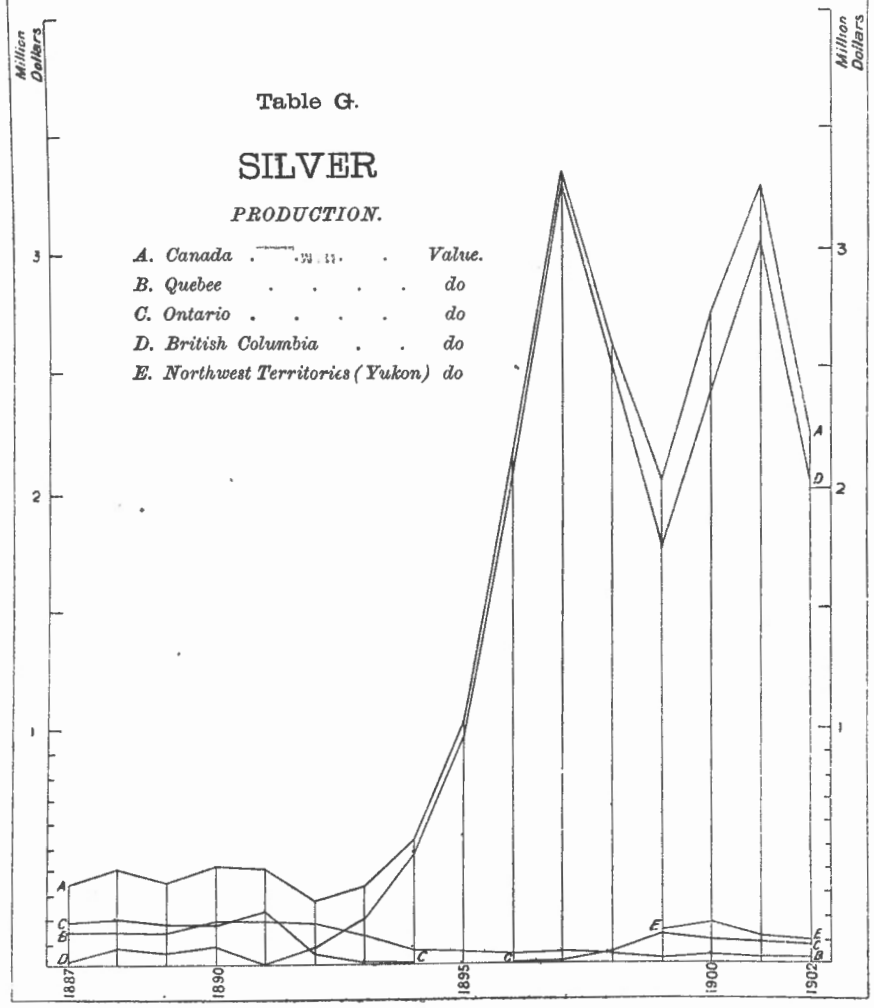
Calendar Year.	Ontario.		Quebec.		British Columbia.		Total.	
	Ounces.	Value.	Ounces.	Value.	Ounces.	Value.	Ounces.	Value.
1887..	190,495	$186,304	146,898	$143,666	17,690	$17,301	355,083	$347,271
1888..	208,064	195,580	149,388	140,425	79,780	74,993	437,232	410,998
1889..	181,609	169,986	148,517	139,012	53,192	49,787	383,318	358,785
1890..	158,715	166,016	171,545	179,436	70,427	73,666	400,687	419,118
1891..	225,633	222,926	185,584	183,357	3,306	3,266	414,523	409,549
1892..	41,581	36,425	191,910	168,113	77,160	67,592	310,651	272,130
1893..	.....	8,689	.....	126,439	.....	195,000	.....	330,128
1894..	.....	.....	101,318	63,830	746,379	470,219	847,697	534,049
1895..	.....	.....	81,753	53,369	1,496,522	976,930	1,578,275	1,030,299
1896..	.....	.....	70,000	46,942	3,135,343	2,102,561	3,205,343	2,149,503
1897..	5,000	2,990	80,475	48,116	5,472,971	3,272,289	5,558,446	3,323,395
1898..	85,000	49,521	74,932	43,655	4,292,401	2,500,753	4,452,333	2,593,929

Table G.

SILVER

PRODUCTION.

A.	*Canada*	*Value.*
B.	*Quebec*	*do*
C.	*Ontario*	*do*
D.	*British Columbia*	*do*
E.	*Northwest Territories (Yukon)*	*do*



PROVINCE.	1899.		1900.		1901.	
	Ounces.	Value.	Ounces.	Value.	Ounces.	Value.
Quebec	40,231	$23,970	58,400	$35,817	41,459	$24,440
Ontario	202,000	120,352	161,650	99,140	151,400	89,250
Yukon district.	230,000	137,034	290,000	177,857	195,000	114,953
British Col'mbia	2,939,413	1,751,302	3,958,175	2,427,548	5,151,333	3,036,711
	3,411,644	2,032,658	4,468,225	2,740,362	5,539,192	3,265,354

PROVINCE.	1902.	
	Ounces.	Value.
Quebec	42,500	$ 22.168
Ontario	145,000	75,632
Yukon district	185,900	96,965
British Columbia	3,917,917	2,043,586
	4,291,317	2,238,351

The greater part of the silver production since 1894 has been obtained from British Columbia, the proportion in 1902 being over 91 per cent.

The output from the province of Quebec is represented by the small amount contained in the pyrites ores mined in the vicinity of Capelton in the Eastern Townships.

In Ontario the West End Silver Mountain Mine, situated south-west of Port Arthur in the Thunder Bay district, is at present the chief producer.

The production by district in British Columbia is shown in the following table :—

PRECIOUS METALS.

Silver.

British Columbia.

TABLE 13.

PRECIOUS METALS.

SILVER:—BRITISH COLUMBIA.—PRODUCTION BY DISTRICTS.

District.	1899.	1900.	1901.	1902.
	Ounces.	Ounces.	Ounces.	Ounces.
Cariboo				4
Cassiar			82	224
Kootenay East—				
Fort Steele division	33,516	960,411	718,451	114,506
Other divisions	1,627	2,219	34,181	27,918
Kootenay West—				
Ainsworth division	268,165	352,167	324,913	320,719
Nelson "	483,659	109,870	377,167	273,870
Slocan "	1,891,025	2,121,176	2,276,259	2,223,810
Trail Creek "	185,818	167,378	970,460	373,101
Other divisions	48,463	96,416	133,774	241,584
Yale				
Osoyoos division	2,719	112,145	241,489	219,798
Similkameen	16			
Yale	47		74	542
Coast and other districts	24,358	36,393	74,483	121,841
Totals	2,939,413	3,958,175	5,151,333	3,917,917

Comparing the output for 1902 with the previous year, it will be seen that nearly every division with the exception of the coast district has shown a falling off, the most notable decreases being in the Fort Steele division of East Kootenay and in the Nelson and Trail Creek divisions of West Kootenay.

The following tables show the output and average yield per ton of the Slocan mines for the past eight years.

NET PRODUCTION PER SMELTER RETURNS.

Year.	Ore, Tons, 2,000 lbs.	Silver oz.	Lead, lbs.	Gold. oz.	Values.
1895	9,514	1,122,770	9,666,324	6	$1,045,600
1896	16,560	1,954,258	18,175,074	152	1,854,011
1897	33,567	3,641,287	30,707,705	193	3,280,686
1898	30,691	3,068,648	27,063,595	60	2,619,852
1899	21,507	1,891,025	16,660,910	14	1,740,372
1900	25,520	2,121,176	19,365,743	5	2,063,908
1901	25,493	2,276,259	15,025,759	244	1,865,752
1902	21,153	2,223,810	13,651,144	353	1,608,827
Total	184,005	18,299,233	150,316,254	1,027	16,079,008

AVERAGE YIELD PER TON.

Year.	Silver.	Lead.	Values.
1895	118·0 oz.	50·8%	$109.90
1896	118·0 "	54·9%	111.95
1897	108·5 "	45·7%	97.73
1898	100·0 "	44·1%	85.36
1899	87·9 "	38·7%	80.92
1900	83·1 "	37 9%	80.87
1901	89·3 "	29·5%	73.19
1902	105·1 "	32·3%	76.06
Average for eight years, 184,005 tons	99·4 oz.	40·8%	$ 87.38

The value of silver ores exported is given in Table 14, as follows :—

TABLE 14.

PRECIOUS METALS.

SILVER.—EXPORTS OF ORE.

Calendar Year.	Value.	Calendar Year.	Value.
1886	$ 25,957	1895	$ 994,354
1887	206,284	1896	2,271,959
1888	219,008	1897	3,576,391
1889	212,163	1898	2,902,277
1890	204,142	1899	1,623,905
1891	225,312	1900	2,341,872
1892	56,688	1901	2,026,727
1893	213,695	1902	1,820,058
1894	359,731		

PYRITES.

The production of pyrites in 1902 reached a total of 35,616 tons valued at $138,939. The greater part of this output represents the product of the mines of the Eustis Mining Company and the Nichols Chemical Company at Eustis and Sherbrooke in the Eastern Townships, province of Quebec. A small quantity of iron pyrites is mined at the Jarman mine in the township of Madoc, Hastings county, Ontario, and is included in the above total.

PYRITES.

Production.

TABLE 1.

PYRITES.

ANNUAL PRODUCTION.

Calendar Year.	Tons. 2,000 lbs.	Value.
		$
1886	42,906	193,077
1887	38,043	171,194
1888	63,479	285,656
1889	72,225	307,292
1890	49,227	123,067
1891	67,731	203,193
1892	59,770	179,310
1893	58,542	175,626
1894	40,527	121,581
1895	34,198	102,594
1896	33,715	101,155
1897	38,910	116,730
1898	32,218	128,872
1899	27,687	110,748
1900	40,031	155,164
1901	35,261	130,544
1902	35,616	138,939

TABLE 2.

PYRITES.

Imports.

IMPORTS :—BRIMSTONE AND 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
1892	4,769,759	67,095
1893	6,381,203	77,216
1894	5,845,463	61,558
1895	4,900,225	56,965
1896	6,934,190	63,973
1897	8,672,751	87,719
1898	38,026,798	373,786
1899	24,517,026	265,799
1900	21,126,656	215,433
1901	23,856,651	270,608
1902*	24,640,735	325,307

*Brimstone, crude, or in roll or flour, and sulphur in roll or flour. Duty free.

SALT.

Production.

The production of salt in Ontario in 1902 from the deposits in the counties of Essex, Lambton, Middlesex, Huron and Bruce, reached a total, according to returns from operators, of 64,456 tons, valued at $292,581, exclusive of packages. The total value of packages used was $109,757.

Although the production for the year under consideration has been the largest recorded, the variation from year to year has been comparatively small, as a glance at Table 1 will show.

The output of salt in 1886 was 62,359 tons and in only five years between that year and the present time has the output been less than 50,000 tons.

Ontario is the only province at present producing salt. In 1896 a few tons were manufactured at the south end of Lake Winnipegosis, Manitoba, but the industry has not been followed up in this district. Small quantities of brine have occasionally been evaporated at Plumweseep, N.B., and sold locally along the line of the Intercolonial Railway, but these operations have apparently ceased since 1898.

The exports af salt, which are of small amount, are shown in Table No. 2. Tables Nos. 3 and 4 show the quantities and values of the salt imported. The value of the salt imported, on which a customs duty is levied, has ranged from $20,000 to $80,000 a year, the value in 1902 being $39,605. Salt imported from the United Kingdom or any British possession, or imported for the use of the sea or gulf fisheries, is free of duty, and a large proportion of the trade of eastern Canada is supplied with salt imported under this class. The quantity imported duty free in 1902 was 119,324 tons, valued at $385,629.

SALT.

Production.

TABLE 1.

SALT.

ANNUAL PRODUCTION.

Calendar Year.	Tons.	Value.
1886	62,359	$227,195
1887	60,173	166,394
1888	59,070	185,460
1889	32,832	129,547
1890	43,754	198,857
1891	45,021	161,179
1892	45,486	162,041
1893	62,324	195,926
1894	57,199	170,687
1895	52,376	160,455
1896	43,960	169,693
1897	51,348	225,730
1898	57,142	248,639
1899	59,339	254,390
1900	62,055	279,458
1901	59,428	262,328
1902	64,456	292,581

TABLE 2.

SALT.

Exports.

EXPORTS.

Calendar 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
1892	2,000	504
1893	4,940	1,267
1894	4,639	1,120
1895	4,865	959
1896	3,842	899
1897	5,383	1,193
1898	5,202	1,252
1899	11,205	2,773
1900	37,653	8,997
1901	39,224	6,510
1902	9,331	3,798

TABLE 3.

SALT.

IMPORTS :—SALT PAYING DUTY.

SALT.

Imports.

Fiscal Year.	Pounds.	Value.	Fiscal Year.	Pounds.	Value.
1880	726,640	$ 3,916	1891	15,140,827	$59,311
1881	2,588,465	6,355	1892	18,648,191	65,963
1882	3,679,415	12,318	1893	21,377,339	79,838
1883	12,136,968	36,223	1894	15,867,825	53,336
1884	12,770,950	38,949	1895	8,498,404	29,881
1885	10,397,761	31,726	1896	7,665,257	24,550
1886	12,266,021	39,181	1897	11,911,766	33,470
1887	10,413,258	35,670	1898	11,068,785	32,792
1888	10,509,799	32,136	1899	11,781,453	32,839
1889	11,190,088	38,968	1900	11,028,337	30,180
1890	15,135,109	57,549	1901	11,625,688	34,087
			Duty.		
1902 Salt, coarse, N.E.S			5c. per 100 lbs.	10,786,285	$25,427
1902 Salt, fine, in bulk			5c. "	644,372	1,014
1902 Salt, N.E.S., in bags, barrels or other packages			7½c. "	2,462,192	13,164
Total				13,892,849	39,605

TABLE 4.

SALT.

IMPORTS—SALT NOT PAYING DUTY.

Fiscal Year.	Pounds.	Value.	Fiscal Year.	Pounds.	Value.
1880	212,714,747	$400,167	1892	201,831,217	314,995
1881	231,640,610	488,278	1893	191,595,530	281,462
1882	166,183,962	311,489	1894	196,668,730	328,300
1883	246,747,113	386,144	1895	201,691,248	332,711
1884	225,390,121	321,243	1896	205,005,100	338,888
1885	171,571,209	255,719	1897	215,844,484	312,117
1886	180,205,949	255,359	1898	202,634,927	293,410
1887	203,042,332	285,455	1899	183,046,365	267,520
1888	184,166,986	220,975	1900	193,554,550	295,253
1889	180,847,800	253,009	1901	216,271,603	339,887
1890	158,490,075	252,291	1902*	238,648,737	385,629
1891	195,491,410	321,239			

* Salt imported from the United Kingdom, or any British possession, or imported for the use of the sea or gulf fisheries.

Following is a list of the chief producers of salt in Ontario :— Producers.

The Canadian Salt Company, Ltd., E. G. Henderson, vice-Pres., Windsor, Ont.
Saginaw Lumber and Salt Co. ..... Sandwich, Ont.
Mooretown Salt Co., Ltd. ..... Mooretown, Ont.
Carter & Kittermaster ..... " "
Sarnia Salt Co., Ltd. ..... Sarnia "

SALT.

Producers.

Sarnia Bay Mills Co.....Sarnia Ont
Cleveland Lumber & Salt Co..... " "
Elarton Salt Works Co., Ltd., C. V. Morris..... Warwick "
Parkhill Salt Co., A. K. Hodgins.....Parkhill "
Exeter Salt Works Co., J. B. Carling, Secy.....Exeter "
Hensall Salt Works, Geo. McEwan.....Hensall "
I. F. Coleman..... Seaforth "
Lake Huron and Manitoba Milling Co., Ltd., P. A. McGaw, Secretary .....Goderich "
R. & J. Ransford .....Clinton, "
Operating the following plants—
Courtright Salt Works.....Courtright Ont.
Stapleton Salt Works.....Clinton "
North American Chemical Co.....Goderich "
Goderich Salt Works..... " "
Brussels Salt Works.....Brussels "
Clinton Salt Works, John McGarva.....Clinton "
Maitland Salt Works, John S. Platt.....Goderich "
The Grey, Young & Sparling Co., of Ont., Ltd., F. G. Sparling, Wingham "
The Ontario People's Salt & Soda Co., Ltd., Jno. Tolmie, Sec., Kincardine "
— Ryghtmeyer..... " "

Deposits.

THE SALT DEPOSITS OF CANADA.

The following extended article has been prepared by Mr. Denis as a result of his observations in the Ontario Salt field supplemented by reference to the available literature of the subject :—

Although a small amount of salt has been produced in Canada from natural brine springs in New Brunswick and Manitoba, these enterprises form quite a minor feature of the industry. In these cases, the salinity of the spring seems to be due to the leaching out by percolating surface waters, of salt scattered through the formation as small aggregations and isolated crystals. The presence of such springs must not therefore be taken to necessarily indicate the presence of extensive salt deposits.

The country's chief resource in this respect consists of the salt beds underlying large areas in Ontario, adjacent to the eastern shores of Lake Huron. The territory, so far proved, has an area of approximately 2,500 square miles fronting on the shore of the lake between Kincardine and Lake Erie, and reaching inland at its greatest breadth to a distance of about 40 miles.

The beds of rock-salt owe their origin to a process of sedimentation and deposition produced by the surface evaporation of bodies of saline water ; such process being comparable to that which produces in warm climates salt by solar evaporation from sea water or other brines.

This is at present going on for instance in the Dead Sea, in the Great Salt lake of Utah and many other bodies of water without outlets, where the quantity of water annually discharged into them, by streams holding salts in solution, is less than the surface evaporation. A similar result happens in the case of basins and bays on the sea coast cut off from the main body of the ocean by sand-bars, etc. Such concentrations of salt waters and eventual depositions from the saturated brines are known to have taken place in most of the geological periods from the Silurian up to the present time, giving rise to the beds of rock-salt which are found in formations of various ages. SALT. Deposits.

From the very nature of the mode of deposition of beds of rock-salt, it can easily be understood that they cannot be expected to be pure sodium chloride. Even the purest ones always contain other salts which may be classified as impurities, such as sulphates and chlorides of calcium, potassium and magnesium.

In some parts of the world the salt deposits occur under such favourable conditions and are so pure that the rock-salt is mined and removed in the solid state. No operations of this kind are, however, carried on in Canada. Where the salt is mixed with layers of rock, gypsum, etc., or is buried at great depths, another mode of extraction is resorted to. Wells or bore-holes are sunk to the salt beds, fresh water is let down and after dissolving the salt, is pumped up in the form of brine; or in certain cases the water infiltrating through the rocks is in sufficient quantity to be taken advantage of as solvent. Both methods are followed in the Ontario field.

Pure water at ordinary temperature dissolves somewhat more than one third its weight of salt, or from thirty five to thirty six hundredths. As results of experiments it appears that 100 parts by weight of pure saturated brine at temperatures of from 32° to 70° Fahrenheit contain from 26·3 to 26·7 parts of salt, the specific gravity of the brine being 1.205 at 60° Fahrenheit. The salometer or instrument used to fix the value of the brines is an aerometer with an arbitrary scale on which 0° represents the density of pure water and 100° the density of saturated brine, both at a temperature of 60° F. The following table gives, in the first column, the degree of the salometer; in the second the degree of Baumé aerometer, which is a hydrometer with an arbitrary scale; the third column the true specific gravity; the fourth, the parts of salt in 100 of the brine; the fifth, the number of gallons of brine required for one bushel of salt. As may be seen these two last columns are based on the supposition that a saturated brine contains 26·5% of salt, which is the quantity arrived at through the further experiments on salt solutions.

SALT DEPOSITS.

Earlier experiments gave as results 25·7% and formerly tables were calculated on that basis. From a practical standpoint, however, it is a question whether the earlier tables are not more accurate if the slight amount of impurities present in the brine is taken into account.—

Salometer degrees.	Baumé degrees.	Specific gravity.	Per cent of salt.	Gallons of Brine for a bushel of salt.
2	.52	1.003	.530	1,264.5
4	1.04	1.007	1.060	629.7
6	1.56	1.010	1.590	418.6
8	2.08	1.014	2.120	312.7
10	2.60	1.017	2.650	249.4
12	3.12	1.021	3.180	207.0
14	3.64	1.025	3.710	176.7
16	4.16	1.028	4.240	154.2
18	4.68	1.032	4.770	136.5
20	5.20	1.035	5.300	122.5
22	5.72	1.039	5.830	111.0
24	6.24	1.043	6.360	101.3
26	6.76	1.046	6.890	93.3
28	7.28	1.050	7.420	86.3
30	7.80	1.054	7.950	80.2
32	8.32	1.058	8.480	74.9
34	8.84	1.061	9.010	70.3
36	9.36	1.065	9 540	66 2
38	9.88	1.069	10.070	62.4
40	10.40	1.073	10.600	59.1
42	10.92	1.077	11.130	56.1
44	11.44	1.081	11.660	53.3
46	11.96	1.085	12.190	50.8
48	12.48	1.089	12.720	48.5
50	13.00	1.093	13.250	46.4
52	13.52	1.097	13.780	44.5
54	14.04	1.102	14 310	42.6
56	14.56	1.106	14.840	41.0
58	15.08	1.110	15.370	39.4
60	15.60	1.114	15 900	37.9
62	16.12	1.118	16.430	36.6
64	16.64	1.123	16.960	35.3
66	17.16	1.127	17.490	34.1
68	17.68	1.131	18.020	33.0
70	18.20	1.136	18.550	31.9
72	18.72	1.140	19.080	30.9
74	19.24	1.144	19.610	30.0
76	19.76	1.149	20.140	29.0
78	20.28	1.154	20.670	28.2
80	20.80	1.158	21.200	27.4
82	21.32	1.163	21.730	26.6
84	21.84	1.167	22.260	25.9
86	22.36	1.172	22.790	25.2
88	22.88	1.177	23.320	24.5
90	23.40	1.182	23.850	23.8
92	23.92	1.186	24.380	23.2
94	24.44	1.191	24.910	22.7
96	24.96	1.196	25.440	22.1
98	25.48	1.201	25.970	21.6
100	26.00	1.205	26.500	21.4

NOTE.—The above is taken from the table by Dr. Englehardt, published in the New York State Museum Bulletin No. 11 on Salt and Gypsum industries of New York.

SALT. Deposits.

As may be observed by a comparison of the above tables of production, the quantity of salt imported into Canada at present, roughly speaking is double the amount produced in the country. This is not owing to a lack of sources from which the whole of the consumption could be derived, but is due to the fact that salt is produced more cheaply in England, from which country the greater proportion of the imports come. This is probably because the extensive salt deposits of Cheshire are in close proximity to the coal supply used for the evaporation of the brine, and also on account of the cheapeness of labour. As a measure of protection and help to the Canadian fishery industry, the salt imported for its use is admitted free of duty, and as very low freight rates across the Atlantic can be obtained, salt being carried as return freight and ballast, the whole Atlantic sea board trade is monopolized by English salt.

In a paper on the 'Goderich Salt Region,' published in Vol. V. of the American Institute of Mining Engineers, Dr. T. Sterry Hunt draws a comparison between the Goderich salt and the rock-salt of Cheshire, England, the most productive field of Great Britain. The sample of Canadian salt was broken off the core of the diamond drill hole put down by Mr. Attrill. Pieces of equal size were taken from each linear foot of the white translucent portion, measuring ten feet, of the second bed of salt which has a total thickness of 25 feet 4 inches.

The analysis of English salt made by Dr. Grace Calvert for Messrs. Fletcher & Rigby, is taken from a report to the British House of Commons, in 1873, and is of 'Crushed Marston rock-salt.'

The two analyses are respectively as follows :—

	Goderich.	Cheshire.
Chloride of sodium	99·687	96·70
" calcium	·032	·68
" magnesium	·095	trace.
" potassium		"
Sulphate of lime	·090	·25
Insoluble in water	·017	1·74
Moisture	·079	·63

Deducting the moisture in both cases, the amounts of impurities in the two salts are, Goderich, 0·234 per cent, Cheshire, 2·67 per cent; that is, the English salt contains eleven times more impurities than the Canadian salt.

In the following brief description of the sources of salt in Canada, the deposits are taken up in their geographical order, from east to west, irrespective of their importance from a commercial standpoint.

SALT.

Deposits.

In the provinces of Nova Scotia and New Brunswick, no deposits of rock salt have been discovered, but numerous salt springs are known, to exist whose brines could be evaporated for salt. These springs are as a rule found in the neighbourhood of the gypsum deposits. Some have been noticed at Pomquets, South river, Brierly brook, Addington Forks, Spring Hill, and other places. They generally take their source in the measures of Lower Carboniferous age.

The manufacture of salt from these brines has been attempted at several places, but in no case does it seem to have been very successful. One of the first attempts was made at Salt Springs, on the West river of Pictou, in 1813. The presence of brine oozing out at the surface was taken as evidence of the presence of a rock-salt bed within easy access, and in the hope of reaching it a shaft was sunk about 200 feet without any results. Some years later the brine itself was used in the manufacture of salt.

Some thirty years ago at Antigonish village, the Nova Scotia Salt Works and Exploration Company put down a bore-hole where the railway station now stands. At a depth of about 159 feet, after penetrating eighteen feet of gypsum, a flow of pure strong brine was started. A plant was erected for the production of salt, and a considerable quantity was manufactured, but the brine eventually became weaker, the original strength having been about 35° of the salinometer. Another bore-hole was sunk, but without satisfactory results, and the enterprise was abandoned.

At Black Brook, Cumberland county, the brine of a spring was used for some time in the manufacture of salt for house use.

At Spring Hill a brine was found recording 30° to 35° of the salinometer; this was also the object of an attempt to manufacture salt.

In New Brunswick, salt springs are known to exist in the vicinity of Sussex and at Saltspring Brook, both in King's county, and on the Tobique river in Victoria county. These springs have their sources in the Lower Carboniferous rocks.

Of those known springs, the Sussex ones are the most important and they are worked intermittently, the product being used locally. These springs were first operated about 100 years ago. There are half a dozen springs within a radius of a quarter of a mile. The brine records 20°. In all cases work is conducted in open pans and wood is used for fuel.

At Salina, King's county, a brine collected from a bore hole 350 feet deep, gave the following results. SALT. Deposits.

	Grains per imp. gallon.
Potassium chloride	19·963
Sodium "	1293·648
Magnesium "	22·315
Sulphate of lime	268·212
" magnesia	11·336
	1615·474

The analysis was made in the laboratory of the Geological Survey of Canada.

In the province of Quebec, although there is an abundance of mineral springs, none of the known ones are suited to the manufacture of common salt. Those in which the proportion of sodium chloride might be sufficient, contain too much earthy chlorides.

The province of Ontario is responsible for almost the total Canadian production of salt, the exceptions being insignificant quantities manufactured intermittently from natural springs for local use only.

The deposits from which this salt is obtained, are found in a basin along the eastern shore of Lake Huron, river and lake St. Clair and Detroit river, and form part of the Onondaga formation of Silurian age. The name of the formation is derived from the county of Onondaga in the state of New York, where these rocks were first studied. In this state this formation had for a long time been known to be saliferous, through the presence of saline springs. In fact, in the "Relations of the Jesuits" as far back as 1646, mention is made of an occurrence of salt springs in the Canton of Onondaga, and the first record of salt manufactured in that region, dates back to 1788, from salt springs, the source of which is the Onondaga formation. It was not until 1865 that this formation was discovered to be saliferous in Canada. The discovery was made accidentally, near the town of Goderich, in a bore hole which was being sunk in search of oil, and which at a depth of 964 feet, struck rock-salt. The boring was continued to 1,010 feet and in that distance passed through 30 feet of rock-salt.

For several years the salt deposits were supposed to be confined to the counties of Bruce and Huron, but they have of late years been recognized to extend south as far as Essex county; the most important salt works in Ontario being now located at Windsor. In the geological column the Onondaga, also called Salina group, is seen

SALT. Deposits.

to be overlaid by the Corniferous and underlaid by the Guelph formation. Its outcrop crosses into Canada from the state of New York at the Niagara river, whence it has a north-west direction to Lake Huron. It dips to the south-west at a very slight angle, so that by boring it is easily reached all along the west shore of the Ontario peninsula, and on the opposite shore in Michigan. The Onondaga includes, both in Canada and New York, beds of gypsum which are worked along the outcrop.

Prof. James Hall in his "Geology of the 4th District" gives the following description of the Salina or Onondaga formation :—"Succeeding the Niagara group is an immense development of shales and marls with shaly limestones including veins and beds of gypsum. The general colour is ashy, approaching drab with some portions of dark bluish green. The lower part is of deep red with spots of green. Succeeding this, where protected from atmospheric influences, the rock is blue like ordinary blue clays, with bands of red or brown. This portion and that succeeding it are often green and spotted, and contain seams of fibrous gypsum, and small masses of reddish selenite and compact gypsum. From this it becomes gradually more gray with a thin stratum of clayey limestone, which is sometimes dark, though generally of the same colour as the surrounding mass. The formation terminates upward with a gray or drab limestone called by Vanuxem the 'magnesian deposit.'" This succession was of course gathered from the outcrops of the formation, hence no rock salt was found in it; on account of its solubility the mineral cannot remain at the surface. It was known, however, even before the actual discovery of rock salt that this formation was the source of the salt springs of the counties of Onondaga and Cayuga, as mentioned by Vanuxem in his "Geology of the third district of New York", but it was only in 1878, that, is more than twelve years after the discovery of the Goderich salt deposits, that rock—salt was struck in the state of New York, in the county of Wyoming. As in the case of the Canadian deposit it was found accidentally in the course of a boring for oil.

As mentioned above, the outcrop of the Onondaga in the State of New York runs parallel to the shore of Lake Ontario, and enters Canada at the Niagara river. Its thickness here is estimated at between 200 and 300 feet. In the Geology of Canada 1863, the following short description of the rocks at the outcrop is given :—"The exposures of the Onondaga formation in Canada, so far examined, appear to belong chiefly to the upper portions, from the summit to a little below the gypsum-bearing beds. Those portions consist of

dolomites and soft crumbling shales, which are greenish and sometimes dark brown or bluish in colour, and are often dolomitic. The dolomites are mostly of a yellowish brown or drab colour and are in beds which seldom exceed a foot in thickness. They often exhibit the vesicular or lenticular cavities just described. Some beds of a bluish dolomite are also met with; and many of the strata both above and below the gypsum, contain such a proportion of clay as make them fit for hydraulic cement. SALT. Deposits.

"The beds of gypsum are never continuous for long distances but appear as detached lenticular or dome-like masses; the strata above them being arched over and often broken, while those below constitute an even undisturbed floor. The gypsum is inter-stratified with the dolomite and often separated by beds of it. The layers of gypsum may sometimes extend for a quarter of a mile, but they have always been found, on working, to be lenticular in form, and to gradually thin out, until the strata above and below the masses, come in contact. This peculiar structure gives rise to mounds on the surface; which are regarded by the inhabitants, as indicative of the presence of gypsum beneath."

As shown on the map accompanying the Geology of Canada 1863, the outcrop of the lowest beds of these rocks after entering Canada at a point near Chippawa village, follows along a line parallel to the lake shore to a point some two miles north of Brantford. From here, it follows a direction north north-west as far as the southern part of the township of Amabel, where it takes a sharp turn and goes under the waters of Lake Huron. At almost any place in that part of the province of Ontario west of this boundary, the measures of the Onondaga can be reached by bore holes of various depths after penetrating through the overlying formations. But of this development, only a limited part is salt-bearing. For a long time after the discovery of the salt beds, the saliferous deposits were thought to be limited to the counties of Huron and Bruce, and it was only in 1884 that it was discovered that the salt basin extended south to Courtright, and some eight years later, salt was struck at Windsor in Essex county.

The limits of the saliferous area as it now stands proved are given further on.

It was in 1865 that the salt beds were first struck in the course of a boring for oil at Goderich Huron county and during several years following this first discovery a certain number of wells were sunk in various places around the town, but the most important to throw light on the stratigraphical sequence of the region, was the diamond drill

SALT. Deposits.

hole put down by Mr. Henry Attrill in 1876, with the view of determining the nature and extent of the salt-beds. The results of the drilling as interpreted from the log and the cores by Dr. T. Sterry Hunt, have been summarized by him as follows :—

	Thickness.		Total depth.	
	Ft.	in	Ft.	in
Clay, gravel and boulders	78	9	78	9
Dolomite, with thin limestone layers	278	3	357	0
Limestone, with corals, chert and beds of dolomite	276	0	633	0
Dolomite with seams of gypsum	243	0	876	0
Variegated marls, with beds of dolomite	121	0	997	0
Rock-salt 1st bed	30	11	1027	11
Dolomite, with marls towards the base	32	1	1060	0
Rock-salt 2nd bed	25	4	1085	4
Dolomite	6	10	1092	2
Rock-salt 3rd bed	34	10	1127	0
Marls with dolomite and anhydrite	80	7	1207	7
Rock-salt 4th bed	15	5	1223	0
Dolomite and anhydrite	7	0	1230	0
Rock-salt 5th bed	13	6	1243	6
Marls, soft with anhydrite	135	6	1379	0
Rock-salt 6th bed	6	0	1385	0
Marls, soft, with dolomite and anhydrite	132	0	1517	0

The drilling thus showed a total thickness of salt of 123 feet in a distance of 388 feet divided up into six beds, ranging from six feet to nearly thirty-five in thickness. Of these the first bed has intercalated with it layers of dolomite, and is stained by earthy matter. This bed would not be pure enough for mining.

The second and third beds which are separated by a layer of less than seven feet are very pure. They measure together over sixty feet, and represent practically one great mass of rock-salt.

The fourth bed, mesuring from 1207 to 1223 feet is uneven in purity, only the upper two feet and the lower two feet nine inches of the core were saved. The former was somewhat impure, the lower was white salt with layers of dolomite.

The fifth bed measures thirteen and a half feet, and from what can be judged from what was obtained of the core (five and a half feet)the salt is impure though white in portions.

The sixth bed is pure white and translucent and measures six feet.

The limits of the salt basin cannot be shown on the map by a definite sharp boundary, but as far as it now stands proved the land-salt area of Ontario is approximately contained within lines joining the towns of Kincardine, Wingham, Brussels, London, Glencoe, Petrolia and a

point a few miles south of Sandwich in Essex county; on the west it is of course bounded by the shores of Lake Huron, St. Clair river and Detroit river. SALT. Deposits.

It is, moreover, very probable that the greater part of the western peninsula, comprising the counties of Kent and Essex is underlain by saltiferous horizons. A bore hole for oil, sunk in the township of Orford, Kent county, is said to have passed through a salt bed of 171 feet in thickness at a depth of 1,510 feet. This assertion would also be confirmed by the fact that in almost all the holes put down in that region great quantities of salt water are struck. The land part of the basin would therefore roughly speaking measure an extreme length of some 150 miles, from Kincardine to Lake Erie with a maximum width of about 40 miles at the center and tapering towards the ends. This would approximately cover an area of over 2,500 square miles.

The salt-beds are supposed to underlie St. Clair lake and river as well as the southern part of Lake Huron as rock-salt is struck in the state of Michigan on the opposite shores, in the same measure. Throughout this region the salt-beds are said to be practically continuous, although there are areas of greater or less extent in which salt-beds are absent, this is probably owing to inequalities in the sea or lake bottom which emerged above the waters of the Onondaga period, forming islands, over the surface of which, no salt was being deposited during this period. It would be very difficult to correlate the beds of salt at the different points where they have been struck, without more complete data. A number of logs of wells drilled in different parts of the basin are given below, and also a list of the depths at which salt was struck together with the thickness of rock-salt beds passed through. These with the log of the well, given on page 222 will give an idea of the conditions encountered by the driller in the region.

Logs.

Huron county, Goderich, Attrills bore hole :—
(See page 222.)

Huron county, Brussels :—

Surface	16	feet.
Limestone	100	"
Limestone, magnesian	266	"
Limestone with chert	180	"
Soapstone	353	"
Dolomite, grey	97	"
Dolomite	168	"
Sandstone, dark brown	64	"
	1,244	feet.

(J. Gibson, American Journal of Science, Vol. V, 3rd series.)

SALT. Deposits.

No salt beds of importance were struck in this well, but the record is nevertheless very interesting, inasmuch that at a distance of less than one mile in a direction south-west from it, another well being sunk, struck thick beds of salt. This last well has been a steady producer since then. The north-eastern limit of the salt basin lies, therefore, probably between these two points.

Middlesex county, London Asylum well :—

Surface	130	feet.	
Limestone, hard	200	"	Corniferous.
" soft..... .	270	"	
" hard....	100	"	Onondaga with Guelph and
"	600	"	Niagara, if present.
Salt and shale	100	"	
Black shale.	200	"	Clinton.
Red "	500	"	Medina.
Limestone and shale ..	150	"	Hudson river.

(G.S.C. Vol. V., Part Q. H. P. Brumell, Natural Gas and Petroleum.)

Lambton county, Petrolea :—

Surface	104	feet.	
Limestone..	40	"	
Shale...	130	"	
Limestone.....	15	"	Hamilton.
Shale	43	"	
Limestone.....	68	"	
" soft.....	40	"	
" grey.....	25	"	Corniferous.
" "	135	"	
" hard, white.	500	"	With hard streaks of sand stone from two to five feet in thickness.
Gypsum.....	80	"	Onondaga.
Salt and shale	105	"	(Including the oriskany, if present.
Gypsum.....	80	"	
Salt and shale	140	"	
	1,505	feet	

Elevation above tide, 667 feet.

(G.S.C. Vol. V., Part Q. H. P. Brumell, Natural Gas and Petroleum.)

Essex county, Windsor, Canadian Salt Works, Well No. 1 :—

Surface	132 feet.
Dolomite	118 "
Limestone (petroliferous)	25 "
Dolomite (marly)	85 "
Limestone (dark petroliferous)	30 "
Dolomite (crystalline)	20 "
Limestone, drab colour	75 "
Sandstone, pure quartzose	55 "
Dolomite, with some gypsum	50 "
" shaly	30 "
" grey and fawn	170 "
" with scales of carbonaceous matter	40 "
" grey	190 "
" shaly, argillaceous	57 "
Rock-salt	40 "
	1,167 feet.

Essex county, Windsor, Canadian Salt Works, Well No. 4 :—

Drift	133 feet.
Limestone	922 "
Salt	30 "
Limestone	25 "
Break in record	35 "
Salt	75 "
Limestone	100 "
Salt	70 "
Limestone	30 "
Salt	252 "
Limestone (ended in)	
	1,672 feet.

(Ont. Bureau of Mines, Sixth Report, p. 33.)

SALT. Deposits.

In the following table is given a list of depths at which salt was encountered at different points in the province, together with the thickness of the salt beds :—

Locality.	Salt struck at depth of.	Thickness of Salt.	
	Feet. In.	Feet. In.	
Bruce county, Kincardine :—			
Total depth, 1,007 feet	993	14	
Huron county, Goderich, Attrill's diamond drill :—			
Total depth, 1,517 feet	997	30 11	
	1,060	25 4	
	1,092	34 10	
	1,027 7	15 5	
	1,230	13 6	
	1,379	6	
Huron county, Goderich, International well :—			
Total depth, 1,170 feet	1,054	19	
	1,103	24	
	1,130	32	
Huron county, Wingham :—			
Total depth, 1,185 feet	1,090	30	
Huron county, Brussels :—			
Total depth, 1,244 feet	No salt.		
Huron county, Brussels, ¾ miles south-west of above well :—			
Total depth, 1,000 feet	970		
Huron county, Blyth :—			
Total depth, 1,215 feet	1,125	90	
Huron county, Clinton :—			
Total depth, 1,239 feet	1,151	15	
	1,214	25	
Huron county, Seaforth :—			
Total depth, 1,135 feet	1,035	110	
Huron county, Hensall :—			
Total depth, 1,206 feet	1,090	116	with shale.
Huron county, Exeter :—			
Total depth, 1,251 feet	1,135		
Middlesex county, London, Asylum well :—			
Total depth, 2,250 feet	1,400	100	with shale.
Middlesex county, Glencoe :—			
Total depth, 1,510 feet	1,290	104	with shale.
Lambton county, Port Franks :—			
Total depth, 1,355 feet	1,245	110	with shale.
Lambton county, Petrolea :—			
Total depth, 1,505 feet	1,180	105	with shale.
	1,365	140	with shale.
Lambton county, Courtright :—			
Total depth, 1,665 feet	1,630	22	
Essex county, Windsor :—			
Total depth, Well No. 1, 1,167 feet	1,127	40	
Essex county, Windsor :—			
Total depth, Well No. 4, 1,672 feet	1,055	30	
	1,110	75	
	1,320	70	
	1,420	252	

The processes used in the production of salt in the Canadian field, are similar to those employed on the Michigan side of the salt area.

These processes may be divided into two general classes differing essentially as to the mode of evaporation of the brine. These are respectively evaporation in vacuum in a closed air tight vessel, and evaporation in an open pan. Each of these processes may again be subdivided, the first, evaporation in vacuum, into single effect and double effect evaporation; the second into direct fire evaporation and steam evaporation, each of which may be further differentiated according to the apparatus used.

Salt, Deposits.

Vacuum pan process.

VACUUM PAN PROCESS.

The principle of this process is evaporation in a closed vessel in which a partial vacuum is maintained by means of an air pump. The reduction of atmospheric pressure causes evaporation to take place at a lower temperature; the crystallization is quicker and a finer grain is formed. The heat is obtained by steam entering a closed compartment in the interior of the vessel, in which are sets of copper tubes placed vertically. The steam surrounds these tubes through which the brine circulates. The object of the tubes, which are some five feet long and have a diameter of about three inches, is to give a greatly increased heating surface. When a sufficient quantity of salt has crystallized in the bottom of the vessel it is dumped out on the double bottom principle, without interrupting the evaporation.

The double effect is a modification by which the steam produced by the evaporation of one pan is made to circulate through the steam compartment of a second vessel. In this second vessel the vacuum is kept slightly higher, by which means the boiling point is lower than in the first pan. The principle of the double effect is therefore the use of the steam evaporated from the first pan as source of heat to produce the evaporation in the second pan, resulting in a great saving of fuel.

The only salt plant of this type in Canada is situated at Windsor, Ontario, and is worked by the Canadian Salt Co. This company, up to the present, has been operating two pans of the single effect type, but is now putting in a double effect apparatus which, when completed, will make it one of the best equipped salt manufacturing concerns of North America. The process followed at Windsor is briefly as follows:—

The wells from which the brine is obtained are from 1,167 to 1,672 feet deep, reaching the beds of solid rock-salt. They are cased with a ten inch tubing through the surface deposits; the tubing then narrows down to seven and a half inches, and eventually to six inches down to the salt-bed. Inside of the tubing is a pipe four and a half inches in

SALT.

Vacuum pan process.

diameter reaching down to the rock-salt. A powerful pump forces water down the outer tube; this dissolves the salt, eventually forming large cavities at the bottom of the well offering a great surface of salt to the action of the water. As the rock is not fissured or porous, and the head of the well is made watertight, the water forced downwards in the outer tube is charged to saturation point in the salt cavity and this brine is forced upwards through the inner tube. As a next step the brine flows into large wooden settling vats where it is heated to from 180 to 200° Fahrenheit, and allowed to settle for from twelve to twenty-four hours. By this operation, a great part of the sulphate of lime which is present in the rock-salt and held in mechanical suspension in the brine is deposited on the bottom of the vats. The brine is thus drawn off perfectly clear and limpid, and pumped into the vacuum pan. This large vessel has a cylindrical body with conical top and bottom. Its diameter is twelve feet, and its height about eighteen feet. It is divided horizontally into three compartments. The steam used as the source of heat for evaporation is admitted into the middle compartment, which is some five feet high and is made steam-tight. Passing through this middle compartment are sets of vertical copper tubes, open at both ends and connecting the two other compartments into which the brine is admitted.

Direct steam from the boilers surrounds these tubes, which offer a great heating surface, and through which the brine circulates freely. The vacuum in the pan is maintained by means of a powerful air pump, which at the same time draws off the steam produced by the evaporation. The salt falls to the bottom of the vessel and is emptied by means of a double valve without any interruption in the process. The vacuum is kept at twenty-eight inches mercury, which is very high. The main trouble encountered in this process is caused by the small quantity of gypsum or sulphate of lime contained in the brine. This impurity is deposited in the interior of the tubes, coating them with a layer of non-conducting substance which has to be scaled off about every twelve hours. There are two pans, one being cleaned while the other is in operation. The Canadian Salt Co. is at present putting in very extensive additions to their plant, and when these improvements are completed their works will be better equipped than any other company in America.

The main improvement now being put in, is a double effect vacuum pan, which is said to be the largest in the world for the manufacture of salt. The intention is to use the two single effect pans as first effects. The advantage derived from having two first effect

pans is obvious, as they will be used alternately, one being in operation while the other is being cleaned of the deposit of sulphate of lime. Thus the process will go on without interruption. The second effect pan can run continuously for at least a week without requiring cleaning. The diameters of the first and double effect pans are respectively twelve and twenty feet. The vacuum in the first pan is to be maintained at twenty-four to twenty-five inches, which lowers the boiling point to a temperature of 135° Fahrenheit, and in the second pan at twenty-eight inches, equal to a boiling point of ninety-two degrees.

Vacuum pan process.

From the evaporation pan the salt is conveyed to the drying rooms where it is allowed to drain. It then passes into the dryer proper, which is a long wooden cylinder, the axis of which is slightly inclined to the horizontal with cleats and riffles placed longitudinally. Through this, currents of hot air circulate while it revolves, and the wet salt fed in at one end issues at the other end perfectly dry. It then passes through sieves of different sizes according to the grade of salt wanted, the finest passing through a fifty mesh screen.

The process as may be seen is very simple and yet very efficient. The Windsor plant compares very favourably with any plant on this continent. The steam is provided by two sets of boilers equipped with mechanical stokers, and capable of developing 1,700 horse power.

The capacity of the plant is at present 1,000 barrels a day; this, when the present improvements are completed, will be increased to 1,500 barrels per day. The present cooperage can turn out from 1,000 to 1,200 barrels a day.

Steam evaporation in open air grainer and raker process.

STEAM EVAPORATION IN OPEN AIR. GRAINER AND RAKER PROCESS.

This process was originally developed in Michigan and in that state is the one most used. In Ontario there are only three plants of this type now in operation, but the present tendency is toward a more extended use of this process and the abandoning of the more primitive direct fire manufacture.

The principle is simple in the extreme. The brine is pumped from the well into large wooden vats or tanks where it is heated and allowed to settle. Then it passes into the grainer proper. This consists of a long shallow vat made generally of boiler plates. The dimensions of the average grainer are 150 feet long by from 10 to 14 wide, and about 2 feet deep. Throughout the whole length of the vats are a number of steam pipes suspended by hangers, so as to leave the bottom smooth and clear of obstruction. One end of the

SALT.

Steam evaporation in open air grainer and raker process.

vat is sloping at an angle of about 20°, forming an apron. The brine, which is first heated in the settling vats is allowed to flow continuously into the grainers, where the level of the liquid is kept constant, at from 15 to 20 inches in depth. The evaporation causes the salt to crystallize, and settle over the bottom of the tanks. The steam used in the pipes of the grainer is, as a rule, live steam or direct from the boiler. To get as much efficiency as possible, the exhaust steam from these pipes is used to heat the brine in the settling tanks. To remove the salt from the grainers, a very ingenious device is used. It is a mechanical rake consisting of two endless chains running along the whole length of the grainer (from 140 to 160 feet) near the sides, over sets of rollers on horizontal axes. At equal intervals are fastened on these chains, vertical narrow blades, four or five inches wide, covering the entire width of the bottom of the vat. These blades, scraping up the salt as it forms and settles, bring it up the incline or apron at one end, giving the crystals a preliminary draining, then drop the salt on a draining and drying floor whence it is shoveled into bins.

At Kincardine a modification of this process is used which is called the "V" system. The only difference is in the shape of the graining vats. In the V system these graining vats have sloping sides in the shape ofthe letter V, and the salt when formed, falls to the bottom, which is made in the shape of a rectangular trough twelve inches wide by ten to twelve inches deep. The raker travels in the trough its dimensions being modified accordingly.

The grainer process is the favourite one in Michigan, and is at present spreading throughout the Ontario salt district. In several cases it is used by large lumber companies, who take up the manufacture of salt as a subsidiary industry, to use up the surplus and exhaust steam of their saw mills.

The process requires very little labour; the installation of the plant is more costly than the old direct fire method; but in the case of the lumber companies as the steam plant is primarily erected to supply the saw mills, very little extra expense in the boiler house is needed to supply the salt plant, and the two industries certainly go very well hand-in-hand.

Other steam evaporation processes.

OTHER STEAM EVAPORATION PROCESSES.

In other cases, the steam instead of being conveyed through pipes to evaporate the brine, is simply made to enter a false bottom under the evaporating vats. This is the case with a plant at Goderich, that of the Lake Huron and Manitoba Milling Co., who use the exhaust

and surplus steam of their mill No mechanical rakers are used in this plant, the salt being removed with hand rakes. The output of this plant is at present one hundred barrels a day, but extensions are now in progress which, when completed, will double its capacity. SALT.

EVAPORATION BY DIRECT FIRE.

Evaporation by direct fire.

A plant of this type consists, besides the brine pumping apparatus, of settling tanks, evaporating pans and floor space to drain and pack the salt. The pans are as a rule 100 feet long by 20 to 25 feet wide and 12 to 14 inches deep; they are made of boiler plate, one quarter of an inch thick, and supported by walls which serve as sides to the fire grates and as horizontal flues along the whole length of the bottoms of the pans. These pans are made with the sides slanting forming a draining apron, on which the salt is raked from the bottom of the pans, as it crystallizes and deposits there. It is then stored in bins and packed in bags or barrels for shipment.

The plants using direct fire evaporation are, of course, the least costly to install and this type of manufacture is greatly used in the Ontario field. The capacity of the average plant is from 100 to 125 barrels of coarse salt per day. For this output from six to eight tons of coal is required, and seven to ten men.

There are at present twenty-one plants in the Ontario field, some of these run continuously and others only at intervals. Of these plants, sixteen use the direct fire evaporation, four have steam evaporation in open air, and one uses the vacuum process. The majority of these plants produce only the coarse packing salt. In fact only three plants in the whole district manufacture the finer grades of salt, which are classified as table, fine, dairy and cheese, according to their fineness. For the production of the better qualities, extra care has to be taken in the handling of the brine and of the salt. This has, moreover, to be dried artificially, and passed through the different mesh screens. There have been no attempts made towards mining rock salt in the district, but a company is at present sinking a shaft on the American shore of the Detroit river, some four miles below the city of Detroit. They hope to strike the first bed of salt at 800 feet. The progress of the enterprise will be watched with great interest.

A list of the plants operating in the Canadian field is given below :— Plants operating.

Location.	Operated by.
Blyth	Young & Sparling.
Brussels	Coleman Salt Co.
Clinton	R. J. Ransford.
Courtright	" "

SALT.

Plants operating.

Location.	Operated by.
Exeter	Exeter Salt Co.
Goderich	North America Chemical Co.
"	Lake Huron & Manitoba Milling Co.
"	Peter McEwan.
Hensall	Geo. McEwan.
Kincardine	Rightmeyer Salt Co.
"	Ontario People Salt Mfg. Co.
Mooretown	Mooretown Salt Co.
"	Carter & Kittermaster.
Parkhill	Parkhill Salt Co.
Sarnia	Sarnia Salt Co.
"	Sarnia Bay Mills Co.
Sandwich	Saginaw Lumber & Salt Co.
Wingham	Young & Sparling.
Warwick	Elarton Salt Co.
Windsor	Canadian Salt Co.

Analyses.

ANALYSES OF BRINES.

——	Sodium Chloride.	Calcium Chloride.	Magnesium Chloride.	Sulphate of Lime.	Specific Gravity.	Degrees of Salometer.
Goderich, sample taken August 19, 1866	259·00	·432	·254	1·882	1·205	100
Goderich, same well as above, November 5, 1868	236·410	·190	·410	4·858	1·187	92
Clinton well	204·070	·470	·184	5·583	1·157	80
Kincardine	241·350	·840	·230	3·264	1·191	94

Analyses by Dr. T. Sterry Hunt, laboratory, Geological Survey of Canada.

ANALYSES OF SALTS.

——	Sodium Chloride.	Magnesium Chloride.	Calcium Sulphate.	Water.	Insoluble.
Goderich (fine table salt)	98·4238	0·0915	1·0426	0·6483	0·4200
" (fine salt)	98·0947	0·0010	1·2574	1·2610	.....
" (coarse)	97·3039	0·0436	1·4316	0·6454	.....
Clinton (fine salt)	98·5743	0·1368	1·1554	0·7944	0·0600
" (coarse)	97·4756	.....	1·3899	0·9830	0·2200
Seaforth (dairy salt)	98·7893	0·0168	1·3642	0·3289	0·0170
" (fine salt)	97·8401	0·0480	1·1568	0·9095	0·0150
" (coarse)	98·2778	0·0078	1·2515	0·6832	0·0160

The above analyses of salt were made by Dr. Ellis, of Toronto.

The salt from which these samples were taken in all cases is manufactured in open pans.

In Michigan the salt industry is well developed along the St. Clair and Detroit rivers. The salt is derived from the beds of the same formation as in Ontario. For the purpose of comparison the depths at which rock-salt is reached at different points in Michigan and the thickness of the beds are given below : SALT. Salt industry in Michigan.

	Salt struck at depth of	Thickness of salt.	
Wayne county—Wyandotte.....	800 feet.	30 feet.	
	940 "	15 "	
	1,120 "	70 "	
St. Clair county—Algonac..... ..	1,562 "	52 "	
" " 5 miles below town.....	1,500 "	80 "	salt and shale mixed.
	1,605 "	18 "	
	1,633 "	94 "	
St. Clair county—St. Clair.....	1,630 "	30 "	
" Marine city....	1,700 "	over 100 "	
" Port Huron....	1,700 "	60 "	stopped in rock-salt.
Oakland county—Royal oak.....	1,540 "	97 "	
	1,650 "	45 "	
	1,735 "	57 "	
	1,820 "	80 "	
	2,005 "	15 "	
	2,115 "	35 "	
	2,165 "	20 "	
	2,200 "	100 "	
	2,315 "	160 "	

Besides the beds of rock-salt, there is another source from which salt is manufactured in Michigan. This is the brine which is found in the porous beds at the base of the Carboniferous measures, and until the discovery of the rock-salt, which, in Michigan was later than in western Ontario, this brine was the only source of salt.

As mentioned before, no mining of the rock-salt beds is at present carried on ; but an attempt is now being made on the shore of the Detroit river a few miles below the city of Detroit, to reach the first bed of salt by a shaft with a view to working it by mining methods. It is expected that the bed will be met with at a depth of 800 feet.

In Manitoba some brine springs have been worked for some length of time, supplying a small local demand. On the north-western part of Lake Winnipegosis, at Salt Point, near the mouth of Bell river, which empties into Dawson bay, salt was manufactured many years ago. The most important salt springs area, however, is that on Red Deer peninsula, in the southern part of Winnipegosis Lake. This was the scene of salt manufacture as early as 1820 or thereabouts, when James Monk- Manitoba.

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man began working these springs. In every case, however, the process used was primitive, and the salt only used to supply local demands. After James Monkman, his sons took up the work, and in 1858, according to Professor H. G. Hind, they were carrying on the industry with profit.

Mr. J. W. Spencer, in the report of the Geological Survey of Canada for 1874 and 1875, gives a short description of how the manufacture was carried on at the time of his exploration in that district :

"The manufacture of the salt is conducted in a rude manner. Pits are dug four or five feet deep, and into them the waters infiltrate. Beside these, temporary furnaces are erected, on which are placed evaporating pans made of iron plate one-eighth of an inch in thickness and five or six feet long, by about three feet wide and eight or ten inches deep. Beside the pans, are trays into which the salt is raked. No pumps are used, the water being lifted into the pans directly from the pits by means of pails. The operation is conducted entirely in the open air. The manufactured salt is put into birch-bark boxes, or "mococks," holding about 100 pounds each, and is then ready for market. During the season Mr. McKay, the only person engaged in the business, made about 500 bushels, or less than half the quantity which had been manufactured in some previous years.

"The following is an analysis, by myself, of a sample of the salt which I brought from the works.

Sodium chloride	95·123
Magnesium chloride	0·600
Calcium sulphate	3·400
Sodium sulphate	0·394
Moisture	0·044
Residue	0·439
	100·000

"The residue consists of silica, alumina, iron and lime. The salt has a light brown tint, and is very coarse grained, owing to the manufacturer allowing the crystallization to go too far undisturbed."

J. B. Tyrrell, in his report on North-western Manitoba, (Geological Survey of Canada, 1890-1891, Part E), gives the following list of points where brine springs were observed :—

Salt Creek, west of Lake Dauphin.

Banks of Mossy river.

Salt Point, south of Lake Winnipegosis.

Monkmans Salt Springs, Red Deer peninsula.
Pine Creek.
Pelican Bay, mouth of Pelican creek.
Pelican Bay, west side.
Mouth of Bell river.
Salt Point.
Salt Point peninsula, with salt area near its base.
Salt Point peninsula, north side of its base.
Mouth of Steep Rock river.
Lower Red Deer river, many places.
Banks of Shoal river.
Mouth of Swan river.

These according to the same authority have their source chiefly in the Devonian rocks, although salt is not absent from the beds of Silurian age. The salt of these brine springs seems to be derived from crystals occurring scattered throughout the rocks rather than from beds of pure rock-salt, for impressions of salt crystals are very common in the dolomites, whereas no indications were observed from which the presence of rock-salt could be surmised. In some cases the crystals are so numerous that salt must have been present to the amount of one-third of the whole mass. As a rule the brine is not strong, but occurs in very large quantities.

Samples were collected and analyzed in the laboratory of the Geological Survey of Canada and from these tests the following table has been made up :—

ANALYSES OF BRINES FROM MANITOBA.

The following table shows the number of grains per Imperial gallon of each of the chief constituents:—

Constituents.	1	2	3	4	5	6	7	8	9	10	11	12
Chloride of Sodium..	3426.61	2777.44	3402.38	3716.73	3884.57	3673.23	6024.98	3233.15	3709.59	1873.78	1347.08	3099.41
" of Potassium.	163.86	114.59	209.39	180.21	137.90	14 .16	86.17	138.81	179.86	150.16	48.72	23.11
" of Calcium ..	.....	28.45	... .	.....	.....	7.87	....	10.43	.....	15.67	.....	44.05
" of Magnesium	77.17	101.16	101.75	85.69	47.43	94.66	125.46	78.03	81.46	79.84	58.53	142.22
Sulphate of Lime....	285.83	233.72	296.23	304.96	272.81	300.30	425.25	281.90	308.38	205.53	204.83	252.71
" of Magnesia.	3.42	.....	1.24	6.49	57.30	.....	19.42	.....	10.98	.....	10.95	.....
Total	3956.89	3255.37	4010.99	4294.08	4400.01	4221.22	6681.28	3742.32	4290.27	2324.98	1670.11	3561.50
Specific gravity.....	1.039	1.032	1.039	1.041	1.044	1.041	1.063	1.035	1.039	1.022	1.016	1.035

1. Spring on the south bank of Red Deer river, four miles from Lake Winnipegosis. N. lat. 52° 52′ 30″; W. long. 101° 5′. Flow 10 gallons a minute, collected 9th Sept. 1889.

2. Lower Salt spring, on the north side of Red Deer river, a mile and three quarters above its discharge into Lake Winnipegosis. N. lat. 52° 53′ 20″; W. long. 101° 2′ 15″. Flow 2 gallons a minute. Collected, 13th August, 1889.

3. Spring near the west shore of Dawson Bay, Lake Winnipegosis, three quarters of a mile north of Steep Rock river. N. lat. 52° 48′ 30″; W. long. 100° 57′. Flow 4 gallons a minutes, Collected, 6th August 1889.

4. Spring on a hill side near the shore of Dawson bay, Lake Winnipegosis, at a point two miles east of the mouth of Steep Rock river. N. lat. 52° 48′ 30″; W. long. 100° 0′ 57″. Flow 25 gallons a minute. Collected August 8th 1889.

5. Salt Point, on the south-west shore of Dawson Bay, Lake Winnipegosis. N. lat. 52° 48′; W. long. 100° 48′. Flow 1½ gallons a minute. Collected August 3rd, 1889.

6. Spring on the west side of Dawson Bay, Lake Winnipegosis, three miles and a half north of the mouth of Bell river, and a mile back from the lake shore. N. lat. 52° 48′; W. long. 100° 51′ 20″. Flow 20 gallons a minute. Collected 2nd August 1889.

7. Brook flowing into the west side of Dawson Bay, Lake Winnipegosis. N. lat. 52° 47′ 40″; W. long. 100° 51′. Flow 60 gallons a minute. Collected 1st August 1889.

8. Spring half a mile back from the west shore of Swan lake, between it and the lower portion of Swan river. N. lat. 52° 26′ 35″; W. long. 100° 42′ 45″. Flow 5 gallons a minute. Collected August 31, 1889.

9. Spring on the shore of Pelican Bay, Lake Winnipegosis, just east of the mouth of Pelican river. N. lat. 52° 38′ 30″; W. long. 100° 21′. Flow 25 gallons a minute. Collected 21st July 1889.

10. Spring on the west side of Pine Creek, near its discharge into Lake Winnipegosis. N. lat. 52° 1′; W. long. 100° 8′. Collected 6th July 1889.

11. Monkman's Salt Springs, on the west shore of Lake Winnipegosis. N. lat. 51° 45′; W. long. 99° 56′ 40″. Collected 1st July 1889.

12. Monkman's Salt Springs, an old well a few yards from the spring from which No. 11 was obtained. Collected 1st July 1889.

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Manitoba.

Of these brines, Dr. G. C. Hoffmann reports as follows:—"The proportion of foreign saline matter in these brines is not excessive and if certain purifying processes are had recourse to, there is no reason, local conditions being favourable, why they should not be utilized in the manufacture of salt."

At present the industry is carried on at intervals on a small scale supplying only local demand. J. B. Tyrrell describes the saline areas as follows:—"The characters of these saline areas are very similar throughout, and the descriptions already given of those on Pelican bay and other places might suffice for all. They are generally barren tracts several acres in extent, surrounded by a fringe of the red salt plant (*Salicornia herbacea*). Here and there springs bubble up and often build rounded mounds of reddish scinter, several feet in height, in the centre of the tops of which, over the springs, are little basins of clear brine. Down the sides of these mounds the water trickles to the arid flats, where it evaporates in the dry seasons. In other places the pool of salt water is in the middle of a little tract of soft mud, over which may be a sod of coarse grass. In the pool bubbles of gas are constantly rising. This gas was found to be uninflammable, and was probably to a large extent composed of air."

Assiniboia.

Further west in the Assiniboia district, saline lakes occur. Mr. R. G. McConnell reports the presence of a great many of these in the plain north, stretching from the escarpment which ends the Cypress Hills on towards the Saskatchewan River. These lakes are of all sizes, among the largest are Many Island lake, Crane lake, Big Stick lake. "The lakes vary through every degree of salinity, from those covered with a thick crust of crystallized salts down to others in which the water is perfectly fresh, and the two extremes are not infrequently met with side by side."

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ZINC.

ZINC.

Production.

The only production of zinc in 1902 of which we have any record was from one mine in Olden township, Ontario. About 950 tons of ore were raised valued at $11,500 or a little over $12 per ton. About 158 tons of ore, averaging about 45 per cent zinc, were shipped to Swansea, Wales, the balance being left at the mine to be shipped during the following season. The metallic zinc contained in the ore shipped amounted to about 142,200 pounds which at the final average New York market price of the metal would be worth $6,882.

ZINC.

Production.

TABLE 1.

ZINC.

ANNUAL PRODUCTION OF ZINC.

Calendar Year.	Pounds.	Value.
1898	788,000	$ 36,011
1899	814,000	46,805
1900	212,000	9,342
1901	.....	.....
1902	142,200	6,882

TABLE 2.

ZINC.

Imports.

IMPORTS OF ZINC IN BLOCKS, PIGS AND SHEETS.

Fiscal Year.	Cwt.	Value.	Fiscal Year.	Cwt.	Value.
1880	13,805	$67,881	1892	21,881	$127,302
1881	20,920	94,015	1893	26,446	124,360
1882	15,021	76,631	1894	20,774	90,680
1883	22,765	94,799	1895	15,061	63,373
1884	18,945	77,373	1896	20,223	80,784
1885	20,954	70,598	1897	11,946	57,754
1886	23,146	85,599	1898	35,148	112,785
1887	26,142	98,557	1899	18,785	107,477
1888	16,407	65,827	1900	28,748	156,167
1889	19,782	83,935	1901	20,527	103,457
1890	18,236	92,530	1902Duty free	34,871	141,560
1891	17,984	105,023			

TABLE 3.

ZINC.

IMPORTS OF SPELTER.

Fiscal Year.	Cwt.	Value.	Fiscal Year.	Cwt.	Value.
1880	1,073	$ 5,310	1892	13,909	62,550
1881	2,904	12,276	1893	10,721	49,822
1882	1,654	7,779	1894	8,423	35,615
1883	1,274	5,196	1895	9,249	30,245
1884	2,239	10,417	1896	10,897	40,548
1885	3,325	10,875	1897	8,342	32,826
1886	5,432	18,238	1898	2,794	13,561
1887	6,908	25,007	1899	5,450	29,687
1888	7,772	29,762	1900	5,836	29,416
1889	8,750	37,403	1901	14,621	58,283
1890	14,570	71,122	1902*Duty free	18,356	80,757
1891	6,249	31,459			

*Spelter in blocks and pigs.

TABLE 4.

ZINC.

IMPORTS OF ZINC, MANUFACTURES OF.

ZINC. Imports.

Fiscal Year.	Value.	Fiscal Year.	Value.
1880	$ 8,327	1891	$7,178
1881	20,178	1892	7,563
1882	15,526	1893	7,464
1883	22,599	1894	6,193
1884	11,952	1895	5,581
1885	9,459	1896	6,290
1886	7,345	1897	5,145
1887	6,561	1898	10,503
1888	7,402	1899	14,661
1889	7,233	1900	11,475
1890	6,472	1901	6,882

		Duty.	
1902	Zinc seamless drawn tubing	Free.	$ 47
	" manufactures of, N.O.P	25 %	6,636
	Total		6,683

The production and sale of zinc-ores may now be regarded as a definite and interesting feature of the mineral industry of the Dominion as shown by the following extract from the Report of the Minister of Mines of British Columbia for 1902 :—

'Formerly, zinc in the silver-lead ores in the Slocan was a detriment, the smelters having exacted a penalty for its presence. The ore is now being sought after by the American zinc smelters, and prices are being paid for it which will enable the shippers to realize a profit on a commodity they had looked upon as being not only worthless but injurious. A number of mines, notably among them the Payne, Ivanhoe, Slocan Star and some others have availed themselves of this new market by shipping a considerable quantity of the ore to Iola, Kansas, where it is being treated. Preparations are also being made to re-model some of the mills, for the better separation of the ores, and it is reported that a number of other mills will be built, during the coming summer, for the proper and more economical handling of the product.'

ZINC-ORE DEPOSITS.

Ores.

The zinc ores of Canada have so far received but slight attention and the work of exploiting them has been spasmodic. In fact it has only been during the last few years that any attention has been paid to the matter, the present awakening of interest being due to the considerable demand for zinc ores which has lately arisen.

ZINC. ORES.

So far as discovery has yet gone, in eastern Canada deposits of workable zinc ores are few. Zinc blende occurs, however, at many points accompanying galena, and in British Columbia a commencement has been made in shipping it to smelters both in the United States and in Belgium. Blende as an associated mineral is of frequent occurrence in Canada in veins worked for gold, silver and copper.

The possibilities for profitable working of some of our zinc ores have been largely increased, owing to the growth in the demand due doubtless to the general commercial activity characterizing the last few years. Ores of this metal, other than blende, have not as yet been proved to exist in Canada in economic quantities.

Taking the separate parts of the Dominion, little is on record as to economic deposits of these ores in Nova Scotia, but blende in small quantities occurs in many of the gold-bearing quartz veins in that province.

In this connection the following information is furnished by Mr. F. H. Mason, F.G.S. Analyst etc., of Halifax Nova Scotia.

"The only deposit of zinc blende that has any economic possibilities that I know of in Nova Scotia, is that owned by the Cheticamp Gold Mining Company situated at Faribault brook, a branch of the Cheticamp river, Inverness Co. C.B. It occurs in a bed of sericite schist some 20 feet in thickness and is associated with pyrrhotite, mispickel and galena. The mineral occurs in bands through the schist and is in places quite massive. I have seen lenses over 2 feet in thickness. A slope 45 feet deep has been sunk upon it. I have found that by crushing to about $\frac{1}{4}$ mesh and roasting prior to concentration a fairly clean galena and blende concentrate may be obtained."

In New Brunswick and Quebec, sphalerite also occurs as an associate mineral in veins carrying galena, but as extensive mining operations have never been carried on continuously, none is produced even as a by-product. In the latter province the only point at which zinc was claimed to occur in anything like commercial quantities is on the property of the Grand Calumet Mining company. This is situated on lot 10 range IV. Calumet island, Pontiac county, Que., at a point on the Ottawa river about 50 miles above Ottawa city. It exists at this place in deposits in the Laurentian rocks of the district. They were described in 1898 by Dr. R. W. Ells of the Geological Survey staff as follows :—

"The most important mining developments along the lower Ottawa at present are on Calumet island. Here the old workings on the

Lawn property, near the east end of the island, on blende and galena deposits, have been extended and development work is now carried on over three lots on Range IV. The containing rocks are largely dioritic with some reddish granite, and these masses are intrusive through the grey gneiss and limestones. These latter are well exposed along the Roche Fendue channel of the Ottawa on the south side of this island. The principal workings at present are on what is known as the Bowie property, where a large open cut has been made on an ore-body in the diorite consisting of both blende and galena. The ore-body is of considerable extent, but is pockety in its character, and no well defined hanging or foot walls were seen, though the mass sends off spurs into the enclosing diorite. Over 1,000 tons of ore were mined at this place during the past summer, and it finds a ready sale in the European market. On the west part of the area, a shaft has been sunk to a depth of nearly 130 feet, in order to cross-cut and intersect several masses of ore that appear at the surface in this vicinity; but work on this location was suspended during the season, in order to fill orders from the Bowie pit. There is evidently a large quantity of mixed blende and galena ores in the intrusive rocks of this district, but in none of the openings examined was any well defined vein structure noted, the ore every where appearing rather in pockety masses, though some of these are of large extent." Zinc. Ores.

In Ontario also numerous deposits of galena accompanied by more or less zinc blende are known to exist. These, although wrought from time to time in past years, have not so far been placed upon a permanent working basis, so that although blende might otherwise be produced as a by-product it cannot as yet be counted upon as worth working alone. A few examples of these which have received attention of late years, may be here mentioned.

The Katherine lead and zinc mine is situated upon lot 7 Con. XI. Lake township, Hastings county, 3 miles from Millbridge. Some development work was done at this place during 1900, by the British and Colonial Mining and Development company of Ontario. As described in the Report of the Ontario Bureau of Mines for 1900, the vein is said to carry galena and zinc blende in calcite, the average of the ore shewing 10 ounces of silver to the ton. It is also stated that the vein is in diorite and has a width varying from one to four feet. Up to 1900 two shafts had been sunk, one to a depth of 125 feet, and another at about half a mile from this, to a depth of 18 feet. Diamond drilling had been carried to a depth of 292 feet.

Zinc. Ores.

A zinc mine is being operated on lots 5 and 6 Con. III. in the township of Olden, Frontenac county, at a point about a mile north of Long lake. According to Dr. W. G. Miller provincial, mineralogist, the deposit is irregular in character, occurring in crystalline limestone. The ore consists of a mixture of zinc blende and galena and averages after rough cobbing about 40 per cent of zinc, 12 to 15 per cent of lead, and the pure galena carries about 20 ounces of silver to the ton of 2,000 lbs. The owners state that about 950 tons of ore were raised prior to the end of 1902, of which a trial shipment of 158 tons was made to Swansea, England. Up to that date, a shaft had been sunk to a depth of 80 feet on a 2 feet rib of good ore.

At Blende lake, about two miles north of the eastern end of Thunder bay, Lake Superior, blende in large crystals occurs in a vein of coarse calcite about eight feet in width. The south wall of the vein, which runs east and west, consists of dioritic schist of Huronian age, while the north wall is formed by ferruginous and silicious clay slates of the Animikie Series.

In the Thunder bay district the silver veins which were extensively worked some years ago, carried considerable blende in places. At some of the mines this mineral, when enriched by the secondary minerals, argentite and native silver, constituted the main constituent of these ore bodies, although at most of them it would simply be an accessory constituent of the vein. The Silver Mountain vein is the only one which has been worked of late, most of the other mines having been idle for a number of years.

The only zinc deposits proper which have so far been developed to any extent in Canada are located in Ontario near Rossport station on the Canadian Pacific Railway, on the north shore of Lake Superior. The Zenith mine is situate some 12 miles north of the lake shore, at the head waters of the White Sand river. Access is had to it in summer by canoeing up the river and the chain of small lakes along its course. In winter, better communication is to be had over the ice by means of a road connecting these sheets of water.

The deposits seem to consist of more or less irregular bodies of sphalerite in the hornblendic and dioritic Huronian rocks of the vicinity. When visited by Mr. E. D. Ingall for the Geological Survey in 1884, the work done had not been of sufficient extent to allow of positive conclusions being arrived at as to their real nature. A number of surfaces of ore had been exposed at different points on the property in following up the surface indications by the removal of the capping of earth or solid rock under which they had been found to pass.

The ore exposures consisted of one on the top of a hill on the one side and the other near the base on the other side, near the shore of a little lake. The hill is about 75 feet in height above the lake level. At neither point had the limit of the ore been shown in any direction, and therefore such features as the strike, dip and thickness could not definitely be determined. At the lower workings a surface of solid ore had been exposed, measuring about 20 feet x 15 feet, a smaller exposure about 90 feet to the south east of this measuring 10 feet x 10 feet. Easterly from the main stripping about 30 feet, outcroppings seem to show the existence of a small vein about six inches thick striking about N.E. dipping 45° N.W. and a small parallel vein shows about 15 feet further west again. The upper workings are some 500 feet north of these. At the time of the visit above mentioned (1884) a surface of solid blende about 15 feet x 20 feet had been exposed by stripping. The formation strikes about W.N.W. and dips northerly about 50°. In an easterly direction from the exposure the ore if continuous must underlie a capping of country rock. Although no final opinion could be formed at that time and under the conditions then existent, the impression was formed, from the features presented on the ground and from the minute structure of some of the ore, that it probably exists as masses coinciding with the foliation of the country rock, and would thus follow it in all its flexures. If this be the case, one would expect in the sharper bends to find large irregular masses of ore connecting with thinner sheets in the less folded portions. This supposition would explain the peculiar features of the ore surfaces above mentioned, especially the upper one, where it would appear as if the prospectors had uncovered one of these bends from above by stripping off the overlying rock representing the upper portion of a fold. ZINC. Ores.

Indications of other occurrences in the vicinity of those already alluded to, were also noted. The foliated structure of the rock was not always plainly apparent, being confused by the jointing.

The blende is dark coloured and the associated minerals noticed were copper and iron pyrites and here and there a little dendritic native copper also a white incrustation on the weathered surfaces, probably sulphate of zinc from oxidation of the ore.

Although the existence of ore at this place was known more than 20 years ago, owing to its inaccessibility it was not worked until the winter of 1898–99. Operations were then continued on and off for a year or two, but the mine is now idle. The total amount of ore shipped as per returns received at this office, was 1065 short tons. The latest description of the progress made at the mine is given in the report of

ZINC. ORES.

the Ontario Government Inspector of mines as follows:—To Feb. 21, 1900, three shafts had been sunk; No. 1, 35 feet deep; No. 2, 40 feet deep; No. 3, 12 feet deep. A small open cut had also been made, from which about 100 tons of ore had been taken. All the shipments were made in the winter by hauling the ore over the ice on the lakes and on the connecting stretches of road which had been cut out for the purpose. Freighting from the mine to the railroad is said to have cost about $2.00 per ton.

Speaking of his visit to this place on Feb. 14, 1901, the mining inspector describes the condition of things as follows;—

"Mining operations since a year ago have been confined to driving a tunnel into the hill in which the zinc blende deposits occur, starting on the level of the small lake at the foot at a point between the old shafts, about 100 feet north of No. 1 and 500 feet south of No. 2 and beneath the old open stope in the brow of the bluff. The length to date is 75 feet, including 18 feet of open cut at the mouth, and in its course of about northeast, the tunnel is intended to crosscut to the main veins found on the surface as well as to explore the country rock.

"In the open cut, a large body of zinc blende was struck and stoped up 15 feet to the surface, in places 4 and 5 feet wide, but of very irregular shape, and without any visible continuous walls. At 12 feet in the tunnel another band of solid blende a foot wide runs down into the floor, and at 30 feet beyond this is a third body, 15 inches wide at first but pinching out in ten feet at the face. Besides these three main strikes, many other intermediate stringers and veins from a fraction to 10 inches wide were passed, all having approximately the same strike of north and south and dip of about 25 degrees east, into the hill, which bearings coincide with those of the outcropping of the large vein at the surface above. The country rock as seen in the tunnel has been disturbed and broken up along two directions, giving it a "blocky" appearance, the main movement having been sufficient to produce schistose areas in widths from streaks up to several feet, striking north and south with dip 25 degrees east, which directions are the same as those of the ore-bodies. In fact it is in this schist, altered in places from the coarse green trap rock to a soft gouge that most of the veins have been found.

"Grains of zinc blende occur imbedded in the massive trap, having no connection with the main deposits; frequently also masses of the sulphides, pyrites, prrrhotite and chalcopyrite, are exposed in the seams, both separate from and contiguous to the blende. The massive zinc blende in the tunnel workings contains small grains of pyrites and

pyrrhotite disseminated uniformly throughout it, forming but a small percentage of the whole, yet in considerably greater quantity than is found in the very coarse blende at the old surface stope." Zinc. Ores.

A specimen of the ore from this place supplied to the chemical branch of the survey by Dr. R. Bell gave 54·26 per cent of metallic zinc. The average of the ore shipped however is said to have run about 45 per cent.

Speaking of the work done in 1901, the Ontario Government Mines Inspector gives the following particulars: "The owners, the Grand Calumet Mining company of Ottawa, Ont., have not undertaken any systematic plan of development, the stoping out of the above ore from the biggest showings in the various old workings leaving the property in practically the same state as before. No. 1 shaft at its depth of 30 feet was enlarged to 20 by 20 feet, in the west side a 10-foot winze sunk, in size 6 by 12 feet, and at the surface some underhand stoping done, producing in all 80 tons of ore. Small stringers and pockets of zinc blende show on all the shaft faces and on the west side the continuation of the ore-body in the winze extends up to the surface, one or two feet wide, in irregular outline, but probably large enough to pay to follow. The tunnel was driven a few feet further, total length now 80 feet, and discontinued as no more ore was struck, but from the whole working, including the open cut at its mouth, 40 tons were extracted. Between No. 1 shaft and the tunnel, an outcropping of blende gave 20 tons from an underhand open stope. From the two old open-cuts on the brow of the hill 160 tons further were mined by stoping 6 feet deeper, still leaving a fair showing of ore in the bottom. No. 2 shaft at the west side of the hill is now down 50 feet, an increase of 15 feet, the last eight forming a sump below the level floor, into which the bucket drops for loading. The first level was abandoned and closed up, no ore being found therein. In the second level at 42 feet depth, the east drift, 42 feet in length, was originally run at 38 feet depth, followed by the removal of a 4-feet underhand level, now 25 feet in, and along which a lense of ore lies from 2 to 8 feet wide, its upper edge pinching out in the roof. The first level, 6 feet above shows no ore at all, but in the floor, ore fills the drift from wall to wall and strikes about northeast-southwest with dip of 60° north. Considerable ore has also been mined from around the mouth of the shaft, which with that from underground totals some 500 tons."

The foregoing detailed descriptions have been reproduced in full on account of their giving a very good idea of the irregular mode of occurrence of the ore-bodies, thus corroborating the idea arrived at by the

ZINC. ORES.

writer from the examination made in 1884 and because a right understanding of the conditions at this place, where the ore-bodies have been worked out, will be very helpful in future in judging the possibilities of other similar deposits found in the district.

Indications of the existence of a number of other bodies of zinc ore are reported from the district around the Zenith mine, and a number of mineral locations have been taken up. On one of these viz. E.S. 79, some development work has been done. This is known as the Gesic mine. The shaft, at the time of the visit of the Ontario Inspector of Mines in February 1900, had been sunk some 23 feet on a shear zone in the "country rock," showing a little mineralization; but he reports the bottom as showing ore in promising quantities.

At Mazokama River, about 25 miles further west, on the main line of the Canadian Pacific Railway, it is reported that zinc blende has been found.

In a strong vein known as Johnston's mine, which also holds galena at Wolf river, north-west of the head of Black bay, Lake Superior, bunches of blende are scattered through the gangue, which consists of calcspar and quartz.

At the Victoria and the Cascade Mines, Garden river, near Sault Ste. Marie, which were worked in past years primarily for galena, a considerable proportion of blende occurs along with it.

Isolated crystals of blende, generally of a light colour, occur in the dolomite of the Guelph formation from the falls of Niagara to the township of Beverley at the head of Lake Ontario.

So far as our present knowledge extends, British Columbia will prove to be the chief source of zinc ores in Canada. In the silver-lead mining districts of East and West Kootenay, zinc blende in varying proportions occurs as an associate mineral with the galena, and in mining, the blende is produced as a by-product. Whilst in some of the mines and districts, blende forms quite a sub-ordinate feature of the veins, in others it exists in quite large proportion.

During 1902 considerable interest was aroused in the province in regard to this mineral owing to the visits of agents of smelter firms in the United States seeking zinc ores. Some difficulty was anticipated in profitably marketing the product on account of high freight and the duty on the ore entering the United States. It is now reported however that favourable arrangements have been arrived at regarding both these points and that shipments of the mineral to the American smelters from the Slocan mines have commenced.

Blende is associated with the galena found in the Devonian limestone of Great Slave lake, N.W.T.* Zinc.

STRUCTURAL MATERIALS.

Structural Materials.

Under this heading are comprised building stone, granites, marbles, slates, flagstone, cements, lime, &c., as well as the manufactures of clay, which include building bricks, tiles, drain-pipe, earthenware and coarse pottery.

The industries based on the structural materials are so widespread and are carried on in so many different places, on various scales and often intermittently, that it is impossible to obtain anything like complete returns of quantity or value of products. The figures of production are, therefore, to be taken only as rough approximations.

TABLE 1.

STRUCTURAL MATERIALS.

ANNUAL PRODUCTION OF BUILDING STONE.

Production.

Calendar Year.	Value.
1886	$ 642,509
1887	552,267
1888	641,712
1889	913,691
1890	964,783
1891	708,736
1892	609,827
1893	1,100,000
1894	1,200,000
1895	1,095,000
1896	1,000,000
1897	1,000,000
1898	1,300,000
1899	1,500,000
1900	1,520,000
1901	1,650,000
1902	1,900,000

*See Dr. Bell's Summary Report for 1899.

STRUCTURAL MATERIALS.

Exports.

TABLE 2.

STRUCTURAL MATERIALS.

EXPORTS OF STONE AND MARBLE, WROUGHT AND UNWROUGHT.

Calendar Year.	Wrought.	Unwrought.
1890	$21,725	$43,611
1891	13,398	46,162
1892	7,698	47,424
1893	9,102	12,532
1894	22,576	34,130
1895	8,587	51,616
1896	4,934	32,897
1897	9,415	42,034
1898	2,526	65,370
1899	5,092	101,931
1900	5,933	115,711
1901	5,917	157,739
1902	8,632	124,829

TABLE 3.

STRUCTURAL MATERIALS.

Imports.

IMPORTS OF BUILDING STONE.

Calendar Year	Value.	Calendar Year.	Value.
1880	$ 35,970	1891	$170,890
1881	58,149	1892	95,550
1882	33,623	1893	56,510
1883	35,061	1894	52,908
1884	51,088	1895	44,282
1885	30,491	1896	54,130
1886	41,675	1897	38,714
1887	54,368	1898	28,495
1888	86,373	1899	48,040
1889	100,314	1900	64,533
1890	132,155	1901	46,078

1902	Flagstones, granite and rough freestone, sandstone, and all building stone, not hammered or chiselled. Duty 15 p.c.	$69,972
	Granite and freestones, dressed; all other building stone dressed, except marble. Duty 20 p.c.	29,102
		$99,074

TABLE 4.

STRUCTURAL MATERIALS.

IMPORTS OF MANUFACTURES OF STONE OR GRANITE, N.E.S.

Fiscal Year.	Value.	Fiscal Year.	Value.
1880	$29,408	1891	$61,051
1881	36,877	1892	39,479
1882	37,267	1893	49,323
1883	45,636	1894	49,510
1884	45,290	1895	51,050
1885	39,867	1896	51,499
1886	41,984	1897	34,026
1887	41,829	1898	41,240
1888	47,487	1899	60,148
1889	61,341	1900	57,039
1890	84,396	1901	66,639

1902	Granite—Sawn only	Duty,	20 p.c.	$ 247
	" Finished and polished	"	35 p.c.	21,410
	" Manufactures of N.O.P	"	35 p.c.	27,056
	Paving blocks	"	20 p.c.	8,512
	Manufactures of stone, N.O.P	"	30 p.c.	15,172
				$72,397

TABLE 5.

STRUCTURAL MATERIALS.

ANNUAL PRODUCTION OF MARBLE.

Marble

Calendar Year.	Tons.	Value.
1886	501	$9,900
1887	242	6,224
1888	191	3,100
1889	83	980
1890	780	10,776
1891	240	1,752
1892	340	3,600
1893	590	5,100
1894	Nil.	Nil.
1895	200	2,000
1896	224	2,405
1897 to 1901 inclusive	Nil.	Nil.

STRUCTURAL MATERIALS.

Imports of Marble.

TABLE 6.

STRUCTURAL MATERIALS.

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
1892			106,268
1893			96,177
1894			94,657
1895			83,422
1896			90,065
1897			77,150
1898			95,894
1899			101,879
1900			94,017
1901			96,159
		Duty.	
1902	Marble and manufactures of :—		
	Marble sawn only	20 %	$87,077
	Finished and polished	35 %	11,828
	Rough, not hammered or chiselled	15 %	9,537
	Manufactures of, N.O.P.	35 %	21,982
	Total, marble and manufactures of		$130,424

Production of Granite.

TABLE 7.

STRUCTURAL MATERIALS.

ANNUAL PRODUCTION OF GRANITE.

Calendar Year.	Tons.	Value.	Calendar Year.	Tons.	Value.
1886	6,062	$63,309	1895	19,238	84,838
1887	21,217	142,506	1896	18,717	106,709
1888	21,352	147,305	1897	10,345	61,934
1889	10,197	79,624	1898	23,897	81,073
1890	13,307	65,985	1899	13,418	90,542
1891	13,637	70,056	1900		80,000
1892	24,302	89,326	1901		155,000
1893	22,521	94,393	1902		210,000
1894	16,392	109,936			

TABLE 8.

STRUCTURAL MATERIALS.

ANNUAL PRODUCTION OF SLATE.

STRUCTURAL MATERIALS.

Production of Slate.

Calendar Year.	Tons.	Value.
1886	5,345	$64,675
1887	7,357	89,000
1888	5,314	90,689
1889	6,935	119,160
1890	6,368	100,250
1891	5,000	65,000
1892	5,180	69,070
1893	7,112	90,825
1894	.....	75,550
1895	.....	58,900
1896	.....	53,370
1897	.....	42,800
1898	.....	40,791
1899	.....	33,406
1900	.....	12,100
1901	715	9,980
1902	.....	19,200

TABLE 9.

STRUCTURAL MATERIALS.

EXPORTS OF SLATE.

Exports of Slate.

Calendar 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
1892	87	2,038
1893	178	3,168
1894	187	3,610
1895	36	574
1896	301	8,913
1897	Nil.	Nil.
1898	Nil.	Nil.
1899	Nil.	Nil.
1900	Nil.	Nil.
1901	16,750	10,000
1902	.....	.....

STRUCTURAL MATERIALS.

Imports of Slate.

TABLE 10.

STRUCTURAL MATERIALS.

IMPORTS OF SLATE.

Fiscal Year.	Value.	Fiscal Year.	Value.
1880	$21,431	1891	$46,104
1881	22,184	1892	50,441
1882	24,543	1893	51,179
1883	24,968	1894	29,267
1884	28,816	1895	19,471
1885	28,169	1896	24,176
1886	27,852	1897	21,615
1887	27,845	1898	24,907
1888	23,151	1899	33,100
1889	41,370	1900	53,707
1890	22,871	1901	72,187

		Duty.	
1902	Slate and manufactures of—		
	Mantels	30 %	$ 171
	Roofing slate	25% not over 75c per square	37,390
	School writing slates	25 %	13,734
	Slate pencils	25 %	3,481
	Slate of all kinds and manufactures of, N.E.S.	30 %	17,825
	Total		$72,601

TABLE 11.

STRUCTURAL MATERIALS.

Production of Flagstone.

ANNUAL PRODUCTION OF FLAGSTONE.

Calendar Year.	Quantity, Sq. ft.	Value.
1886	70,000	$ 7,875
1887	116,000	11,600
1888	64,800	6,580
1889	14,000	1,400
1890	17,865	1,643
1891	27,300	2,721
1892	13,700	1,869
1893	40,500	3,487
1894	152,700	5,298
1895	80,005	6,687
1896		6,710
1897		7,190
1898		4,250
1899		7,600
1900		5,250
1901		4,575
1902	87,300	7,760

TABLE 12.

STRUCTURAL MATERIALS.

IMPORTS OF FLAGSTONE.

STRUCTURAL MATERIALS.

Imports of Flagstone.

Fiscal Year.	Tons.	Value.	Fiscal Year.	Tons.	Value.
1881	23	$ 241	1892	1,571	15,048
1882	90	848	1893	884	8,500
1883	10	99	1894	218	2,429
1884	137	1,158	1895	15	84
1885	205	1,756	1896	Nil.	Nil.
1886	1,602	9,443	1897	13	227
1887	1,316	10,966	1898	587	1,540
1888	2,642	21,077	1899	Nil.	Nil.
1889	1,669	15,451	1900	9	63
1890	5,665	48,995	1901	14	116
1891	3,770	36,348	*1902	232	1,231

* Flagstones dressed. Duty, 20 %. (See table 3).

Cement.—The production of cement in Canada in 1902, both natural rock and Portland, amounted to a total of 722,525 barrels, valued at $1,127,550 as compared with 450,394 barrels valued at $660,030 in 1901 and 417,552 barrels valued at $662,910 in 1900. The above figures represent actual sales and shipments. The increase in the sales in 1902 as compared with 1901 was 272,131 barrels or over 60 per cent.

TABLE 13.

STRUCTURAL MATERIALS.

ANNUAL PRODUCTION OF CEMENT.

Production of Cement.

Calendar Year.	Barrels.	Value.	Calendar Year.	Barrels.	Value.
1887	69,843	$ 81,909	1892	117,408	147,663
1888	50,668	35,593	1893	158,597	194,015
1889	90,474	69,790	1894	108,142	144,637
1890	102,216	92,405	1895	128,294	173,675
1891	93,473	108,561	1896	149,090	201,651

		Barrels.	Value.		
1897	Naturel	85,450	$ 65,893	205,213	$275,273
	Portland	119,763	209,380		
1898	Naturel	87,125	73,412	250,209	397,580
	Portland	163,084	324,168		
1899	Naturel	141,387	119,308	396,753	633,291
	Portland	255,366	513,983		
1900	Naturel	125,428	99,994	417,552	662,910
	Portland	292,124	562,916		
1901	Natural	133,328	94,415	450,394	660,030
	Portland	317,066	565,615		
1902	Natural	127,931	98,932	722,525	1,127,550
	Portland	594,594	1,028,618		

STRUCTURAL MATERIALS.

Natural Rock Cement.

Natural Rock Cement was made by four firms in Ontario and one in Manitoba, and the production in 1902 was as follows:—

Total sales during the year 124,400 barrels, valued at $91,870.
Total manufactured during the year 131,400 barrels.
Stock in manufacturers hands 1st June, 1902, 19,400 barrels.
" " " 31st Dec., 1902, 24,600 "

The prices realized at the works were from 70 to 80 cents per barrel of 240 lbs. net, in Ontario, while in Manitoba $2.00 per barrel of 200 lbs. was obtained.

Following is a list of producing firms:—

The Hamilton Cement Works, Hamilton, Ont.
The Queenston Cement Works, Queenston, Ont.
Battle's Thorold Cement Works, Thorold, Ont.
The Toronto Lime Company, Toronto, Ont.
The Manitoba Union Mining Co., Ltd., Winnipeg, Man.

The total capacity of the works of the above companies is about 800 barrels per day, or 240,000 barrels per year of 300 days. The plants were apparently operated to only about 60 per cent of their capacity during 1902.

Portland Cement.

Portland Cement was made by eight companies, one in Quebec and seven in Ontario, and the total production for 1902 was as follows:—

Total sales during the year 594,594 barrels valued at $1,028,618.
Total manufactured during year 562,335 barrels.
Stock in manufacturers hands 1st June, 1902, 65,705 barrels.
" " " 31st Dec., 1902, 33,446 "

The prices realized at the works ranged from $1.57 to $2.00 per barrel of 350 lbs. net.

The total capacity of the eight works in operation during the year was about 3,000 barrels per day or 900,000 barrels a year of 300 days, so that the output for the year was less than 63 per cent of the capacity; it should be noted however that two of the works were in operation for a few months only.

The imports of Portland cement for the year were (see table 17) 1,971,616 cwt. valued at $833,657. This would represent about 492,904 barrels of 400 lbs.

Adding the imports to the sales we have an estimated consumption of Portland cement in Canada in 1902 of 1,087,498 barrels.

Cement.

Following is an estimate of the consumption of Portland cement in Canada for the past six years :—

——	Canadian.	Imported.	Total.
	Barrels.	Barrels.	Barrels.
1897	119,763	210,871	330,634
1898	163,084	268,264	431,348
1899	225,366	325,106	550,472
1900	292,124	325,340	617,464
1901	317,066	403,108	720,174
1902	594,594	492,904	1,087,498

Producers.

Following is a list of Portland cement companies in Canada.

Companies producing cement in 1902 :—

Crescent Cement Works, Longue Point, Que.

Canadian Portland Cement Company, Deseronto, Ont.

Lakefield Portland Cement Co., Lakefield, Ont.

Imperial Cement Co., Ltd., Owen Sound, Ont.

Owen Sound Portland Cement Co., Ltd., Owen Sound, Ont.

Grey and Bruce Portland Cement Co., Ltd., Owen Sound, Ont.

Sun Portland Cement Co., Ltd., Owen Sound, Ont.

Hanover Portland Cement Co., Ltd., Hanover, Ont.

Companies erecting plants.

Companies with works completed or in process of erection and companies proposing to erect plants :—

National Portland Cement Co., Toronto and Durham, Ont.

International Portland Cement Co., Toronto, Ont. and Hull, Que.

Colonial Portland Cement Co., Wiarton, Ont.

Belleville Portland Cement Co., Belleville, Ont.

Raven Lake Portland Cement Co., Toronto and Victoria Road, Ont

Ontario Portland Cement Co., Brantford, Ont.

Superior Portland Cement Co., Orangeville, Ont.

St. Mary's Portland Cement Co., Orangeville, Ont.

Standard Portland Cement Co., Toronto, Ont.

Royal Cement Co., Montreal, Que.

Western Portland Cement Co., Winnipeg, Man.

Manitoba Portland Cement Co., Winnipeg, Man.

Structural Materials.

Cement.

Exports.

TABLE 14.

STRUCTURAL MATERIALS.

EXPORTS OF CEMENT.

Calendar Year.	Value.
1891	$ 2,881
1892	938
1893	1,172
1894	482
1895	937
1896	1,328
1897	644
1898	2,117
1899	2,733
1900	3,296
1901	1,514
1902	2,267

TABLE 15.

STRUCTURAL MATERIALS.

Imports.

IMPORTS ON CEMENT IN BULK OR BAGS.

Fiscal Year.	Bushels.	Value.	Fiscal Year.	Bushels.	Value.
1880	65	$ 28	1892	14,351	3,394
1881	579	298	1893	12,534	2,909
1882	386	86	1894	9,027	2,618
1883	1,759	548	1895		2,112
1884	4,626	1,236	1896		3,672
1885	4,598	1,315	1897		4,318
1886	6,808	1,851	1898		3,263
1887	5,421	1,419	1899		8,929
1888	23,919	5,787	1900		10,452
1889	32,818	10,668	1901		4,890
1890	21,055	5,443	1902*		12,234
1891	11,281	2,890			

*Cement, N.E.S., and manufactures of cement, Duty 20 per cent.

TABLE 16.

STRUCTURAL MATERIALS.

IMPORTS OF HYDRAULIC CEMENT.

STRUCTURAL MATERIALS.

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
1892	2,214	2,782
1893	4,896	8,060
1894	1,054	985
1895	5,333	7,001
1896	5,688	8,948
1897	2,494	3,937
	Cwt.	
1898	16,033	7,097
1899	1,678	694
1900	10,418	4,711
1901	17,784	6,865
1902 (Cement hydraulic or waterlime)*	29,585	17,755

*Duty, 12½c. per 100 lbs.

TABLE 17.

STRUCTURAL MATERIALS.

IMPORTS OF PORTLAND CEMENT.

Portland Cement.

Fiscal Year.	Barrels.	Value.	Fiscal Year.	Barrels.	Value.
1880		$ 55,774	1892	187,233	281,553
1881		45,646	1893	229,492	316,179
1882		66,579	1894	224,150	280,841
1883		102,537	1895	196,281	242,813
1884		102,857	1896	204,407	242,409
1885		111,521	1897	210,871	252,587
1886		120,398		Cwt.	
1887	102,750	148,054	1898	1,073,058	355,264
1888	122,402	177,158	1899	1,300,424	467,994
1889	122,273	179,406	1900	1,301,361	498,607
1890	192,322	313,572	1901	1,612,432	654,595
1891	183,728	304,648	1902 (Portland)*	1,971,616	833,657

* Duty, 12½c. per 100 lbs.

Structural Materials.

Table 18.

Structural Materials.

Production of Roofing Cement.

Production of Roofing Cement.

Calendar Year.	Tons.	Value.
1890	1,171	$ 6,502
1891	1,020	4,810
1892	800	12,000
1893	951	5,441
1894	815	3,978
1895	.....	3,153
1896	86	430
1897 to 1902 inclusive	Nil.	Nil.

Table 19.

Structural Materials.

Production of Lime.

Annual Production of Lime.

Calendar Year.	Value.	Calendar Year.	Value.
1886	$283,755	1895 estimated	700,000
1887	394,859	1896 "	650,000
1888	339,951	1897 "	650,000
1889	362,848	1898 "	650,000
1890	412,308	1899 "	800,000
1891	251,215	1900 "	800,000
1892	411,270	1901 "	830,000
1893 estimated	900,000	1902 "	892,000
1894 "	900,000		

Table 20.

Structural Materials.

Exports.

Exports of Lime.

Calendar Year.	Value.
1891	$119,853
1892	121,535
1893	86,623
1894	83,670
1895	71,397
1896	70,820
1897	53,177
1898	49,594
1899	73,565
1900	80,852
1901	99,194
1902	116,009

TABLE 21.

STRUCTURAL MATERIALS.

IMPORTS OF LIME.

STRUCTURAL MATERIALS.

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
1892	6,132	4,241
1893	6,879	4,917
1894	6,766	4,907
1895	12,008	5,743
1896	10,239	7,331
1897	16,108	10,529
1898	12,850	9,002
1899	15,720	11,124
1900	12,865	11,211
1901	19,657	14,534
1902 Duty, 20 p.c.	24,602	17,584

TABLE 22.

STRUCTURAL MATERIALS.

ANNUAL PRODUCTION OF BUILDING BRICKS.

Production of Building Bricks.

Calendar Year.	Value.
1886	$ 873,600
1887	986,689
1888	1,036,746
1889	1,273,884
1890	1,266,982
1891	1,061,536
1892	1,251,934
1893	1,800,000
1894	1,800,000
1895	1,670,000
1896	1,600,000
1897	1,600,000
1898	1,900,000
1899	2,195,000
1900	2,275,000
1901	2,400,000
1902	2,593,000

STRUCTURAL MATERIALS.

Exports of Bricks.

TABLE 23.

STRUCTURAL MATERIALS.

EXPORTS OF BRICKS.

Calendar Year.	M.	Value.
1891	246	$1,163
1892	1,963	12,192
1893	6,073	44,110
1894	1,095	7,405
1895	1,655	8,665
1896	983	5,678
1897	573	2,679
1898	65	442
1899	172	1,351
1900	546	4,528
1901	646	5,189
1902	2,110	12,786

TABLE 24.

STRUCTURAL MATERIALS.

Imports of Building Brick.

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
1892	5,075
1893	14,108
1894	18,320
1895	4,705
1896	23,189
1897	10,336
1898	6,652
1899	21,306
1900	19,305
1901	20,677
1902 ..... Duty, 20 p.c.	33,802

Imports of paving brick in 1898: Value, $2,337; duty, 20 p.c.
" " 1899: " 23,648; "
" " 1900: " 35,644; "
" " 1901: " 10,414; "
" " 1902: " 16,788; "

TABLE 25.

STRUCTURAL MATERIALS.

PRODUCTION OF TERRA COTTA, &c.

Production of Terra Cotta.

Calendar Year.	Value.
1888	$ 49,800
1889	Not available.
1890	90,000
1891	113,103
1892	97,239
1893	55,704
1894	65,600
1895	195,123
1896	83,855
1897	155,595
1898	167,902
1899	220,258
1900	259,450
1901	278,671
1902	276,241

TABLE 26.

STRUCTURAL MATERIALS.

PRODUCTION OF SEWER PIPES, &c.

Sewer Pipes.

Calendar Year.	Value.
1888	$266,320
1889	Not available.
1890	348,000
1891	227,300
1892	367,660
1893	350,000
1894	250,325
1895	257,045
1896	153,875
1897	164,250
1898	181,717
1899	161,546
1900	231,525
1901	248,115
1902	301,965

STRUCTURAL MATERIALS.

Imports of Drain Tiles and Sewer Pipes.

TABLE 27.

STRUCTURAL MATERIALS.

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
1892			59,537
1893			39,001
1894			24,625
1895			21,053
1896			19,296
1897			34,286
1898			29,611
1899			33,898
1900			39,149
1901			56,083
		Duty.	
1902	Drain tile, not glazed	20 %	$ 269
	Drain pipes, sewer pipes, chimney linings or vents, chimney tops and inverted blocks, glazed or unglazed	35 %	55,261
	Total		$55,530

Production of Pottery.

TABLE 28.

STRUCTURAL MATERIALS.

ANNUAL PRODUCTION OF POTTERY.

Calendar Year.	Value.	Calendar Year.	Value.
1888	$ 27,750	1896	163,427
1889	Not available	1897	129,629
1890	195,242	1898	214,675
1891	258,844	1899	185,000
1892	265,811	1900	200,000
1893	213,186	1901	200,000
1894	162,144	1902	200,000
1895	151,588		

TABLE 29.

STRUCTURAL MATERIALS.

IMPORTS OF EARTHENWARE.

STRUCTURAL MATERIALS.

Imports of Earthenware.

Fiscal Year.	Value.	Fiscal Year.	Value.
1880	$322,333	1891	$634,907
1881	439,029	1892	748,810
1882	646,734	1893	709,737
1883	657,886	1894	695,514
1884	544,586	1895	547,935
1885	511,853	1896	575,493
1886	599,269	1897	595,822
1887	750,691	1898	675,874
1888	697,082	1899	916,727
1889	697,949	1900	959,526
1890	695,206	1901	1,114,677

		Duty.	
1902	Earthenware and china :—		
	Baths, tubs and washstands, of earthenware, stone cement or clay, or of other material, N.O.P.	30 %	$ 78,957
	Brown or coloured earthen and stoneware, and Rockingham ware	30 %	24,377
	Decorated, printed or sponged, and all earthenware, N.E.S.	30 %	368,971
	Demijohns, churns and crocks	30 %	9,164
	White granite or ironstone ware, C.C. or cream coloured ware	30 %	177,667
	China and porcelain ware	30 %	351,330
	Earthenware tiles	35 %	38,914
	Manufactures of earthenware, N.E.S.	30 %	225,713
	Total		1,275,093

TABLE 30.

STRUCTURAL MATERIALS.

EXPORTS OF SAND AND GRAVEL.

Exports of Sand and Gravel.

Calendar Year.	Tons.	Value.
		$
1893	329,116	121,795
1894	324,656	86,940
1895	277,162	118,359
1896	224,769	80,110
1897	152,963	76,729
1898	165,954	90,498
1899	242,450	101,640
1900	197,558	101,666
1901	197,302	117,465
1902	159,793	119,120

MISCELLANEOUS.

MISCELLANEOUS.

Antimony.

Antimony.—There has been no record of production of antimony ore since 1898. The Dominion Antimony Company, Ltd., Halifax, has been formed to work the Rawdon mines, Hants county, Nova Scotia, but no production was obtained in 1902. These mines were worked to a small extent in 1898 and also in 1891 and previous years.

The statistics of exports of antimony ore, Table 2, presented by the Customs Department show an export of antimony ore for each of the past four years. It is thought, however, that this is a result of wrong classification, the export being probably some manufacture of antimony from imported material.

TABLE 1.

MISCELLANEOUS.

Production.

ANNUAL PRODUCTION OF ANTIMONY ORE.

Calendar Year.	Tons.	Value.
1886	665	$31,490
1887	584	10,860
1888	345	3,696
1889	55	1,100
1890	26½	625
1891	10	60
1892 to 1897	Nil.	Nil.
1898	1,344	20,000

TABLE 2.

MISCELLANEOUS.

Exports.

EXPORTS OF ANTIMONY ORES.

Calendar Year.	Tons.	Value.	Calendar Year.	Tons.	Value.
1880	40	$ 1,948	1889	30	$ 695
1881	34	3,308	1890	38	1,000
1882	323	11,673	1891	3½	60
1883	165	4,200	1892 to 1897	Nil.	Nil.
1884	483	17,875	1898	1,232	15,295
1885	758	36,250	1899	6¾	190
1886	665	31,490	1900	210	3,441
1887	229	9,720	1901	10	1,643
1888	352½	6,894	1902	90	13,658

TABLE 3.

MISCELLANEOUS.

IMPORTS OF ANTIMONY.

Fiscal Year.	Pounds.	Value.	Fiscal Year.	Pounds.	Value.
1880.....	42,247	$ 5,903	1891.....	114,084	17,483
1881..... ...	.....	7,060	1892...	180,308	17,680
1882.....	183,597	15,044	1893. .:	181,823	14,771
1883.....	105,346	10,355	1894.....	139,571	12,249
1884....	445,600	15,564	1895.....	79,707	6,131
1885..	82,012	8,182	1896.....	163,209	9,557
1886..	89,787	6,951	1897.....	134,661	8,031
1887.....	87,827	7,122	1898.....	156,451	12,350
1888.....	120,125	12,242	1899.....	289,066	16,851
1889.....	119,034	11,206	1900..... ..	186,997	20,001
1890.....	117,066	17,439	1901....	350,737	24,714

		Duty.		
1902	Antimony, or regulus of, not ground pulverized or otherwise manufactured.	Free.	248,373	16,821
	Antimony salts.....	"	256,449	22,455
	Total....	.. ..	504,822	39,276

Arsenic.—The production of white arsenic in 1902, from the Deloro mine was 800 tons, valued at $48,000 compared with 695 tons valued at $41,676 in 1901, and 303 tons valued at $22,725 in 1900. This output is all obtained as a by-product in working the auriferous mispickel ores of the Deloro mine, Hastings county, Ontario, and this is practically the only mine on the continent producing arsenic at the present time. The world's supply of arsenic is derived largely from England and Germany, the production for the past six or seven years having varied from 7,000 to 8,000 tons per annum. Arsenic.

The imports of arsenic into Canada have varied greatly from year to year, a maximum being reached in 1895 when 558 tons were brought into the country, valued at $31,932. In 1897 only 76 tons valued at $8,378 were imported, increasing again to 291 tons valued at $24,203 in 1899, and falling off in 1902 to 53 tons valued at $3,002. Arsenic was not classed as a separate item in the export returns in the fiscal year 1902 and previous years, but the exports for the six months ending December 1902 were 274 tons, valued at $16,192, all of which with the exception of $18 worth, went to the United States. As exhibiting the market in the United States for arsenic, the imports, free of duty, into that country during the year ending June 30, 1902, were :—

MISCELLANEOUS.

Arsenic.

Production.

	Pounds.	Value.
Arsenic, and sulphate of	6,930,578	$264,686
Arsenic and arsenous acid	1,412,743	44,181
	8,343,321	308,867

TABLE 4.

MISCELLANEOUS.

ANNUAL PRODUCTION OF ARSENIC.

Calendar Year.	Tons.	Value.
1885	440	$17,600
1886	120	5,460
1887	30	1,200
1888	30	1,200
1889	Nil.	Nil.
1890	25	1,500
1891	20	1,000
1892	Nil.	Nil.
1893	"	"
1894	7	420
1895	Nil.	Nil.
1896	"	"
1897	"	"
1898	"	"
1899	57	4,872
1900	303	22,725
1901	695	41,676
1902	800	48,000

TABLE 5.

MISCELLANEOUS.

Imports.

IMPORTS OF ARSENIC.

Fiscal Year.	Pounds.	Value.	Fiscal Year.	Pounds.	Value.
1880	18,197	$ 576	1892	302,958	9,365
1881	31,417	1,070	1893	447,079	12,907
1882	138,920	3,962	1894	292,505	10,018
1883	51,953	1,812	1895	1,115,697	31,932
1884	19,337	773	1896	664,854	27,523
1885	49,080	1,566	1897	152,275	8,378
1886	30,181	961	1898	291,967	14,270
1887	32,436	1,116	1899	582,383	24,203
1888	27,510	1,016	1900	230,730	11,035
1889	69,269	2,434	1901	159,263	8,361
1890	138,509	4,474	1902...Duty free.	106,857	6,004
1891	115,248	4,027			

TABLE 6.

MISCELLANEOUS.

IMPORTS OF CHALK.

MISCELLANEOUS.

Imports of Chalk.

Fiscal Year.	Value.	Fiscal Year.	Value.
1880..	$2,117	1892.....	9,558
1881.....	2,768	1893.....	9,966
1882.....	2,882	1894.....	11,308
1883..	5,067	1895.....	7,730
1884.....	2,589	1896.....	6,467
1885.....	8,003	1897..	7,432
1886.....	6,583	1898.....	9,338
1887..	5,635	1899..	10,461
1888.....	5,865	1900..	12,212
1889.....	5,336	1901.....	11,629
1890.....	7,221	1902*..... . .	11,337
1891..	8,193		

* Chalk prepared. Duty, 20 p. c.

TABLE 7.

MISCELLANEOUS.

IMPORTS OF WHITING.

Whiting.

Fiscal Year.	Cwt.	Value.	Fiscal Year.	Cwt.	Value.
1880.....	84,115	$26,092	1892.....	102,985	26,867
1881.....	47,480	16,637	1893.....	88,835	25,563
1882.....	36,270	16,318	1894..... .	103,633	26,649
1883.....	76,012	29,334	1895.....	102,751	25,441
1884.....	76,268	28,230	1896.....	113,791	27,322
1885.	67,441	23,492	1897.....	102,453	22,541
1886.....	65,124	25,533	1898.....	166,293	25,761
1887.	47,246	15,191	1899.....	134,884	34,310
1888.....	76,619	20,508	1900.....	127,455	34,575
1889.....	84,658	22,735	1901.....	209,868	60,878
1890.....	96,243	27,471	1902*..... .	153,982	42,136
1891.	84,679	27,504			

*Whiting or whitening, gilders whiting, and Paris white. Duty free

Felspar.—Felspar was mined in Canada in 1901 by the Kingston Felspar Mining Company at their mine in Bedford township, Frontenac county, Ont. The total production was 7,576 tons valued at $15,172, compared with 5,350 tons valued at $10,700 produced in 1901, the increase being 2,226 tons or over 41 per cent.

MISCELLANEOUS.

Production of Feldspar.

TABLE 8.

MISCELLANEOUS.

PRODUCTION OF FELDSPAR.

Calendar Year.	Tons.	Value.
1890	700	$3,500
1891	685	3,425
1892	175	525
1893	575	4,525
1894	Nil.	Nil.
1895	.....	*2,545
1896	972	*2,583
1897	1,400	3,290
1898	2,500	6,250
1899	3,000	6,000
1900	318	1,112
1901	5,350	10,700
1902	7,576	15,152

* Exports.

Fire-clay.

Fire-clay.—Returns of fire-clay production were received from British Columbia, Nova Scotia and New Brunswick, the importance of the value from each province being in the order named. Practically the total output is obtained in connection with the mining of coal from thin beds usually underlying the coal seams, and the material is mostly used locally in the construction and repairs of coke ovens and in connection with metallurgical operations.

TABLE 9.

MISCELLANEOUS.

Production.

PRODUCTION OF FIRE-CLAY.

Calendar Year.	Tons.	Value.
1889	400	$4,800
1890	Nil.	Nil.
1891	250	750
1892	1,991	4,467
1893	540	700
1894	539	2,167
1895	1,329	3,492
1896	842	1,805
1897	2,118	5,759
1898	670	1,680
1899	599	1,295
1900	1,245	4,130
1901	3,979	5,920
1902	2,741	4,283

Mercury.—There has been no output of mercury since 1897. The small output for the years 1895, 1896 and 1897, was obtained from the mine in the vicinity of Kamloops lake, B.C. MISCELLANEOUS. Mercury.

"On the properties owned by the Hardie Mountain Cinnabar Company considerable work has been done during the past year. Five tunnels were driven as follows:—No. 1 tunnel, 350 feet; No. 2 tunnel, 234 feet; No. 3 tunnel, 230 feet; No. 4 tunnel, 152 feet; B. tunnel, 100 feet; total 1,066 feet; and about $1,500 were expended on houses, offices, etc. Low grade ore has been encountered in each tunnel, while in the open cuts on the top of the hill ore said to average from 2 to 3 per cent in quicksilver has been found. During the year, from 14 to 16 men have been employed. It is the intention of the company to prosecute development work and possibly to erect a reduction furnace during the ensuing year.

"The Copper Creek Cinnabar Mining Company did nothing beyond the necessary assessment work on its property this year as the directors are awaiting the results of certain tests of the ore.

"The Toonkwa cinnabar claim, south of Savona, has been further developed, and shows up a fine body of ore which it is contemplated to exploit on a considerable scale during the coming year.

"As there is a good demand for quicksilver and the supply is limited, it is hoped that the development will be carried on steadily, and, should the expectations be fulfilled, the outlook for this vicinity seems promising." (Report of the Minister of Mines for B.C., 1902, p. 191.)

TABLE 10.

MISCELLANEOUS.

PRODUCTION OF MERCURY. Production.

Calendar Year.	Flask (76½ lbs.)	Price per flask.	Value.
1895	71	$ 33 00	$ 2,343
1896	58	33 44	1,940
1897	9	36 00	324

MISCELLANEOUS.

Imports of Mercury.

TABLE 11.

MISCELLANEOUS.

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
1892	30,936	15,038
1893	50,711	22,998
1894	36,914	14,483
1895	63,732	25,703
1896	77,869	32,343
1897	76,058	33,534
1898	59,759	36,425
1899	103,017	51,695
1900	85,342	51,987
1901	140,610	94.564
1902 Duty free	97,283	56,615

Molybdenite.

Molybdenite.—A shipment of four tons of molybdenite was made from Coboconk station on the Midland branch of the Grand Trunk railway, according to a statement of railway shipments kindly furnished by freight traffic manager of the above railway. This production is of special interest as although occurrences of this mineral are fairly numerous in the eastern part of Ontario and adjacent portions of Quebec, some difficulty seems to have been experienced in the past in finding deposits of sufficient extent to be of economic importance.

Moulding Sand.

Moulding Sand.—The figures given in Table 12 are derived from returns of railways shipments and do not therefore, nearly represent the total production. Deposits of sands answering the requirements of moulding sand are known to occur in almost every province, and in many cases are worked for the local wants. Of those it is almost impossible to keep record or to obtain returns of output from the producers. The greater proportion of the above railway shipments is derived from deposits in the Ontario peninsula, and is exported to the United States.

TABLE 12.

MISCELLANEOUS.

PRODUCTION OF MOULDING SAND.

MISCELLANEOUS.

Production of Moulding Sand.

Calendar Year.	Tons.	Value.
1887	160	$ 800
1888	169	845
1889	170	850
1890	320	1,410
1891	230	1,000
1892	345	1,380
1893	4,370	9,086
1894	6,214	12,428
1895	6,765	13,530
1896	5,739	11,478
1897	5,485	10,931
1898	10,572	21,038
1899	13,724	27,430
1900	6,181	12,316
1901	14,705	29,410
1902	13,352	27,651

TABLE 13.

MISCELLANEOUS.

ANNUAL PRODUCTION OF QUARTZ.

Quartz.

Calendar Year.	Tons.	Value.
1890	200	$ 1,000
1891	.....	.....
1892	.....	.....
1893	100	500
1894	.....	.....
1895	.....	.....
1896	10	50
1897	.....	.....
1898	284	570
1899	600	1,260
1900	.....	.....
1901	.....	.....
1902	.....	.....

MISCELLANEOUS.

Imports of Silex.

TABLE 14

MISCELLANEOUS.

IMPORTS OF "SILEX"—CRYSTALLIZED QUARTZ.

Fiscal Year.	Cwt.	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
1892	1,429	1,244
1893	2,447	1,301
1894	2,451	1,521
1895	2,882	1,881
1896	3,289	2,174
1897	2,564	3,415
1898	3,104	2,773
1899	3,951	2,595
1900	4,021	2,876
1901	3,562	2,106
1902 Duty free.	4,388	3,858

Soapstone.

Soapstone.—No statistics of production of soapstone have been received for the past two years. In previous years small quantities were mined and used chiefly in the manufacture of roofing cement.

TABLE 15.

MISCELLANEOUS.

Production.

ANNUAL PRODUCTION OF SOAPSTONE.

Calendar Year.	Tons.	Value.	Calendar Year.	Tons.	Value.
1886	50	$ 400	1895	475	2,138
1887	100	800	1896	410	1,230
1888	140	280	1897	157	350
1889	195	1,170	1898	405	1,000
1890	917	1,239	1899	450	1,960
1891	Nil	Nil	1900	420	1,365
1892	1,374	6,240	1901		
1893	717	1,920	1902		
1894	916	1,640			

Tin.—No ores of tin are known to occur in Canada, although a report of its occurrence in the Cariboo district of British Columbia is mentioned by the provincial Mineralogist as follows* :— MISCELLANEOUS. Tin.

"This department has recently received samples taken from a tunnel of a mine in the Cariboo district, and on examination these samples were found to contain tin in very distinct metallic particles. The rare occurrence of tin in the metallic state is recognized, and, while no doubt is felt as to the good faith of the sender of the sample, the discovery will require to be further investigated."

The importance of Canadian trade in tin and tin manufactures may be gathered from the accompanying table of imports.

TABLE 16.

MISCELLANEOUS.

IMPORTS OF TIN AND TINWARE. Imports.

Fiscal Year.	Value.	Fiscal Year.	Value.
1880	$ 281,880	1891	$1,206,918
1881	413,924	1892	1,594,205
1882	790,285	1893	1,242,994
1883	1,274,150	1894	1,310,389
1884	1,018,493	1895	973,397
1885	1,060,883	1896	1,237,684
1886	1,117,368	1897	1,274,108
1887	1,187,312	1898	1,550,851
1888	1,164,273	1899	1,372,813
1889	1,243,794	1900	2,418,455
1890	1,289,756	1901	2,339,109

		Duty.	
1902	Tin crystals	Free.	$ 3,872
	Tin in blocks, pigs and bars	"	598,958
	Tin plates and sheets	"	1,528,655
	Tin foil	"	46,715
	Tin strip waste	"	62
	Tin and manufactures of:—		
	Tin plate in sheets, decorated	25 %	581
	Tinware, plain, japanned, or lithographed and all manufactures of tin, N.E.S.	25 %	115,115
	Total		$2,293,958

Tripolite.—Shipments of tripolite in 1902, amounted to 1,052 tons, valued at $16,470. This is mined at Bass river lake, Colchester county, and St. Anns, Victoria county, Nova Scotia, and sold chiefly in the United States. The operators are, The Premier Tripolite Company; Tripolite.

*Report of the Minister of Mines, British Columbia 1902, p. 21.

MISCELLANEOUS.

Tripolite.

New York, operating under lease the property at St. Anns owned by the Victoria Tripolite Company, of North Sydney, Cape Breton.

The Fossil Flour Company, New York, operating at Bass river lake.

It is the custom of the Fossil Flour Company to operate their plant at Bass river every second season only, and usually only a portion of the product is shipped during the year of operation, the shipments being continued during the year following.

TABLE 17.

MISCELLANEOUS.

Production.

PRODUCTION OF TRIPOLITE.

Calendar Year.	Tons.	Value.
		$
1896	664	9,960
1897	15	150
1898	1,017	16,660
1899	1,000	15,000
1900	336	1,950
1901	850	15,300
1902	1,052	16,470