COLONIAL AND INDIAN EXHIBITION.

LONDON, 1886.

DESCRIPTIVE CATALOGUE

OF A COLLECTION OF THE

ECONOMIC MINERALS OF CANADA

BY

THE GEOLOGICAL CORPS,

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

Director.

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WHILE essentially an annotated Catalogue of the Economic Minerals of Canada displayed in the Canadian Section of the Colonial and Indian Exhibition, this publication will be found to include also notes on some minerals and rocks of purely scientific interest. The name and address of the exhibitor of each specimen is placed opposite that of the place from which the specimen was obtained, and in many cases the geological formation in which the exhibit occurs is also stated. Under each heading the subordinate arrangement is geographical, the exhibits being enumerated as nearly as possible in order from west to east by provinces, as follows :—British Columbia (B.C.), North-West Territories (N.W. T.), Manitoba (Man.), Ontario (O.), Quebec (Q.), North-East Territory (N.E.T.), New Brunswick (N.B.), Prince Edward Island (P.E.I.), Nova Scotia (N.S.). Some of the descriptive paragraphs are adopted, with a little alteration, from the Catalogue prepared for the International Exhibition at Philadelphia (1876); others are from the Catalogue des Minéraux, Roches, etc., prepared for the Paris Exhibition (1878). The annual Reports of Progress of the Geological Survey have also been consulted, while many additional facts not before published have been added. Specimens which have been obtained by the Geological Corps are in some instances credited to the owners of the properties from which they come. The length of the notices must not in all cases be accepted as indicative of the relative importance of the deposits to which they refer, the time available for the preparation of the catalogue not having been sufficient to enable the matter to be fully systematized, and it being impossible, in most cases, to obtain statistical information.

CLASSIFICATION.

INDEX TO SPECIMENS EXHIBITED.

In addition to a written or printed card, each specimen bears a smaller label, with its number printed upon it. The colour of this smaller label indicates the provinces from which the specimen comes, as follows:—

COLOURS.	PROVINCES.
Blue (dark)	Prince Edward's Island.
,, (light)	Nova Scotia.
Green (dark)	New Brunswick.
White	Ontario.
Yellow	Quebec.
Pink	Manitoba.
Green (light)	North-West Territories.
Orange	British Columbia.

I.

METALS AND THEIR ORES.

IRON.

Metallic Iron.

Madoc, O. ..... *Geological Survey.*

521. Meteoric iron (Model).

The meteorite, of which this is a model, is now in the Museum of the Geological and Natural History Survey at Ottawa. It was found in 1854, and before cutting weighed 370 pounds. It contains 6·35 per cent. of nickel, and in making a section of it, rounded masses of magnetic sulphide of iron (probably troilite) were found. When etched with an acid it exhibits in a beautiful manner the so-called Widmannstättian figures.

As might be anticipated from the great area and the diversity of the geological formations of the Dominion of Canada, the country is preeminently rich in ores of iron, and in many districts the deposits are of great extent and excellent quality. Some of these districts labour under the disadvantage of a want of accessible fuel, but in the case of others, where coal or wood may be obtained in immediate proximity to the iron ores, it would appear to be possible to establish iron works on a large scale. There are several furnaces in the province of Quebec, producing charcoal pig; but at the present moment there is only one blast-furnace making coke pig-iron, and one rolling-mill in connection with puddling furnaces, in operation in the Dominion, while the total value of iron and steel imported in various forms in 1884 was $14,790,727, and the grand total of imported iron and steel for the seventeen years since confederation (1868) reaches the sum of $230,741,434, equal to an annual average of thirteen and a half million dollars. (See "The Manufacture, Consumption and Production of Iron, Steel and Coal in the Dominion of Canada. J. H. Bartlett. Montreal: Dawson Bros.") These figures serve to give some idea of the market which is now available in the Dominion, and which might be supplied by iron manufactured there.

Magnetic Iron Ore.

Texada Island, B. C.

39. Magnetic iron ore from mine three miles from Gillies Bay.—
Geological Survey

277. Magnetic iron ore from north-east side of Texada Island.—*Geological Survey.*

103. Pig-iron manufactured from Texada ore, with one-third of bog ore from Puget Sound.—*W. F. Bullen, Victoria, B.C.*

These important deposits occur in crystalline rocks supposed to be of Carboniferous age. The largest exposure is on the south side of Texada Island, about three miles north-west of Gillies Bay. Here the ore mass is seen to be from twenty to twenty-five feet thick, in contact with grey crystalline limestone, with which, for about two feet down, are intercalated bands of ore, of from half an inch to one inch in thickness. From this point to the north-west, for nearly a mile, the ore is occasionally seen, and at one place there is a continuous exposure about 250 feet long and from one to ten feet thick. As regards mining and shipment, the ore is most favourably situated; while in the event of smelting operations being carried on, there is an abundance of wood suitable for making charcoal on the island; and Comox Harbour, from which the coal of the Comox area will be shipped, is less than twenty miles distant.

The ore is of an iron-grey colour, and frequently contains little cavities, which hold red or yellow ochre, and are sometimes lined with octahedral crystals of magnetite. A partial analysis of a specimen collected by the late Mr. James Richardson of the Geological Survey, gave 68·40 per cent. of iron, and only ·003 per cent. of phosphorus.

Considerable quantities of this ore have lately been shipped to Washington Territory for smelting in conjunction with bog iron ore.—*Carboniferous* (?)

An Island in Queen Charlotte Sound, B. C. ..... *Geological Survey.*

35. Magnetic iron ore.

This deposit occurs on a small island of the Walker group, and though exceptionally rich—the specimens examined yielding as high as 71·57 per cent. of iron—has not attracted much attention, owing to the want of a convenient harbour.—*Palæozoic.*

An Island in Queen Charlotte Sound, B. C. { *Hon. J. C. Helmcken, M.D., Victoria, B. C.*

528. Magnetic iron ore.

This and the preceding specimen are from the same locality.—*Palæozoic.*

Sooke, Vancouver Island, B. C..... *F. G. Richards, Jr., Victoria, B. C.*

96. Magnetic iron ore.
96*a*. „ „ from new opening (1885).

These ores are from Sections 79 and 83, Sooke district, at a distance of about twenty miles from Victoria, near the coast, and with excellent facilities for shipment. The deposit is rather of the nature of a stockwork than a true vein, but can be traced for some distance in a N.E.-S.W. direction, and in places shows from ten to twenty feet of nearly pure ore. The country rock is a

coarsely crystalline diorite (?), containing much hornblende. The following assays of various specimens of the ore give the percentage of metallic iron:—

Wm. Julian, San Francisco	72·40
Thos. Price, „ „	51·80
„ „ „ „	57·30
J. T. Bernige, Cornwall	48·90
„ „	68·50
J. Kestle & Co., San Francisco	64·50
D. Wallace, Glasgow	61·50
„ „	65·00—*Palæozoic.*

Mining Location Y XII., near Killarney, Lake Huron. { *J. A. Lindsay, Toronto, O.*

280. Magnetic iron ore.

This locality is near the west line of the township of Rutherford, and about three miles north-west of the village of Killarney. The main vein, which is of solid ore, is reported to be about twenty feet thick, and is situated conveniently for shipping on the west side of a bay on the shore of Lake Huron. It runs north-west and south-east, and is flanked by greenstone or diorite on the north-east and quartzite on the south-west side. Professor Chapman has made an analysis of this ore, and finds it to contain 60·85 per cent. of iron, no titanium, and only traces of sulphur and phosphorus. Two other veins, each about four feet thick, also occur on the property.—*Huronian.*

Around Lakes Superior and Huron magnetic iron ores, in quantities which may be of economic value, also occur in the following localities:—To the south of Nequaquon and Gun-flint Lakes (massive crystalline ore); in the north-west corner of the township of Neebing, interstratified with sandstone (contains 37·73 per cent. of iron); one to two miles west of the mouth of the Little Pic River (deposit ninety feet thick—the iron is chiefly a silicate—metallic iron from 36 to 46 per cent., according to Hayes, Hunt, and Girdwood); Portage at the west end of Little Long Lake, near Long Lake House (ore siliceous and slaty); Gros-Cap, near mouth of Michipicoten River (a good quality of ore); Mammoth and Vulcan Iron Mountains about eight miles north of Batchawana Bay (large quantities of fine-grained magnetite, averaging about 50 per cent. of iron); Agawa River (a large deposit of ore, said to have been recently discovered a few miles from Lake Superior).—*Archæan.*

Blairton, Belmont, O. { *The Coburg, Peterborough and Marmora Railway and Mining Company, Belmont, O.*

78.	Magnetic iron ore.	"Deep Pit," 10 feet below surface.
79.	„ „	„ 50 „ „
80.	„ „	„ 140 „ „
82.	„ „	New opening 25 „ „
83.	„ „	"Big Ore Bed" known as "Lake Pit" from surface.
84.	„ „	"Big Ore Bed" known as "Lake Pit," 90 feet below surface.

The "Blairton Ore Bed," or "Big Ore Bed," as it was formerly called, is one of the most important deposits of magnetite in Canada, and has been extensively worked for many years. The ore is finely granular, and often contains a

considerable admixture of hematite. It occurs in a series of beds interstratified with crystalline limestone, talcose slate, serpentine and other metamorphic rocks, the whole being highly inclined. Some of the beds are very pure, but others contain a good deal of rock matter and iron pyrites. An analysis of a specimen from what is known as the "Sand-pit Bed" gave Dr. Hunt:

Magnetic oxide of iron.....	72·80 = Metallic iron, 52·72.
Magnesia	6·46
Lime	0·35
Carbonate of lime...	2·40
Carbonate of magnesia ...	0·84
Phosphorus.....	0·035
Sulphur	0·027
Water.....	3·50
Insoluble	14·73
	101·142

Most of the ore raised from this deposit has been shipped to the United States for smelting.—*Laurentian.*

Madoc, O., lot 11, range 5 ..... *Geological Survey.*

38. Magnetic iron ore.

A bed from twenty-five to thirty feet thick, known as the "Seymour Ore Bed." The ore is finely granular, unusually free from pyrites, and one of the finest in the country. It is underlaid by a thin band of soft black mica-schist, and overlaid by reddish-grey highly felspathic rocks, which are porphyritic in places, and graduate into syenite or syenitic gneiss with epidote. On the run of the bed to the eastward dark grey hornblendic rocks, as well as the felspathic rocks just alluded to, occupy the surface in places. Actinolite forms the chief associate of the magnetite, occurring in scattered radiating bunches, and also uniformly disseminated through the ore. In 1837 a furnace was erected at the village of Madoc for smelting this ore, but was in blast only a short time when it was abandoned, one of the proprietors having been killed in the mine, and the other not having sufficient means to carry on the work. The iron produced is said to have been of a very superior quality. For a short time wood was employed as fuel.

The Grand Junction Railway now passes a few miles to the south of this deposit, and a branch has been built to the adjoining ore deposits in Madoc. The following is an analysis of the ore by Dr. T. Sterry Hunt:

Peroxide of iron Protoxide of iron }	89·220 = Metallic iron, 64·61.
Phosphorus	0·012
Sulphur.....	0·073
Insoluble matter	10·420
	99·725—*Laurentian.*

Coe Hill Mine, Wollaston, O. .... *Central Ontario Railway Co., Trenton, O.*

382. Magnetic iron ore.

From a vein said to be nineteen feet wide. Taken from shaft No. 1 at the depth of 125 feet.

Work at this mine was commenced in 1881, and in the following year the construction of the Central Ontario Railway from the mine to Trenton, on the Bay of Quinte, Lake Ontario, a distance of ninety miles, was undertaken. This Railway was completed in the summer of 1884, and at the end of that year the company had expended at the mine, on the new Railway, on the purchase of the Prince Edward Railway (running from Picton to Trenton), on the branch to Weller's Bay, on the Shipping Docks there, and in the buying and testing of several other deposits of iron ore in Madoc, Tudor, Wollaston, and Chandos townships, a sum of money amounting to nearly $2,000,000. The Coe Hill mine, however, is the only one of these mines from which shipments of any importance were made. These amounted to about 30,000 tons in 1884, and 10,000 or 15,000 tons in 1885, and were for the most part sent to Cleveland, Ohio. Some 30,000 tons were raised, and in stock at the mine, at the end of 1885, not having been shipped during last year on account of the very depressed state of the iron industry.

The vein runs east and west, dipping to the south, and cuts a rock composed of red orthoclase and black mica. This rock occurs, both at the mine and in the region to the south of it, in the form of dykes and irregular masses, cutting through the Laurentian gneisses, mica schists, and crystalline limestones. With the exception of 250 feet of unknown ground between the west slope of No. 1, and the east slope of No. 2 shaft, the vein is opened for a distance of 900 feet from east to west. Its width varies from twenty to seventy feet, but for much of this width the ore is so mixed with sulphides and rock matter that it cannot be profitably mined.

On an average the vein is worked for a width of about twenty feet, though some of the slopes in No. 1 ore have been as wide as forty feet. This No. 1 ore is a very high grade, giving sixty-eight per cent. metallic iron, is very free from phosphorus and titanium, and unusually soft.

In October, 1885, the depth of these three shafts was respectively—No. 1, 95 feet; No. 2, 135 feet; and No. 3, 100 feet; the length of the slopes being—No. 1, about 50 feet; No. 2, about 140 feet; and No. 3, about 200 feet.

Laurentian.

Wollaston, O., lot 14, range 1 ..... *Chambers & McLeod, Madoc, O.*

72. Magnetic iron ore (from surface).—*Laurentian.*

Wollaston, O., lot 10, range 15....*Jenkins, Chambers & Mallet, Madoc, O.*

179. Magnetic iron ore (from surface).—*Laurentian.*

Wollaston, O., lot 15, range 2..... *Jenkins, Chambers, Brown & Clute, Wollaston, O.*

335. Magnetic iron ore (from surface).—*Laurentian.*

Wollaston, O., lot 15, range 1 ..... *Jenkins & Chambers, Madoc, O.*

336. Magnetic iron ore (from surface).—*Laurentian.*

Wollaston, O., lot 9, range 15 ..... *Jenkins & Chambers, Madoc, O.*

337. Magnetic iron ore (from surface). —*Laurentian.*

Wollaston, O., lots 17 and 18, range 8.... { *Jenkins, Chambers & Clute, Wollaston, O.*

339. Magnetic iron ore (twenty feet below surface).—*Laurentian.*

Wollaston, O., lot 14, range 4 .... { *Jenkins, Chambers, Brown & Clute, Wollaston, O.*

340. Magnetic iron ore (from surface).—*Laurentian.*

Wollaston, O., lot 16, range 2 .... { *Jenkins, Chambers, Brown & Clute, Wollaston, O.*

341. Magnetic iron ore.—*Laurentian.*

The want of railway communication has hitherto prevented the development of these promising ore deposits in the township of Wollaston; but as this difficulty is now to a certain extent removed by the Ontario Central Railway, which runs in close proximity to them, there is every probability that, if iron ore advances in price, they will contribute largely to the yield of ore from the county of Hastings.

Palmerston, O., lot 8, range 7.... *Norman Clark, Mississippi Station, O.*

224 Magnetic iron ore.—*Laurentian.*

Roberts Mine, Palmerston, O. ....*Norman Clark, Mississippi Station, O.*

240. Magnetic iron ore.—*Laurentian.*

Palmerston, O., west half lot 3, range 9 .. { *Norman Clark, Mississippi Station, O.*

242. Magnetic iron ore.

This mine was closed about two years ago, owing to a dispute as to the title.
Laurentian.

Zainsville Iron Mines, Bedford, O., lot 6, range 2 ..... { *Zainsville Iron Mining Co., Godfrey, Frontenac, O.*

109. Magnetic iron ore.

This deposit was opened about 16 years ago by Mr. John Chaffey, after which it was leased by the Glen Gower Iron Mining Company of Elmira, N.Y., which took out about 7,000 tons of ore. In the year 1882 the mining rights passed into the hands of the Zainsville Iron Mining Company of Ohio, U.S.A., which has extracted up to the present time about 6,000 tons. An open cutting, 100 yards long and 70 feet deep, has been made across the stratification, exposing the beds for about 150 feet; deducting 50 feet for the intercalated serpentine, there remains 100 feet of workable ore. Two shafts have been sunk to the depth of 100 feet, one of which penetrates the ore for a distance of 50 feet, and some drifting has been done. The hanging wall is limestone, and the foot wall gneiss.

The following are analyses of this ore by Dr. M. E. Reed :

	1.	2.	3.
Metallic Iron.....	61·87	62·32	63·80
Silica.....	9·78	10·67	8·30
Manganese	·59	·51	·47
Sulphur..... ..	trace	·39	·12
Lime.....	·68	·64	·09
Magnesia ..... ,....	2·01	·98	4·01
Phosphorus.....	·015	·010	·011

(See Report of Progress of the Geological Survey for 1882–84, page 10 L.)

This mine is now connected with the Kingston and Pembroke Railroad, by a branch line.—*Laurentian.*

Madoc, O., lot 18, range 1.....*Geological Survey.*

274. Magnetic iron ore.

From an opening known as the "Dufferin Mine."—*Laurentian.*

Madoc, O., lot 19, range 1.....*Geological Survey.*

275. Magnetic iron ore.

From an opening known as the "Hobson Mine."—*Laurentian.*

Darling, O., east half of lots 21 and 22, range 4 ..... } *W. H. Wylie, Carleton Place, O.*

346. Magnetic iron ore, lot 22.
347. „ „ lot 21.

These two specimens were taken from near the surface.—*Laurentian.*

Barrie, O., lots 5, 6, and 7, range 12 ..... } *Allison & Platt, Adolphustown, O.*

394. Magnetic iron ore, from 10 feet vein.
„ *a.* „ „ 9 „
„ *b.* „ „ 8 „

These deposits are now being developed.—*Laurentian.*

Bagot, O.....*Calabogie Mining Co. (Limited), Bagot, O.*

284. Magnetic iron ore from No. 1 Mine.
285. „ „ „ 4 „

This property comprises the east half of lot 15, the west half of lot 16

in the 9th range, the east half of lot 16, range 11, and lot 14, range 7. A partial analysis of specimens from mines Nos. 1 and 4, by Dr. F. Fricke, of Pittsburg, Penn., gave—

	No. 1.	No. 4.
Iron	63·610	63·620
Phosphorus	·018	·143.—*Laurentian.*

Bristol, Q., lot 22, range 2 . . *Bristol Iron Mining Co., Bristol Corners, Q.*

173. Magnetic iron ore.

This ore occurs in a series of beds which are interstratified with reddish hornblendic gneiss and glistening micaceous and hornblendic schists of Laurentian age. The thickness of what appears to be the highest and most important bed has not been ascertained; but the lowest one exposed is about 9 or 10 feet thick. Openings were first made during the winter of 1873–74. Several thousand tons of ore have been raised.—*Laurentian.*

The following is an analysis from the Report of Progress of the Geological Survey for 1873–74, page 208 :—

Peroxide of iron	65·44	Metallic iron, 58·37.
Protoxide of iron	14·50	
Bisulphide of iron	2·74	Sulphur, 1·46.
Protoxide of manganese	0·11	
Alumina	0·60	
Lime	3·90	
Magnesia	0·45	
Silica	11·45	
Carbonic acid	1·64	
Phosphoric acid	traces.	
Titanic acid	none.	
Water	0·14	
	100·97	

The ore, though generally known as magnetite, contains a considerable proportion of hematite.—*Laurentian.*

Ascot, Q., lot 8, range 9 . . . . . *E. Clarke, Sherbrooke, Q.*

Magnetic iron ore.

This deposit is quite extensive, but the ore is of low grade. Assays of several samples by Mr. F. D. Adams gave an average of 28·39 per cent. metallic iron. (No specimen exhibited.)—*Pre-Cambrian.*

Ascot, Q. . . . . *S. E. Smith, Sherbrooke, Q.*

328. Magnetic iron ore.

This deposit is apparently not only of large extent, but the ore is of fine quality, and as it is only three-quarters of a mile from the Grand Trunk Railway station at Sherbrooke, the ore should be delivered on the cars at a low figure, and be of considerable economic importance. A complete analysis has not as yet been made.—*Pre-Cambrian.*

Leeds, Q., lot 7, range 5 ....*John A. McVety, Kinear's Mills, O.*

390. Magnetic iron ore.

This ore is said to occur in beds from two to three feet thick, but as yet only prospecting has been done.—*Pre-Cambrian.*

Leeds, Q. .....*Chas. Lionais, Montreal, Q.*

134. Magnetic iron ore.—*Pre-Cambrian.*

Moisie, Q. .....*William Rhind, Montreal, Q.*

Magnetic iron sand.

Many of the rocks in the great Laurentian series, which is so extensively developed to the north of the Gulf of St. Lawrence, contain small disseminated grains and crystals of magnetite and ilmenite, which, on the disintegration of the rocks, are gathered together by natural processes of concentration, to form important deposits of "iron sand," stretching in some cases along the coast for many miles. Some of these are of recent origin, but others belong to the post-pliocene age, and are found as high as one hundred, and even two hundred feet above the present tide-level. Mixed with the ores of iron are variable proportions of siliceous sand, and small quantities of garnet, so that artificial concentration is necessary to fit the material for metallurgical treatment. In practice this is effected, but in a very incomplete manner by means of shaking tables. Dr. Hunt found that a sample of the Moisie sand which before washing contained 46·2 per cent. of magnetic grains, by washing only had this percentage increased to 52 per cent., owing to the high specific gravity of the associated minerals. The unwashed sand contained 55·23 per cent. of iron, 16.00 of titanic acid, ·07 of sulphur, ·007 of phosphorus, and 5·92 of insoluble matter. (For further particulars see Report of the Geological Survey of Canada, 1866-69 p. 267).

At Moisie these sands have been smelted in bloomary furnaces, but the undertaking did not prove a pecuniary success. (No specimen exhibited.)

Between Economy and Five Islands, N.S.....*Geological Survey.*

279. Magnetic iron ore.

From a vein in trap.—*Triassic.*

Wilmot, Annapolis county, N.S. .....*John Grant, Halifax, N.S.*

141. Magnetic iron ore.

Magnetic iron ores are found at various points throughout the north-western trap range, but are generally too limited in extent to be of economic importance. A deposit however which occurs at Digby, though only partially opened, discloses pockets and veins of large size. The proportion of metallic iron contained in the ore is from 40 to 50 per cent. It is comparatively free from phosphorus sulphur, or titanic acid.—*Triassic.*

Hematite (including Crystalline and Earthy Varieties).

Sooke, Vancouver Island, B.C. .....*F. G. Richards, Jr., Victoria, B.C.*

95. Hematite.

This ore occurs in the vicinity of the magnetite previously mentioned, and close to the shore of the Straits of Fuca.

Big Island, Lake Winnipeg, Man.. { *International Smelting Co., F. Proudfoot, Winnipeg, Man.*

567. Hematite.

This ore is said to yield from 45 to 63 per cent. of iron. It has been practically tested and proved to be of good quality.—*Archæan.*

Silver Lake Mining Location, Thunder Bay, Lake Superior, O. } *Geological Survey.*

22. Hematite.

The above location is situated five and a half miles N.E. of the head of Thunder Bay. The ore occurs in a series of beds, not less than 40 or 50 feet in thickness, near the base of the Nipigon series, associated with compact sandstone, and ferruginous limestone which is suitable for a flux. Most of the beds consist of very pure hematite, containing on an average, according to assays made by Prof. H. Alleyne Nicholson of Newcastle, England, and Dr. Ellis of Toronto, from sixty-eight to sixty-nine per cent. of iron. The outcrop of the ore beds is 470 feet above Lake Superior, and is very favourably situated for mining and for smelting with charcoal.—*Nipigon Series.*

North Shore of Lake Superior, Thunder Bay District, O..... } *Thos. A. Keefer, Port Arthur, O.*

415 Hematite.

The Dickson Location, Desert Lake, near Bruce Mines, O. ..... } *James Stobie, Bruce Mines, O.*

498. Hematite.

This location comprises Blocks A1, and A2, situated on the north side of Desert Lake, and about five miles from Portlock Harbour on Lake Huron. The vein, consisting of solid ore like the specimen, cuts the greyish-white Huronian quartzite, is three feet thick, and runs a little north of west and south of east. It has been traced for nearly a mile on the location, and in one place is very advantageously situated for mining. It occurs at an elevation of 200 feet above Desert Lake, which is connected with Lake Huron by a navigable river

(the Thesalon). According to Dr. Ellis of Toronto, the ore contains fifty-six per cent. of iron and no appreciable quantity of sulphur or phosphorus.—*Huronian.*

In addition to the above localities, hematite occurs in the region about Lakes Superior and Huron, in deposits which appear to be of economic importance at the following localities:—East side of Lake Nipigon near the mouths of Oniminisagi or Red Paint River, and of the Sturgeon River (slaty hematite ores)—a specimen from the latter place was found to contain 36·06 per cent of iron; hills east of Lake Nonwatanose, Black Sturgeon River (a red earthy hematite); west Point of the largest of the Slate Islands (impure slaty ore); near Wallace mine, Lake Huron (mixed with magnetite); about 10 miles up the east branch of the Montreal River, Ottawa valley (veins of specular iron in quartzite); foot of Big Rapids, below the Long Portage, south branch of Moose River (a large deposit of an impure carbonate of iron passing into hematite).

Belmont, O. ..... { *The Coburg, Peterborough and Marmora Railway and Mining Company, Belmont, O.*

81. Hematite. "New opening."
85. ,, ,, (Surface).
86. ,, ,, (Bottom).—*Archæan.*

Madoc, O., east half of lot 12, range 5. ..... *Geological Survey.*

273. Hematite.

From a deposit locally known as Wallbridge's Hematite Mine. The ore is a finely granular hematite, of a steel-grey colour on fresh fracture.

In 1880 the Bethelem Iron Mining Company commenced operations here, and after extracting about 35,000 tons of ore, abandoned the deposit as exhausted in 1883. Since then this mine has again been worked by Mr. Coe, with very favourable results, but, after the extraction of some thousands of tons, it has again been pronounced exhausted.—*Archæan.*

Palmerston, O..... *Norman Clark, Mississippi Station, O.*

239. Red hematite.—*Archæan.*

McNab, O., lot 6, concessions C & D ..... *Geological Survey.*

43. Red hematite.

This deposit occurs near the Fall of the Dochart, and about a mile from the shore of the Lac des Chats. The thickness at the surface was about 30 feet, but at a depth of 80 feet the ore is said to have thinned out. It is possible, however, that if further mining operations were carried on, the bed, at some places at least, would be found to extend to a greater depth. The ore is of excellent quality, as will be seen from the following analysis:—

Peroxide of iron	84·42	Metallic iron	59·09
Carbonate of lime	5·40		
Carbonate of magnesia.	1·05		
Phosphorus	0·03		
Sulphur	0·065		
Insoluble matter	7·16		

—*Laurentian.*

The Haycock Iron Location, Templeton and Hull, Q. ..... } *Ed. Haycock, Ottawa, O.*

37 & 268. *a.* Specular iron ore.
268. *b.* Magnetic iron ore.

The ore of the Haycock location occurs in highly felspathic gneisses belonging to the Laurentian system, and forms a series of parallel beds striking north-east and south-west, and dipping to the north-west at an angle of about 50 degrees. The beds range from a few inches up to several feet in thickness at the surface, and one of them, which was less than two feet thick at the surface, at a depth of fourteen feet, is said to have widened to over twelve feet. The ore is essentially a hematite, but contains a small proportion of magnetic oxide of iron some specimens being readily attracted by the magnet. It contains, on an average, about 64 per cent. of iron. The following analyses are taken from a report on the location by Professor Chapman, of Toronto University:—

	I.	II.
Sesquioxide of iron	83·08	85·45
Protoxide of iron	6·86	5·24
Titanic acid	3·17	2·12
Protoxide of manganese	0·24	0·15
Magnesia	0·13	0·17
Lime	0·55	0·41
Phosphoric acid	0·16	0·13
Sulphur	0·03	0·35
Graphite	0·35	0·28
Insoluble rock matter	0·26	5·77
	99·83	100·07

The deposit was first opened during the winter of 1872–73. It is about ten miles from the city of Ottawa, and six and a quarter miles from a shipping point on the Gatineau river.—*Laurentian.*

Sutton, Q., lot 9, range 11 ..... *Geological Survey.*

278. Hematite.

A bed seven feet thick in chloritic schists. Contains from 20 to 50 per cent. of iron.—*Huronian.*

Jacksontown, near Woodstock, Carleton county, N. B....*Geological Survey.*

281. Brownish-red hematite.

The iron ores of Woodstock were first discovered by the Geological Survey of the state of Maine under Dr. Charles T. Jackson, as early as the year 1836, having been traced by him from the Aroostook region in that state north-eastward to the river St. John. More recently other explorers have traced the deposit to the east of the river, where it forms several bands extending over considerable portions of the northern and north-eastern portions of the county

of Carleton. The principal locality at which the ore has been mined is Jacksontown, situated about three and a half miles from Woodstock and about two miles from the west bank of the river St. John. As seen at this point, the ore-beds (portions of which are true hematite, while others consist of hydrous peroxide of iron or limontite) are somewhat irregularly interstratified with a series of clay slates, usually bright red or brownish-red in immediate proximity to the ore, but elsewhere of a pale-grey colour, and which are highly inclined. The ore-beds, which vary in number, are from six inches to eight feet thick, the average being about three and a half feet. A considerable quantity of ore was at one time smelted here, but the works have long since been abandoned.—*Silurian.*

Stewiacke, Colchester county, N. S. ..... *Government of Nova Scotia.*

459. Hematite.—*Palæozoic.*

The iron ores of Pictou county are of several kinds, including bog ore, limonite, hematite, clay ironstone, spathic ore, &c. Mr. Gilpin states, in his report entitled "Mines and Minerals of Nova Scotia," that clay ironstone is found everywhere in the coal measures in irregular beds from five to forty inches thick, and yields thirty-five per cent. of metallic iron. Spathic ore, carrying manganese in considerable quantity and with only small amounts of phosphorus and sulphur, occurs in beds from six to ten feet thick on Sutherland's River. Limonite, which also carries a considerable amount of manganese, is found on the East River, in the vicinity of Springville, and is stated by Mr. Gilpin to be from fifteen to twenty-one feet thick. Limonite is also reported on St. Mary's River. Hematite is found in several localities; those known as the Blanchard and the Webster areas being the most important. In the former the deposit is stated to vary in width from thirty to one hundred feet, while in the latter it is supposed to have a thickness of fifteen to thirty feet. They are both on the east side of the East River, and on the west side of that stream other large deposits occur, which are considered to be the equivalents of those found in the great Londonderry Mine. Other veins of specular and magnetic iron ore are met with in the vicinity, but have not as yet been thoroughly tested. Hematite also occurs at Arisaig. Dr. B. J. Harrington, in an article entitled "Notes on the Iron Ores of Canada and their Development," which appeared in the Report of Progress of the Geological Survey of Canada for 1873-74, says, in speaking of these ores (p. 70):—"It is to be hoped also that something will soon be done towards developing the valuable deposits of iron ore in Pictou county. Here the ores are abundant and of varied character; they are near to the Pictou coal fields, whence coal, suitable for the manufacture of coke, could be obtained from a number of mines now in active operation. Limestone, suitable for a flux, occurs abundantly in the valley of the East River, the Intercolonial Railway passes through the coal fields and within a few miles of the ore deposits, and the harbour of Pictou affords an excellent port of shipment during six months of the year."

As above stated, the proximity of these ores to the limestones and coals of the Pictou and Cumberland Carboniferous basin should render them of great economic value, but although a considerable amount of money has been spent in testing the value and extent of the ore-beds, nothing has as yet been done in the way of smelting the ores. (See also Nos. 456 and 454.)—*Devonian, Silurian and Cambro-Silurian.*

Pictou county, N. S. Lease No. 29 ..... *J. H. Bartlett, Montreal, Q.*

455. Specular iron ore.

These specimens are from an important deposit of ore occurring in slates and quartzites on the west side of the East River. The lode is from ten to twenty feet thick, and has occasional side veins. From a single pit which was sunk to a depth of thirty feet, about fifty tons of ore were obtained. A specimen examined by Dr. T. E. Thorpe, of the Andersonian University, Glasgow contained—

Peroxide of iron	96·63	Metallic iron, 68·33.
Protoxide of iron	0·89	
Sulphide of iron	0·06	
Phosphorus	none	
Silica and insoluble matter.	3·20	
	100·78	

The proximity of the Pictou coal field adds greatly to the value of this and other deposits of ore in the vicinity of the East River.—*Silurian.*

Pictou county, N.S., Lease No. 32 (Webster's) ..... *J. H. Bartlett, Montreal, Q.*

457. *a*, Red hematite.
458. „ „

From what is known as the "Great Red Hematite Bed of McLellan's Mountain," a bed of ore occurring interstratified with slates and quartzites. The following analysis of a specimen of the ore is by Dr. Stevenson MacAdam of Edinburgh:—

Oxide of iron.....	75·67	Metallic iron, 54·36.
Oxide of manganese	0·52	
Alumina	0·45	
Carbonate of lime	2·44	
Carbonate of magnesia	0·98	
Phosphoric acid	0·22	
Sulphur.....	0·29	
Titanic acid	trace	
Silica.....	19·43	
	100·00	

The bed is from fifteen to thirty feet thick, the angle of dip being from twenty-five to seventy-five degrees. The specimens are from about the centre of the area, where a section showed fifteen feet four inches of ore of uniform quality.—*Lower Helderberg formation, Silurian.*

Nictau, Annapolis county, N.S. ..... *John Grant, Halifax, N.S.*

142. Red Hematite.—*Silurian.*

Roman Valley, Guysborough county, N.S. ..... *Geological Survey.*

36. Specular iron ore.—*Palæozoic.*

Manchester, Guysborough county, N.S... *Thos. Callahan, Manchester, N.S.*

461. Specular iron ore.—*Palæozoic.*

Melrose, Guysborough county, N.S.....*A. Cumminger, Guysborough, N.S.*

549. Specular iron ore.—*Palæozoic.*

Salmon River, Guysborough county, N.S. { *Chas. Kenney, Salmon River, Guysborough, N.S.*

460. Specular iron ore.

Near Guysborough there are several deposits of specular iron ore. The most important of these was worked in 1872 by the Crane Iron Co., of Philadelphia, which took out about 3,000 tons of excellent ore, but the distance from a shipping point and the character of the roads over which the ore had to be carried prevented its profitable handling. The price at that time in the American market was from $7 to $8 per ton. It was used for lining puddling furnaces.—*Devonian.*

St. Peter's, Cape Breton, N.S..... { *Jos. Matheson, L'Ardoise, Cape Breton, N.S.*

463. Specular iron ore.

Sydney, Cape Breton, N.S.....*E. T. Moseley, Sydney, Cape Breton, N.S.*

462. Hematite.—*Palæozoic.*

Nova Scotia..... *H. S. Poole, Stellarton, N.S.*

117. Collection of iron ores.

Ilmenite or Titaniferous Iron Ore.

St. Urbain, Bay St. Paul Q..... *Geological Survey.*

31. Ilmenite.

A bed ninety feet thick, occurring in anorthosite rock. The ore contains over forty per cent. of titanic acid, and about thirty-seven per cent. of metallic iron. In some parts of the bed orange-red grains of rutile are disseminated through the ilmenite. In 1873 two blast furnaces were erected near Bay

St. Paul by *The Canadian Titanic Iron Company*, and attempts made to smelt the ilmenite with charcoal; but although good pig-iron was produced, the enterprise was soon abandoned, owing to the enormous consumption of fuel. Under the most favourable circumstances from 190 to 237 bushels of charcoal were required to make a ton of iron, while in some cases over 400 bushels were consumed.—*Laurentian.*

Limonite (including Bog Iron Ore).

Big Island, Lake Winnipeg, Man. { *International Smelting Co.,* *F. Proudfoot, Winnipeg, Man.*

572. Limonite.

This ore is reported to yield from thirty-two to forty-four per cent. of iron It has been practically tested and proved to be of good quality.

St. Maurice Forges, Q..... *J. MacDougall & Sons, Three Rivers, Q.*

Bog iron ore.

Bog iron ores are of common occurrence in the provinces of Quebec and Ontario, more especially in the sandy tracts which often flank the Laurentian hills. The variety employed for smelting occurs in concretionary masses, which, on the fresh fracture, are sometimes dull or earthy, and at other times highly lustrous. The colour is usually yellowish-brown, but dark brown or black when much manganese is present. The concretions are scattered through the soil, or else form patches or continuous layers, which sometimes attain a thickness of several feet, though generally only a few inches in thickness. The specimens analysed contained on an average fifty per cent. of iron, but the yield in the furnace was generally only thirty to forty per cent., owing, no doubt, to the difficulty of freeing the ore from sand. The blast furnace at "St. Maurice Forges" was built as early as 1737, and is the oldest one in Canada. The fuel employed was entirely charcoal, and the flux was limestone from the Trenton formation. The usual charge was, bog iron ore 600 lbs., limestone 45 lbs., charcoal 16 bushels (the "minot"=2,250 cubic inches), weighing eleven to twelve pounds to the bushel. The pig iron produced was shipped to Montreal, and there manufactured into car wheels, for which long experience has shown it to be well adapted. Small quantities of wrought iron were also made in a hearth-finery. These works have been closed for several years. (No specimen exhibited.)—*Alluvial.*

Vaudreuil, County of Vaudreuil, Q..... *Geological Survey.*

33. Bog iron ore.

In the seigniory of Vaudreuil, at the confluence of the rivers Ottawa and St. Lawrence, bog iron ore is found in many places, but appears to be most abundant in Côte St. Charles, where in one place a bed is said to attain a thickness of eight feet. In St. Angelique, on what is known as the McGillis

property, and also in St. Elizabeth, the ore occurs in the form of brownish-black concretions, averaging about three-quarters of an inch in diameter, and containing a large proportion of oxide of manganese.

The specimen exhibited is from Côte St. Charles, where the ore generally contains over fifty per cent. of iron, and but little manganese.—*Alluvial.*

Liverpool, N.S. ..... *Capt. Captique, Liverpool, N.S.*

465. Bog iron ore.

Springville, Pictou county, N.S. ..... *J. H. Bartlett, Montreal, Q.*

456. Limonite.

At this place a large deposit of limonite, varying in thickness and quality, occurs at the junction of the Lower Carboniferous and Silurian formations. The ore is sometimes massive, but more frequently in fibrous concretionary balls of large size, and in some places is associated with pyrolusite and manganite. (See general note on iron ores of Pictou county, page 29.)

The following analysis (Report of Progress of the Geological Survey, 1873–74, page 233, shows the ore to be of excellent quality :—

Peroxide of iron	85·01	Metallic iron 59·50
Protoxide of manganese	0·38	
Alumina	0·69	
Lime	0·49	
Magnesia	0·19	
Phosphoric acid	traces	
Sulphuric acid	0·55	
Water hygroscopic	0·36	
„ combined	10·77	
Insoluble residue	2·14	
Organic matter	traces	
	100·085	

Limestone suitable for a flux occurs in the immediate vicinity of the ore, and there are several coal mines in active operation only a few miles away.—*Junction of the Silurian and Carboniferous.*

Brookfield, Colchester county, N.S. .. { *R. E. Chambers, New Glasgow, Pictou county, N.S.*

223. Limonite.

Limonite of excellent quality, and in masses often of large size, is found about three miles east of Brookfield station, and considerable quantities have been from time to time collected and shipped to Londonderry and elsewhere. Attempts have been made to find the bed from which these blocks were derived, but so far apparently without success, though there is evidently a large deposit in the immediate vicinity. The low price of ore at present prevents this from being profitably worked.—*Devonian.*

Londonderry, Colchester county, N.S. — *The Steel Company of Canada (Limited), Londonderry, N.S.*

464*a*. Rolled axle blank prepared for the hammers, made from puddled iron, squeezed in rotary squeezer and rolled into puddled bar 5 in. wide, $\frac{11}{16}$ thick, and 4 in. wide, $\frac{11}{16}$ thick. Pilled 9 in. wide, 10 in. high. Heated in reheating furnace on a sand bottom. Rolled in an 18-in. train, and subjected to the following tests: Four blows at 9 feet and two blows at 11 feet of a 2,000 lbs. weight, striking midway between solid iron supports placed 3 feet apart. Blank turned over after each blow. The deflection after each blow was found to be as follows:—

Blow deflection.	Drop, 9 feet; weight, 2,000 lbs.
1st	$1\frac{5}{8}$ inch.
2nd	$2\frac{3}{8}$ inches.
3rd	$2\frac{1}{8}$ inches.
4th	$2\frac{7}{8}$ inches.
5th	$2\frac{5}{16}$ inches.
6th	$2\frac{5}{8}$ inches.
7th	$4\frac{1}{2}$ inches.

Taken thence to hydraulic press and bent until the ends came into contact without showing the least fracture, weighing about 300 lbs.

„ *b*. 1 puddled ball.

„ *c*. 1 puddled bloom.

„ *d*. Samples bar iron—One piece $2\frac{1}{4}$ in. square Siemens iron; one piece 3 by $1\frac{1}{4}$ ditto; one piece $\frac{5}{8}$ by $\frac{11}{32}$ ditto; one piece $\frac{7}{8}$ round ditto; one piece $\frac{1}{2}$ round tied in a knot; one piece $\frac{1}{4}$ ditto; one piece $\frac{7}{8}$ by $\frac{1}{2}$ Siemens horse-shoe iron; one piece 1 by $\frac{7}{16}$ ditto; two pieces 3 by $\frac{11}{16}$ Muck bar.

„ *e*. One piece 6 by 1 Siemens iron; one piece 4 by 1 ditto; one piece 1 by $\frac{7}{8}$ ditto; one piece 3 by $1\frac{1}{4}$ ditto; 1 piece $\frac{3}{4}$ round ditto; one piece 1 in. ditto, tied in a knot; one piece $1\frac{1}{4}$ square; two pieces $1\frac{1}{4}$ by $1\frac{3}{8}$ ditto link iron, for cars. The latter stood the following tests, viz.:—Ultimate tensile strength, 53,947 lbs. per square inch; reduction at point of fracture, 31 per cent.; elongation in 12 diameters, 26 per cent.; one link $1\frac{1}{4}$ by $1\frac{3}{8}$ ready for use, one piece Siemens link iron (cold bend).

„ *f*. One piece brown hematite ore from best mine, weighing about 5,000 lbs.

„ *g*. One piece brown hematite from West mine.

„ *h*. Two pieces specular ore and two pieces red hematite ore from East mine, weighing about 2,000 lbs.

„ *i*. Three pieces spathic ore from West mine, weighing about 2,000 lbs.

„ *j*. Two pieces Brookfield limestone, two pieces West mine ditto, one piece ankerite, 1 piece ditto.

„ *k*. One piece Totten brook ore from East mine, being a mixture of ankerite, spathic, and hematite ores.

„ *l*. Bar each Nos. 1, 2, 3, 4 pig iron, 1 bar car wheel iron.

A most important vein of iron ore occurs in slates and quartzites, supposed to be of Cambro-Silurian age, at Londonderry, on the southern slope of the Cobequid Hills. It has an approximately east and west course, and has

been traced for a distance of more than twelve miles. The ore consists for the most part of limonite (brown hematite), which is generally earthy, but sometimes occurs in lustrous stalactitic and mammillary forms. It has evidently been derived from the alteration of spathic ore and ankerite, both of which are in many places found in an unaltered condition. The vein also contains ochreous red hematite, specular iron ore, and small quantities of magnetite. The following analyses (Report of Progress of the Geological Survey, 1873–74, pp. 231 and 233) will serve to illustrate the composition of the limonite :—

	Ochrey Limonite.	Compact Limonite.
Peroxide of iron	79·68	84·73
Protoxide of iron.....		traces
Protoxide of manganese...	2·51	0·23
Alumina	0·63	0·23
Lime	0·57	0·14
Magnesia	0·34	0·14
Silica	3·05	
Phosphoric acid	0·44	0·19
Sulphuric acid	0·01	0·01
Water hygroscopic	0·78	0·33
,, combined	11·65	11·07
Insoluble residue		2·67
	99·66	99·74
Metallic iron.....	55·78	59·31

Mining has been carried on here since 1849. A charcoal furnace was erected in 1853, which was in blast at short intervals for some years. Two improved blast furnaces, with a weekly capacity of from 500 to 600 tons, were subsequently erected, the fuel used being coke, and the capacity of the puddling furnaces being about twenty-five tons per day. In 1873 the property passed into the hands of the Steel Company of Canada. Coke is obtained principally from the Pictou mines, though a considerable quantity is now made on the premises from the Springhill coal. According to the Report of the Government Inspector of Mines for Nova Scotia, the amount of ore smelted in 1884 was 54,155 tons, and 5,799 tons of ankerite were also used, the number of men employed being about 800. A branch railway, three miles in length, connects the mines with the Intercolonial Railway at Londonderry station. Changes in the management and financial difficulties have seriously interfered with the output during the past year.—*Cambro-Silurian.*

Pictou county, N.S. (Cullen area) .... *Geological Survey.*

Compact limonite.

On the banks of a small stream, near the West Branch of the East River, a band of quartzite, intersected by numerous reticulating veins of limonite, is exposed. The veins are for the most part very thin; but, according to Dr. Gilpin, there is one with a thickness of three feet. Judging from the numerous masses of ore scattered over the surface for a considerable distance from the stream there is some reason to suppose that the deposit will, at some point, prove of economic value. (No specimen is exhibited.)—*Palæozoic*

Spathic Iron Ore.

Sutherland's River, Pictou county, N.S. ....*J. H. Bartlett, Montreal, Q.*

454. Spathic or sparry iron ore.

An irregular bed occurring in sandstones of the Millstone-grit formation. The ore is crystalline, and, where unacted upon by the weather, is light grey in colour. The following is an analysis of a specimen which was evidently somewhat weathered.—(Report of Progress of the Geological Survey, 1866-69, p. 442):—

Sesquioxide of iron.....	16·98	} Metallic iron, 43·56.
Carbonate of iron	65·61	
,, manganese ...	7·98	
,, lime	2·67	
,, magnesia	3·23	
Silica	3·76	
Sulphur	0·00	
Phosphorus.....	0·013	
Hygroscopic water.....	0·76	
Organic matter	traces	
	101·003	

The bed has been traced for several hundred yards, and where exposed in the bank of a brook has a thickness of about ten feet. According to Dr. Dawson its mode of occurrence is not unlike that of the non-fossiliferous sub-crystalline limestones found associated with gypsum in some parts of the Lower Carboniferous. This bed is only four miles from the Vale Colliery.—*Millstone-grit formation, Lower Carboniferous.*

Souris River, N. W. T. .....*Geological Survey.*

500. Clay iron-stone.

Clay iron-stone is widely distributed in the north-west territory associated with the coals, lignitic coals, and lignites of the Cretaceous and Laramie formations. Though occurring in some localities in considerable abundance, as nodules and nodular sheets, it is not at present likely to be utilised. The quality of the ore is often excellent. The average percentage of iron in several specimens from near Fort Edmonton is 34·98. A specimen from Dirt Hills contained 41·49 per cent. of iron, 1·18 of protoxide of manganese, ·087 of phosphorus, and ·068 of sulphur.—*Laramie and Cretaceous.*

Note.—Iron Ores in the North.—It is probable that many additional rich deposits of magnetic iron ore will be found throughout the great Laurentian and Huronian areas of Canada as they become better known. Specimens of a fine variety of magnetite have been brought from what is reported to be a large deposit near the entrance of Black Bay, on the north side of Lake Athabasca. At the narrows of Knee Lake, between Lake Winnipeg and Hudson's Bay, a large deposit of magnetite has been examined. Magnetite is also reported to occur on the north side of Hudson's Straits. At the foot of the Grand Rapids of the Wattagami River, a branch of the Moose, there is a large deposit of clay iron-stone passing into limonite associated with the Devonian limestones and marls. Very extensive deposits of manganiferous spathic iron have been found

on the Nastupoka Islands, near the eastern shore of Hudson's Bay. The bedded ore, broken up by the frost, is scattered over thousands of acres on a number of these islands. Specimens examined contain an average of 50 per cent. of carbonate of iron, and 28 per cent. of carbonate of manganese, constituting a valuable ore for the manufacture of Spiegeleisen.

COPPER.

Native Copper.

British Columbia ..... *Geological Survey.*

349. Large nuggets (found loose).

Native copper has not yet been discovered *in situ* in British Columbia, but loose nuggets which are occasionally found, indicate its existence, probably among some of the ancient volcanic rocks of the province. Native copper, supposed to come from one or other of the rivers of the Alaska coast, has been used from time immemorial by the coast Indians, and was accounted by them of great value.

Cassiar, B. C. ..... *Dr. J. W. Powell, Victoria, B. C.*

89. Native Copper.
Found with arquerite in gold washings. (See No. 396.)

Michipicoten Island, Lake Superior, O. ..... *Geological Survey.*

350. Native copper.
24. „ „ in sandstone.
350*a*. Specimen of sandstone presented by W. W. Stuart, and polished to show the grains of native copper.

These specimens are from the location of the Quebec and Lake Superior Mining Association in the north-western part of Michipicoten Island. This island is formed of a series of igneous and sedimentary rocks, resembling the copper-bearing strata of Keeweenaw Point, on the south side of Lake Superior. On this location a shaft has been sunk to a depth of ninety-six feet on two contiguous copper-bearing beds, which together have a thickness of about three

feet, and contain an average of about two and one-half per cent. of native copper. The upper of the beds is a reddish-grey sandstone, with fine particles and filaments of copper, and has a thickness of from one to two feet, while the lower is a bluish grey amygdaloid from eight to eighteen inches thick, with coarser grains of copper, but containing about the same percentage of that metal as the sandstone. The appearance of a section of the upper bed is shown in the woodcut below; the larger irregular black spaces represent the metallic copper. These layers are underlaid by a soft argillaceous ash-bed, six feet or more in thickness, and containing from one-half to one per cent. of copper, and below this is a massive greenstone. The copper-bearing beds are overlaid by massive compact greenstone, succeeded by amygdaloid and conglomerate. These strata dip south-eastward at an angle of 30 degrees, or at the rate of three feet in a fathom. The location was leased and worked by Mr. Hugh R. Fletcher, of Toronto, to whom we are indebted for the facts given above. In 1860, he took forty-five tons of the ore to the Bruce Mines, and there smelted one half of it without dressing, obtaining about three per cent. of fine copper. The balance was hand-dressed, and yielded on smelting seven and one-eighth per cent.—*Lower Cambrian, Keeweenaw Series.*

Drawing showing the mode of occurrence of Native Copper at Michipicoten Island, Lake Superior.

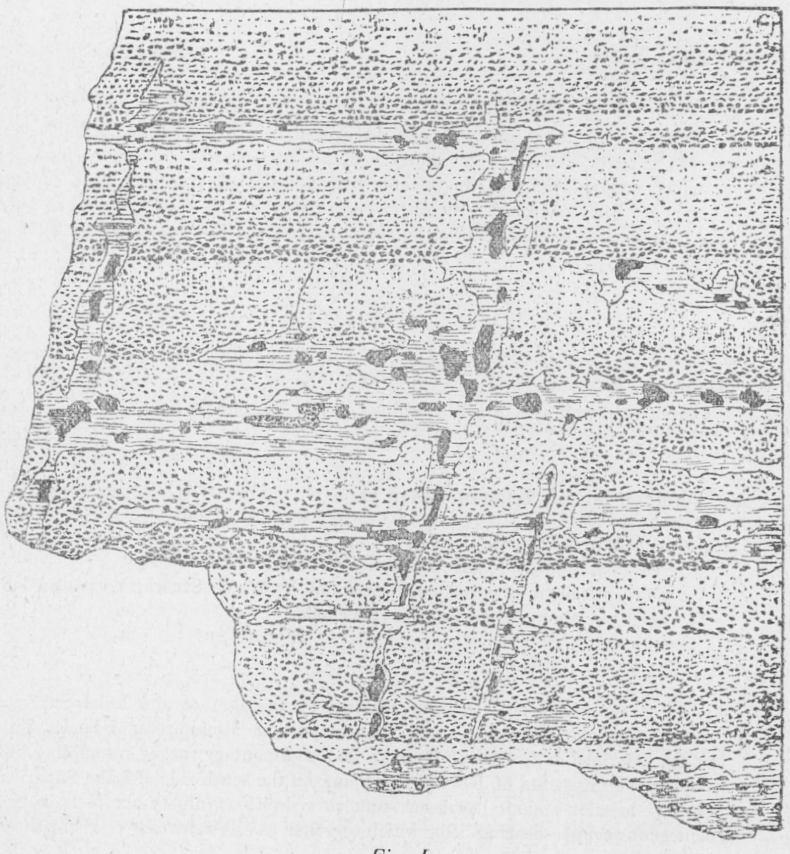

Fig. I.

Michipicoten Island, Lake Superior, O. ..... *W. J. Lavington, London, England.*

115. Native copper.

From the Quebec Mine.

Mamainse, Lake Superior, O. *Lake Superior Copper Company (Limited), London, England.*

120. Native copper.

North Shore of Lake Superior, Thunder Bay District, O. ..... *Thos. A. Keefer, Port Arthur, O.*

406. Native copper beaten out by Indians.

Margaretville, Annapolis county, N.S. ..... *John Grant, Halifax, N.S.*

144. Native copper.

This metal is met with in plates and dendritic masses, enclosed in the basaltic rocks which form the cliffs on the south shore of the Bay of Fundy. Pieces several pounds in weight have been met with. (See Report of Progress of the Geological Survey, 1882–4, p. 20L.)

Sulphides of Copper.

Near the Head of Salmon Arm, Jarvis Inlet, B.C. ..... *Howe Mining Co. (Limited), E. C. Baker, Esq., Secty., Howe Sound, B.C.*

97. Purple copper ore (Bornite).

This ore, which is not far from the sea-coast, at an elevation of about 3,000 feet, was discovered in 1865, and was worked at intervals between the years 1877–83, though rather with the view of developing the property than the actual extraction of ore for shipment. Three levels have been driven on veins which are reported to be from 2 feet 6 inches to 3 feet 6 inches in width. Assays have shown 58 per cent. of copper and 50 ounces of silver to the ton. An assay of an average specimen in the laboratory of the Geological Survey showed 40 per cent. of copper. The veins traverse granites or highly altered rocks of the Coast Range Series.

Malaspina, Mine, Texada Island, B.C. ..... *Thos. Shotbolt, Secty., Victoria, B.C.*

50. Copper pyrites.

This deposit occurs on the shore of Malaspina Strait, less than 100 yards from

the beach, and near the junction of limestone with granitic rocks. The vein is irregular in thickness. A drift has been run in about 50 yards, but operations are at present in abeyance.

Echo Lake, Lake Huron, O. ..... *Geological Survey.*

42. Yellow copper ore (Chalcopyrite).—*Huronian.*

West Canada Mines, Lake Huron, O. ..... *Geological Survey.*

19. Yellow and variegated copper ore.—*Chalcopyrite and Bornite.*

The mines of the West Canada Mining Company, although not now in operation, have been worked longer and more extensively than any other copper mines in the Dominion. They comprise three originally distinct, but adjoining properties—the Bruce, Wellington, and Huron Copper Bay. The Bruce Mines were the first which were discovered, and work was commenced in 1846. Operations were subsequently extended westward across the other locations to a total length of nearly four miles. The veins, which all run in a westerly direction, consist of a gangue of white quartz carrying copper pyrites, and cutting dark-green finely crystalline diorite. On the Bruce location, in addition to working the main veins, several parallel veins were opened, the largest of which was four feet wide. On the other two locations, however, operations were almost entirely confined to two principal veins, each of which varied in width from about four to about twenty feet. The workings on the Bruce location were for the most part less than 30 fathoms deep, while on the other two they extended a little below 60 fathoms. Some of the ore was smelted at the mines, and some of it was reduced by a wet process; the greater portion, however, was shipped to England, after having been dressed, so as to contain an average of about 20 per cent. of copper. Owing to the caving in of the most productive part of the mine, and the continual fall in the price of copper, operations were suspended in 1875.

Statistics of these mines, from their commencement in 1846 to their close in 1875, have been obtained, from which it appears that a total of 40,515 tons of 21 hundredweight of ore, precipitate, ingots, and marketable slags were produced, and sold for about $3,300,000. The mines gave employment to hundreds of men, and led to the establishment of a town, which has survived the suspension of mining operations, owing to the agricultural capabilities of the country in the vicinity.—*Huronian.*

Princes Location, Lake Superior, O. ..... *Geological Survey.*

20. Copper Glance.—*Chalcocite.*

The country rock at Princes Location is a dark argillite, which is interstratified with greenstone, and overlaid by a great thickness of that rock possessing columnar structure; the whole dips to the south-east at a low angle. These rocks are cut transversely by a vein, which, on Spar Island is twenty feet thick and on the main land from four to five feet, and runs north-west. It is composed of calcspar, heavy spar and amethystine quartz, the latter appearing in druses in the calcspar. With these are associated yellow, variegated and

vitreous sulphurets of copper in promising quantity, together with iron pyrites, blende and galena. Silver, both native and as a sulphuret, also occurs in the vein in addition to cobalt and arsenic, as well as traces of gold.—*Animikie Series, Lower Cambrian.*

Palmerston, O., west half of lot 2, range 9 ..... *Norman Clark, Mississippi Station, O.*

241. Copper pyrites.

The vein occurs in dark green hornblende rocks and mica slates, and is said to average four feet in width. The gangue consists of quartz and calcite, and holds both copper and iron pyrites.—*Archæan.*

Acton Mine, Acton, lot 32, range 3 ..... *Geological Survey.*

26. A polished slab of the copper-bearing breccia.

The ore of the Acton mine consists of yellow, variegated and vitreous sulphurets of copper, disseminated through dolomite, and in places forming the cementing matter of a calcareous breccia, which constitutes the upper part of the dolomite band, and which is accompanied by a trap dyke. When first opened in 1859, a considerable quantity of good ore was raised, but operations have been suspended for some years.—*Pre-Cambrian.*

Crown Mine, Ascot, O., lot 2, range 9 ..... *Orford Copper and Sulphur Company, Capelton, Q.*

90. Copper pyrites (Chalcopyrite).

This mine is said to be producing about 18,000 tons of ore a year, all of which has been exported to the United States. The work is now for the most part confined to a shaft 1,325 feet deep, from which a number of levels have been driven, the longest being 300 feet. The cupriferous schist is said to vary in thickness from one to forty feet.—*Pre-Cambrian.*

Albert Mine, Ascot, Q. ..... *J. H. Nichols & Co., New York, U.S.A.*

137. Copper pyrites (Chalcopyrite).

The opening known as the "Albert Shaft" is now about 600 feet deep, and intersects a vein fifteen feet wide, which has been followed for 200 feet, affording a monthly yield of 2,000 tons. The "Wheal Betsy" shaft has been sunk to a depth of 200 feet on a four-foot vein, which has been followed for forty feet, yielding an output of 150 tons a month.—*Pre-Cambrian.*

Hartford Mine, Ascot, Q. lot 3, range 9 ..... *Canadian Copper and Sulphur Company, Capelton, Q.*

139. Copper pyrites.

This mine has yielded a large quantity of ore. For some years the monthly

output was about 1,000 tons, the average yield of copper being 4½ per cent.; but operations have been suspended since May, 1884, on account of low price of copper. The ore was treated by Henderson's wet process. It is proposed to erect sulphuric acid works in connection with the works, so as to fully utilize the ore. The country rock is a light grey, fine-grained mica schist, striking north-east and south-west. The vein, which nearly coincides with the foliation, consists of granular iron pyrites mixed with more or less copper pyrites, usually running in streaks parallel to the walls. It has an average thickness, in the workings, of ten feet, the extreme variation being from four to about thirty feet. The dip, which is about south-south-east, varies from eighty degrees to forty degrees, and averages about thirty degrees. The proportion of copper is greatest towards the footwall, but the richest streaks seldom contain more than ten per cent.—*Pre-Cambrian.*

The Huntingdon Mine, Bolton, Q., lot 8, range 8 ..... } ..... *Geological Survey.*

126. Copper pyrites.

The ore of the Huntingdon mine consists chiefly of a chloritic slate and diorite, more or less impregnated with copper pyrites. Nothing has been done at this locality for several years, nor is any mining being carried on at present, but considerable quantities of ore yielding between four and five per cent. of copper were raised in 1874, and treated by the Henderson process.—*Pre-Cambrian.*

St. Francis Mine, Cleveland, lot 25, range 12 ..... } *Canadian Copper and Sulphur Company, Capelton, Q.*

138. Bornite, purple copper ore with malachite.

These ores are disseminated through a vein which is slightly oblique to the stratification of a quartzite and chloritic rock through which it cuts. The chloritic rock contains numerous nodules of orthoclase, often surrounding small centres of quartz, and giving to the rock the aspect of an amygdaloidal trap. The vein has an average thickness of three feet, and can be traced, running N.E. for ninety fathoms. Five or six small excavations, two feet deep, and a few fathoms in length have been made in the outcrop, and in these the variegated and vitreous ores are found mixed with the yellow sulphuret.—*Pre-Cambrian.*

Harvey Hill Mine, Leeds, Q., lot 18, range 15 ..... *Geological Survey.*

40. Bornite or purple copper ore, in a gangue of quartz and dolomite, from the "Fanny Eliza" lode.

40*a*. Bornite and copper pyrites, in nacreous schist.

At the Harvey Hill mine the country rock consists chiefly of finely micaceous or nacreous schists. Purple copper ore, copper glance and copper pyrites are found both in veins cutting the strata and in beds conformable with the stratification. The veins, which are irregular and lenticular in shape, have

a gangue of quartz and dolomite, with more or less calcspar and chlorite, and in places contain titanic iron ore, molybdenite and small quantities of native gold. In the beds the copper ore is distributed throughout the nacreous schist in small patches, generally of a lenticular form, as well as in irregular crystals and grains.

Mining operations have been carried on for many years, and some years ago works, subsequently destroyed by fire, were erected at the mine for the treatment of the ore by the Hunt and Douglass process. Operations have been suspended since 1879.—*Pre-Cambrian.*

Garthby, lot 22, range (north) 1 ..... *Geological Survey.*

Iron and copper pyrites.

This appears to be a large deposit of iron and copper pyrites in calcareous serpentine, and which runs N.E. and S.W., with a dip about S.E. 50 degrees. The thickness of the deposit is uncertain, but the breadth of the bands through which the sulphurets are distributed is probably not less than twenty feet. In some places iron pyrites predominate almost to the exclusion of copper pyrites, while elsewhere the rock contains as much as eight per cent. of copper. (No specimen exhibited).—*Pre-Cambrian.*

Colonial Copper Mine, Dorchester county, N.B. ..... *Colonial Copper Mining Company, Dorchester, N.B.*

3. Copper glance (chalcocite).

This copper deposit is near the contact of the millstone grit with the red marly shales of the Lower Carboniferous. The ore occurs in pockets and bunches where it has been precipitated by the action of the organic matter of fossil plants upon solutions of copper, and is often associated with small layers of coaly matter. The band of sandstone containing the ore is from six to eight feet thick, and is said to be in places so charged with the finely distributed mineral, as to contain from four to six per cent. of copper. This ore has been mined, to some extent, chiefly with a view of developing the deposit, and experiments have been made to test the possibility of concentrating it on the spot.—*Carboniferous.*

Glengary, Pictou county, N. S. ..... *John Grant, Halifax, N. S.*

143. Copper ore.—*Archæan.*

Antigonish, N. S. ..... *L. Johnstone, Stellarton, N. S.*

479. Copper pyrites (chalcopyrite).

College Lake, Antigonish, N. S. ..... *R. P. Fraser, Pictou, N. S.*

482. Copper pyrites (chalcopyrite).

Lochaber Lake, Antigonish, N. S... *James Hudson, Albion Mines, N. S.*

180. Copper pyrites (chalcopyrite).

Coxheath, Cape Breton, N. S. .. { *D. McLaughlin, Coxheath Mining Co., Sydney, Cape Breton, N. S.*

474. Copper pyrites (chalcopyrite).

„ *a.* Flux { Iron ore. Limestone.
„ *b.* Copper matte.
„ *c.* Slag.
„ *d.* Assay samples.

Mining operations of a somewhat extensive character are in progress here. In addition to copper the Coxheath lode also carries silver, an assay by C. T. Lee yielding—

Silver 35 oz. per ton, value at date	$38·50
Gold 1–5 „ „ „ „	4·13
Copper 20 1–5 per cent. per ton value	60·00
Total value	102·83

Lead, a trace. Arsenic, none.

(Report of Progress of the Geological Survey, 1882–84, p. 95 H.)

A trial of this ore on a large scale was made last October by Mr. E. D. Peters, Jr., at the Bay State Smelting and Refining Works in Boston, Mass. The ore was smelted in a 30-inch water-jacket furnace, and the coke, as well as the iron ore and limestone used for flux, were brought from Cape Breton. The ore smelted was a mixture of three grades, intended to represent about the average run of the mine. The analyses of these three grades are as follows:—

	First Grade. (Selected ore.)	Second Grade. (Coarse ore.)	Third Grade. (Low-grade screenings.)
Copper.....	13·40	5·30	3·14
Iron.....	13·62	9·84	7·18
Silica	52·70	69·80	73·60
Sulphur	18·10	11·13	8·64
Lime, Aluminia, &c.	not det.	not det.	not det.
	97·82	96·07	92·56

The charge of ore smelted weighed 13,450 lbs., and contained 5·2 per cent. of copper. A clean matte containing 37·2 per cent. of copper was obtained, one ton of coke smelting seven tons of charge. The results of the trial were considered very satisfactory, and Mr. Peters states that, taking into consideration the prices of fuel, flux and labour, smelting can be done far more cheaply at the mine than at any point in the United States, and probably cheaper than at any extensive works in America or Europe.—*Pre-Cambrian.*

ZINC.

Zinc Blende or Sulphide of Zinc.

Blende Lake, near Thunder Bay, Lake Superior, O... *Geological Survey.*

A vein about eight feet wide on the shore of Blende Lake, a small sheet of water about one mile and a half N.N.W. of the head of Thunder Bay. The vein runs east and west. The north wall consists of beds of ferruginous and siliceous clay slates belonging to the Animikie series, and the south wall of dioritic schist of Huronian age. The blende (which is dark in colour) occurs in bands two or four inches thick, transverse to the strike of the vein, in a gangue of white calcspar with some galena and iron and copper pyrites. Silver is also said to have been detected in it. A shaft has been sunk upon it to a depth of twenty-five feet. (No specimen exhibited.)—*Huronian.*

Zenith Zinc Mine, North Shore of Lake Superior, O. ..... { *Thos A. Keefer, Port Arthur, O.*

414. Blende.

The ore occurs in two parallel veins traversing massive diorite about twelve miles to the north of McKay's Harbour, on the Canadian Pacific Railway. The route to it is by a series of lakes and portages on the course of the White Sand River. The deposit is an exceedingly interesting one, and when more easily accessible may prove of considerable value. Already some 400 or 500 tons of ore have been raised, but as there is at present no available road from the mine to the lake shore, it cannot be sent to market.—*Huronian.*

Silver Lake Location, Thunder Bay, O ..... *Geological Survey.*

136. From a vein on the above location, described under galena (p. 47), and which also contains blende in considerable quantities.—*Nipigon Series.*

NICKEL.

Orford, Q, lot 5, range 13 ..... { *Orford Copper and Sulphur Co., Capelton, Que.*

Sulphuret of nickel (Millerite).

An attempt was made to work this deposit, but the result proved unsatisfactory. (No specimen exhibited).—*Pre-Cambrian.*

LEAD.

Galena or Sulphide of Lead.

Scotch Creek, Shuswap Lake, B.C. .... { *Zero Silver Mining Co.,* *B. Bailey, Victoria, B.C.*

570. Galena (argentiferous).

Specimens from different parts of this lode were assayed in the laboratory of the Geological Survey, and found to contain from 11 ounces to 47 ounces of silver to the ton.

Kootanie Lake, B.C.....*R. L. T. Galbraith, M.P.P., British Columbia.*

102. Galena (argentiferous).

In 1885, as many as forty-nine claims had been located in the vicinity of Kootanie Lake, chiefly on galena deposits. These deposits have not been examined by the Geological Survey, but assays made in the laboratory have shown as much as 15½ ounces of silver to the ton.

Kokesailah River, Cowrichan Bay, B.C... *Chas. A. Vernon, Victoria, B.C.*

104. Galena (said to be argentiferous and auriferous).

North Shore of Lake Superior, Thunder Bay District, O..... } *Thos. A. Keefer, Port Arthur, O.*

405. Galena.

Neebing, lot 25, Thunder Bay District, O. .... *Geological Survey.*

8. Galena (argentiferous)—*Animikie Series, Lower Cambrian.*

Victoria Mine, Garden River, near Sault Ste. Marie, O... *Geological Survey.*

12. Galena.

This mineral is frequently mixed with more or less blende and iron and copper pyrites. The vein three inches wide at the surface, at the depth of fifteen feet widens out to nineteen inches. Specimens from different parts of the lode assayed by Dr. B. J. Harrington gave 2·1875 to 168·4575 oz. of silver to the ton.—*Huronian.*

Enterprise Mine, Lake Superior, O. ..... *Geological Survey.*

582. Galena.

Location, "Island No. 2 in Silver Lake," O. ..... *C. W. H. Wearne, Toronto, O.*

13. Galena.

The vein on the island known as "Island No. 2" runs nearly east and west, and is described as being about six feet wide, with good walls. The gangue consists chiefly of calcspar, with some quartz and barite, but carries a fair proportion of galena accompanied by blende. Two samples of dressed ore, assayed by Prof. Chapman, gave an average of 57·53 per cent. of lead and two ounces six pennyweights of silver per ton of 2,000 lbs.—*Nipigon Series.*

Lake Temiscamangue, Upper Ottawa ..... *E. V. Wright, Ottawa, O.*

439. Galena in gangue.
„ *a.* „ concentrated ore.

A specimen of this galena, entirely freed from gangue, yielded to Dr. B. J. Harrington 18·958 ounces of silver to the ton.—*Huronian.*

Tudor, O., lot 27, range 3 ..... *Geological Survey.*

9. Galena.

Numerous veins of galena in a gangue of either calcite or barite, or of both the minerals, intersect the country rock in this as well as in the adjoining township of Lake.—*Laurentian.*

Chats Island, Fitzroy, O. ..... *A. Gunn & Co., Kingston, O., and Geological Survey.*

172. Galena.
„ *a.* „ (prills).
„ *b.* Pig lead.

The vein from which these specimens are obtained consists of a coarse crystalline calcite, holding, in addition to the galena, small quantities of pyrite and blende. The vein, which varies in width from one to six feet, has been penetrated by three shafts, the deepest of which is sixty feet. The ore, as it comes from the shaft, is broken by hand, and concentrated to about seventy per cent., in which shape it is shipped to the Frontenac Lead Mining and Smelting Company, at Kingston, Ontario.—*Laurentian.*

Limerick, O., lot 1, range 3 ..... *Geological Survey.*

583. Galena, weighing about 150 lbs.

The vein from which this specimen is taken is situated fifty-six miles north of Belleville, on Lake Ontario.—*Laurentian.*

Frontenac Lead Mine, Township of Loughborough, O... *Geological Survey.*

584. Galena in gangue of calcite.

The country rock at the Frontenac Lead Mine consists of greyish and reddish Laurentian gneiss interstratified with thick bands of crystalline limestone, all striking N.N.E. and S.S.W., and dipping to the west at a high angle. The vein cuts these at right angles, and at the surface has a slight underlie to the north; although at a depth of sixty feet in the main shaft it becomes vertical. The vein-stone consists of calcspar, generally showing a banded structure, and containing in addition to galena small quantities of blende, and iron and copper pyrites. The galena occurs in bunches, scattered throughout the whole vein, but appears to be most abundant towards the north wall. This and indeed, most of the lead-bearing veins of Ontario, are probably of the same age as those of Rossie in New York State, which cut rocks of both the Potsdam and Calciferous formations. In the Laurentian their greatest dimensions and largest content of galena seem to be attained where they traverse crystalline limestones, while in the interstratified gneisses and diorites the galena is often replaced by blende, copper pyrites, or other minerals.—*Laurentian.*

South Side of Little Whale River, N.E.T..... *Geological Survey.*

10 and 11. Galena.

This mineral is said to occur in bunches in a drusy magnesian limestone, about twenty-five feet thick. A specimen from the north side of the river assayed by Dr. Harrington contained 5·104 ounces of silver to the ton. This limestone can be traced to Richmond Gulf, at the entrance of which bunches of ore weighing 100 lbs. were observed. This ore, separated from the gangue, gave to Dr. Harrington 12·03 ounces of silver to the ton of 2,000 lbs.—*Animikie Series, Lower Cambrian.*

Guysborough county and St. Paul's Island, Cape Breton, N.S. ..... } *John Grant, Halifax, N.S.*

145. Galena (argentiferous).

Found in small quantities with copper ore in a gneissic rock on St. Paul's Island.—*Pre-Cambrian.*

Smithfield, Hants county, N.S. ..... { *D. McLaughlin, Shubenacadie, Hants county, N.S.*

471. Galena (argentiferous).

SILVER.

Native Silver and Silver Ores.

Cassiar, British Columbia ..... *Dr. J. W. Powell, Victoria, B.C.*

396. Arquerite (silver amalgam).

This mineral, as well as native copper, is found in the washings with the alluvial gold in northern British Columbia. (See also No. 37 in the Gold Collection.)

Vital Creek, British Columbia ..... *William Wilson, Victoria, B.C.*

91. Arquerite (silver amalgam), large nugget and smaller grains. Found in gravel in the bed of the creek.

Nuggets and grains of native silver or silver amalgam have been found in washing for gold in several parts of British Columbia, the largest being obtained in the Ominica gold district, on a branch of the Peace River. A nugget from this district, analysed by Messrs. Riotte & Leckhardt, of San Francisco, contained silver 83·30 per cent., mercury 11·00, lead 0·40, copper 0·20, as well as traces of gold, platinum, and iron.—*Alluvion.*

Fort Hope, British Columbia ..... *Geological Survey.*

6. Argentiferous ore from "Victoria Mine."
98. Argentiferous ore from "Eureka Mine."

The following facts concerning these ores were obtained from the Report of the Minister of Mines of British Columbia:—

About 1871, veins of silver ore were discovered in the Cascade Mountain Range at Fort Hope, which is about eighty miles from the mouth of the Fraser River, and six miles south of the town. The first vein discovered, named the "Eureka," crops out about 5,000 feet above the river level, is well defined, and from four to seven feet thick, and has been traced for 3,000 feet. A tunnel 190 feet long has been driven into this vein. The ore is described as argentiferous grey copper ore, and contains from $20 to $1,050 of silver to the ton. While this vein was being worked, another, about 300 feet distant, was discovered. This is much richer, and is called the "Van Bremer." The ore is described as chloride of silver, and the vein contains from $25 to $2,403 of silver to the ton. A quantity taken from the outcrop sold at San Francisco for $420 a ton. This vein can be traced for half a mile.

A specimen of the Hope silver ore—"a yellowish decomposed vein stone"—assayed by Dr. Harrington of the Geological Survey, gave 271·48 ounces of silver to the ton of 2,000 lbs.; it also contained lead, copper, antimony, iron, arsenic and sulphur.

A specimen from the "Eureka" mine—"a vein stone of spathic iron with

some quartz"—assayed by Dr. Hunt, gave 347·08 ounces of silver to the ton of 2,000 lbs., and contained also copper, antimony and sulphur.—*Palæozoic.*

Queen Mine, Yale, B.C. ..... *Yale Mining Co., Yale, B.C.*

639. Argentiferous ore.

135. Concentrated ore from two pans of clay matter taken from mouth of tunnel.

640. Argentiferous ore (surface).—*Palæozoic.*

Stump Lake, Nicola, B.C. ..... *W. F. McCullough, Victoria, B.C.*

558. Auriferous and argentiferous ore.

A specimen from this locality examined by Mr. Hoffmann consisted of galena, associated with tetrahedrite, small quantities of iron pyrites, copper pyrites, &c., in a gangue of quartz. It was found to contain nearly an ounce of gold, and over 100 ounces of silver to the ton.—*Palæozoic.*

Cherry Creek, B.C..... *John Merritt.*

559. Argentiferous ore.

This is an exceptionally rich ore, but some difficulty has been experienced in following the vein. No extensive mining operations have yet been undertaken. The ore appears to consist of freibergite with galena and blende. Average specimens broken from a large mass yielded 658·437 ounces of silver to the ton. —*Palæozoic.* (Report of Progress of the Geological Survey, 1877-78, p. 160B.)

Silver Islet, near Port Arthur, Thunder Bay District, O. .. .. *Thos. A. Keefer, Port Arthur, O.*

402. Argentiferous ores from the "Silver Islet Mine," in cabinet made of native wood.

This mine is of special interest, having proved by far the richest yet worked in the entire district.

Silver Islet, originally a mere rock, whose greatest diameter was seventy-five feet, and greatest height above Lake Superior about eight feet, lies at a distance of about half a mile from the north shore of the lake, and six miles east of Thunder Cape. It consists of part of a dyke of crystalline diorite, which has been traced west-south-westward through several islands to McKellar's Point, and thence inland for a number of miles. At Silver Islet it is nearly vertical, and is less than 300 feet wide, but in other parts of its course it attains a width of upwards of 500 feet, and shows bands of different characters. The dyke cuts the nearly horizontal dark argillites of the Animikie series, which, on the mainland opposite the islet, are overlaid by the conglomerates and red and white sandstones of the Nepigon series. This vein crosses this dyke nearly

at right angles, its course being N. 32° W. (Ast.), with a slight underlie to the north-east. Its average width in the mine is four or five feet, the extreme variations being six inches and twelve or fifteen feet, and it has an appearance of great persistence. The veinstone consists of white calcspar, bitter-spar, fluor-spar, and quartz, and occasionally holds masses of the wall rocks (slate and diorite). The silver occurs both native and as silver-glance, the former running in small arborescent forms into the latter. The associated minerals are plumbago, zinc-blende, iron pyrites, copper-nickel, and small quantities of cobalt and antimony ores. The vein continues across Burnt Island and on to the mainland, where several shafts have been sunk on it. Beyond the proximity of the dyke, however, it was not found to hold enough silver ore to pay for working. The vein was discovered in 1868 by Mr. John Morgan, an assistant to Mr. Thomas Macfarlane, who was making a survey of the location (Wood's), of which Silver Islet forms a part, for the Montreal Mining Company, who were then the owners of the property. Work was begun on a small scale in 1869, from which date to 1884 mining was prosecuted more or less continuously. The aggregate yield is estimated at about $3,000,000. The vein having deteriorated, work was stopped in the spring of 1884, a depth of 1,230 feet having been reached.—
Animikie Series, Lower Cambrian.

Rabbit Mountain Mine, Thunder Bay, Lake Superior, O. .... *Rabbit Mountain Mining Co., Ed. A. Wild, Sec., Port Arthur, O.*

325. Silver-glance.—*Animikie Series, Lower Cambrian.*

Rabbit Mountain Mine, Thunder Bay, Lake Superior, O. .... *Thos. A. Keefer, Port Arthur, O.*

416. Silver-glance.—*Animikie Series, Lower Cambrian.*

Rabbit Mountain Mine, Thunder Bay District, O. .... *Thos. A. Keefer, Port Arthur, O.*

531. Argentiferous ores in cabinet made from native wood.—*Animikie Series, Lower Cambrian.*

Pie Island Mine, Lake Superior, O..... *D. McKellar and R. M. Eames, Thunder Bay, O.*

18. Brecciated veinstone.

This mine is on the south-west point of Pie Island. According to Prof. Eames the vein runs N. 30° W. (Ast.), and is three feet two inches wide at the surface and four feet one inch wide at a depth of sixty feet. It is filled with angular fragments of the wall rock (a dark hard argillite) cemented together with crystalline quartz, calcite, blende and galena, and contains native silver in grains and strings. A diorite dyke accompanies the vein.—
Animikie Series, Lower Cambrian.

Singleton Mine, Port Arthur, Lake Superior, O. ..... *S. J. Dawson, Port Arthur, O.*

21. Quartz with native silver.

This name was given to a small opening on a vein of granular white quartz about one foot thick, and containing some rich bunches of native silver.—*Animikie Series, Lower Cambrian.*

Duncan (formerly Shuniah) Mine, Thunder Bay, O. ..... *Thos. A. Keefer, Port Arthur, O.*

422. Native silver and argentite.

This mine, at which work has been suspended since 1883, is situated on lot 8 of the township of McIntyre, about four miles north of the town of Prince Arthur. The vein is about thirty feet wide at the surface, and the gangue consists of white, coarsely crystalline calcspar, which, at a greater depth, becomes finer and mixed with quartz. Both silver-glance and native silver are sparingly distributed throughout the whole width of the vein. Three shafts have been sunk, and several adits and cross-cuts have been driven. In sinking the deepest shaft, 400 feet of dark argillite, with layers of dolomite and cherty quartzite, were first passed, and then another 400 feet of red syenitic gneiss, making a total depth of 800 feet. A boring was then made, by means of a diamond drill, from the bottom of the shaft for 250 feet more. The cores were all of the same red syenitic rock. The total depth reached was thus 1,050 feet. The country-rock at the mine consists of a variety of granular siliceous, cherty and dark (sometimes black) argillites, lying almost horizontally. A thick bed of crystalline diorite overlies these rocks for an area of several square miles immediately to the southward of the vein.—*Animikie Series and Huronian.*

Thunder Bay Silver Mine, Lake Superior, O..... *Geological Survey.*

23. Native silver in quartz.

The lode at this mine, which has been abandoned since 1876, consists of closely reticulated veins of white granular quartz, the largest being about one foot thick, and the aggregate averaging perhaps ten feet in width. It runs north-eastward with a slight underlie to the north-west, and cuts a series of flaggy dark drab and grey to black shales, interstratified with dolomitic beds, which are overlaid a short distance to the north-west by a massive bed or overflow of dark crystalline diorite. The vein has been traced for upwards of half a mile. The silver occurs as native silver, in the form of grains and filaments mixed with the quartz, and also as silver-glance.—*Animikie Series, Lower Cambrian.*

Beaver Silver Mine, near Port Arthur, Thunder Bay District, O..... *Thos. A. Keefer, Port Arthur, O.*

401. Cabinet containing argentiferous ores.
401*a*. ,, of native wood containing auriferous ores.
401*c*. Argentiferous ores.

Animikie Series, Lower Cambrian.

Silver Creek Mine, North Shore of Lake Superior, O. ..... } ....*Thos. A. Keefer, Port Arthur, O.*

417. Silver-glance (argentite).—*Animikie Series, Lower Cambrian.*

Silver Creek Mine, Thunder Bay District, O. ..... } .....*Thos. A. Keefer, Port Arthur, O.*

529. Argentiferous ores in cabinet made of native wood.—*Animikie Series, Lower Cambrian.*

Porcupine Silver Mine, Thunder Bay District, O. ..... } .....*Thos. A. Keefer, Port Arthur, O.*

532. Argentiferous ores in cabinet made from native wood.
418. Silver glance (argentite).
Animikie Series, Lower Cambrian.

The Crown Point Mine, North Shore of Lake Superior, O..... } .... *Thos. A. Keefer, Port Arthur, O.*

419. Silver-glance (argentite) in barite.—*Animikie Series, Lower Cambrian.*

East End Mine, Silver Mountain, Thunder Bay District, O..... } ..*Thos. A. Keefer, Port Arthur, O.*

420. Argentiferous ores.—*Animikie Series, Lower Cambrian.*

Silver Mountain Mine, Thunder Bay District, O. ..... } *Thos. A. Keefer, Port Arthur, O.*

530. Argentiferous ores in cabinet made of native wood.—*Animikie Series, Lower Cambrian.*

Spar Island Mine, Thunder Bay District, O. ..... } *Thos. A. Keefer, Port Arthur, O.*

421. Argentiferous copper-glance.—*Animikie Series, Lower Cambrian.*

Uneshenahba Mine, Thunder Bay District, O. ..... } *Thos. A. Keefer, Port Arthur, O.*

423. Argentiferous ores.—*Animikie Series, Lower Cambrian.*

Pike Lake Gold and Silver Mine, Thunder Bay District, O. ..... } *Thos. A. Keefer, Port Arthur, O.*

424. Specimens of the ores on table made of native wood.—*Animikie Series, Lower Cambrian.*

Tip Top, Highland and Kam Kam Mines, Thunder Bay District, O... } *Thos. A. Keefer, Port Arthur, O.*

533. Argentiferous and auriferous ores in cabinet made of native wood.—*Animikie Series, Lower Cambrian.*

Thunder Bay District, O. (Various Localities) ..... } *Thos. A. Keefer, Port Arthur, O.*

534. Argentiferous ores in cabinet made of native wood.—*Animikie Series, Lower Cambrian.*

Little Pic Silver Lode, Lake Superior, O. ..... } *Thos. Marks and McKellar Bros., Thunder Bay, O.*

14. "Brown ore."

Three miles west of the mouth of Little Pic River, and one mile north of the shore of Lake Superior. The vein has an average thickness of three feet and is very persistent, having been traced for a distance of five miles. At the above locality its course is N. 67½° W. (Ast.) The veinstone is principally white and reddish bitter spar, and "brown ore," with galena and blende, while the country rock is greenish-grey silicious slate. The silver occurs chiefly in the "brown ore," three assays of which yielded Mr. C. Kreissman an average of $25·95 to the ton.—*Huronian.*

Little Pic Mine, Lake Superior, O. .... *Thos. A. Keefer, Port Arthur, O.*

410. "Brown ore" from a depth of 80 feet.

GOLD.

The most important auriferous regions af Canada are situated in the provinces of British Columbia, Quebec, and Nova Scotia; the first on the Pacific coast, the last forming the extreme eastern portion of the Dominion. Gold is also found however, in some of the rivers of the North-West Territory, in the Lake of the Woods and Lake Superior region, in the district north of Lake Ontario in the province of the same name, and is reported to have been found in a few localities in New Brunswick. In British Columbia mining has been almost entirely confined to the placer deposits. In the vicinity of the Lake of the Woods and of Lake Superior gold occurs in veins associated with silver and other

ores. In the counties of Madoc and Marmora, in the province of Ontario, in auriferous mispickel. In Quebec the placer deposits of the Chaudière region and of the township of Ditton are the only ones in which much work has yet been attempted. The gold of Nova Scotia is found in quartz, the alluvial gold so far discovered being quite inconsiderable in quantity.

Native gold

391. Alluvial gold ..... *Geological Survey.*

A collection of specimens of placer gold and models of nuggets, etc., chiefly from British Columbia, but including also specimens from the Saskatchewan, and from the Chaudière district in the province of Quebec. (These specimens are, for convenience, placed together with separate numeration, which departs somewhat from the order observed in the rest of the catalogue.)

British Columbia.

Gold is very generally distributed throughout this province, but the richest gold-fields follow a region of mountains and high plateaux comprising the Purcell, Selkirk, Gold, and Cariboo ranges and their north-western continuations, lying to the south-west of the Rocky Mountain range properly so called, and parallel in direction to it.

Gold is said to have been first discovered in paying quantity within the limits of the province near Nicoamen on the Thompson River, not far from its junction with the Fraser. Miners began to flock to the province in 1858-59, or ten years after the "rush" to California in 1849. The "bars" and "benches" of the Fraser first attracted attention; but the miners were not long in working their way far up toward the head-waters of this great river. In 1860 work may be said to have fairly commenced in the Cariboo district, Ominica was developed about 1869, Kootanie in 1883, and in 1886 the rush to the Big Bend of the Columbia took place. In 1872 Cassiar was discovered, and work began on an extensive scale in the following year, while 1885 has been marked by the development of the Granite Creek region. Of all these districts that of Cariboo has proved the richest, and has been most continuously productive.

The total yield of gold of the province of British Columbia to the end of the past year (1885) may be estimated at $49,342,500, of which Cariboo has probably yielded nearly $30,000,000.

The approximate gold product by years, as well as the number of miners employed and their average earnings, is given in the annexed table. As no official record has been maintained of the gold exported, the figures are not exact. They are based on the amounts actually shipped by the banks and express companies, these being in each case (to 1877) increased by one-third to represent unreported gold carried away in private hands. From 1877 the amount so added is one-fifth.

Year.	Amount received by Banks and Private Hands.	Number of Miners employed.	Average annual earnings per man.
	$		$
1858, 6 months	520,000	3,000	173
1859	1,615,072	4,000	403
1860	2,228,543	4,400	506
1861	2,666,118	4,200	634
1862	4,246,266	4,100	517
1863		4,400	482
1864	3,735,850	4,400	849
1865	3,491,205	4,294	813
1866	2,662,106	2,982	893
1867	2,480,868	3,044	814
1868	2,372,972	2,390	992
1869	1,774,978	2,369	749
1870	1,336,956	2,348	569
1871	1,799,440	2,450	734
1872	1,610,972	2,400	671
1873	1,305,749	2,300	567
1874	1,844,618	2,868	643
1875	2,474,904	2,024	1,222
1876	1,786,648	2,282	783
1877	1,608,182	1,960	820
1878	1,275,204	1,883	677
1879	1,290,058	2,124	607
1880	1,013,827	1,955	518
1881	1,046,737	1,898	551
1882	954,085	1,738	548
1883	794,252		
1884	736,165		
1885	670,783		
Total...	49,342,558		

The following notes give in a summarized form some facts concerning each of the districts mentioned above. The Fraser River and some of its main tributaries are still worked to a limited extent, though all the richer bars have long since been exhausted. Cariboo, from which the greatest quantity of gold was obtained in 1864, is still steadily worked with profitable results. In 1884, the total number of miners in this district was about 1,000. In the Kootanie district there are a number of outlying "diggings," but the richest ground has been found in a length of about two miles on Wild Horse Creek. Some creeks in the Big Bend were found very rich, but these were soon worked out or abandoned, owing to the scarcity of provisions and inaccessibility of the region. Ominica, though a very promising district and still supporting a small number of miners, is heavily handicapped by its great distance from sources of supply. Cassiar is reached by the Stickeen River, the district being drained by the feeders of the Liard, a tributary to the McKenzie. It is the most northerly of the recognised mining districts, and has yielded a large quantity of gold. Prospectors are now pushing northward from it, along the tributaries of the Yukon. The discovery of rich placers on Granite Creek, an affluent of the Tulameen or north branch of the Similkameen, in a part of the country which has been for a comparatively long time well known, is an unexpected development. A large influx of miners is expected here during the coming summer of 1886, as all accounts so far received are exceedingly favourable.

The fluctuations in yield shown by the above table, are due not only to the number of miners and the discovery of new rich deposits, but are also dependent on the character of each season; heavy freshets in the streams being disastrous to mining. Regarded as a whole, the table shows, however, a steady falling off in the gold production of the province. This is due to the more or less complete exhaustion of the richer or more readily worked creeks; while "quartz mining" can scarcely yet be said to have been initiated. Once successfully begun with proper appliances, knowledge and sufficient capital, it is believed that the gold production of the province will again show a rapid increase.

A pyramid, representing the amount of gold obtained in British Columbia during the last 25 years, is exhibited in the Canadian Court.

The specimens exhibited, illustrate the character of the gold obtained in different localities, throughout the length of the gold-bearing belt of British Columbia :—

Gold, No. 1. William's Creek (Upper), Cariboo, B.C.

Gold, No. 2. William's Creek (Lower), Cariboo, B.C.

Gold, No. 3. Davis Creek, Cariboo, B.C.

Gold, No. 4. Antler Creek, Cariboo, B.C.

Gold, No. 5. Jack of Clubs Creek, Cariboo, B.C.

Gold, No. 6. Harvey Creek, Cariboo, B.C.

Gold, No. 7. Lowhee Creek, Cariboo, B.C.

Gold, No. 8. Cunningham Creek, Cariboo, B.C.

Gold, No. 9. Keithley Creek, Cariboo, B.C.

Gold, No. 10. California Creek, Cariboo, B.C.

Gold, No. 11. Bear River, Cariboo, B.C.

Gold, No. 12. Cariboo, B.C.

Gold, No. 13. Cariboo, B.C.

Gold, No. 14. Cherry Creek, B.C.

Gold, No. 15. Mission Creek, Okanagan, B.C.

Gold, No. 16. From various creeks, Cariboo, B.C.

Gold, No. 17. Tranquille River, B.C.

Gold, No. 18. Ominica, B.C.

Gold, No. 19. (Nugget) Cassiar, B.C.

No. 26. Bogus gold. Made by Chinamen in British Columbia.

No. 27. Amalgam.

No. 29. Native platinum, Similkameen River, B.C.

No. 30. Model of gold nugget, found at Mosquito Creek, Cariboo, B.C.

No. 31. Model of gold nugget, Mosquito Creek, Cariboo, B.C.

No. 32. Model of gold nugget, Cassiar, B.C.

No. 37. Model of nugget silver amalgam (Arquerite) from Vital Creek, Ominica, B.C.

Gold No. 38. Granite Creek, Similkameen River, B.C... *Geological Survey.*

Gold value $287·25.

Gold No. 39. Keithly Creek, Cariboo, B.C..... *Geological Survey.*

Nugget of gold, value $105·84.

Gold, No. 20. Edmonton, Saskatchewan River, N.W.T.

Gold is obtained by washing the sands and gravels of the Saskatchewan and other rivers, in the North-West territory. On the Saskatchewan, it appears to be most abundant in the neighbourhood of Edmonton; and miners there are said to make about $5·00 a day. Above Rocky Mountain House it has not been found, though frequently looked for by experienced miners. Its origin, therefore, cannot be the Rocky Mountains, but is in all probability the drift, which is spread over the country for hundreds of miles, and which is derived from the great belt of crystalline archæan rocks to the north-east. These rocks are largely developed about Lake Superior and Lake Huron, and extend from the former lake in a north-westerly direction to the Arctic Ocean. The gold is always in a very finely divided state, showing that it has been transported from a great distance.—*Alluvion.*

Province of Quebec.

The occurrence of gold in the Chaudière Valley was first mentioned by Lieutenant Baddeley, R.E., in 1835, since which date repeated examinations have shown it to be distributed over much of the country lying between the Chaudière River and the boundaries of Maine and New Hampshire, and embracing the south-eastern townships of the province of Quebec. Although by washing, more or less gold may be found in nearly every stream in this area, its profitable extraction has, as yet, been confined to two localities, namely—the upper waters of the Salmon River, in the county of Compton, and along the Chaudière and its tributaries, in the county of Beauce. No attempt has yet been made to work the quartz veins, which occur in these districts, operations

being entirely confined to alluvial diggings, although from the researches of Mr. Michel and the assays of Dr. T. S. Hunt (see Report of the Geological Survey, 1866), it is evident that many of the quartz leads are sufficiently rich to be worked with profit. The occurrence of nuggets, which are sometimes quite ragged, and have angular pieces of quartz attached to them, show that rich gold streaks must occur in the vicinity, especially as these pieces are frequently picked up in close proximity to the quartz veins. The amount of gold obtained from the various mines cannot be ascertained. Work has been carried on in a desultory way for some years, on a section of the Little Ditton River, about one mile in length, and probably about $100,000 worth of gold has been taken out, though on account of the generally flat character of the country along the stream precluding the application of hydraulic sluices, the bed rock on which the heaviest gold is always found has not often been reached. The appliances also were of the rudest kind. The presence of old river-channels in the Chaudière River valley, which are many feet below the present level of the river, and which, when reached, are found to be exceedingly rich in coarse gold, will, without doubt, in the near future, make this valley one of the richest mining districts of the Dominion.

Gold No. 21. Lots 17 and 18. De Lery Concession Seignory of Vaudreuil, Beauce county, Q.

Gold No. 22. First Range N.E. of River des Plantes, Seignory of Vaudreuil county, Q.

Gold No. 23. Lot 16. Chaussegros concession, Gilbert River, Seignory of Vaudreuil, Beauce county, Q.

Gold No. 24. Ditton, Q., lot 41, range 8.

Gold No. 25. Lots 17 and 18. De Lery Concession, Seignory of Vaudreuil, Beauce county, Q.

No. 33. Model of gold nugget, tributaries of the Chaudière River, Beauce county, Q.

No. 34. Model of gold nugget, tributaries of the Chaudière River, Beauce county, Q.

No. 35. Modèl of gold nugget, tributaries of the Chaudière River, Beauce county, Q.

No. 36. Model of gold nugget, tributaries of the Chaudière River, Beauce county, Q.

Slate Creek, Parish of St. George, county of Beauce, Q. ..... } *W. A. Allen, Ottawa, O.*

505. Placer gold, value about $333. From a depth of 18½ feet in an old river channel. 165/

Lunenberg county, N.S. ..... *F. W. Christie, Bedford Station, N.S.*

490. Auriferous alluvium from "The Ovens," situated on the seashore, four miles south of the town of Lunenburg. Some gold has been obtained in this district by "cradling." More or less gold is found in all the beaches in the vicinity of "The Ovens."

Burns Mountain, Cariboo, B.C..... *Oppenheimer Bros., Victoria, B.C.*

108. Gold in quartz.

Preliminary mining operations in this vicinity have brought to light some specimens of gold-bearing quartz of exceptional richness (see number 435).

"Big Bend," Columbia River, B.C. .... *Minister of Mines, Victoria, B.C.*

266. Gold in quartz taken three feet from surface.

Homestead Claim, McCullock Creek, B.C..... } *Minister of Mines, Victoria, B.C.*

267. Gold in quartz, taken from the surface.

The extension of the Canadian Pacific Railway through the southern portion of the "Big Bend" country has made this district comparatively easy of access, and auriferous veins from which the placers worked in former years have been supplied are now beginning to be discovered.

Hixon Creek, Fraser River, above Quesnel, B.C..... } *Quesnel Quartz Mining Co., British Columbia.*

566. Auriferous quartz.

This deposit is situated about forty miles north of the town of Quesnel. The present company began to develop the mine in 1878, but work was discontinued till 1885, when it was resumed, and is now being vigorously prosecuted. Assays at the Government Assay Office at Barkerville are reported to have yielded from $28 to $274, and others by Kuhn & Lockhard, of San Francisco, $87·92 to $110·22 per ton of 2,000 lbs.

Island Mountain, Cariboo, B.C..... *S. Walker, Cariboo, B.C.*

552. Auriferous quartz from "Fox Ledge." Vein said to be two feet wide.

Island Mountain, Cariboo, B.C..... *S. Walker, Cariboo, B.C.*

553. Auriferous quartz, upper tunnel.
553*a*. ,, ,, lower ,,

Vein said to be four feet wide.

Bonanza Ledge, Cariboo, B.C. .... { *Cariboo Gold Mining Co., British Columbia.*

554. Auriferous quartz. Vein said to be 22 feet wide.

Lowhee Mountain, Cariboo, B.C. ..... *Moonlight Co., Cariboo, B.C.*

556. Auriferous quartz. Vein said to be nine feet wide.

Lowhee Creek, Cariboo, B.C. ..... *Lowhee Co., Cariboo, B.C.*

557. Auriferous quartz. Vein said to be six feet wide.

Lake of the Woods, O. ..... *Thos. A. Keefer, Port Arthur, O.*

427. Collection of specimens from various mines.

This district has lately attracted considerable attention on account of the number of auriferous quartz veins discovered in it. Energetic efforts have been made to develop these, and some specimens have yielded good results on assay. Mr. E. Coste, of the Geological Survey, states it as his opinion that several of the known lodes will average about $12 to the ton in gold. The veins occur chiefly in Huronian rocks where these are penetrated by bosses of intrusive granite.

Township of Moss, Lot H. I., Thunder Bay District, O... { *Huronian Mining Co., Thos. A. Keefer, Port Arthur, O.*

261. Auriferous and argentiferous ore.
261*a*. Two samples of concentrates.

Huronian Mine, Township of Moss, Lot H. I., Thunder Bay District, O. { *Huronian Mining Co., Thos. A. Keefer, Port Arthur, O.*

404. Auriferous and argentiferous ores in cabinet made of native wood.
404*a*. Three specimens of auriferous and argentiferous ores.

This property is situated fifty miles north-east of Savanne station, on the Canadian Pacific Railway. Operations were commenced in 1883, and the development of the mine is being energetically carried on. The average width of the vein is about five feet, and it is remarkably well defined. Several hundred tons of ore have been crushed, in milling tests, and the precious metals actually saved found to be from $10·50 to $35 per ton. Assays are reported as high as $59·71 per ton.

Tip Top Mine, Thunder Bay District, O... *Thos. A. Keefer, Port Arthur, O.*

535. Three specimens of auriferous and argentiferous iron and copper pyrites weighing respectively 164, 120, and 15 lbs.

Thunder Bay District, O. ..... *Thos. A. Keefer, Port Arthur, O.*

536. Auriferous ores, from various mines in the district, in cabinet made of native wood.

Highland Gold and Silver Mines, Thunder Bay District, O..... } *Thos. A. Keefer, Port Arthur, O.*

537. Three specimens of auriferous and argentiferous ores, weighing respectively 35, 31, and 16 lbs.

Kam Kam Mine, Thunder Bay District, O..... } *Thos. A. Keefer, Port Arthur, O.*

538. Three specimens of auriferous ores weighing respectively 116, 74, and 19 lbs.

Partridge Lake Mine, Thunder Bay District, O. ..... } *Thos. A. Keefer, Port Arthur, O.*

539. Two specimens of auriferous ores, weighing respectively 19 and 16 lbs.

Gold Lake Mine, Thunder Bay District, O. ..... } *Thos. A. Keefer, Port Arthur, O.*

540. A specimen of auriferous and argentiferous iron and copper pyrites, weighing 50 lbs.

Victoria Cape, Lake Superior, O. .. { *McKellar Bros., Fort William, Lake Superior, O.*

7. Gold-bearing quartz taken from the surface.

Victoria Cape is on the west side of Jackfish Bay (opposite the Slate Islands), Lake Superior. The vein from which the specimens are taken is from 1½ to 3½ feet thick, and runs N. 55° E. It is rich in iron pyrites, and also holds galena and blende. The country rock is a slaty dioritic rock, which, to the north of the cape, comes against a reddish granite. The discovery of gold in this locality was made in the summer of 1883. The vein has been uncovered for a distance of 500 feet, and shows a vertical section of sixty feet in a neighbouring cliff. An average of assays of the white and the dark parts of the veinstone gave Mr. Charles Kreissman $27·00 gold and $7·78 silver per ton. A smaller vein, a short distance south-east of the one just referred to, shows free gold, and yielded the same assayer $140·33 gold and $17·62 silver to the ton.—*Huronian.*

Marmora, O. ..... { *Canada Consolidated Gold Mining Co. (Limited), Deloro, O.*

133. Gold-bearing arsenical pyrites.
132. Schist from wall of vein.

133*a*. Ore crushed and concentrated ready for roasting.
133*b*. Ore crushed and concentrated, roasted.
133*c*. Crude arsenic.

The gold of this region is found in veins which have a quartz gangue, and contain large quantities of mispickel, and sometimes also grey copper ore and other minerals. The proportion of gold has been found to be very variable, but twenty assays of specimens from the Marmora mines, containing a large portion of mispickel, have given an average of 1·6367 ounces of gold (equal to $33·81) to the ton of 2,000 lbs. Twelve of the samples were from the Gatling Mine, and these gave an average of 1·9107 (equal to $39·47) to the ton. The mode of treating the ore at this mine is as follows:—

The ore is first broken in Blake crushers, then further pulverized in a set of Cornish rolls, after which the powdered material is passed through sizing screens. The fine powder is then placed in a revolving roaster, which treats in two operations an average of five or six tons in twenty-four hours. The coarser powder, after having been concentrated on Hartz jigs, is again crushed between steel rollers. The roasted ore is transferred to a lead-lined cylinder (chlorinator), which is kept rotating for about two hours. The gold is dissolved or chlorinated by means of chlorine gas, made from chloride of lime and sulphuric acid, and is then precipitated by hydrogen sulphide, made from paraffine and sulphur. This sulphide is collected on specially constructed pressure-filters, it is then dried, roasted in pans, and melted. The bars of gold thus produced average from 998 to 990 fine. The arsenical fumes generated during the roasting process contain 97½ per cent. of pure arsenious acid and are condensed to a powder, which near the furnace is light grey in colour, and furthest from the furnace is of a white colour. This is known and sold as crude powdered arsenic. The nearer sublimate is mixed with quartz dust and oxide of iron, and is again sublimed, and sold as "refined," "powdered white," "arsenic glass," or "lump arsenic." *Archæan.*

Marmora, O., lot 6, range 7 ..... *John Jones, Madoc, O.*

338. Mispickel (auriferous) from surface.

Marmora, O., lot 18, range 8..... *J. Stewart, Madoc, O.*

243. Meneghenite.

This mineral is said to occur in lenticular patches in a magnesian limestone, and to have assayed from $16 to $20 gold, and from $8 to $12 silver to the ton.—*Laurentian.*

Marmora, O. ..... *Geological Survey.*

4. Arsenical pyrites (arsenopyrite).—*Archæan.*

Nova Scotia.

Gold was first discovered in Nova Scotia in 1859, and in 1862 upwards of 7,000 ounces were obtained. Since that time the average annual yield for the province has been high, the total yield of gold to the end of the year 1885 being

395,180 ounces. The following table from the Report of the Department of Mines of Nova Scotia gives the annual yield of gold, as well as other statistics concerning the mining of this metal.

Year.	Total ounces of Gold extracted.	Stuff Crushed.	Yield per Ton of 2,000 lbs.	Total Days' Labour.	Average earnings per man per day and year, at 300 working days $18 per oz.	
	Oz. Dwt. Gr.	Tons.	Oz. Dwt. Gr.		A day.	A year.
1859						
1860 } 1861 }	6,000 0 0					
1862	7,275 0 0	6,473	1 2 11	156,000	$ 83	$249
1863	14,001 14 17	17,002	16 11	273,264	92	276
1864	20,022 18 13	21,434	18 16	252,720	1 42	426
1865	25,454 4 8	24,423	1 0 20	212,966	2 15	645
1866	25,204 13 2	32,161	15 2	211,796	2 14	642
1867	27,314 11 11	31,386	17 9	218,894	2 24	672
1868	20,541 6 10	32,262	12 17	241,462	1 53	459
1869	17,868 0 19	35,147	10 4	210,938	1 52	456
1870	19,866 5 5	30,829	12 21	173,680	2 05	615
1871	19,227 7 4	30,791	12 11	162,992	2 12	636
1872	13,094 17 6	17,093	15 7	112,476	2 09	627
1873	11,852 7 19	17,708	13 9	93,570	2 28	684
1874	9,140 13 9	13,844	13 5	77,246	2 12	636
1875	11,208 14 19	14,810	15 4	91,698	2 20	660
1876	12,038 13 18	15,490	15 13	111,304	1 94	582
1877	16,882 6 1	17,369	19 10	123,565	2 46	738
1878	12,577 1 22	17,990	13 23	110,422	2 05	615
1879	13,801 8 10	15,936	17 8	92,002	2 34	702
1880	13,234 0 4	14,037	18 20	103,826	2 18	654
1881	10,756 13 2	15,556	12 20	126,308	1 52	456
1882	14,107 3 20	22,081	12 18	106,884	2 37	711
1883	15,446 9 23	25,954	10 21	97,733	2 84	862
1884	16,059 18 17	25,147	12 18	118,087	2 40	720
1885	22,203 12 20	28,890	15 4	157,421	2 53	759
Total	395,180 3 15	524,813	.....	3,637,614	.....	.....

Owing to its great purity, the gold sells at about $19·50 per ounce, although officially valued at only $18·00.

The gold-bearing rocks form a broad belt along nearly the whole of the Atlantic coast of Nova Scotia proper. They consist usually of compact white-weathering, greenish-grey felsitic quartzite, sometimes approaching sandstone in character, interstratified with beds of dark pyritous slate. Several areas of coarse grey and reddish-grey granite of considerable extent occur within the gold-bearing belt of rocks. The gold is found in isolated districts of limited size, about twenty of which are known. It generally occurs in thin interlaminated veins of hyaline quartz, accompanying the slaty bands. The outcrops of the veins in each district appear to be arranged in concentric lines, approaching ellipses in form, and due to domes along anticlinal axes. Occasionally a small productive vein is found cutting the quartzite (locally called "whin") at an angle to the bedding. Sometimes the interlaminated veins are quite large, but in those cases they seldom contain much gold. The richer veins are usually less than two feet thick, oftener only a few inches), but occasionally several of these lie near enough to each other to be worked together, and frequently the slate between them also carries gold. The same vein is generally found to vary much in richness in different parts, as if the gold ran in "streaks" or "shoots"

and branches. As a general rule, the greater part of the gold contained in the veins occurs as visible grains and nuggets, the latter frequently weighing as much as five ounces. Of late new areas, some of which promise well, and have already produced a large amount of gold, have been opened up at Rawdon, Hants county, and in Queen and Lunenburg counties, as well as to the east of Halifax.

Salmon River, N.S. .... { *Dufferin Mining Co., Salmon River, East Halifax, N.S.*

121. Auriferous quartz.—*Lower Cambrian.*

Montague, N.S. .. { *Albion Gold Mining Co., Montague, Halifax county, N.S.*

476. Auriferous quartz.—*Lower Cambrian.*

Caledonia, Queen's Co., N.S. { *McGuire & McLaren, Caledonia, Queen's county, N.S.*

488. Auriferous quartz.—*Lower Cambrian.*

Nova Scotia ..... *Government of Nova Scotia.*

426. Collection of specimens of auriferous quartz.

PLATINUM.

Native Platinum.

Granite Creek, Similkameen River, B.C..... *T. Elwyn, Victoria, B.C.*

436. Platinum from gold washings.

More or less platinum has been found with alluvial gold in several of the streams of British Columbia, but especially in the river from which this specimen comes. It occurs in grains corresponding in size to those of the associated gold. Where first observed on the south Similkameen the particles were fine, but with the coarser gold lately found in the Granite Creek region heavier fillets of platinum occur. Grains of iridosmine occur with the platinum.

ANTIMONY.

Sulphide and Oxysulphide of Antimony (Stibnite and Kermesite), &c.

South Ham, Q., lot 28, range 1 .... *Dr. James Reed, Robertson Station, Q.*

503. Native antimony, sulphide of antimony (stibnite), red antimony (kermesite) and valentinite.

This deposit, which occurs in the magnesian rocks of the Eastern Townships (province of Quebec), was discovered in 1863. It contains native antimony, antimony glance, and small quantities of senarmontite, valentinite, and the red oxysulphide (kermesite). At the surface the vein was from six to sixteen inches thick, the gangue consisting of quartz and a little dolomite. (See Report of Progress of the Geological Survey, 1880–2, p. 366.)—*Pre-Cambrian.*

Prince William, York county, N.B. { *Lake George Mining Co., Prince William, N.B.*

551. Stibnite, &c.

Parish of Prince William, York county, N.B. ..... *Geological Survey.*

16. Stibnite.

Stibnite or grey sulphide of antimony is here found more or less abundantly over an area of several square miles, occurring chiefly in veins of white quartz or of quartz and calc-spar, intersecting hard clay slates and sandstones. These veins vary in thickness from a few inches to six feet, the ore being irregularly distributed through the quartz in strings or little veins, sometimes attaining a thickness of from twelve to fifteen inches. A large portion of that hitherto raised has been obtained within a short distance of the surface by means of trenches dug on the course of the lodes, but several shafts have also been sunk. In connection with these, the Lake George Mining Company has erected extensive works and machinery, as well as furnaces for desulphurization and smelting. These, when in full operation, yield fifteen tons of metal about every six weeks, the charges (of 500 cwt.) yielding from 45 to 55 per cent. of regulus. The materials employed in smelting are charcoal, soda or salt-cake and resin. The value of the metal on the ground is twelve to fourteen cents per pound. Part of it is exported in cakes or ingots to the United States, and part employed at the works in the manufacture of Babbit metal (containing fifteen to twenty per cent. of antimony with lead and tin, or in the better qualities with lead, copper, and tin), valued at from twenty to fifty cents. per pound.—*Cambro-Silurian.*

Rawdon, Hants county, N.S. ..... *B. M. Davidson, Halifax, N.S.*

477. Stibnite.

In 1883 a valuable vein of grey antimony ore, having a width of from four to eighteen inches, and cutting talcose slates, was opened at this locality: There is very little impurity except a small amount of quartz and calcite. The yield per week during the past year averages about twenty tons of excellent quality. The distance from the mine to the Intercolonial Railway is about eighteen miles.—*Cambrian.*

BISMUTH.

Sulphide of Bismuth (Bismuthenite).

Tudor, O., lot 34, range 3.....*Geological Survey.*

351. Bismuthenite.

II.

MATERIALS USED IN THE PRODUCTION OF LIGHT AND HEAT.

The aggregate area of the coal-bearing formations of the Dominion of Canada is very great, the fuels of economic importance occurring not only in the rocks of the Carboniferous system, but also in the Cretaceous, the Laramie (a formation to some extent connecting the Mesozoic and Caaiozoic eras) and in strata of Miocene age.

The extent of the coal-bearing rocks in the northern and sparsely inhabited part of the Dominion is scarcely known. For that portion of the country which has been more or less thoroughly explored geologically, the subjoined table gives an approximate estimate, which though far from complete may be accepted as a probable minimum statement.

	Square Miles.
Nova Scotia and New Brunswick, Bituminous coals, *Carboniferous* (near approximation)...	18,000
North-west Territory, south of the 56th degree of latitude, area of coals and high-class lignites, *Cretaceous and Laramie* (rough approximation)	50,000
North-West Territory, Souris District, Lignites, *Laramie* (rough approximation)	15,000
Area in the Rocky Mountains, Bituminous coals and anthracite, *Cretaceous* (rough approximation) say.....	500
Nanaimo coal basin, British Columbia, Bituminous coals, *Cretaceous* (near approximation)	200
Comox coal basin, British Columbia, Bituminous coals, *Cretaceous* (rough approximation) ...	700
Queen Charlotte Island and other areas of coal-bearing rocks on coast of British Columbia, Bituminous coals and anthracite, *Cretaceous* (rough approximation) say	800
Lignite-bearing rocks in different parts of British Columbia south of the 52nd degree of latitude, *Tertiary* (*Miocene*, rough approximation)	12,000
Total coal and lignite-bearing area in the surveyed and partially surveyed portion of the Dominion of Canada, about	97,000

The coals of Nova Scotia and New Brunswick are bituminous in character, and referable to the Carboniferous system, and it is possible that these measures may yet be found at a workable depth underlying Prince Edward Island. In the provinces of Ontario and Quebec coal is not found, although an anthracitic mineral is occasionally found in small quantities in the vicinity of Quebec, on the Island of Orleans, and elsewhere in this province, and has given rise to considerable expenditure in fruitless search for workable coal in these localities, in all of which only rocks of Lower Palæozoic age occur. In the North-West Territory the coals and lignites are of Cretaceous and Laramie age. In British Columbia the bituminous coal and anthracite of the coast region is of Cretaceous age, while both on the coast and in the interior of the province wide-spread Tertiary deposits occur, yielding lignites which in some cases approach true coals in composition.

Anthracite.

Cowgitz, Skidegate, Queen Charlotte Islands, B.C. . . *R. Austin, Victoria, B.C.*

101. Anthracite.

The deposits of anthracite on the Queen Charlotte Islands are, so far as examined, somewhat irregular in character. The locality best known is on Skidegate Channel, at the southern end of Graham Island. Here the coal has been worked in several places, and found in one instance to be as much as six feet thick. In the direction of its strike, however, it appears to thin out altogether, or to be represented by coal of very inferior quality, mixed with shale and clay iron-stone. The seams are vertical, and the associated strata are flanked to the north by escarpments of volcanic rock.

Analysis of two specimens of the anthracite by fast coking, gave (Report of the Geological Survey of Canada, 1872-73, p. 81, also Report for 1878-79):—

Hygroscopic water	1·89	1·60
Volatible combustible matter	4·77	5·02
Fixed carbon	85·76	83·09
Sulphur	0·89	1·53
Ash	6·69	8·78

A large amount of money has been spent by the Queen Charlotte Coal Mining Company in the construction of a wharf, houses, tramway, &c., and in endeavouring to work the seams, and though these efforts have not so far been attended with success, the measures here are worthy of further and more complete examination, particularly as this is the only known deposit of anthracite on the Pacific Coast. Bituminous coal has been found during the past year (1885) in the rocks of the same age some miles further north.—*Cretaceous.*

Banff Mines, N.W.T. . . . . *McLeod Stewart, Ottawa, O.*

389. Coal (anthracite).

Like the anthracite from the Queen Charlotte Islands, this fuel is of Cretaceous age, though belonging to a lower horizon, in a formation which yields a flora with some Jurassic characters (Kootanie group, see Transactions Roy. Soc.

Canada, 1885). The coal occurs on the line of the Canadian Pacific Railway, within the first range of the Rocky Mountains. The Cretaceous coal-bearing rocks here occupy a valley, which is in part that of the Bow, in part that of the Cascade River, and extends northward for a long distance. They are in the form of a synclinal fold, bounded by palæozoic limestones, and overturned to the eastward, and it is doubtless owing to the metamorphism occasioned by this great disturbance that the coal has passed into the state of anthracite. Two seams, each about four feet in thickness, are already known, and preparations are now in progress for working them on an extensive scale at an early day. In quality the fuel compares favourably with some of the best anthracites of Pennsylvania.

A recent analysis by Mr. C. Hoffmann, shows it to have the following composition :—

Hygroscopic water	1·04
Volatile combustible matter	9·15
Fixed carbon	87·18
Ash	2·63
	100·00

Bituminous Coal and Lignite.

Baynes Sound Mine, B.C. ..... *Geological Survey.*

146. Bituminous coal.

This mine is situated about forty miles north of Nanaimo, and about one and a half south-west from the shore of Baynes Sound, which forms a good harbour for shipping. In this locality there are two seams of coal. The lower varies in thickness from five feet two inches to seven feet; the lower two feet, however, containing thin seams of shale with impressions of plants. The upper seam is separated from the lower by about sixty feet of brownish-grey sandstone, and shows five feet ten inches of good coal. An analysis of a specimen from the lower seam gave Dr. Hunt by slow coking :—

Fixed carbon	64·70
Volatile combustible matter	29·55
Ash	5·75

A somewhat weathered specimen from the upper seam gave :

Fixed carbon	57·48
Volatile combustible matter	29·10
Ash	13·42

In both cases a good coke was obtained.—*Cretaceous.*

Union Mine, Comox, B.C...... *R. Dunsmuir & Sons, Victoria, B.C.*

352. Bituminous coal.

This property is situated near the last. Only exploratory work has yet been undertaken, owing to the fact that the market is fully supplied by the Nanaimo mines. The most important seam shows seven feet six inches of good coal.

The following is an analysis by Dr. Harrington :—

Hygroscopic water	1·70
Volatile combustible matter	27·17
Fixed carbon	68·27
Ash	2·86
	100·00—*Cretaceous.*

Wellington Collieries, Departure Bay, B.C. .... { *R. Dunsmuir & Sons, Victoria, B.C.*

437. Obelisk of coal, representing whole thickness of seam.
437*a*. Series of views of mines, wharves, etc.

The mines, four in number, are situated two and a half miles north-west of Nanaimo, and three miles west of Departure Bay. The deepest shaft is 365 feet, and the shallowest 210 feet deep. They are connected by a railway with the shipping wharves at Departure Bay, and extensive mining operations are carried on. The seam worked averages about nine feet in thickness. Specimens gave Mr. Hoffmann the following results :—

Proximate analysis :—

Hygroscopic water	2·75
Volatile combustible Matter	30·95
Fixed Carbon	59·72
Ash	6·58
	100·00

Ultimate analysis :—

Carbon	72·65
Hydrogen	4·89
Oxygen and Nitrogen	12·77
Sulphur	·36
Ash	6·58
Hygroscopic Water	2·75
	100·00

The coal does not form a strong coke. The output for 1884 aggregated 254,538 tons, the total number of hands employed being 672. The total output of coal from these mines in 1885 was 220,000 tons. The mines, however, are capable of producing double this amount if the demand should warrant it. Earnings of miners per day $3 to $4. The coal may be estimated as worth $4 per ton at the wharf. The greater portion is shipped to San Francisco, and some is sent to the Sandwich Islands.—*Cretaceous.*

Victoria, B.C. ..... *Victoria Gas Co., Victoria, B.C.*

514. Coal used in gas manufacture.
514*a*. Coke.

The coal used for making gas at Victoria is obtained from the Vancouver Coal Company's mines at Nanaimo, B.C.

Nanaimo Collieries, B.C. { *Vancouver Coal Mining & Land Co. (Limited), Nanaimo, B.C.*

94. Block of Coal (steam) weighing 5 tons 6 cwt. Esplanade shaft.
94*a*. Block of coal (steam), Esplanade shaft.

105. Block of coal (house), South Field mine.
106. Block of coal (gas), New Douglass mine.
555. Series of views of mines, wharves, &c.

This locality is seventy miles north-west of Victoria. The principal workings are on a seam which varies from six to ten feet in thickness. A specimen gave Dr. Hunt, by slow coking, the following results :—

Volatile matter	38·40	Coke firm.
Fixed carbon	51·45	
Ash	10·50	

Another seam, seven feet thick, occurs above the one just mentioned, from which it is separated by about 140 feet of sandstone. The colliery has been in operation for nearly thirty years. The slopes and shafts are connected with the wharves by a well-built railway. The Esplanade shaft is fitted with a hoisting engine of the most modern pattern, and of great power. The output of coal for 1884 was 133,858 tons. 541 men were employed. The miners earn $2·50 to $4 a day. The output in 1885 was 137,548 tons. The principal markets are Victoria and San Francisco, but small quantities are also shipped to Honolulu, Mazatlan, Alaska, &c.—*Cretaceous.*

Saaquash, Vancouver Island, B.C. ..... { *Saaquash Coal Mining Co., Victoria, B.C.*

288. Bituminous coal.

The seams found at this place in natural exposures near the beach are comparatively thin. Coal was worked here on a small scale by the Hudson Bay Company, before the discovery of the Nanaimo mines, but work has been suspended for many years. The measures are very regular, and are such as to warrant boring operations in search of other seams.—*Cretaceous.*

North-West Territory.—The coals and lignites of this great region are entirely of Cretaceous and Laramie age, and differ in this respect from coals of the eastern provinces and states, and of Great Britain, which occur in the Carboniferous system.

The portion of the North West Territory, which, so far as yet known, affords the most abundant and valuable deposits of mineral fuel, is that in proximity to the Bow and Belly Rivers and their tributaries, extending eastward from the base of the mountains to about the 111th meridian, and forming the southern part of the district of Alberta. This region is, however, the only one which has, up to the present time, been made the subject of careful and approximately complete observation by the Geological Survey, and it is thus quite possible that the country holding the same relation to the base of the Rocky Mountains further north may yet prove throughout equally valuable as a source of fuel.

The fuels embraced in this region vary from lignites but slightly superior in quality to those of the Souris (to be mentioned further on), to coals containing a very small percentage of water, forming a strong coke, yielding an abundance of highly illuminating hydrocarbons, and resembling in every way ordinary bituminous coals. They have been made the subject of a series of careful proximate and ultimate analyses by Mr. C. Hoffmann, the results of which will be found in the Report of Progress of the Geological Survey for 1882-84. In some of the smaller basins included within the area of the Rocky Mountains, the alteration has been carried so far as to produce anthracite (see under Banff mine). The approach of the lignite-coals of the plains toward bituminous coals is, in a general way, co-ordinate with the distance from the disturbed region of the mountains. In the district of Assiniboia no fuels, other than true lignites, are met with.

Figure II.

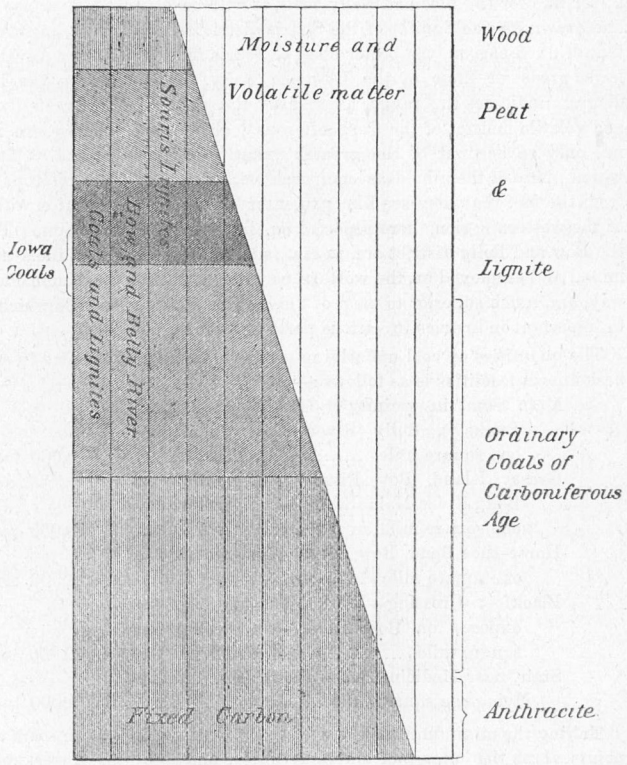

DIAGRAM ILLUSTRATING RELATIVE COMPOSITION OF COALS, LIGNITES, &C.

The annexed diagram, taken from Dr. G. M. Dawson's Report on the Geology of the Bow and Belly River Region (Report of Progress of the Geological Survey, 1880-82) has been constructed for the purpose of illustrating in a general way the place of these coals and lignites in the scale of fuels. The fuels are here classed according to the amount of "fixed carbon" (charcoal or coke) which they yield. This method of classification, though by no means complete as regards the heat-giving capacity of a fuel—as much also depends on the quantity of moisture and ash, and quantity and nature of the volatile combustible matter—yet approximates sufficiently to the truth to illustrate the heating value, in a broad general way. The shaded portion of the diagram represents the fixed carbon graduating from twenty-five per cent. (charcoal) in wood to over ninety per cent. in anthracite, the complement to 100 per cent. being in each case made up by moisture and volatile matter. The spaces between the vertical lines represent ten per cent. each. An inspection of the diagram will show how favourable a position the workable coals and lignite coals of the Bow and Belly River region hold, and how completely they bridge over the gap which is sometimes assumed to exist between coals and lignites. The fuels near which the lower line is drawn in the diagram for the Bow and Belly region are those which are found in the disturbed belt near the base of the mountains, and, as before explained, appear to have been affected to a certain extent by pressure,

and possibly by heat, developed in connection with the folding of the beds. The upper line for the Bow and Belly coals, it will be observed, overlaps the lower line drawn for the lignites of the Souris district, showing that, in regard to content of fixed carbon, the better class of Souris fuels are about equivalent to the lower grades of those of the Bow and Belly. The brace on the left of the diagram indicates the range, as regards the proportion between fixed carbon and volatile matter, of the Carboniferous coals of Iowa. These are interesting not only on account of the greater quantity of moisture and volatile matter which many of them hold as compared with ordinary Carboniferous coals, but from the fact that they are likely to enter into direct competition with the fuels of the western region, here reported on, in the Manitoba market. The coals of the Bow and Belly district are, in fact, similar to the class of fuels now largely mined and employed on the western part of the line of the Union Pacific Railway, and much superior to most of the lignites and brown coals which give rise to important industries in various parts of Europe.

The quantities of coal underlying each square mile of surface in some of the best known localities is as follows:—

Main seam, in vicinity of Lethbridge ("Coal Banks"), Belly River—Coal underlying one square mile	5,500,000 tons.
Grassy Island, Bow River—(continuation of Belly River Main Seam)—Coal underlying one square mile, over	5,000,000 tons.
Horse-shoe Bend, Bow River—Coal underlying one square mile	4,900,000 tons.
Blackfoot Crossing—Workable coal seam as exposed on Bow River—Underlying one square mile	9,000,000 tons.
Stair, near Medicine Hat—Workable coal underlying one square mile	5,000,000 tons.

Taking the minimum thickness of the "Coal Banks" main seam at different points along the outcrop of sixty-six miles, and assuming a workable width of but one mile, the coal contained in this seam alone would be 330,000,000 tons. (See Report of Progress of the Geological Survey, 1882-84.)

The Tertiary fuels of the province of British Columbia, of which no specimens are exhibited, vary from inferior lignites to coals of a bituminous character, containing over 61 per cent. of fixed carbon.

Lethbridge, District of Alberta, N.W.T. { *North Western Coal and Navigation Co., Lethbridge, N.W.T.*

510. Coal.

510*a*. Four photographs illustrating character and position of workings.

This is the only locality at which the coals or lignite-coals of the North West Territory have yet been extensively worked. A railway, 107 miles in length, connects the mine with the main line of the Canadian Pacific Railway. The seam worked, which is very uniform in character, crops out at a number of places along the banks of the Belly River, and is five feet four inches thick. It has been opened by levels driven in from the bank of the river-valley, and a slope constructed by which the coal is brought up to the terminal station of the railway on the prairie-level, nearly 300 feet above the river. The coal is an excellent fuel, but does not yield a coherent coke.

The quantity underlying each square mile in the vicinity of Lethbridge is given above. The deposit occurs at the base of the Pierre shales in the

Cretaceous system. (Report of Progress of the Geological Survey, 1882-84, p. 71 c.) The following proximate analysis by Mr. Hoffmann is by slow coking :—

Hygroscopic water	6·50
Volatile combustible matter	31·59
Fixed carbon	54·36
Ash	7·55
	100·00

An ultimate analysis yielded the following result :—

Carbon	65·30
Hydrogen	4·30
Oxygen and nitrogen	15·65
Sulphur	0·70
Ash	7·55
Hygroscopic water	6·50
	100·00— *Cretaceous.*

Saskatchewan River, N.W.T. ..... *Geological Survey.*

175. Lignite coal.

This specimen is from a great lignitic coal bed on the North Saskatchewan River, about seventy-five miles above Edmonton. The bed is seen in two places eight or ten miles apart, and has a thickness of twenty feet above low-water mark, but as the bottom is not seen, its total thickness is not known. The coal burns freely, with a resinous odour and pleasant flame, leaving a reddish-grey ash. It is dull and black, and often contains mineral charcoal; on exposure it is liable to crack and fall to pieces. An analysis of a specimen by slow coking gave :—

Hygroscopic water	10·90
Volatile combustible matter	28·69
Fixed carbon	54·96
Ash	5·45

Souris River District, Assiniboia, N.W.T. } *Pocock, Feeth & Pocock, Emerson, Man.*

509. Lignite coal.

The lignite coals found on this part of the Souris River are nearer to the province of Manitoba than any others of a workable character yet discovered. The beds are practically horizontal, and very extensive, and might in many places be worked by simple levels run in from the banks of the deep river-valleys. The most important seam observed is about seven feet thick, though the quantity of available lignite-coal underlying a square mile of surface near Short Creek is estimated by Dr. Selwyn at 7,136,864 tons (Report of Progress of the Geological Survey, 1879-80). In composition the fuels of this place resemble those of the Satz-Teplitz basin of Bohemia. The following is the result of an analysis of the seven-foot seam above referred to :—

Hygroscopic water	15·11
Fixed carbon	47·57
Volatile combustible matter	32·76
Ash	4·56
	100·00

—"Fort Union" division of the *Laramie.*

Grand Lake, Queen's county, N.B.

641. Coal.

More than a third of the province of New Brunswick is underlaid by rocks of the Carboniferous system, which present the usual variety of sandstones, conglomerates and shales, met with in other Carboniferous regions, together with numerous and characteristic fossil remains. Seams of coal have been found at various points; none of them, however, exceed twenty-six inches in thickness. But as the stratification is nearly or quite horizontal, and the seams close to the surface, they can be readily mined over very large areas. The possible occurrence of thicker seams at greater depths can only be ascertained by boring. The results already obtained by this means are unfavourable, and tend to prove that the Carboniferous strata are of inconsiderable thickness in this region. As, however, they rest on a very uneven surface of older rocks, it is possible that at some point they may attain a much greater thickness, and include workable beds of coal.

The only localities in which coal is now raised are in the vicinity of the Newcastle River and about the shores of Grand Lake in Queen's county. The seam is about two feet thick and from ten to fifteen feet from the surface. It has been mined at a great number of points over an area of one hundred square miles, indicating a total productive capacity of about 150,000,000 tons. It is a caking bituminous coal, and is employed both for household and blacksmiths' use.—*Carboniferous.*

Nova Scotia.—In this province there are three important coal basins, namely, those of Cape Breton, Pictou, and Cumberland counties. The first mentioned is situated at the north-eastern extremity of the island of Cape Breton, and occupies an area of at least 190 square miles. The Carboniferous strata are here not less than 7,000 feet thick. The Pictou area, situated in the county of the same name, is only about twenty-two square miles in extent, but several of the coal seams are of great thickness, one worked in the Albion mines showing fifty-eight feet of coal of good quality, besides a considerable additional thickness of an inferior character. The area of the Cumberland coal field is also small, but it includes, as shown in the detailed notes below, several good coal seams. The total amount of coal raised in Nova Scotia in 1885 was 1,352,205 tons.

Springhill Mines, Cumberland county, N.S. .... { *Cumberland Coal Co., Springhill, N.S.*

118. Coal (nut size).
118*a*. Block.
118*b*. Column.

The Springhill coal-field is situated in the county of Cumberland, N.S.; about twenty-two miles from Amherst, and twenty miles south-east of the Joggins shore. It may be divided into two sections, North and South Springhill. The "Black seam" is situated in the latter.

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ERRATUM.

Springhill Mines, Cumberland County, N.S.

Recent work has proved the existence of a second eleven-feet seam in this coal-field. It is intermediate in position between those marked C and D in the accompanying section, and is separated from the latter by a vertical thickness of ninety feet of strata.

Seven principal coal seams have been discovered in this section, as follows in descending order :—

	Feet	Inches.	
A.....	13	0	
B.....	6	0	
C.....	2	4	
D.....	11	0	"Black" seam.
E.....	2	6	
F.....	4	0	Shaly.
G.....	2	0	„

The average of four analyses made by the late Mr. E. Hartley gave for the coal of the "Black" seam :—

Hygroscopic water	1·02
Volatile combustible matter.....	34·38
Fixed carbon	60·82
Ash (white)	3·78

The Intercolonial Railway, which passes through this section, affords an outlet to markets at the ports of St. John and Halifax. The coal is admirably fitted for the manufacture of gas; it yields a compact coke, containing but little ash, and is well adapted for iron smelting.

The mine was first opened in 1872, and has since then produced 1,732,156 gross tons. The yield in 1884 was 232,451 tons. This company, with a capital of $800,000, has only been in operation about three years, and is rapidly developing this already extensive mine. There are four slopes, two of which are 800 feet, one 600 feet, and one 1,300 feet in length. Besides these, one level has been driven for a mile and a half, one for 2,700 feet, and a number of others for shorter distances. 840 men and boys are employed in connection with the workings.—*Carboniferous.*

Salt Springs, Cumberland county, N.S. .... *Thos. Clark, Truro, N.S.*

147. Coal.

Joggins Mines, Cumberland county, N.S. { *Joggins Coal Mining Association, Joggins Mines, N.S.*

450. Column of coal.

The output of this mine for 1884 was 25,034 tons, but changes in working and management have lately been made by which the output can be increased to 300 tons per day. The new works, which have reached a depth of 1,400 feet, are one mile and a quarter east of the wharf, and are connected with it by an endless cable, so that the empty cars are hauled back to the slope, the loaded cars descending by gravitation. The parting of shale which separates the two thin seams at this colliery decreases in thickness towards the east.—

Carboniferous.

Intercolonial Mines, Pictou county, N.S. { *Intercolonial Coal Co., Bridgeport, N.S.*

453. Coal, large.
453*a*. Coal, nut.

The Drummond Colliery, which is the only one at present in operation on this property, is situated on the Bear Creek area. It includes the extension of the Acadia seam from the Carmichael area, which seam, in a section exposed in the air pit of this colliery, gives eighteen feet seven inches of coal, with an included parting of three inches of fire-clay. An analysis of coal from the upper bench, six feet from the top of the seam and directly under the clay parting, gave, according to Mr. Gordon Broome—

Total volatile matter	33·526
Fixed carbon	55·390
Ash (grey)	10·500
Sulphur	0·584

In a trial of the coal from this bench at the gas works at Pictou, 8,500 cubic feet of gas per ton were obtained, as well as thirty-six bushels of good coke. It is also an excellent coal for steam and domestic purposes. The output for 1884 was 120,656 tons, and the number of hands employed was 371.—*Carboniferous.*

Acadia Mines, Pictou county, N.S. ..... { *Acadia Coal Co., H. S. Poole (Manager).*

113. Coal, large.
113*a*. Coal, nut.

The Acadia Coal Company owns three mining rights known as the Carmichael area, the Fraser area, and No. 3 area. Work is at present confined to the first of these, on which the Acadia Colliery is situated. Here the supposed representatives of the Main and Deep seams of the Albion Mines are found. The Acadia seam, the equivalent of the Main seam, is eighteen feet two inches thick, and is overlaid by a band of carbonaceous and oil shale eleven feet seven inches thick. The second seam is about 160 feet below the first, and where exposed in a trial pit, consists of three feet ten inches of shaly coal, and seven feet eight inches of good coal. It is not worked at present, operations being restricted to the Acadia seam. A specimen of coal from the latter gave Mr. Gordon Broome—

Hygroscopic water	2·10
Volatile combustible matter	32·27
Fixed carbon	57·57
Ash	7·56
Sulphur	0·50

The coal from this seam is more compact than that from the Albion Mines, and contains but little mineral charcoal. It does not coke readily, but is an excellent steam coal. In 1884 the production was 115,451 tons, and the number of hands employed 261.—*Carboniferous.*

Albion Mines, Pictou county, N.S. { *Halifax Co.* (*Limited*), *Albion Mines, N.S.*

451. McGregor coal in large lumps.

451*a*. Coal, nut.

451*b*. Coke.

451*c*. Coal (third seam).

451*d*. Block of coal.

This property is three square miles in extent, and is the central area within the limits of the productive coal-measures. It includes the outcrops of the two principal seams, the "Main" and the "Deep." Till within a few years the workings on this area and those on the McGregor seam constituted the principal ones in the Pictou coal field. The term "Albion Mines" embraces the following collieries:—1st, Burnt Mines; 2nd, Crushed Mines (abandoned); 3rd, Dalhousie Pit works; 4th, Forster Pit works; 5th, Ford Pit works—all on the Main seam—and the Cage Pit works on the Deep seam. A section of the Main seam at the Dalhousie Pit works gave thirty-six and three-quarter feet of coal, including five interstratified bands of ironstone with a total thickness of twenty-three inches. The quality of the coal varies, so that in some places only a part can be worked, while in others the whole thickness is mined. A section of the Deep seam, taken three-quarters of a mile from Cage Pit, where the whole thickness of the bed is worked, gives eighteen feet three inches of good coal, with a parting of pyritous coal one foot and a-half thick. The amount of coal raised from these mines in 1884 was 201,557 tons. 705 persons were employed.

The following analyses are by Professor How, of Windsor College, N.S.:—

Main Seam:	
Hygroscopic water	1·48
Volatile combustible matter	24·28
Fixed carbon	66·50
Ash	7·74
Deep Seam:	
Hygroscopic water	2·54
Volatile combustible matter	20·46
Fixed carbon	68·50
Ash	8·50

This coal cokes well, and is largely used both for house and steam purposes.—*Carboniferous.*

Vale Colliery, Pictou county, N.S. .... *Vale Coal Co., Pictou county, N.S.*

452. Coal, McBean's seam.

452*a*. "McBean's six-feet seam."

The area belonging to the Vale Coal Iron and Manufacturing Company is three miles in extent, and contains two important seams, the "McBean six-feet seam" and the "McBean eight-feet seam." The latter, which is the only one worked by the company at present, is about 800 feet below the former, the measures having an inclination of about thirty-five degrees. Operations were

begun in 1873. In 1884 there were 302 hands employed, and 73,529 tons of coal raised. An analysis of a specimen from the eight-feet seam gave :—

Hygroscopic water	2·22
Volatile combustible matter	30·23
Fixed carbon	59·70
Ash (white)	7·85

The coal is chiefly used as a steam and house coal. Like the other collieries in the Pictou fields, this one is worked by the post-and-stall system.—*Carboniferous.*

Sydney Mines, Cape Breton, N.S. { *General Mining Association, Sydney Mines, Cape Breton, N.S.*

444. Column of coal, from the Sydney main seam.

The Sydney mines are the most important in Cape Breton. From 1785 to 1827 they were worked in a very irregular manner, sometimes by the government and at others by various individuals and companies. According to Mr. Richard Brown, the production during this period was only 275,000 tons, or less than half what should have been produced from the area worked. In 1827 the mines passed into the hands of the General Mining Association of London, who hold under lease in the district more than 30,000 acres, underlaid for the most part by valuable seams of coal, which range from four to eight feet in thickness.

The Sydney main seam has been the most extensively worked in the past, and at present operations are almost entirely confined to it. It is from five and a half to six feet thick, and of good quality throughout. The following is an analysis of a specimen of the coal by Professor How, of Windsor, N.S. :—

Hygroscopic water	3·04
Volatile combustible matter	31·14
Fixed carbon	61·50
Ash (reddish-brown)	4·32

According to G. Buist, Esq., manager of the Halifax Gas Works, the yield of gas (8 candles) is 8,200 cubic feet per ton (2,240 lbs.) of coal. The coal is largely exported to the United States and the neighbouring provinces, and is used chiefly for domestic purposes. In 1884 there were 517 persons employed in connection with the mines, and the output was 149,378 tons of coal.—*Carboniferous.*

Low Point Mine, Cape Breton, N.S. { *Low Point, Barasois and Lingan Mining Co., Cape Breton, N.S.*

445. Coal.

This mine is situated about half way between Lingan and Victoria mines. Work was commenced in 1884. The seam is six feet thick, and the coal appears to be of very good quality.—*Carboniferous.*

Lingan Mine, Cape Breton, N.S. .. { *Low Point, Barasois and Lingan Mining Co., Cape Breton, N.S.*

446. Coal from the Lingan main seam.

The Lingan Colliery is situated on the north shore of Indian Bay, about twelve miles from Sydney. It was first opened in 1854, by the General Mining Association, on whose valuable area of fourteen square miles eight workable seams have been found and proved. The aggregate thickness of these is not less than forty feet of good coal. The seam worked at present is known as the Lingan main seam. It is eight feet eight inches thick, and dips N. 32° E. at an angle of from 12 to 16 degrees. At a height of five feet eight inches from the floor, a clay parting occurs, which, at its outcrop in Indian Bay, is one inch in thickness, but in the working slope, half a mile westward, increases to fifteen inches, and at a further similar distance west, forms a division of eight feet, splitting the seam in two. The land and sea areas of this tract, taking the lower seam only, should contain about 73,000,000 tons of coal. The coal is used largely in the manufacture of gas, for which purpose it is well suited; the yield of gas per ton is stated to be 9,700 cubic feet. An analysis of specimen gave—

Volatile matter	33·84
Fixed carbon	63·60
Sulphur	0·77
Ash	1·79

The output of coal for 1884 amounted to 23,404 tons. The number of persons employed was only 100.—*Carboniferous.*

Reserve Mine, Cape Breton, N.S. { *Sydney and Louisburg Coal and Railroad Co., Cape Breton, N.S.*

447. Coal.
447*a*. Coke.

This mine is on what is known as the Phelan seam, but a drift was made in 1884 to connect it with the Emery seam which lies below it, and it is expected that the new coal will be reached at 900 feet. The output for the year was 96,114 tons; the number of persons employed being 262.—
Carboniferous

International Mine, Cape Breton, N.S. { *International Coal Co., Cape Breton, N.S.*

441. Column of coal, from the Harbor seam.

The International Coal and Railway Company of New York acquired in 1863 an area of four square miles, situated about half way between Sydney Harbor and Cow Bay, the breadth of the property being not less than three miles, in the centre of the productive coal measures. It is underlaid by at least four most important seams, with an aggregate thickness of twenty-two feet of workable coal. Mining operations have been hitherto confined to the Harbor seam, which is the highest in the series, and has a thickness of from five feet six inches to six feet of good coal.

It has been proved to extend entirely across the area, having an outcrop of over two miles. It is estimated that on the property this seam contains 4,500,000 tons of coal, and about 500,000 have been extracted. For the year 1884 the output amounted to 87,216 tons, the number of persons employed being 797. The coal is of excellent quality, and is largely exported for the manufacture of gas; it is said to yield 10,000 cubic feet of sixteen candle gas; and 1,470 lbs. of coke per ton. It is also an excellent steam coal. An analysis of a specimen gave—

Volatile matter	34·09
Fixed carbon	62·92
Ash	2·99

The seam dips S. 84° E. at an angle of 5°, and the coal has a regular cleat running N. 75°—80° W. The mine is worked by means of a shaft ninety-six feet deep and a slope 550 feet long.—*Carboniferous.*

Old Bridgeport Mine, Cape Breton, N.S. { *Henry Mitchell, Old Bridgeport, Cape Breton, N.S.*

443. Coal.

This mine is on the Phelan seam. The shaft in 1884 was 120 feet deep, and was cleaned out at that date. The amount of coal raised in that year was only 3,115 tons, only 12 persons being employed.—*Carboniferous.*

Little Glace Bay Mines, Cape Breton, N.S..... { *Glace Bay Mining Co., Cape Breton, N.S.*

448. Column of Coal.

These mines are owned by a company of Halifax capitalists, who leased an area of 1,640 acres in 1861 from Mr. E. N. Archbold of Sydney. They have been worked more or less profitably, and at one time are said to have paid a dividend of 40 per cent. to the shareholders. The area is about sixteen miles from Sydney, and is most favourably situated as regards shipment of coal. It embraces the entire land outcrop of the Hub seam, and a large proportion of that of the Harbor seam (from which the column was taken), and is also underlaid, at a depth of not more than 700 feet below the last-mentioned seam, by three workable seams, and at a lower depth by two others, the thickness of which has not yet been determined. The total thickness of the Hub seam is nine feet ten inches, of which the upper portion, one foot eight inches thick, being of inferior quality, is not taken out except in the main level. The Harbor seam, which is the representative of the Sydney main seam, is five feet six inches thick. The coal from both these seams is largely used for gas purposes in Halifax and the United States, and yields nearly 10,000 cubic feet of 15 candle gas per ton. An analysis of a specimen from the Harbor seam gives—

Volatile matter	30·21
Fixed carbon	67·78
Ash	2·01

The total output of coal in 1884 amounted to 36,138 tons, giving employment to 160 men and boys.—*Carboniferous.*

Gowrie Mines, Cape Breton, N.S. { *Gowrie Coal Mining Co., Cow Bay, Cape Breton, N.S.* (*C. Archibald, Manager*).

442. Coal.
442*a*. Sample of patent fuel.

The property on which these mines are situated covers an area of two square miles, and is situated on the north side of Cow Bay, adjoining that of the Blockhouse mine. It is underlaid by several workable seams, only one of which, the McAuley, is being worked. This seam has an average thickness of five feet of good coal, with from two to six inches which is inferior, and is left to support the roof. The amount of coal yet remaining, besides that contained in the pillars, may be estimated at about 5,000,000 tons. The coal has an excellent reputation both for domestic and steam purposes, and though it has a considerable proportion of ash, it is not apt to form clinkers. An analysis by slow coking gave—

Volatile matter	30·64
Fixed carbon	63·00
Ash	3·50
Sulphur	2·86

It has been extensively used in the manufacture of gas, though the large proportion of sulphur is objectionable. The output from this mine during 1884 was 89,384 tons, the number of persons employed being 198.—*Carboniferous.*

Albertite.

Albert Mines, Albert county, N.B. ..... *Geological Survey.*

51. Albertite.

This remarkable mineral, occurring in connection with calcareo-bituminous shales or pyrochists, was first discovered by accident about the year 1850, and has been by some regarded as a true coal, by others as a variety of jet, and by others again as more nearly related to asphaltum. It resembles the latter closely in appearance, being very black, brittle and lustrous, with a broad conchoidal fracture, and like asphaltum is destitute of structure, but differs in fusibility and in its relation to various solvents. It differs from true coal in being of one quality throughout, in containing no traces of vegetable tissues, and in its mode of occurrence, which is that of a vein, and not a bed. The vein which was worked out about six years ago occupied an irregular and nearly vertical fissure, and varied from one inch to seventeen feet in thickness. It was mined to a depth of nearly 1,500 feet, gradually thinning out as it descended. The accompanying shales are in some portions abundantly filled with the remains of fossil fishes (Palæoniscus), and it is not improbable that from these, in part at least, the mineral was derived, existing perhaps at first in a fluid or semi-fluid condition (in which state it has in some instances become the cementing material of conglomerates), and subsequently becoming altered into its present form. Plant remains are almost entirely wanting in the shales.

It is estimated that the total amount of albertite raised was not far from 200,000 tons, the price of which varied at different times from $15 to $20

per ton. It was principally used for admixture with ordinary bituminous coals in the preparation of illuminating gas. For this purpose it was admirably adapted, yielding per ton 100 gallons of crude oil or 14,500 cubic feet of gas of superior illuminating power. When employed with coal it left as a residuum a valuable coke.—*Lower Carboniferous.*

Bituminous Shale.

Collingwood, O., lot 23, range 3..... *Geological Survey.*

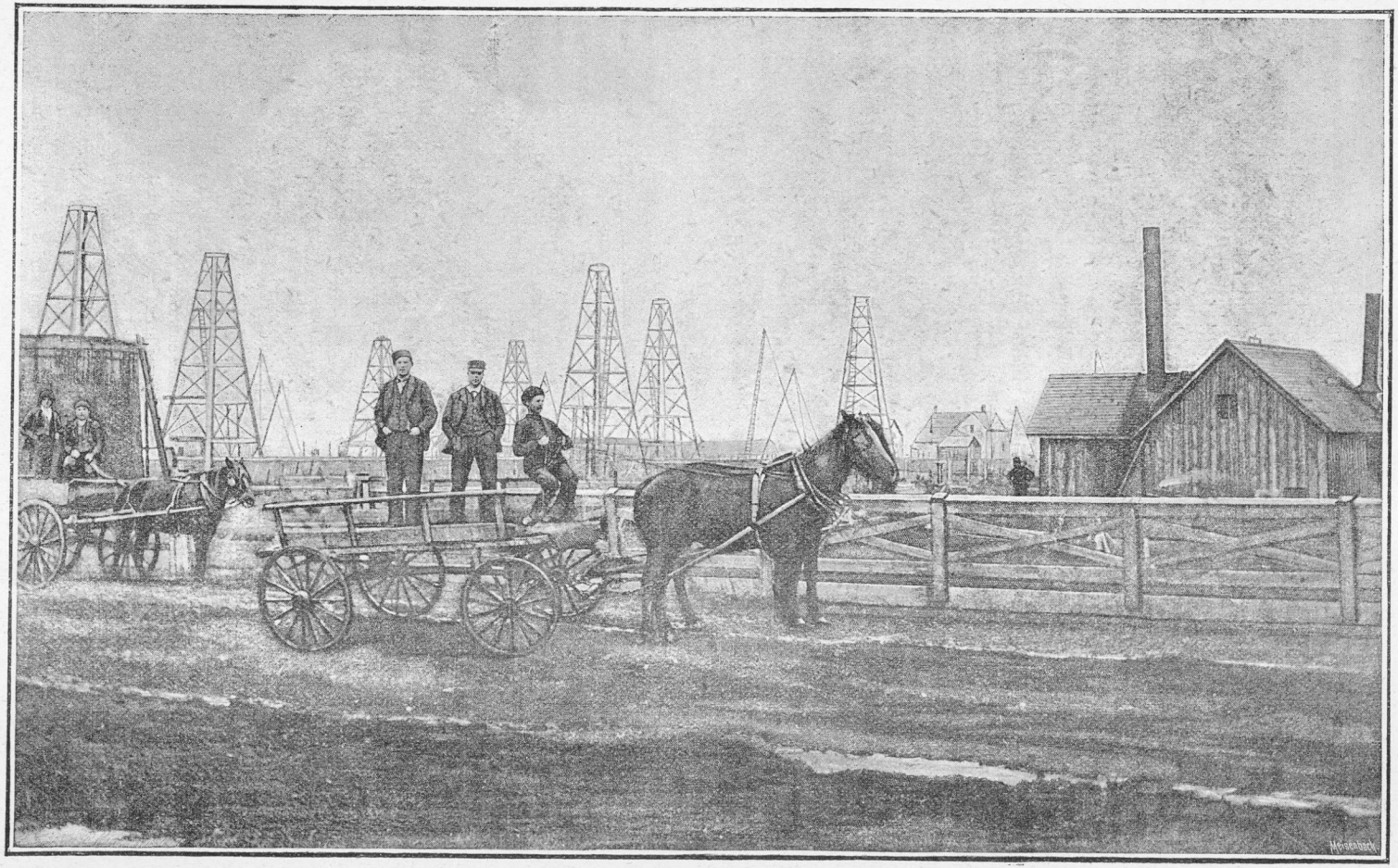
585. The shale of Collingwood, on lot 23, range 3, yields when distilled, from three to four per cent. of tarry oil, which, by the usual process of rectification, affords illuminating and lubricating oils. Works containing twenty-four retorts, and capable of producing about 250 gallons of oil daily, by the distillation of from twenty to thirty tons of shale, were erected by Messrs. Pollard and Macdonell, in October 1859. The available bed of shale is seven feet thick, and the material was delivered, broken for the retorts, at twenty cents per ton. The cost of the crude oil was said to be fourteen cents a gallon, and for a while the business was carried on successfully, a ready market being found for the oils produced; but the works were repeatedly destroyed by fire, and the petroleum from the oil wells of Enniskillen, coming into competition with the oil produced, the enterprise was finally abandoned.—*Utica Shales, Cambro-Silurian.*

Petroleum.

Petrolia, O.....*Isaac Waterman, London, O.*

Crude Petroleum and products manufactured from it by Isaac Waterman.

470. Crude petroleum.
470 *a*. Benzine.
„ *b*. Refined petroleum, 115° fire test.
„ *c*. „ „ 125° „
„ *d*. „ „ 150° „
„ *e*. „ „ 170° „
„ *f*. „ „ 300° „
„ *g*. Signal oil (for railroad use).
„ *h*. Gas „ („ gasworks).
„ *i*. Oleine „ 868° specific gravity.
„ *j*. Black lubricating oil for winter use.
„ *k*. Tanners' oil.
„ *l*. Oleine oil, 890° specific gravity.
„ *m*. Amber tiger oil (a compound oil, the principal constituent being oleine oil).
„ *n*. Lion machine oil (a compound oil).



OIL WELLS AT PETROLIA. (*From a photograph*)

470 *o*. Locomotive cylinder oil (used instead of tallow).
„ *p*. Black lubricating oil for summer use.
„ *q*. Bloomless oil (used for adulterating seal and lard oils).
„ *r*. Tiger engine oil (a compound oil).
„ *s*. Paint oil (for common work).
„ *t*. Lion Amber oil (a compound oil).
„ *u*. Bolt and screw cutting oil.
„ *v*. Dark cylinder oil, 600° fire test.
„ *w*. „ „ „ 800° „
„ *x*. Oleine oil (paraffin oil) 907° specific gravity.
„ *y*. Zone oil (a machine oil).
„ *a*2. Rope oil (used largely in the manufacture of ropes).
„ *b*2. Petroleum tar (refuse of crude oil which is distilled to get oleine oil, paraffin wax, greases, &c.)
„ *c*2. Sawmill oil.
„ *d*2. Wool oil (used for washing the wool before spinning).
„ *e*2. Fuel oil.
„ *f*2. Unpressed paraffin oil (contains the wax in the raw state).
„ *g*2. Spindle oil.
„ *h*2. 6 boxes axle grease.
„ *i*2. Railroad car grease.
„ *j*2. Yellow grease.
„ *k*2. Black grease.
„ *l*2. Soft coke from crude petroleum.
„ *m*2. Crude paraffin wax in scales.
„ *n*2. Hard crude paraffin wax in cakes.
„ *o*2. Clay from oil regions.
„ *p*2. Hard coke from petroleum tar.
„ *q*2. 40 pieces of paraffin wax of various shapes.
„ *r*2. 19 pieces of fancy paraffin wax in different forms.
„ *s*2. Paraffin flour.
„ *t*2. 50 boxes of paraffin candles of various shapes, sizes and colours.
„ *u*2. 19 drinking cups made from paraffin wax.
„ *v*2. 1 small lion and 2 ornamental pieces made from paraffin wax.
„ *w*2. Wooden models of derrick and engine house used in Petrolia, also a piece of a drilling pole such as used in drilling oil wells.
„ *x*2. 60 bottles filled with samples of all the oils manufactured from the petroleum.

The only productive oil region in Canada is that in the township of Enniskillen, in the county of Lambton, Ontario. Surface oil and "gum-beds" were known to exist in the southern part of the township of Enniskillen from the time of the first settlement of Western Ontario. In 1860, Mr. Williams of Hamilton, Ontario, first obtained petroleum by boring in the underlying rock at this locality, which was then named Oil Springs. It was soon discovered, however, that the best "oil territory" was situated a few miles further north in the same township, in the vicinity of the present town of Petrolia. All the surrounding country is very level, with a clay surface. The petroleum-bearing region is overlaid by continuous beds of sand and clay, from 40 to 100 feet in thickness. In some places these deposits rest immediately upon the limestones of the Corniferous formation, but more frequently these latter are found to be capped by rocks of the Hamilton formation, both of which belong to the Devonian system. The true source of the petroleum seems to be in the Corniferous rocks. The wells of the Enniskillen region lie along the axis of an anticlinal dome, which brings to the surface the shales of the Hamilton

formation. The petroleum is as a rule denser than that of Pennsylvania, and richer in paraffin; but there is frequently a notable difference in the density, colour and odour of petroleum derived from a single locality, that from the shallower wells being of a darker colour and thicker. The disagreeable odour of the crude material is largely removed in the process of refining, which is carried on chiefly at London, St. Thomas, and Petrolia.

The town of Petrolia, having a population of 6,000, is the principal centre of the oil trade. The production for the last four years has been about 6,000,000 barrels of crude oil per year, and about 6,000 people find employment in the oil business, some of them working at the wells and others in the refineries, cooper shops, machine shops, &c. About $2,500,000 are invested in the wells, and an equal amount in shops and such machinery as is necessary for converting the crude oil into the merchantable products. The largest well in the Canadian region at present produces 25 barrels per day, but the majority of the wells only produce one barrel daily. These small wells are generally pumped in groups of from 6 to 15, one engine being sufficient for all. The average depth of the wells in Petrolia is 490 feet, while the average distance of bed rock from the surface is 100 feet, the superficial deposits consisting of blue clay. There are at present over 2700 wells in existence, nearly all of them pumping oil. New wells are being continually sunk, the average diameter of bore being five inches. Although the wells do not produce such large quantities as some twenty years ago, the total production has materially increased, and is continually increasing, owing to the large number of new wells which are constantly being sunk.

In former years, and when petroleum commanded much higher prices than at present, it was sought for and obtained in greater or less quantities, by boring near Wequamikong, on the Grand Manitoulin Island in Lake Huron, at Tilsonburg and Bothwell, in the western peninsula of Ontario, and around Gaspe Bay in the province of Quebec. Traces of it have been found in various other parts of Ontario and Quebec, also in Cape Breton, and at Port-au-Port on the west coast of Newfoundland. The petroleum of Manitoulin Island comes from the Cambro-Silurian limestones of the Trenton formation; that of Gaspe, Tilsonburg, Bothwell, and as before mentioned, that of Enniskillen, as well as the great natural outflow of the Athabasca River, is derived from rocks belonging to the Devonian system.

Athabasca River, N.W. Territory..... *Geological Survey.*

The occurrence of petroleum or "bitumen" on the Athabasca was recorded by Sir Alexander Mackenzie in 1789, and again by Sir John Henderson in 1851. The first-named author states, on page 87 of his narrative, alluding to the Forks of Athabasca, that "At about twenty-four miles from the Forks are some bituminous fountains into which a pole 20 feet long can be inserted without the least resistance. The bitumen is in a fluid state; heated it remits a smell like that of sea coal." And Sir John Richardson says, "The whole country for many miles is so full of bitumen, that it flows readily into a pit dug a few feet below the surface."

The deposits occurring along the Athabasca have since been visited by officers of the Geological Survey, and the maltha or mineral pitch has been examined in the Survey laboratory. It appears that, while the pitch is derived from the underlying Devonian rocks, the lower sandy beds of the Cretaceous system have become saturated with this substance, which is now found exuding from them for a great distance along the Athabasca and Peace Rivers.—Report of Progress of the Geological Survey, 1882–84. (No specimens exhibited.)

Peat.

St. Hubert, Q.....*Canada Peat Fuel Company, Montreal, Q.*

Peat occurs in great abundance in many places in the Dominion, but has never been much worked, except in a few localities south of the River St. Lawrence, and not far from Montreal. The bogs which were worked for some years by the Canada Peat Fuel Company are situated at St. Hubert in Chambly county, about ten miles from Montreal, and at Ste. Brigide, about ten miles from the town of St. Johns, on the Richelieu River. The peat was extracted and prepared by Hodge's machines, of which, in 1875, there were two in use at St. Hubert and one at Ste. Brigide. The two at St. Hubert produced 8,000 tons of peat during the season, and that at Ste. Brigide 5,000 tons, or 13,000 tons in all. A small proportion of this was sold for domestic purposes, chiefly in Montreal, the balance being employed by the Grand Trunk Railway Company in their locomotives. The manufacture has been suspended, but efforts are now being again made to utilize the deposits in this vicinity. (No specimens exhibited.)

Ste. Thérèse, Q., ...*Mr. D. Morris, Ste. Thérèse de Blainville, Q.*

586. Peat.

III.

MINERALS APPLICABLE TO CERTAIN CHEMICAL MANUFACTURES, AND THEIR PRODUCTS.

Iron Pyrites.

Elizabethtown, O..... { *Brockville Chemical and Superphosphate Works, Elizabethtown, O.*

256. Cobaltiferous iron pyrites.

An important deposit of iron pyrites occurs in the Laurentian quartzites and gneisses at Elizabethtown, near Brockville, O. According to the determinations of Hunt and Macfarlane, the pyrites contains about half of one per cent. of oxide of cobalt. Small quantities of both nickel and cobalt have also been recently detected in the pyrrhotite, which is sometimes associated with the pyrites. In 1869, sulphuric acid works were erected in Brockville, about three miles from the pyrites mine. They were, however, destroyed by fire in 1871. Work was commenced at the present sulphuric acid works at Elizabethtown in 1872. The pyrites contains, on an average, about forty per cent. of sulphur, and a ton of pyrites produces nearly a ton of acid. Most of the pyrites used in these works is now imported from neighbouring deposits in the state of New York. (See Report of Progress of the Geological Survey, 1882–4, p. 10 L.)

Darling, O., lot 5, range 4. ..... *W. H. Wylie, Carleton Place, O.*

348. Iron pyrites.
348*a*. Limonite, resulting from the decomposition of the pyrites.

Knob Mine, Madoc, O., lot 18, range 2.... { *Central Ontario Railway Co., Trenton, O.*

398. Pyrrhotite (magnetic iron pyrites).

Apatite or Phosphate of Lime.

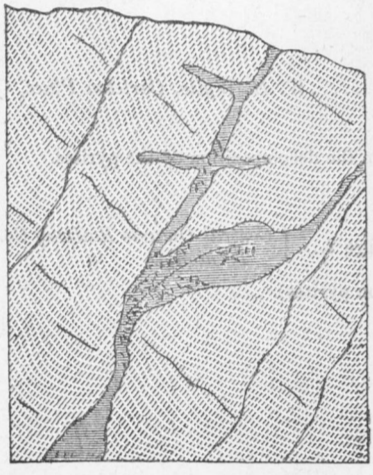
Among those mining industries of the Dominion which have of late years attained important dimensions, none have grown more rapidly or promise

better for the future than the mining of apatite or phosphate of lime. The existence of this mineral in the Laurentian rocks of Canada, and its value for the manufacture of artificial manures was pointed out by the Geological Survey many years ago, but its importance was not at first generally recognised. Gradually, however, the deposits were worked to a limited extent, and during the last ten years mining has been carried on very extensively. The following figures show the amount shipped from the port of Montreal (through which, practically, all the apatite exported passes), for the past four years :—

	Tons.	Value.
1882	16,585	$332,019
1883	19,466	$421,962
1884	23,000	$519,000
1885	23,908	

The amount shipped in 1873 was only 195 tons, the shipments of the succeeding year showing a rapid increase. The mineral, which, as above-mentioned, occurs in the Laurentian system, is generally found either in pyroxenite, crystalline limestone, or garnetiferous gneiss. The largest deposits are generally found in or associated with the pyroxenite, which is always regarded by the miners as a good indication of "phosphate." This pyroxenite varies in colour, but is usually light green, and consists of pyroxene often with but little admixture of other minerals. It seems, in Canada, to occupy to a certain extent the place of the "gefleckter gabbro" of Norway, which latter rock, however, also occurs in Canada, but apparently does not stand in the same intimate relation to the apatite deposits as it does in the former country. It is very difficult to say whether the pyroxenite is, or is not, a bedded rock. Evidences of foliation are usually very obscure. When the apatite occurs in the limestone, it is usually as crystals of various sizes, but often attaining

Figure III.



Vein of Apatite in massive Pyroxene Rock.
Templeton, Q., lot 12, range 11.

Figure IV.

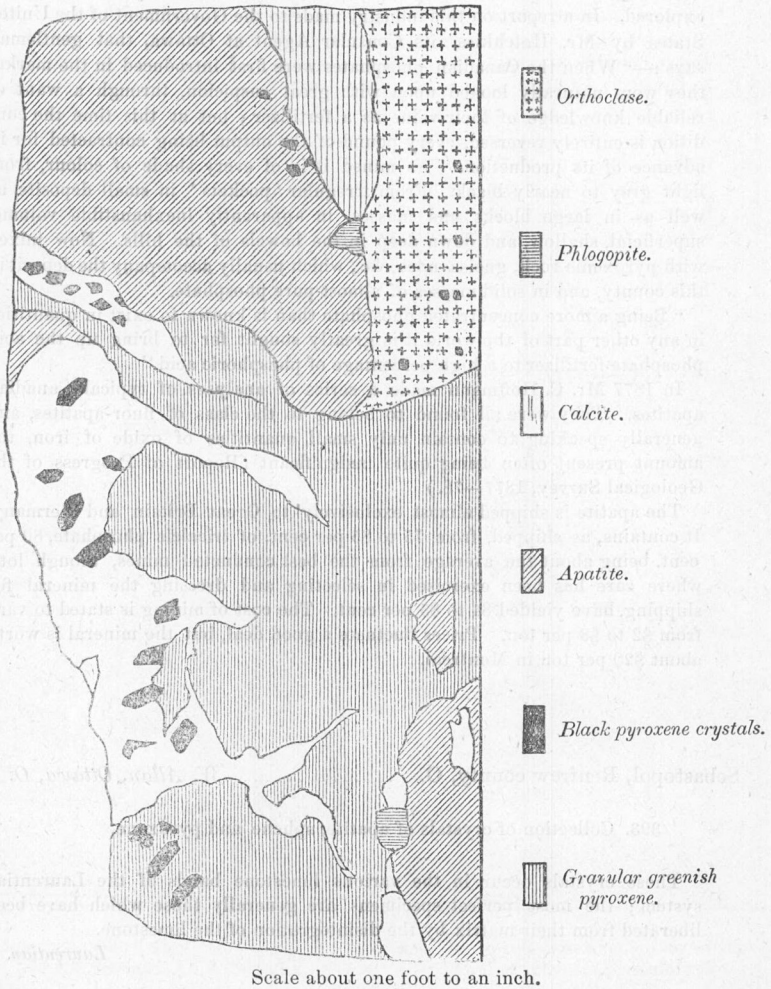
Vein showing large Apatite Crystal.
Templeton, Q., range 9, lot 17.

large dimensions. (See No. 93 and Figures 6 and 7.) As all the limestone must be separated before the apatite is ready for shipment, the cost of mining when the mineral occurs in this manner is considerable.

By far the most productive apatite district is that situated in Ottawa county, in the province of Quebec. Of the 23,908 tons exported in 1885, no less than 22,408 tons came from this county. The principal apatite mines of this district are situated in the townships of Templeton, Wakefield, Buckingham, and Portland, and the apatite is shipped to Montreal, either by the Ottawa River, or by the Canadian Pacific Railway, which passes along the front of the county. A considerable quantity of apatite has also been mined in the townships of North and South Burgess and North Elmsley, in the province of Ontario.

The apatite occurs sometimes in veins (as shown in figures 3 and 4),

Figure V.



Scale about one foot to an inch.

associated with pyroxene, scapolite, sphene, zircon and other minerals, but in other places in immense deposits of irregular shape which it is difficult to characterize as either beds or veins (see figure 5). In figure 4 the diagonal shading represents the country rock (pyroxenite), the arrow-head markings, calcite, and the white, apatite. See Dr. Harrington's Report on the Minerals of some of the Apatite-bearing veins of Ottawa county (Report of Progress of the Geological Survey, 1877—78.)

Until within the last few years the mineral was extracted by means of open workings, but recently shafts have been sunk on many of the more important deposits, and the mineral is being taken out by means of proper underground workings, which in addition to being a more economical method of mining, enables the miners to work as comfortably in winter as in summer. The quantity of apatite in the Dominion is very great, many large deposits being known which cannot at present be worked owing to their inaccessibility, but which will be opened up as means of communication are improved, and other deposits will undoubtedly be discovered as the country becomes better explored. In a report on this industry made to the Government of the United States by Mr. Hotchkiss, its Consular Agent at Ottawa, that gentleman says :—"When the Canadian phosphates were first introduced in the market they were naturally looked upon with great suspicion, through a want of reliable knowledge of their value as a fertilizer ; but at this time the condition is entirely reversed, every pound of the output being contracted for in advance of its production. As mined it is of every shade of colour, from light grey to nearly black. From irregular 'pockets' in small deposits, as well as in large blocks and masses, in apparently inexhaustible volume, superficial, shallow, and down deep in the bowels of the hills. Now mixed with pyroxenic rock, gneiss, mica, &c., which usually accompany the deposit in this county, and in solid masses of almost pure phosphate.

"Being a more concentrated phosphate than is known to exist in quantities in any other part of the world it is greatly sought for to bring up the acid phosphate fertilizer to a high percentage of phosphoric acid."

In 1877 Mr. C. Hoffmann made a series of analyses of typical Canadian apatites. They were all found to belong to the class of fluor-apatites, and generally speaking to contain only small quantities of oxide of iron, the amount present often being quite insignificant (Report of Progress of the Geological Survey, 1877—78.)

The apatite is shipped almost exclusively to Great Britain and Germany. It contains, as shipped, from 75 to 85 per cent. of tricalcic phosphate, 80 per cent. being about the average from the best conducted mines, though lots, where care has been exercised in selecting and dressing the mineral for shipping, have yielded 84 to 85 per cent. The cost of mining is stated to vary from $2 to $8 per ton. Prices fluctuate a good deal, but the mineral is worth about $20 per ton in Montreal.

Sebastopol, Renfrew county, O. ..... *W. Allan, Ottawa, O.*

393. Collection of crystals of apatite, sphene, and pyroxene.

These crystals occur in the various limestone bands of the Laurentian system ; the most perfect specimens are generally those which have been liberated from their matrix by the disintegration of the limestone.

Laurentian.

Wakefield, Q., lot 18, range 2 ..... *A. H. Taylor, Ottawa, O.*

381. Crystals of apatite.—*Laurentian.*

Wakefield, Q., lot 18, range 2 .....*Isaac Moore, Ottawa, O.*

76. Crystals of apatite.

These crystals are very abundant in the opening known as "Moore's Mine," either lining the walls of large cavities or imbedded in pink crystalline limestone. One large limestone vein which was opened a year ago contained several hundred tons of them, individual crystals ranging in weight from a few ounces to several hundred pounds, and basal sections of some of them measuring as much as eighteen inches. Several hundred tons of these crystals have been exported.—*Laurentian.*

Wakefield, Q., lot 12, range 1 .....*M. Haldane & Sons, Aylmer, Q.*

148. Apatite (phosphate of lime).

This deposit was first opened in 1878, and is said to have yielded up to the present time between two and three thousand tons of apatite. The mineral varies in texture from coarsely crystalline to finely granular, the latter being the predominating variety. It sometimes encloses crystals of scapolite, pyrite, chabazite, epidote, and natrolite.—*Laurentian.*

Templeton, Q..... { *Anglo-Canadian Phosphate Company (Limited), 3, Chapel Street, Liverpool; 28, Gracechurch Street, London, E.C.; Robert C. Adams, Managing Director, Montreal, Q.*

92. Apatite (phosphate of lime).—*Laurentian.*

Templeton, Q., lot 10, range 11..... { *McLaurin & Blackburn, East Templeton, Q.*

127. Apatite (phosphate of lime), coarsely crystalline.
128. „ „ „ finely granular.

This mine was opened in 1878, and has since been in continual operation, producing annually about 2,000 tons, the amount exported to England and Germany during these years amounting to 14,000 tons. The value of the mineral at the mines is $17 per ton. The apatite occurs as a network of veins which intersect calcareous and pyroxenic rocks. Two small veins are often seen uniting to form a single large one; at other times the veins are found to be abruptly terminated by the dislocation of the surrounding rocks. Large quantities of black mica are often found in the mine, but seldom so mixed with the apatite as to detract from the commercial value of the latter.—*Laurentian.*

Templeton, Q., lot 10, range 9 .....*J. H. Post, East Templeton, Q.*

140. Apatite (phosphate of lime).—*Laurentian.*

Buckingham, Q. .....*Lomer, Rohr & Co., Montreal, Q.*

114. Apatite (phosphate of lime).

From the Dominion Phosphate Mining and Land Company's Mine.
Laurentian.

Emerald Mine, Buckingham, Q., lot 18, range 12.....*Geological Survey.*

330. Apatite (Phosphate of lime).
330*a*. Apatite „ „ , crystals in calcite (see Fig. 7).—
Laurentian.

Emerald Mine, Buckingham, Q., lot 18, range 12..*W. A. Allan, Ottawa, O.*

93. Crystal of Apatite.

This apatite crystal, which weighs 550 lbs., and is 62½ inches in circumference, is supposed to be one of the largest ever obtained in any country. These crystals occur in a pink crystalline limestone, and in some places are very abundant. (See Fig. 6.)—*Laurentian.*

Little Rapids Mine, Portland, Q.....*W. A. Allan, Ottawa, O.*

74. Apatite (Phosphate of lime).—*Laurentian.*

High Rock Mine, Portland West, Q. .....*Geological Survey.*

300. Apatite (Phosphate of lime) with orthoclase.
300*a*. Apatite „ „ „ pyroxene (banded).—*Laurentian.*

High Rock Mine, Portland West, Q. { *Phosphate of Lime Co. (Limited). Sole Agents, Pickford & Winkfield, 148½, Fenchurch Street, London, E.C.*

116. Apatite (Phosphate of lime).—*Laurentian.*

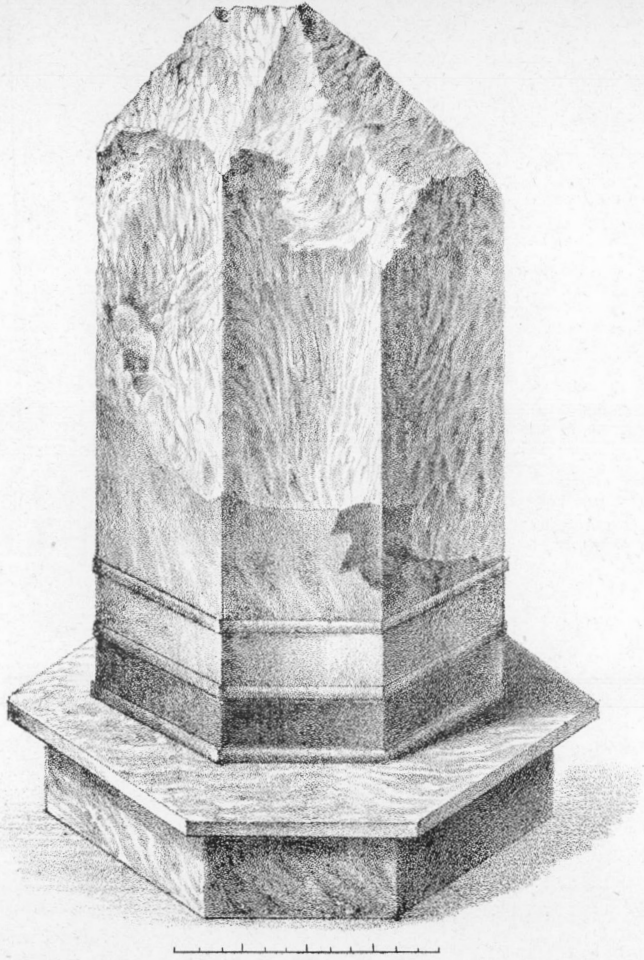
Buckingham, Q. ..... { *Union Phosphate Mining and Land Co., J. E. Smith, Buckingham, Q.*

525. Apatite (Phosphate of lime).—*Laurentian.*

Buckingham, Q. .....*Geological Survey.*

65. Apatite (Phosphate of lime). From the Union Phosphate Mining and Land Company's mine.

These specimens are from an open cut 60 feet deep, which is reported to have already yielded over 8,000 tons.—*Laurentian.*



1 foot.

Crystal of Apatite, Buckingham, Q., lot 18, range 12.

1 foot.

Crystals of Apatite imbedded in Calcite, Buckingham, Q., lot 18, range 12.

Birch Lake Mine, Storrington, O. .....*Jas. Bell, Arnprior, O.*

317. Apatite (Phosphate of lime).—*Laurentian.*

North Burgess, O. ..... *Geological Survey.*

399. Apatite (Phosphate of lime).—*Laurentian.*

Magnesite or Carbonate of Magnesia.

Magnesite forms rock masses associated with the dolomites, serpentines, and steatites of the Eastern Townships of the province of Quebec. In Bolton it occurs on the east side of the Melbourne and Potton anticlinal, in an enormous bed which resembles crystalline limestone in appearance. A specimen from lot 17, range 9, of Bolton, was found to contain, besides small quantities of chromium and nickel,—

Carbonate of magnesia	59·13
Carbonate of iron	8·32
Insoluble (nearly pure quartz).....	32.20
	99·65

In the township of Sutton magnesite occurs on the east side of the Shipton and St. Armand anticlinal. It is here often slaty in structure, and contains an admixture of felspar and green chromiferous mica. The purest specimens yield over eighty per cent. of carbonate of magnesia. In the township of Melbourne magnesitic ophiolites or rocks consisting of a mixture of serpentine and magnesite, occur. The use of magnesite for the manufacture of magnesia and magnesian salts is well known.—*Pre-Cambrian.*

Sutton, Q., lot 12, range 7 .....*Geological Survey.*

34. Magnesite.

Bolton, Q. .....*Geological Survey.*

520. Magnesite.

Celestite or Sulphate of Strontia.

Bagot, Q., lot 7, range 10 .....*Hiram Robinson, Ottawa, O.*

68. Celestite.

From a vein of about 2 feet wide, which is said to have been traced for 200 yards. No work has yet been done to develop this deposit, but it is thought to be extensive.—*Laurentian.*

Oxides of Manganese.

Markhamville, King's county, N.B. . . *Alfred Markham, Markhamville, N.B.*

110. Pyrolusite and manganite.

Deposits of oxides of manganese, consisting chiefly of pyrolusite but containing more or less manganite, are not of uncommon occurrence in the rocks of the Lower Carboniferous formation in New Brunswick, and have been mined to a greater or less extent at several points, such as Markhamville, Quaco, and Shepody Mountain. At each of these localities the mineral is met with in the limestone, lying at or near the base of the series, being distributed through the latter partly in the form of veins, but chiefly in irregular masses or "pockets," some of which are of remarkable richness.

The most important deposits which are at present being worked are those of Markhamville. These were first opened in 1863, since which time a large quantity of ore has been obtained. Owing to the mines being eleven miles from railway transport, the ore is subject to a cartage of $3.00 per ton, but is, notwithstanding, profitably worked. The price, delivered at Sussex station, on the Intercolonial Railroad, varies, according to quality, from $15.00 to $100 per ton.—*Lower Carboniferous.*

Amherst Island, Magdalen Islands, Q. ..... *Geological Survey.*

15. Manganite.

A specimen from this locality, examined in the laboratory of the Survey by Mr. F. Adams, contained 45·61 per cent. of available manganese dioxide.

Ores of manganese are known to occur at several points in the counties of Hants, King's, Cumberland, Colchester, Pictou, Antigonish, and Cape Breton, but are extensively worked only at Teny Cape, Walton, East Mountain, and Loch Lomond, where the quarries yield annually upwards of 300 tons of excellent pyrolusite, valued at $30,000. The ore is found in Lower Carboniferous rocks in the form of lenticular beds and veins, either alone or intimately mixed with limestones and iron ores.

Walton, Hants County, N.S..... *Churchill Bros., Walton, N.S.*

17. Pyrolusite.

In this locality the mineral is found in detached lumps ranging from one pound to three tons in weight. It is liberated by the disintegration of the enclosing rock, and can readily be removed with a pick and shovel. Between the months of April and June, 1883, three men took out twenty tons, valued at $100 per ton. (See Report of Progress of the Geological Survey, 1882-84, p. 21L.)—*Lower Carboniferous.*

Teny Cape Mine, Hants county, N.S. . . *J. W. Stephens, Teny Cape, N.S.*

25 and 642. Pyrolusite.

At this place several shafts have been sunk in a reddish limestone, but as

the deposits are, for the most part, pockets and irregular masses, it has been thought more expedient to make use of open workings, thus securing a large surface for operations, so that the pockets which are discovered can be more easily followed. A few years ago a pocket discovered near the surface afforded over 1000 tons of pure ore. (See Report of Progress of the Geological Survey, 1882-84, p. 22L.)—*Lower Carboniferous.*

Loch Lomond, Cape Breton, N.S. ..... *E. T. Moseley, Sidney, N.S.*

77. Pyrolusite.

This mine was opened in 1880 by Mr. Moseley, and has since then produced 1000 casks of ore (500 tons). The ore occurs in lenticular masses, sometimes arranged with the stratification and occasionally as pockets which afford many tons of high-grade ore. It is remarkably pure. An analysis by Mr. F. D. Adams gave manganic oxide 91·84, ferric oxide ·12, insoluble residue 2·91.

Onslow, Colchester county, N.S. ..... *Alex. Carter, Truro, N.S.*

122. Manganese ore.

Springville, N.S. ..... *J. Brown, Springville, N.S.*

475. Manganese ore.

Chromic Iron Ore.

Bolton, Q., lot 23, range 6 ..... *Geological Survey.*

29. Chromic iron ore.

A bed occurring in serpentine, and stated by Sir William Logan to have a thickness of from one to two feet. The ore occurs in detached masses of from 50 to 1,000 lbs. in weight.—*Pre-Cambrian.*

Wolfstown, Q., lot 24, range 3 .... *Calvin Carter, Belmina, Wolfe, Q.*

283. Chromic iron ore.—*Pre-Cambrian.*

South Ham, Q., lot 4, range 2..... ..... *Geological Survey.*

30. Chromic iron ore.

From a bed occurring in serpentine. About ten tons of the ore, yielding 45 per cent. of chromic oxide, were many years ago shipped to England, but since then the deposit has not been worked.—*Pre-Cambrian.*

Leeds, Q., lot 1, range 10.... { *Hon. J. G. Ross and Dr. J. Reed, Robertson' Station, Q.*

219. Chromic iron ore.

This deposit occurs in a band of serpentine which extends into the fifth range of Leeds. The vein is about four feet wide and is exposed for eighteen feet on its strike.—*Pre-Cambrian.*

Mount Albert, Shickshock Mts., Q..... *Geological Survey.*

28. Chromic iron ore.

This mineral is supposed to occur in certain beds of serpentine, as it is generally found in loose blocks, sometimes as much as ten inches in diameter, scattered along the strike of the rock. Where seen in place the ore was in widely separated pockets scattered through the serpentine, and unless larger deposits can be found in the vicinity it is doubtful whether the mineral can be extracted with profit. (See Report of Progress of the Geological Survey, 1882-84, p. 20F.)—*Pre-Cambrian.*

Molybdenite.

Ross, O., lot 22, range 2. ..... *Geological Survey.*

5. Molybdenite.

This mineral occurs in a gangue of quartz, and is often associated with molybdic acid, which occurs in the form of yellow crusts.—*Laurentian.*

IV.

MINERAL MANURES.

See also under Apatite or Phosphate of Lime, p. 89.

Gypsum.

Gypsum is worked in Ontario in rocks of the Onondaga formation (Silurian), and in New Brunswick and Nova Scotia is extensively developed in the Lower Carboniferous beds underlying the productive coal-measures. It is not known to occur in quantities of commercial importance in British Columbia, but in the Cretaceous formations of the great plains it occurs sparingly in the form of selenite crystals disseminated through shales and clays. On the Peace and Salt Rivers, tributaries of the Mackenzie, it is found in thick beds of Devonian age, and occurs again in rocks of the same system on rivers flowing into James' Bay.

Grand River, O. . *Grand River Plaster Co., Gypsum Mines, Haldimand, O.*

125. Gypsum.

The gypsum or "plaster" deposits of Ontario belong to the Onondaga formation, which is extensively developed in northern New York, crosses the Niagara River into Canada, and extends north-westward to Lake Huron a distance of 150 miles, again appearing at the Straits of Mackinac, between Lake Huron and Lake Michigan. It not only affords gypsum, but is also the source of valuable brine springs, and includes magnesian limestones, which in many places are suitable for the manufacture of hydraulic cement. The principal gypsum mines worked are along the Grand River between Cayuga and Paris, a distance of thirty-five miles. The mineral here occurs in lenticular masses, varying from a few yards to a quarter of a mile in horizontal diameter, and from three to seven feet thick. Dolomite is found immediately above and below the gypsum, and is sometimes interstratified in thin beds with it. The beds above are often arched, forming domes or mounds at the surface indicative of gypsum beneath.—*Onondaga formation, Silurian.*

Mount Healy, O. . . . . *Geological Survey.*

2. Gypsum

Three Brooks, Victoria, N.B..... { *John Edgar, Three Brooks, Victoria, N.B.*

513. Gypsum.

The deposits of gypsum occurring in New Brunswick are wholly confined to the Lower Carboniferous formation, and are both numerous and extensive. The largest ones known at present are those of Hillsborough in Albert county, where extensive quarries have been opened, and whence enormous quantities have been and are still being removed for calcination and exportation. The mineral is usually met with in very irregular masses, associated with red marls, sandstones and limestones, at or near the summit of the series, and varies much in character. Thus at Hillsborough, in the quarries now being worked, there is exposed a total head of rock of from 90 to 100 feet, of which about 70 feet, forming the upper portion, consists for the most part of "soft plaster" or true gypsum, which rests on beds of "hard plaster" or anhydrite of unknown thickness. At the same place considerable masses of a very beautiful snow-white gypsum or alabaster are also associated with the varieties named above, but comparatively little selenite is found; while at Petitcodiac, where the deposit has a breadth of about forty rods, and a total length of about one mile, the whole is fibrous and highly crystalline, and is traversed through its entire extent by a vein of nearly pure selenite, eight feet wide. The rock on the Tobique river, which rises in bluffs along the stream some thirty miles above its mouth, is mostly soft, granular or fibrous, and of a more decidedly reddish colour than at the localities above described.—*Lower Carboniferous.*

Hillsborough, N.B.....*Albert Manufacturing Co., Hillsborough, N.B.*

560. Gypsum.
560*a*. Large block of "alabaster."
560*b*. Prepared "plaster."

Mount Windsor, N.S. ..... *E. W. Dimock, Halifax, N.S.*

478. Gypsum.

In connection with the Lower Carboniferous limestones of Nova Scotia, there are enormous deposits of gypsum alternating with, or in some cases mixed with, anhydrite. The gypsum is known as *soft plaster*, and is classified as *white* and *blue*, the former being best adapted for calcining, while that which is of a blue or grey colour answers as well as the white for agricultural purposes. On account of its greater hardness, the anhydrite is known as *hard plaster*, and is generally regarded as a waste product of the quarries, although occasionally employed for structural purposes. To give an idea of the thickness of the deposits, it may be mentioned that there are cliffs of solid snowy white gysum from 100 to 200 feet high. Considerable quantities have been quarried for many years, most of it being shipped to the United States. The gypsum is worth about 95 cents per ton. In the year 1885, 87,644 tons were exported from Nova Scotia.

Mount Windsor, N.S. ..... *Government of Nova Scotia.*

487. Gypsum.

Wentworth, Hants county, N.S. ..... *Geological Survey.*

587. Gypsum.
587*a*. Anhydrite.

Beaver Brook, Hants county, N.S. ..... *C. Jamieson, Walton, N.S.*

379. Small column of polished gypsum.

Montague, Hants county, N.S. ..... *Geological Survey.*

588. Gypsum.

The deposit of gypsum from which these specimens were taken is supposed to be from the lowest bed in the series, in the Windsor trough. It rests on coarse grits which repose on the black slates associated with the gold-bearing rocks.—*Lower Carboniferous.*

Shubenacadie, N.S. ..... *D. McLaughlin, Shubenacadie, N.S.*

473. Gypsum.

Cape Blomidon, N.S. ..... *Geological Survey.*

385. Selenite.
385*a*. Gypsum (fibrous).

Veins of this mineral occur in the Triassic sandstone, but it is doubtful whether they are of economic importance.

Oxford, River Philip, N.S. ..... *A. J. Hill, Sydney, Cape Breton, N.S.*

589. Selenite.
589*a*. Massive gypsum.

The selenite occurs in a cliff, fifteen to twenty feet high, associated with red clay, soft red and greenish sandstones, and considerable quantities of massive gypsum. The river Philip flows at the base of the cliff and undermines it, so that large quantities of the mineral are constantly falling. Vast deposits of gypsum occur in this vicinity, and stretch eastward across the country to and beyond the Pugwash River, and westward towards Springhill. Near it are found the grey and red sandstones of the Millstone grit formation, and coarse conglomerates which also occur six miles below Oxford. Brine pools and springs also occur near the river.—*Lower Carboniferous.*

Shell Marl.

Madoc, O., lot 1, range 9 ..... *J. Stewart, Madoc, O.*

188. Shell Marl.

Deposits of marl are very common throughout eastern Ontario, and form the beds of many lakes.

North River, P.E.I. ..... *Francis Bain, North River, P.E.I.*

574. Shell Marl.

Marshfield, Queen's county, P.E.I. ..... *Hon. D. Ferguson, P.E.I.*

575. Shell Marl.

V.

MINERAL PIGMENTS.

Iron Ochres, &c.

Blandford, Q., lot 3, range 2 ..... *G. B. Hall, Quebec, Q.*

252. Crude black ochre.
252*a*. Prepared „ —*Alluvion.*

Hull, Q., lot 15, range 10 ..... *M. Scott, Old Chelsea, Q.*

194. Iron ochre, brownish-yellow.

This deposit extends over several acres, and where opened it was three feet thick.

Point du Lac, Q. ..... *Geological Survey.*

244. Iron ochre, yellowish-brown.
250. „ „ yellow.
255. „ „ burnt. } brownish-red.
258. „ „ „ }

An ochre bed, about 400 acres in extent, is situated on the St. Nicholas range of Point du Lac seigniory, on the property of Mr. Pierre Chaillon and his brother. It varies in thickness from six inches to four feet, and may have an average of about 18 inches. From the natural tints that have been mentioned, eight colours are said to have been prepared. The blackish-brown variety is scarcer than the others, and affords colours of a more valuable description. Freed from sods, without the aid of fire, it has been sold under the name of raw sienna, and is admirably adapted for graining. When calcined it assumes a brown of less intensity, and is sold as burnt sienna. As it does not turn red by burning, it is probable that there is an admixture of manganese in this ochre.—*Alluvion.*

Three Rivers, Q. ..... *John McDougall & Sons, Three Rivers, Q.*

499. Iron ochre, yellowish-brown.

This specimen is, for convenience, classed with the ochres intended to be used as pigments, although it is exhibited by the Messrs. McDougall as a material for the purification of coal gas.—*Alluvion.*

Cap de la Madelaine, Q. .... *Geological Survey.*

249. Iron ochre, greenish-brown.
246. „ „ yellowish.
245. „ „ burnt, dark brownish-red.
248. „ „ „ light „
251. „ „ „ brownish-red.

In the St. Malo range of the seigniory of Cap de la Madelaine, about two miles below the church, and two miles back from the St. Lawrence, there is a deposit of ochre extending over 600 square acres. It is interstratified with peat and underlaid by shell marl. A very great quantity of red and yellow ochres might be obtained from this locality, and where the ochre is mixed with the peat, masses of the mixture might be cut, dried, and afterwards burned. Experiments on a small scale show that the quantity of peat in the mixture is often sufficient to calcine the ochre.—*Alluvion.*

Montmorency Falls, Q. ..... *Geological Survey.*

254. Yellow ochre.
253. „ „ burnt.—*Alluvion.*

Ste. Anne de Montmorenci, Q. ..... *Geological Survey.*

247. Brownish iron ochre.
259. Brownish-black iron ochre.

This deposit of ochre is situated about a mile and a quarter above the mouth of the St. Anne River. It appears to extend over about four square acres. The locality is on the top of a bank overlooking the main road, from which it is distant about a quarter of a mile. The surface of the bed has a slope to the south-east of about 50 feet in 450. The deposit varies from four to seventeen feet in thickness. Its form gives great facilities for excavating the ochre, as by beginning on the lower side a considerable amount of it would be exposed, and the water would run from it without the necessity of cutting drains. The colours exhibited occur at the surface, but the lower, and by far the larger part, is of a pale green-colour. In this green portion the iron is in a lower state of oxidation than in the yellow, but by ignition in the air is peroxidized, and a red colour thus produced.—*Alluvion.*

Port Medway, N.S. .....*A. G. Anly, Port Medway, N.S.*

438. Iron ochre.

Pudsey's Point, N.S. ..... *Geological Survey.*

257. Iron ochre.—*Alluvion.*

New Westminster, B.C. { *L. L. Doane, represented by Griffith Bros. & Co., Webber St., Blackfriars Rd., London, S.E.*

576. Nine samples of iron, zinc and lead paints, &c.

Barite or Heavy Spar.

Jarvis Island, Lake Superior, O. ..... *Geological Survey.*

643. Barite.

Jarvis Island is situated near the north-west shore of Lake Superior, between Thunder Bay and Pigeon River. The vein from which the specimen was taken is about ten feet thick, and has been worked for silver to a depth of about 150 feet. Other veins of barite occur on the adjacent islands, the principal one being on McKellar's Island, one mile south of Pie Island. This latter vein is forty-five feet in width, one-third of it consisting of white barite in bands from two to six feet thick, running parallel to the walls of the vein, while the rest of the vein is crystalline calcite holding some silver glance and native silver.—*Animikie Series.*

North Burgess, O. ..... *Geological Survey.*

1. Barite—occurs in a vein.

Bass River, Five Islands, N.S. ..... *Geological Survey.*

577. Barite.

This deposit is situated two miles up the Bass River. Eight hundred tons of crude barite, having a market value of $10 per ton, were shipped in 1874-75, and the total amount extracted may be estimated at over 3,000 tons. A portion of this was used for the manufacture of paint by the "Dolphin Manufacturing Company," of St. Catherines, O., and the rest of it was shipped to the United States. (Report of Progress of the Geological Survey, 1882-4, page 23L.)—*Cambro-Silurian.*

Stewiacke, N.S. ..... *Henderson & Potts, Halifax, N.S.*

111. Barite.
111*a*. „ (crushed.)

Greenville, N.S. ..... *Geological Survey.*

579. Barite.

Packenham, O., lot 3, range 11 ..... *W. H. Wylie, Carleton Place, O.*

263. Barite.

Whiting.

Marlbank, Hastings county, O., lot 35, range 3 .. { *W. G. Allen & Sons, Marlbank, O.*

524. Shell marl.
524*a*. Whiting manufactured from marl.

The marl is purified by mixing with water and allowing it to settle in vats. The prepared whiting sells at $8 per ton.

VI.

SALT, BRINES, AND MINERAL WATERS.

Salt and Brine.

Warwick, O., lot 6, range 3. { *Elarton Salt Works Co., (Limited), Warwick West, Lambton, O.*

301. Fine salt.
301*a*. Coarse salt.

This brine was drawn from the well-tube on the 19th of December before it had time to settle. Salometer strength was then 99 to 100 degrees, at a temperature of 54 degrees Fah. One pan having a capacity of forty barrels of salt (280 lbs. to the barrel), is in operation, which quantity is produced every twenty-four hours. Price seventy-five cents per barrel, or $4·00 per ton. The annual product is from 6,000 to 10,000 barrels a year.

Port Franks, Bosanquet, O. . *Williams & Murray, Port Franks, Lambton, O.*

303. Coarse salt.

One pan having a capacity of hundred and fifty barrels of salt (200 lbs. to the barrel) is used, which quantity is produced daily. Work has been suspended for the present.

Seaforth, O. ..... *Gray, Young & Sparling, Seaforth, O.*

384. Table salt.
384*a*. Fine salt.
384*b*. Coarse salt.
384*c*. Brine.

An Analysis of *a* and *b* gave—

	a.	*b.*
Sodium chloride	98·46	95·8838
Calcium sulphate.....	1·29	1·3230
Magnesium chloride	0·00	0·2660
Water	0·58	2·3946
Insoluble matter	0·04	0·0010
	100·37	99·8684

This company employs four evaporating pans, each having a capacity of about 150 barrels of salt per day. Price seventy-five cents per barrel, or $3 per ton. Their annual production may be estimated at 60,000 barrels. The

surface rock in the Ontario salt region is of Corniferous age, although the brine is believed in all cases to come from the underlying Onondaga formation.—*Silurian.*

In 1865 brine was discovered at Goderich, a town situated on the shore of Lake Huron, in a township of the same name, in a boring made with the hope of obtaining petroleum. In the next three years several wells were sunk here and in the vicinity, the salt being derived from the Onondaga formation. The manufacture of salt from brines has since been carried on, and the brines are found to be not only very pure and free from deliquescent chlorides, but remarkably concentrated, and to yield an excellent quality of salt.

In 1876 Mr. Attrill bored to a depth of 1517 feet with a diamond drill, for the purpose of ascertaining the amount and character of the rock salt which had been reached in some of the wells made before that date. This boring showed the existence of no less than six beds of rock salt, as follows :—

	Thickness. ft.	in.	Distance from surface. ft.	in.
Rock Salt—1st bed	30	11	1027	11
„ 2nd „	25	4	1085	4
„ 3rd „	34	10	1127	0
„ 4th „	15	5	1223	0
„ 5th „	13	6	1243	6
„ 6th „	6	0	1385	0

These salt beds are not alike in purity. The first is scarcely suitable for mining, while the second is remarkably pure, and the third approaches it in this respect. The latter two beds, which together measure over sixty feet, are separated from each other by a layer of less than seven feet of rock, and for practical purposes may be regarded as one great workable mass.

Dr. Hunt, who analysed the salt, calculated that the yield from the best white layer, which is ten and a half feet thick, would be 880,000 bushels to the acre.

In 1873, 451,576 barrels of salt were made in the province of Ontario ; the manufacture is, however, only limited by the demand.

(See Reports of Progress of the Geological Survey, especially those of 1866-9 and 1876-7, which contain Dr. Hunt's papers, also those for 1874-5.)

Sussex, N.B. ..... *Sussex Salt Co., Sussex, King's County, N.B.*

Brine springs occur at several places in King's county. They are supposed to be derived from a series of bright red sandstones and brownish-red shales, forming one of the upper members of the Lower Carboniferous formation. Salt has been manufactured at the locality above-named since 1827, but in a very primitive manner, there being no concentration previous to boiling and great waste of heat owing to improper construction of the ovens. The quantity of salt annually produced is very variable ; under favourable circumstances however, it reaches sixty to seventy bushels per week, but might readily be increased to 300 bushels per week. Its consumption is entirely local, being chiefly used in the manufacture of butter, for which it is preferred by the farmers to any imported salt. The price at Sussex is $1·20 per bushel, or $4 per barrel of four bushels. (No specimen exhibited.)—*Lower Carboniferous.*

Ottawa, O. ..... *W. Borthwick, Ottawa, O.*

603. Mineral water.

VII.

MATERIALS APPLICABLE TO COMMON AND DECORATIVE CONSTRUCTION.

BUILDING STONES.

Limestones.

Taxada Island, B.C. ..... *Geological Survey.*

324. Six-inch cube of limestone, dressed.

At the north-western end of Texada Island, crystalline limestones are well exposed along the coast for a distance of about seven miles. They are white, dove-grey, and bluish in colour, and resemble those of Mount Mark, on Vancouver Island; some of the white, however, are of rather finer texture. *Carboniferous.*

Saanich, near Victoria, B.C. ..... *Joseph Wrigglesworth, Victoria, B.C.*

547. Limestone (white), polished fragment.

Goderich, O. ..... *John Hyslop, Goderich, O.*

580. Six-inch cube of limestone, dressed.

About thirty feet of this rock, in beds from three to six feet thick, is exposed in a cliff at Mr. Hyslop's quarry, and large blocks can be easily obtained. The stone makes good lime, but is chiefly used for building purposes. The piers of the Maitland bridge at Goderich, and the Goderich jail, are built of it.—*Corniferous formation, Devonian.*

Point Ann Quarry, Thurlow, O. ..... *Geological Survey.*

47. Six-inch cube of limestone, dressed.

Downey's Rapids, Hog Lake, O. ..... *Geological Survey.*

581. Six-inch cube of limestone, dressed.

These limestones are from an escarpment about 100 feet high, which runs

along the south shore of Hog Lake. Small quantities have been quarried and used in the construction of Wallbridge's Mills at Downey's Rapids. Window sills or stones for coping can be obtained more than ten feet in length.—*Birdseye and Black River formation, Cambro-Silurian.*

Ross, O., east half lot 25, range 4 ..... *C. Smith, Haleys, O.*

149. Six-inch cube of limestone, dressed.

This stone is used only for local purposes. It forms a small band, of which the lower beds contain a great deal of mica.—*Laurentian.*

Madoc, O., lot 1, range 8 ..... *Geological Survey.*

323. Six-inch cube of limestone, dressed.

This specimen was taken from the surface, and is therefore scarcely a fair sample of what might be obtained if a quarry were opened.—*Laurentian.*

Kingston, O..... *Grand Trunk Railway, Kingston, O.*

287. Six-inch cube of limestone, dressed.—*Trenton formation.*

Kingston, O..... *Geological Survey.*

48. Six-inch cube of limestone, dressed.

This specimen is from Mr. Kirkpatrick's quarry, and is used for building purposes, principally in the city of Kingston.

Lanark, O., lot 21, range 10 ..... *J. Hogg, Almonte, O.*

151. Six-inch cube of limestone, dressed.

This building stone is obtained from a band of Laurentian limestone, supposed to be over 1,000 feet thick. At its base this band is thinly bedded, and affords large flagstones, which are employed at Lanark for hearths and doorsteps. The beds gradually thicken, however, to about three feet, and blocks of this thickness, and any required length and breadth, can be obtained. The limestone is underlaid by hornblende rocks and diorites, and succeeded by a dolomite, containing large quantities of tremolite. Like the Arnprior limestone, which is probably an extension of the same band, it displays a banded structure, the alternate layers being white and grey. The latter owe their colour to finely disseminated graphite. Analyses show that the limestone is somewhat magnesian, and also that the grey layers are more highly magnesian than the white. It has been employed for building purposes, both in Lanark and Perth, and for culverts on the road between these places.—*Laurentian.*

Horton, O., lot 11, range 2 ..... *Geological Survey.*

152. Six-inch cube of limestone, dressed.

This quarry is called the Renfrew Granite Quarry, probably on account of the fact that the stone is supposed to resemble granite somewhat in appearance. The stone is largely used for monuments, &c., and is capable of being turned so as to show the finest relief working. The beds, which are extensive, vary from a few inches to several feet in thickness.

Ramsay, O., lot 24, range 9 ..... *John James, Almonte, O.*

153. Six-inch cube of crystalline limestone, dressed.

The quarry from which this stone was taken is situated close to the Indian River, where a great thickness of this limestone occurs. It is white, highly crystalline, and contains scales of graphite. It has been extensively quarried for burning lime, and small quantities have been employed in Pakenham and Almonte for foundations and facings of buildings.—*Laurentian.*

Ramsay, O., lot 7, range 4 ..... *N. Lavallée, Carleton Place, O.*

150. Six-inch cube of crystalline limestone, dressed.

This stone was formerly burnt for lime, and is employed for foundations in Carleton Place.

Pakenham, O., lot 11, range 11 ..... *Geological Survey.*

195. Six-inch cube of limestone, dressed.

From the quarry of Mr. William Dickson, which has been worked at intervals for the last forty years, and now shows a worked face 30 by 100 feet. Some of the beds of a chocolate colour are susceptible of a high polish.—*Black River formation, Cambro-Silurian.*

Pembroke, O., lot 12, range 1 ..... *Geological Survey.*

159. Six-inch cube of limestone, dressed.

From the quarry of Mr. P. White. The beds are from three to twelve inches thick. The stone is largely employed in the town of Pembroke, and has been used to some extent for bridges, &c. The price of block stone is 9 cents a cubic foot. An analysis of a specimen, similar to that exhibited, gave—carbonate of lime, 83·96; carbonate of magnesia, 9·29; carbonate of iron, 0·69; insoluble, 6·06.—*Chazy formation, Cambro-Silurian.*

Hull, Q. ..... *Geological Survey.*

156. Six-inch cube of limestone, dressed.

From the quarry of Mr. John Mahoney.

Hull, Q. ..... *Geological Survey.*

157. Six-inch cube of limestone, dressed.

From the quarry of Mr. C. B. Wright. These quarries have been extensively worked for a long time, the beds, which are almost horizontal, having been removed over a large area for a depth of fifteen feet. Blocks ten by five by three feet can be taken out, and are sold at from 25 to 35 cents per cubic foot. Most of this stone is used for building purposes in the city of Ottawa. The upper portion of some of the beds presents a banded structure, the lower portion being finely granular. The stone is easily dressed and susceptible of high polish and sharp tooling.—*Trenton formation, Cambro-Silurian.*

Hull, Q., lot 14, range 8 ..... *Geological Survey.*

210. Six-inch cube of limestone, dressed.

There is an exposure of seventy feet of this limestone. The lower beds are comparatively free from any detrimental inclusions, and large blocks could be obtained. The upper beds might be employed as a marble, since the stone is sometimes beautifully mottled with translucent green serpentine.—*Laurentian*

Portage du Fort, Lichfield, Q. ..... *Geological Survey.*

154. Six-inch cube of limestone, dressed (white).
158. „ „ „ „ (grey).

From an extensive band of crystalline limestone, striking north-east and south-west. The beds, which vary in thickness, are sometimes grey in colour, alternating with others which are almost pure white. The stone takes a good polish and weathers evenly.

Pointe Claire, Q. ..... *L. W. Mallette, Pointe Claire, Q.*

222. Six-inch cube of limestone, dressed.

The beds of limestone quarried at Pointe Claire are from one to three feet thick. The stone is compact and dark grey to black in colour, and was used in the construction of the piers of the western half of the Victoria Bridge at Montreal, the blocks obtained for this purpose weighing from four to seven tons each. At present the quarries are only worked on a very limited scale.—*Birdseye & Black River formation, Cambro-Silurian.*

Pointe Claire, Q. ..... *Geological Survey.*

617. Six-inch cube of limestone, dressed.

Caughnawaga, Q. ..... *Geological Survey.*

590. Six-inch cube of limestone, dressed.

The Caughnawaga quarries are on lands belonging to the Indians, and at one time furnished large quantities of stone for the upper locks of the Lachine

canal and for those of the Beauharnois canal. Subsequently they were only worked at intervals, and on a very limited scale; but at present considerable quantities of stone are being obtained from them to be used in the enlargement of the Lachine canal. The beds are from nine inches to three feet thick.—*Chazy formation, Cambro-Silurian.*

Terrebonne, Q. ..... *Worthington & Co., Montreal, Q.*

591. Six-inch cube of limestone, dressed.

At the quarry of Messrs. Worthington and Co:, the beds of limestone worked are from eight inches to four or five feet thick, and are cut by joints from ten to forty feet apart, which greatly facilitates the quarrying. The stone is of excellent quality, and blocks of any required size can easily be obtained. It is carried to Montreal, a distance of sixteen miles, in scows towed by steam-tugs.—*Chazy formation, Cambro-Silurian.*

Montreal, Q. ..... *Geological Survey.*

592. Six-inch cube of limestone, dressed.

La Chevrotière, Q. (St. Alban's Quarry) ..... { *Charles Dussault, La Chevrotière, Q.*

231. Six-inch cube of limestone, dressed.

The Trenton formation, which is the next in succession above the Birdseye and Black River, yields excellent building stone at Montreal, at Chevrotière nearly forty miles above Quebec, and at many intermediate places. The best stone at Montreal is derived from a band of granular grey bituminous limestone, ten feet thick. The beds are from three to eighteen inches thick at the bottom, passing toward the top into a black nodular bituminous limestone; which is interstratified, in irregular layers of from one to three inches thick, with black bituminous shale. This grey limestone, which is near the base of the formation, is a mass of comminuted organic remains, consisting largely of crinoids and cystideans. In Montreal, undressed ashlar stone sells at from eighteen to twenty cents per square foot, dressing costing from fifteen to thirty cents extra per foot. Stones of larger dimensions, sold by cubic measure, are worth forty-five cents per foot for blocks of fifteen cubic feet or under; blocks containing from fifteen to thirty feet sell for sixty cents per foot.—*Trenton formation, Cambro-Silurian.*

Deschambault, Q. ..... *Public Works Department, Quebec, Q.*

343. Six-inch cube of limestone, dressed.

This quarry is being extensively worked at present, about 150 men being employed in the various openings. The beds vary from nine inches to three feet in thickness, and the finest stone suitable for all the better class cut stone work can be obtained. It has been used extensively in the cities of Quebec and Montreal for the last thirty years.

Pointe aux Trembles, Q. ..... *Public Works Department, Quebec, Q.*

309. Six-inch cube of limestone, dressed.

These quarries are now abandoned, the Deschambault stone being preferred.

St. Valentine, St. John's county, Q. .... *Paul Legault, St. Valentine, Q.*

232. Six-inch cube of limestone, dressed.

This stone has been extensively quarried for the last fifteen years, and has been used in many of the public buildings in the neighbourhood. Price of block stone is twenty cents per cubic foot.—*Trenton formation, Cambro-Silurian.*

Château Richer, Q. ..... *Public Works Department, Quebec, Q.*

220. Six-inch cube of limestone, dressed.

This stone is said to occur in beds from five to fourteen inches thick, and makes fine rubble work. The price is $4 per ton at the quarry, and $8 per ton laid down in the city of Quebec.—*Black River formation, Cambro-Silurian.*

Shipton, Q., lot 22, range 7 ..... *Geological Survey.*

515. Polished slab of limestone.

Dudswell, Q., lot 18, range 7 .... *Dudswell Marble and Lime Company, Marbleton, Q.*

201. Six-inch cube of limestone, dressed.

Dudswell, Q., lot 22, range 8 .... *Dudswell Marble and Lime Company, Marbleton, Q.*

202. Six-inch cube of limestone, dressed.

Dudswell, Q., lot 15, range 5 ..... *Geological Survey.*

205. Six-inch cube of limestone, dressed.

This stone is used principally as a flag stone, for which it is admirably adapted.—*Silurian.*

Point Levis, Q. ..... *Geological Survey.*

359. Six-inch cube of limestone conglomerate, dressed.

Baily's Brook quarry, 3½ miles from Antigonish, N.S. .... *C. B. Whidden & Sons, Antigonish, N.S.*

502. Six-inch cube of limestone, dressed.

This stone is largely used for the production of lime, and has also been employed in the construction of various buildings, among which may be mentioned St. Ninian's Cathedral at Antigonish.—*Lower Carboniferous.*

New Glasgow, N.S.....*Government of Nova Scotia.*

485. Concretionary limestone.

Dolomite.

Anderdon, O.....*Thomas B. White, Gordon, O.*

271. Six-inch cube of dolomite, dressed.

This quarry has been worked for the last fifteen years. The beds are from two to twelve inches thick. The stone has been employed in several public buildings, and is said to weather well. The price of block stone is 20 cts. per cubic foot.

Guelph, O.....*Geological Survey.*

594. Six-inch cube of dolomite, dressed.

The Guelph formation, which immediately overlies the Niagara formation in Western Ontario, is largely developed in the neighbourhood of Guelph and Galt. It is made up of pure dolomites, which, though generally porous, are nevertheless coherent and well suited for building purposes. At Guelph, where the beds are from four inches to two feet in thickness, there are nine quarries in the immediate vicinity of the town, and large quantities of stone are taken out. Blocks suitable for dressing sell for about 40 cts. per cubic foot.—*Guelph formation, Silurian.*

Dundas, O.....*E. & C. Farquhar, Toronto, O.*

595. Six-inch cube of dolomite, dressed.

The quarry of Messrs. Farquhar is only a short distance from the Dundas railway station. The beds here are from three inches to three feet thick, the total thickness being about sixty feet. A specimen like that exhibited was found to contain carbonate of lime, 51·85; carbonate of magnesia, 41·65; carbonate of iron, 0·62; and insoluble matter, 5·88. The stone is chiefly used for making lime and for road metal, the latter selling at $10 per cubic toise.—*Niagara formation, Silurian.*

Beckwith, O.....*Geological Survey.*

155. Six-inch cube of dolomite, dressed.

This greyish-brown dolomite is from the quarries of the Canadian Pacific Railway, on the 12th lot of the 12th range of the township of Beckwith. It is

used for window and door sills, and also largely for general building purposes. The stone when first quarried is very soft, but hardens on exposure. The roundhouse at Brockville, as well as bridges and culverts along the line of the Brockville and Ottawa Railway, are built of it. Blocks 3 × 3 × 15 feet can easily be obtained.—*Calciferous formation, Cambro-Silurian.*

Aldfield, Q., lot 10, range 4.....*R. H. G. Chapman, Aldfield, Pontiac, Q.*

269. Six-inch cube of dolomite, dressed.—*Laurentian.*

Mingan Islands, Q.....*Public Works Department, Quebec, Q.*

308. Six-inch cube of dolomite, dressed.

This stone occurs in beds from twelve inches to five feet thick, but has not yet been sufficiently opened to satisfactorily determine its character. It weighs 170 lbs. per cubic foot, and can be transported to the city of Quebec, a distance of 420 miles, for $2 per ton. The stone is susceptible of a fine polish.

Quebec, Q.....*Public Works Department, Quebec, Q.*

310. Six-inch cube of dolomite, dressed.

This stone, which has a thickness of about forty feet, is chiefly used by Messrs. Gauvreau & Co., Quebec, for the manufacture of hydraulic cement. It is also employed in foundations and other works of construction.

Sandstones.

Newcastle Island, B.C. { *Vancouver Coal Mining and Land Co. (Limited), S. Robbins, Supt., Nanaimo, B.C.*

99. Six-inch cube of sandstone, dressed.

Among the coal-bearing rocks of Newcastle Island there are beds of brownish-grey sandstone, which afford excellent material for building and flagging stones. The upper beds are of the best quality, and it was from one of these that Mr. E. E. Emery, of San Francisco, obtained the stone for the construction of portions of the mint in that city. Blocks for pillars were taken out, which after dressing were twenty-seven feet six inches in length, and three feet ten inches in diameter. Flagstones, with even surfaces, as much as ten feet square, have also been obtained, and are easily quarried, and it is not unlikely that some of the measures will afford good grindstones.—*Cretaceous.*

Nanaimo, B.C. ..... { *Vancouver Coal Mining and Land Co. (Limited), Nanaimo, B.C.*

321. Six-inch cube of sandstone, dressed.

From an extension of the beds which occur on Newcastle Island. The

quarry was opened in the spring of 1875; and large blocks can be easily obtained.—*Cretaceous.*

Chase River Quarry, Nanaimo, B.C. { *Vancouver Coal Mining and Land Co. (Limited), Nanaimo, B.C.*

320. Six-inch cube of sandstone, dressed.—*Cretaceous.*

Ledge Point, Port McNeil, Vancouver Island, B.C... *Geological Survey.*

319. Six-inch cube of sandstone, dressed.

A hard calcareous bed in the Cretaceous sandstones. There is no quarry at this place, the specimen exhibited being collected by Dr. G. M. Dawson in 1885.—*Cretaceous.*

Haddington Island, Broughton Strait, B.C..... *Geological Survey.*

322. Six-inch cube of sandstone, dressed.

The remarks made in connection with the last specimen apply also to this one. A quarry on an extensive scale might be opened at this place.—*Cretaceous.*

Salt Spring Island, B.C. ..... *Geological Survey.*

342. Six-inch cube of sandstone, dressed.

This stone occurs at the shore of Salt Spring Island, where there is every facility for quarrying and shipment. It is a sandstone of great strength and has been extensively quarried of late for the construction of the dry dock at Esquimalt, B.C.—*Cretaceous.*

Pender Island, B.C. ..... *John Mortimer, Victoria, B.C.*

544. Sandstone (Browning Island Stone).—*Cretaceous.*

Oneida, O., lot 48, range 1

596. Six-inch cube of sandstone, dressed.

This sandstone is from a band which runs through Haldimand county, and is largely developed on the town-line between Oneida and North Cayuga, north of the Talbot road. It occurs in beds from one to four feet thick, and Mr. William De Cew's quarry, from which the specimen was obtained, has a face of twelve feet. The stone is largely employed for building purposes, for which, when fine grained, it is well adapted.—*Oriskany formation, Devonian.*

Grimsby, O. ..... *Geological Survey.*

597. Six-inch cube of Sandstone, dressed.

There is a band about sixteen feet thick of this red and grey mottled

sandstone. The beds are about four feet thick. A large quantity of the stone has been employed by the Great Western Railway Company for the construction of bridges.—*Niagara formation, Silurian.*

Verte Island, Nipigon Bay, Lake Superior, O. { *The Chicago and Verte Island Stone Co., Chicago, U.S.A.*

298. Six-inch cube of sandstone, dressed.

This stone is known to have a thickness of thirty feet. The upper bed alone is twenty feet thick. Mr. Geo. P. Merrill, of the United States Geological Survey, recently made a microscopic examination of it, and found it to be composed of quartz and felspar, with a very little mica. The crushing strength is reported to be 11,500 lbs. to the square inch. Thus far it has been used principally in the United States. The price of blockstone is 50 cts. per cubic foot of 160 lbs.—*Lower Cambrian, Nipigon formation.*

Caledon, O.

644. Six-inch cube of sandstone, dressed.—*Brown Stone Co., Credit Forks, O*
644*a*. Ditto.—*Public Works Department, Ottawa, O.*

Caledon, O., lot 9, range 4.. *Credit Forks Stone Co., Credit Forks, O.*

45. Six inch cube of sandstone, dressed.

In these two adjoining quarries about 150 men are employed. The brownish-red variety of the stone occurs in beds six feet thick, and is underlaid by a greyish or whitish sandstone. The beds have been stripped over an area of four acres and the stone removed to a depth of about fifteen feet. It is an excellent building material. The price of the grey stone is 45 cents, and of the brownish-red stone 60 cents per cubic foot.—*Medina formation, Silurian.*

Gloucester, Carleton county, O. ..... *Geological Survey.*

598. Six-inch cube of sandstone, dressed.

From Skead's quarry, about four miles from Ottawa. The stone is very fine grained, of a brownish-grey colour, and would make handsome buildings. It appears, however, to be difficult to quarry, the blocks obtained being of very irregular form, owing to a somewhat conchoidal fracture. A dressed specimen, about seven feet long, may be seen in the coping of the wall round the grounds of the Parliament Buildings at Ottawa, but it can only be distinguished from the adjoining blocks of Ohio stone by its finer texture.—*Chazy formation, Cambro-Silurian.*

Pembroke, O. ..... *Geological Survey.*

599. Six-inch cube of sandstone, dressed.

The quarry from which this fine stone was obtained is in the vicinity of the Allumette rapids, near Pembroke, and is owned by Mr. John Rankin. The

stone occurs in beds from six to twenty inches thick. It is easily worked, and, although soft, is tough and retains sharp angles. The Pembroke court-house is built of it, and it is sometimes employed for making monuments.—*Chazy formation, Cambro-Silurian.*

McBride's Corners, Rideau Canal, O. ..... *Geological Survey.*

600. Six-inch cube of sandstone, dressed.

Cap Rouge, Q. ..... *Geological Survey.*

344. Six-inch cube of sandstone, dressed.

The Sillery division of the Quebec group affords massive beds of greyish-green sandstone, which are extensively quarried in the vicinity of Quebec. The upper beds are even, and split well both with the layers and across them, but the lower portions are inferior in this respect. The stone has been used in the construction of the Quebec jail, and many other large buildings, also in parts of the fortress walls and for pavements. Blocks of large dimensions can be easily obtained, and some of the beds are as much as four feet thick.—*Sillery formation, Cambrian.*

St. Simon, Q. ..... *Public Works Department, Quebec, Q.*

311. Six-inch cube of sandstone, dressed.

This stone is said to occur in beds from eight inches to five feet thick. It has been employed in the construction of some piers and buildings at Quebec.

South Quebec (Point Levis), Q. .... *Public Works Department, Quebec, Q.*

69. Six-inch cube of sandstone, dressed.

From the *Point Levis Quarry.* Blocks of any size required for building can be obtained. It has been used in the new Parliament Buildings and in the court-house at Quebec.—*Sillery formation, Cambrian.*

Cap à l'Aigle, Murray Bay, Q. .... *Messrs. Pitton & Co., South Quebec, Q.*

71. Six-inch cube of sandstone (white), dressed.
312. „ „ „ (green), „

These two stones have been extensively used in the public buildings at Quebec.

They are said to occur in well stratified beds, the white having a thickness of twenty feet and the green of seventy feet. The former is largely used for pavements.—*Potsdam formation, Cambrian.*

Budreau Village, Dorchester, Westmorland county, N.B. . *Geological Survey.*

601. Six-inch cube of sandstone, dressed.

Rockport, Westmorland county, N.B..... *Peter Hagan, Rockport, N.B.*

198. Six-inch cube of sandstone, dressed.

This quarry is known as the Westmoreland Union Freestone Quarry, and is situated near the Cumberland Basin. Blocks of almost any size can be obtained, and sell at $5·00 a ton. It is exported to New York, Boston, and Portland, U.S.A.—*Millstone Grit formation, Carboniferous.*

Rockland, Dorchester, N.B..... *Caledonia Freestone Company, Rockland, N.B.*

602. Six-inch cube of sandstone, dressed.

Dorchester; Westmoreland county, N.B..... *S. P. Osgood, St. John, N.B.*

562. Column of freestone (brown).
562*a*. „ „ (red).
562*b*. Foot cube „ (olive).

These specimens are from the Millstone Grit formation, or lower member of the Carboniferous system, as represented in New Brunswick and Nova Scotia. Large shipments have been made from some quarries in this district. The Budreau quarries being first opened in 1856, and the Caledonia quarries at Rockland in 1864.

The stone, which in the United States is known as "Nova Scotia stone," is prized on account of its colour, the facility with which it may be cut, dressed, and ornamented, and also on account of its durability. The prevailing colour is a yellowish or olive-grey, shading on the one hand into a chocolate-brown, and on the other hand into a bluish-grey. At Mary's Point a portion of the rock is a pale purplish-grey colour (and stone of this colour is the most abundant and durable). The workable beds are from two to six feet in thickness, and blocks can readily be obtained of any size up to a length of thirty feet and a weight of twenty tons. As a rule, they contain little or no pyrites, and after seasoning by wetting and exposure, are unaffected by frost. Portions of the rock also yield good grindstones, moderately soft, and with a clear sharp grit.—*Millstone Grit formation.*

Near Newcastle, Northumberland county, N.B. ..... *Rhodes, Curry & Co., Amherst, N.S.*

380. Six-inch cube of sandstone, dressed.

This stone is being employed in the new Departmental Buildings at present in course of construction at Ottawa.—*Millstone Grit formation.*

Bay Chaleur Quarries, Gloucester county, N.B. ..... *Joseph Reed & Co.*

272. Two six-inch cubes of sandstone, dressed.—*Millstone Grit formation.*

Wallace, Cumberland county, N.S. ..... *Geological Survey.*

604. Six-inch cube of sandstone, dressed.

The Carboniferous sandstones of Nova Scotia in many localities afford

fine building stones. This specimen is from a quarry at Wallace, situated about 150 feet above high-water mark, and only 600 yards from a good harbour. The beds are horizontal, and for the first fifteen feet from the surface vary in thickness from four inches to two feet; below this there is a massive bed, which is stated by Mr. Heustis to be from three to eight feet thick. It is divided into rectangular masses by joints from six to fourteen feet apart, which greatly facilitate the quarrying.—*Carboniferous.*

North Grant Quarry, Antigonish, N.S..... { *C. B. Whidden & Sons, Antigonish, N.S.*

501. Six-inch cube of sandstone, dressed.

Six Mile Brook, West River, Pictou county, N.S. ... *Geological Survey.*

345. Six-inch cube of sandstone, dressed.

This stone is from the Elliot quarry, owned by Wm. R. McKenzie, and has been used principally for monuments. The price of block stone is 50 cents per cubic foot, or $6·00 per ton.—*Lower Carboniferous.*

Eight Mile Brook, West River, Pictou county, N.S. { *John Macpherson, Eight Mile Brook, Pictou county, N.S.*

304. Six-inch cube of sandstone, dressed (brown).
305. „ „ „ (grey).—*Lower Carboniferous.*

Wallace, Cumberland county, N.S. .. *Wallace Grey Stone Co., Wallace, N.S.*

306. Six-inch cube of sandstone, dressed (blue).
307. „ „ „ (grey).

This quarry has been in operation for the last four years, producing annually about 2,000 tons, the value of which would be $10,000. The beds from which the specimens were obtained have an aggregate thickness of seventy feet.—*Upper Carboniferous.*

River John, Pictou county, N.S. .. .. *Geological Survey.*

207. Six-inch cube of sandstone, dressed.

From the quarry of Dr. Collie.

Belleville Quarry, Pictou, N.S..... *Adam McKean & Sons, Pictou, N.S.*

208. Six-inch cube of sandstone, dressed.

These beds have been penetrated for about fifty feet, and it is said are still yielding well. The stone is largely employed in Nova Scotia for public buildings. The price of block stone is 50 cents per cubic foot.—*Upper Carboniferous.*

Granton Quarry, Pictou, N.S. ..... *R. E. Chambers, Pictou, N.S.*

204. Two six-inch cubes of sandstone, dressed.

At this quarry there is about twenty-five feet of workable stone, which has been quarried on a small scale for the last twenty years.

Granite and Syenite.

Victoria, B.C. ..... *Geological Survey.*

527. Six-inch cube of syenite cut from a boulder.

This specimen was, for convenience, taken from a boulder found in the vicinity of Victoria, but it represents a rock which is abundant in the Coast Range, and which might be easily quarried at many places along the coast in British Columbia. Granite is also abundant on the same coast. Most of the erratics of this character occurring near Victoria have already been broken up and employed in construction.

Nelson Island Quarry, Jarvis Inlet, B.C. ..... *Geological Survey.*

466. Six-inch cube of granite, dressed.

Nelson Island Quarry, Jarvis Inlet, B.C. } *E. C. Baker, M.P., Victoria, B.C.* (*Agent for proprietors*).

542. Twelve-inch cube of granite, dressed.

This quarry is well situated for the extraction and shipment of stone in blocks of any size. It has so far been worked only to a limited extent, the stone having been used in the construction of some parts of the dry dock at Esquimalt.

North Bend Quarry, Fraser River, B.C. ..... *Geological Survey.*

545. Six-inch cube of granite.

Used for construction in portions of Canadian Pacific Railway near this locality.

Quarry at Fraser River Bridge, B.C. ..... *Geological Survey.*

546. Six-inch cube of granite.

Used in construction of piers of great cantilever bridge across Fraser River, on line of Canadian Pacific Railway.

Kingston, O.....*Canadian Granite Co. (Limited), Ottawa O.*

100 and 392. Pedestals of red granite.

The company's quarry, from which this stone was taken, is situated on the east cove of Kingston Harbour. The stone obtained varies somewhat in character, sometimes having a gneissic structure, but elsewhere being quite massive. The colour is generally some tint of red with grey wavy markings. It is claimed to be peculiarly adapted for decorative purposes, and is much in demand for buildings and monuments. Large quantities of paving blocks are now being prepared at the quarry. In 1885 this company purchased a large mill in the city of Ottawa ; it is a two-and-a-half story building, and covers an area of 120×100 feet. Its situation on the Rideau Canal affords easy and cheap transport by water from their quarry at Kingston. The mill has been fitted up with all the most improved machinery, including a granite-turning lathe capable of turning columns, &c., up to a diameter of three feet and length of twenty feet ; two large double polishing lathes ; one marble-turning lathe ; two granite-polishing jennies ; one vertical polishing machine ; double-pendulum polishing machine ; large granite polishing machine with carriage, with a surface capacity of about eighty-four superficial feet ; one basin hole cutter and boring machine ; Shortsleeve's patent gang saw, capable of sawing blocks eleven feet long by nine feet wide, fed by one of Shortsleeve's automatic sand-feed machines ; rubbing bed eleven feet in diameter with marble machine ; Shortsleeve's new patent marble moulding and countersinking machines, &c.

The granite work for the new Departmental Buildings at Ottawa, including 153 massive columns, is being executed by this company. The company is also utilizing many Canadian marbles and serpentines previously unknown to the trade. These materials are noticed under their respective heads.

Forsyth's or Barrow Island.....*Robert Forsyth, Montreal, Q.*

428. Pedestals of granite.
428*a*. Six-inch cube of granite, dressed.
428*b*. Small column „ „

The handsome red granite of Barrow (now called Forsyth's) Island has long been known to the Geological Survey, and described in different reports, though it was not quarried until about twelve years ago, when the property came into the possession of Mr. R. Forsyth, of Montreal, who has since worked it on a moderate scale. The island is situated in the St. Lawrence, opposite, and about a mile from, the village of Gananoque. It has an area of about twenty acres, and the rock in places is about thirty feet above low-water mark. The stone is said to be harder than the red granite of Peterhead (Scotland), and takes a very fine polish. It consists of bright red felspar, bluish-grey quartz, often slightly opalescent, a small quantity of greenish-black or black hornblende, and generally a little mica. The facilities for shipping are all that could be desired, as vessels can load direct from the quarry. Mr. Forsyth's extensive works are situated in Montreal.—*Laurentian.*

Hull, Q.....*C. Christian, Hull, Q.*

174. Hornblende gneiss.

This stone is extensively used for macadamizing in the city of Ottawa.

The quarry, which has been but recently opened, shows a worked face of about 100 yards long and 70 feet deep.

Wakefield, Q., lot 7, range 1.....*Geological Survey.*

203. Six-inch cube of granite, dressed (pink).
209. „ „ „ „ (grey).

These two specimens are from an extensive mass of granite occurring on the east and west banks of the Gatineau River. No attempt has yet been made to quarry it, but blocks of almost any size might be obtained.—*Laurentian.*

Greenville, Q. ..... *Geological Survey.*

365. A pedestal of red syenite (base of No. 366).

This specimen is from a mass of syenite which occupies an area of about thirty-six square miles in the townships of Greenville, Chatham, and Wentworth.—*Laurentian.*

Black Lake, Memphramagog, Q.....*Geological Survey.*

433. Six-inch cube of granite, dressed.

Montreal, Q.....*R. Forsyth, Montreal, Q.*

434. Small column of syenite.
434*a*. Six-inch cube „ dressed.

This stone is a nepheline-syenite, and forms a part of the intrusive mass of Mount Royal, which breaks up through nearly horizontal beds of Cambro-Silurian limestone.

Beebe Plain, Stanstead, Q.....*R. Forsyth, Montreal, Q.*

429. Pedestals of granite.
429*a*. Small column of granite.

Granite occurs in abundance in Barnston, Stanstead, and elsewhere in the "Eastern Townships" of the province of Quebec. In the last-named township it occupies an area of six square miles. The granite is composed of white quartz, white felspar, and black mica, and takes a fine polish. It is easily worked, and in many localities can be obtained in blocks of any required size. The new Eastern Townships Bank at Sherbrooke is built of it, and it was used many years ago for bridges on the St. Lawrence and Atlantic Railway. There is also considerable demand for it for monuments. Mr. George Taylor, of New Edinburgh, states that the quarry at Marlow, in Stanstead, was first opened about forty years ago.—*Devonian.*

Barnston, Q..... *Geological Survey.*

366. Upper portion of pedestal of grey granite.

Yamaska Mountain, Q. ..... *Geological Survey.*

431. Six-inch cube of syenite, dressed.
431*a*. Small column „ „

St. Joseph, Beauce, Q. ..... *Geological Survey.*

334. Six-inch cube of granite, dressed.

Although classed here as a granite, this is probably a fragmental rock made up of quartz, felspar, and mica. The band is fifty or sixty feet thick, and is associated with a band of serpentine. It has been used for millstones, and would probably afford excellent material for purposes of construction.—*Cambro-Silurian.*

The Intercolonial Railway ..... *Geological Survey.*

430. Six-inch cube of reddish porphyritic granite, dressed.
430*a*. Small column of reddish porphyritic granite, dressed.

St. George, N.B. ..... *Milne, Coutts & Co., St. George, N.B.*

563. Red granite, polished.

Spoon Island Quarry, St. John River, N.B... *J. W. Taylor, St. John, N.B.*

516. Grey granite column with polished face.
516*a*. Post (in rough).

Extensive areas of granites and syenites of several different shades of colour and varieties of texture occur in New Brunswick. Most, if not all, of them are of intrusive origin, but appear to represent at least two very distinct periods of intrusion, the rocks of the one—characterized usually by grey and dark grey colours, containing more or less hornblende, and not unfrequently magnetic iron ore in disseminated grains—having probably been produced at least as early as the lower Silurian era; while the other—varying in colour from a pale pink or grey to a tawny yellow or bright red, and usually more or less porphyritic—is probably of Devonian age. Rocks of both these types yield good building materials, but it is in the latter that the principal quarries have been opened. Formerly the grey rock only was quarried, being employed within the province for ordinary constructive purposes, but the introduction of processes for polishing such rocks, together with the growing demand for bright coloured granites, similar to those of Scotland, caused attention to be directed to the red variety. Of this, extensive areas forming a portion of the Nerepis range of hills, occur in the county of Charlotte, and have been worked in the vicinity of the town of St. George, on the Magaguadavic river. There is here every facility for removing and working the stone, blocks of any size up to thirty or forty feet in length and four or five feet in thickness being easily obtainable, while the river affords at all seasons ample means of transport, as well as inexhaustible water power. Works were erected at St. George about thirteen years ago by the Bay of Fundy Red

Granite Co. Another company (the St. George Red Granite Co.) are working in Carleton near St. John, their stone being taken from quarries near St. George, Charlotte county.—*Lower Silurian (?), Devonian.*

Sunbury county, N.B. ..... *S. P. Osgood, St. John, N.B.*

605. Pedestal of grey granite.

Charlotte county, N.B. ..... *S. P. Osgood, St. John, N.B.*

606. Pedestal of red granite.

Birch Cove, Halifax, N.S. ..... *R. Forsyth, Montreal, Q.*

432. Six-inch cube of granite, dressed.
432*a*. Small column of granite, dressed.

Gneiss.

Grenville, Q., lot 3, range 8 ..... *Geological Survey.*

234. Foot cube of coarse-grained gneiss, dressed.

Grenville, Q., lot 1, range 3 ..... *Geological Survey.*

234. Foot cube of porphyroid gneiss, dressed.

The Laurentian gneisses, of which this is one variety, occur in bands of immense thickness, and occupy an area of almost a quarter of a million square miles. They vary much in colour, texture, and in the relative proportions of their constituents. Hornblende or pyroxene often replace the mica in part or altogether. In some places they have a well marked foliation, but in others they become massive, and not distinguishable from granite or syenite ; but although many of them are well adapted for structural purposes, and can be obtained in unlimited quantity, their employment is not common. The Canadian Pacific Railway used large quantities of Laurentian gneiss for bridges, culverts, etc., on their line between Ottawa and Lake Superior. The dam and reservoir of the Quebec water-works also, near Jeune Lorette, on the St. Charles river, is built of a grey gneiss, which was obtained in the vicinity.—*Laurentian.*

Labradorite Rock.

Abercrombie, Q. .... *Geological Survey.*

607. Foot cube of labradorite rock, dressed.

Morin, Q., range 2 ..... *Geological Survey.*

233. Six-inch cube of labradorite rock, dressed.

New Glasgow, Terrebonne county, Q. ..... *Geological Survey.*

270. Six-inch cube of labradorite rock, dressed.

This rock is extensively developed in several parts of the Dominion, which are now easily accessible by means of recently constructed railways. Numerous large boulders are also scattered over the country in the vicinity of Grenville, St. Andrews (Q.), and other places, more especially along the Ottawa and St. Lawrence. In some localities, as for example in the township of Rawdon (Q.), the rock is fine grained and foliated, while elsewhere, as in the townships of Abercrombie and Morin, where it forms large mountain masses, it consists of a compact base, composed chiefly of labradorite, containing imbedded cleavable masses of the same felspar, sometimes several inches in length, and often exhibiting beautiful opalescent reflections, as well as masses of iron ore, hornblende, etc. The rock has been but little used for building purposes, although its durability certainly recommends it. It is not quite so hard as granite, and takes a fine polish, so that it might in many cases be employed with advantage for decorative construction.—*Laurentian.*

Marble.

Mount Mark, near Horne Lake, Vancouver Island, B.C... *Geological Survey.*

353. Short column of marble.

The crystalline limestones of Mount Mark occur in very thick beds, interstratified with diorite. White, dove-grey and bluish tints are the most common, but some varieties contain reddish and greenish bands. A great variety of marbles suitable for ornamental purposes, though not fine enough for statuary, could be easily obtained in large blocks, entirely free from flaws. Though the limestones are highly crystalline, they are in many places crowded with fossils, among which Mr. Billings has detected corals of the genera *Zaphrentis* and *Diphiphyllum*, large crinoidal columns, specimens of *Fenestella* or *Polymorpha*, as well as a large *Productus* and a large *Spirifer*.—

Carboniferous.

Departure Bay, Nanaimo, B.C. ..... *Geological Survey.*

368. Polished slab of bronze-speckled marble.

This rock forms the base of the Cretaceous at Departure Bay near Nanaimo, where it rests unconformably on older rocks. It is filled with organic fragments, which appear to consist chiefly of stony Polyzoa, but also include species of Echinids and shells. It is too impure to burn for lime. The specimen shown was obtained through the kindness of Mr. S. Robins.—

Cretaceous.

Beaver Cove Quarry, Vancouver Island, B.C. . . *Hon. J. Robson, Victoria, B.C.*

107. Polished slab of variegated marble.

A quarry has been opened at this place within three quarters of a mile of a good harbour. Large blocks can be obtained and shipped with facility.—*Triassic or Carboniferous.*

Texada Island, Strait of Georgia, B.C. ..... *Geological Survey.*

327. Polished slab of grey marble with black spots and veins.
369. „ „ greyish-white marble with brownish veins.

A quarry has been worked to some extent on the shore of Malaspina Strait near the north end of the island. Marbles like those exhibited form low cliffs along the shore for several miles.—*Triassic or Carboniferous.*

Red Rock, Nipigon Bay, Lake Superior, O. ..... *Geological Survey.*

371. Polished specimen of variegated marble.—*Nipigon formation.*

Madoc, O., lot 1, range 8 .... *Geological Survey.*

331. Pedestal of limestone.

This specimen, although fairly representing the general character of the marble, is rather misleading in not being quite sound. It must be remembered that it was taken from near the surface, and that the rock would probably improve both in soundness and colour at a greater depth.—*Laurentian.*

Cornwall, O. .... *Geological Survey.*

608. Polished slab of black marble.

This rock occurs at the base of the Birdseye and Black River formation. The beds from which the specimen was obtained are about two feet thick, and are apparently the only ones in the formation which are sufficiently pure to be employed as marble. The higher beds contain argillaceous patches, which take an inferior polish, thus rendering the stone unfit for decorative purposes.—*Birdseye and Black River formation, Cambro-Silurian.*

Horton, O., lot 11, range 2 ..... *Geological Survey.*

354. Polished slab of grey crystalline marble.

This stone has been largely employed for monuments. Blocks from a few inches to several feet thick can be easily obtained.

Horton, O., lot 11, range 2 .... { *Canadian Granite Company (Limited), Ottawa, O.*

491. Marble monument.

The marbles employed by this company are chiefly obtained from Renfrew and other places near Ottawa on the line of the Canadian Pacific Railway.

Lanark, O., lot 21, range 10 ..... *Geological Survey.*

357. Polished slab of wavy grey marble.
357*b*. „ „ banded marble.

The limestone found on this lot is from an important bed several thousand feet thick traversing portions of the counties of Lanark and Renfrew, and which, at various points, affords banded or wavy marbles, according to the direction in which it is cut. The limestone has hitherto been used only for the production of lime, its distance from lines of railway having prevented its employment as a marble.—*Laurentian.*

Arnprior, O. ..... *Geological Survey.*

609. Polished slab of marble (striped, light and dark grey).
609*a*. Ten-inch cube „ „ „ „ „

Near the mouth of the Madawaska, in the township of McNab, a large band of crystalline limestone is exposed. The rock contains dark bands, which are sometimes narrow and sometimes wide, producing, where there are no corrugations in the layers, a regularly barred or striped pattern. When the layers are contorted a pattern something like that of a curly grained wood results. The colours are various shades of light and dark grey intermingled with white. The dark colours are due to a greater or less amount of graphite, which is intimately mixed with the limestone. The texture of the stone is somewhat coarse, but it takes a good polish. Considerable quantities were employed in the decorative work of the Houses of Parliament at Ottawa.—*Laurentian.*

Arnprior, O. ..... *Hurd & Roberts, Hamilton, O.*

511. Monument of marble (striped, light and dark-grey).

Pakenham, O. ..... *Geological Survey.*

638. Paper weight of brown marble.—*Black River formation, Cambro-Silurian.*

Barrie, O., lot 28, range 9 ..... *Geological Survey.*

360. Pedestals of pink marble.
360*a*. Slab „ „

Barrie, O., lot 27, range 9.....*Geological Survey.*

361. Lower pedestal of bluish white marble.
363. Upper „ mottled dove coloured marble.
362. Upper and lower pedestal of variegated marble.
387. Slab of blue and white marble, with brown markings.
387*a*. „ „ mottled marble, with brown markings.

The property is owned by Mr. W. E. Sandford, of Hamilton, O.

About twenty-five years ago an attempt was made by Mr. Alexander Cowan to work some of these marbles, but owing to the beds which he opened containing specks of quartz and radiating masses of actinolite, the enterprise was not remunerative. In this quarry the white and pink marbles were found sometimes in alternate beds, but generally with a tendency to graduate into each other. Some of the bluish white marble as well as some of that locally known as "graphic" marble, is, however, free from the impurities mentioned above, and should rank high as an ornamental stone. The varieties are represented by surface specimens.

Hull, Q., lot 14, range 9.....*Geological Survey.*

356. Polished slab of marble, spotted green and white.

This serpentine limestone is well exposed in an extensive band overlying a white crystalline limestone. Large blocks could be easily quarried, and being in close proximity to the main road, the cost of transport would be small.

Ironsides, Hull, Q.....*Canadian Granite Company (Limited), Ottawa, O.*

492. Pink marble monument.

The locality at which this remarkable marble occurs is about twelve miles from the city of Ottawa. No quarry has yet been opened.—*Laurentian.*

L'Original, O.....*Geological Survey.*

610. Polished slab of marble, grey with white spots.

The bed from which this specimen is taken varies in thickness from three to six inches. It is near the surface, and easily quarried. The locality is a quarter of a mile from the south bank of the Ottawa, four miles west of the village of L'Original, and sixty-four above Montreal. The white spots are caused by the presence of small bivalve shells (*Atrypa plena*) filled with calcite. There are two beds of a darker variety, respectively six inches and one foot in thickness, which occur near the surface, and overlie that just mentioned.—*Chazy formation, Cambro-Silurian.*

Hull, Q.....*Geological Survey.*

329. Pedestal of limestone.
329*a*. Polished slab of „

This peculiarly-marked limestone is from the quarry of Mr. R. Lester, and

blocks of almost any dimensions can be obtained, although chert pebbles which are occasionally included in the rock, to a certain extent interfere with its usefulness as an ornamental stone. It has been used chiefly in "rock-faced" work and foundations in the city of Ottawa.—*Trenton formation, Cambro-Silurian.*

St. Hyacinthe, Q. ..... *Grand Trunk Railway.*

593. Foot cube of limestone.

Grenville, Q. ..... *Geological Survey.*

611. Polished slab of yellow, green, and white marble.
611*a*. „ „ green and white marble.
611*b*. „ „ clouded green and white marble.
611*c*. „ „ pinkish white and green marble.

St. André Avelin, Q. ..... *Geological Survey.*

376. Polished slab of green and white marble.

Augmentation of Grenville, Q., lot 1, range 1 ..... *Geological Survey.*

355. Polished slab of spotted green and white marble.

In the township of Grenville and in its Augmentation a band of crystalline limestone, containing *Eozoon Canadense*, is extensively developed, and affords in many places a peculiar variety of marble, having a white ground marked with small green spots and strings of serpentine, which occasionally form angular masses several inches in diameter. The serpentine usually runs in bands marking the foliation of the rock. These bands, as in the case of the Arnprior marble, are sometimes straight, and at other times corrugated, giving diversities of pattern.

Instead of being green, the serpentine is sometimes sulphur-yellow, as in the specimen from Grenville. In many parts of the country, the Laurentian limestones are tolerably free from foreign minerals, and form white marbles. These, however, are usually too coarse-grained for statuary purposes, and sometimes, as in the case of that occurring in the township of Elzevir, they are barred with slightly different colours. Many years ago, a mill for cutting and polishing marble was erected on the Calumet, on lot 19, range 3, of Grenville, but the demand for the marble was not sufficient to make the enterprise profitable.—*Laurentian.*

Caughnawaga, Q. ..... *Geological Survey.*

612. Paper weight of marble, grey with red spots.

Grey marbles, with red spots (generally corals), occur behind the city of Montreal, and on Isle Bizard, in the same formation as the rock from Caugh-

nawaga. In all these localities the rock is filled with fossils, which are plainly seen on the polished surfaces.—*Chazy formation, Cambro-Silurian.*

St. Lin, Q. ..... *Geological Survey.*

613. Red marble, polished slab.

At St. Lin, about thirty miles from Montreal, there are massive beds of limestone, portions of which are of a red colour, and afford a good marble.—*Chazy formation, Cambro-Silurian.*

Terrebonne, Q. ..... *James Worthington & Co., Montreal, Q.*

374. Polished slab of grey marble.

Montreal, Q. ..... *Geological Survey.*

373. Polished slab of grey marble.

This marble is obtained from a bed in the Trenton, and from another in the Chazy formation. It is not in great demand at present, though it has sometimes been used for mantel-pieces and table tops.—*Trenton and Chazy formations, Cambro-Silurian.*

St. Dominique, Q. ..... *Geological Survey.*

614. Paper weight of marble, dove-grey, with white spots.

The marble of St. Dominique is easily cut, and takes a good polish. It seems surprising that, being situated so near Montreal, it has not been used in that city.—*Chazy formation, Cambro-Silurian.*

St. Armand, Q. ..... *Geological Survey.*

615. Paper weight of white marble.

This marble occurs in great abundance in the immediate vicinity of Philipsburg, on Lake Champlain. It is easily cut and takes a good polish.

St. Armand, Q. ..... *Geological Survey.*

494. Polished slab of black marble.

A black marble, like the specimen, is found about a mile and a half south-east of Philipsburg. The beds dip to the eastward at an angle of about twelve degrees. On one of them, which has a considerable thickness, a quarry was many years ago opened. The stone was exported to the United States, and was much esteemed in New York; but the opening of the black marble

quarries at Glen's Falls, where there is good water power, interfered with the demand, and caused the enterprise to be abandoned.

Dudswell, Q., lot 22, range 7 .... *Geological Survey.*

616. Polished slab of marble, cream white, striped with yellow.

It is possible that good marble might be obtained from these limestones. The yellow streaks are composed of dolomite, while the light ground is carbonate of lime. When the ground approaches black, as it sometimes does, and the yellow streaks are narrow, the marble bears a strong resemblance to the Porter marble from northern Italy, sometimes known as black and gold. On analysis, the resemblance between the two is farther sustained by the fact, that in both cases the ground is pure limestone, and the yellow veins are dolomite.—*Silurian.*

St. Joseph, Beauce, Q..... .....*Geological Survey.*

618. Polished slab of red marble veined with white.
618*a*. „ „ red marble.

This handsome marble occurs near the River Guillaume, associated with red shales and sandstones, resembling those of Sillery, near Quebec. The bed is from ten to forty feet thick, and in a distance of half a mile on its strike is exposed in four places. The marble takes a fair polish, and could be obtained in large blocks. The locality is forty-five miles south of Quebec.

Point Levis, Q..... .*Geological Survey.*

359. Polished slab of mottled grey marble.
359*a*. Six-inch cube of mottled grey marble.

A limestone conglomerate.

Trois Pistoles, Q.....*Geological Survey.*

619. Paper weight of red and grey marble.

Kamouraska, Q. ....*Geological Survey.*

620. Paper weight of brown and black marble.

Esquimaux Island, Mingan group, Q. ....*Geological Survey.*

621. Paper weight of drab marble.

A drab-coloured marble occurs in large quantity on this island, and there are facilities for loading small vessels. It can be cut easily, and takes a uniform polish.—*Chazy formation, Cambro-Silurian.*

Charleton Point, Island of Anticosti, Q. ..... *Geological Survey.*

388. Paper weight of spotted drab marble.

The fossiliferous limestones, which are largely developed on this island, are susceptible of a good polish.

Marble Mountain, Cape Breton, N.S. { *D. McLaughlin, Schubenacadie, Hants County, N.S.*

472. Marble.

Cape Breton, N.S. ..... *Government of Nova Scotia.*

484. Marble, polished specimen.

Serpentines.

Burgess, O., lot 2, range 8 ..... *Geological Survey.*

622. Paper weight of serpentine, pale green veined with red.—*Laurentian.*

Grenville, Q., lot 26, range 2 ..... *Geological Survey.*

196. Two six-inch cubes of serpentine, dressed.

Beds of this serpentine, about 100 feet thick, are exposed on the road to Pointe au Chêne station, and an attempt was made some time ago to utilize the mineral for fire-proof paint; 100 tons were shipped to the United States for this purpose.—*Laurentian.*

Orford, Q., lot 6, range 13 ..... *Geological Survey.*

623. Paper weight of brecciated serpentine, dark green.

Orford, Q., lot 6, range 13 ..... *Geological Survey.*

624. Paper weight of brecciated serpentine, green.
624*a*. ,, ,, serpentine, green and grey, with less white.
326. Polished slab of ,, dark green mixed with light green.

Orford, Q., lot 6, range 8 ..... *Geological Survey.*

495. Polished slab of serpentine, dark green spotted with grey.

Orford, Q., lot 15, range 18 ..... *Geological Survey.*

625. Polished slab of brecciated serpentine, dark green with grey markings.

Orford, Q., lot 12, range 8 ..... *Geological Survey.*

626. Paper weight of brecciated serpentine, dark green.

Melbourne, Q., lot 21, range 6..... *Geological Survey.*

627. Paper weight of serpentine, yellowish green.

Melbourne, Q., lot 22, range 6..... *Geological Survey.*

628. Paper weight of dark green serpentine, with light green spots.

South Ham, Q., lot 21, range 2 ..... *Geological Survey.*

629. Paper weight of dark green serpentine.

The specimens from Orford, Melbourne, and South Ham were taken from a band of serpentine which has been traced on the south side of the St. Lawrence from Potton to Cranbourne, a distance of 140 miles. In forty miles of this distance it is repeated twice by undulations, giving an additional eighty miles to its outcrop. It is again recognized 250 miles farther to the north-east at Mt. Albert, in the Shickshock Mountains, and about seventy miles beyond this, at Mt. Serpentine near Gaspe Bay. All the specimens of these rocks which have been analyzed contain small quantities of chromium and nickel, and the band is associated (in its distribution) with soapstone, potstone, dolomite and magnesite. All these rocks occur in large quantities, and chromic iron ore, sometimes in workable amount, is found in them, as well as in the serpentine. They also contain iron, lead, zinc, copper, nickel, silver, and gold; and with the alluvial gold derived from these strata, platinum, iridosmine and traces of mercury are found. In 1847 these serpentines, on account of their distribution, were described in the Reports of the Geological Survey as altered sedimentary rocks; subsequent observations, however, have shown that in all probability they are of igneous origin.

Shickshock Mountains, Q..... *Geological Survey.*

630. Paper weight of serpentine, brown spotted with black.
630*a*. „ „ „ „ „

Templeton, Q. ..... *Geological Survey.*

386. Pedestals of light green mottled serpentine, polished.
386*a*. Two polished slabs of light green mottled serpentine.

From a band of limestone occurring in this township which in many places contains masses of a light-coloured translucent serpentine. These are at

present being quarried and sawn into slabs by the Canada Granite Company (Limited), Ottawa.—*Laurentian.*

Templeton, Q. ..... *Canadian Granite Co. (Limited), Ottawa, O.*

493. Serpentine monument.
„ *a.* „ mantel-piece.
„ *b.* „ vases (7 specimens).
„ *c.* „ card receivers (7 specimens).
„ *d.* „ cigar holders (2 specimens).
„ *e.* „ baptismal font.
„ *f.* „ paper weight (6 specimens).

The serpentines employed in the manufacture of these articles are obtained from quarries belonging to the company in the township of Templeton, county of Ottawa, Q., and are of Laurentian age. (See notes under Nos. 392 and 386).

Joliette, Q. ..... *N. Dupius, Joliette, Q.*

631. Polished specimen of serpentine.

Rensselaerite.

Hull, Q., lot 14, range 9..... *Geological Survey.*

206. Short column of rensselaerite.

This mineral, which is apparently an altered pyroxene, occurs in large masses, in a limestone holding apatite crystals.—*Laurentian.*

Breccia.

One of the Ballinac Islands, B.C..... *Geological Survey.*

375. Polished slab of volcanic breccia.

Breccias or agglomerates, of this character, but more frequently green than brown in colour, are abundant on Vancouver Island and vicinity. They probably occur both in the Triassic and Carboniferous systems.

SLATES, FLAGSTONES, LIME, BRICKS, AND DRAIN TILES.

Slates.

Madoc, O. ..... *D. Loomas, Madoc, O.*

276. Roofing slate (various sizes).
276*a*. Slate flagstone.

An attempt was made some years ago to work a band of slate which is exposed over a large area in this township, but although the cleavage planes are tolerably smooth, they are obtained with some little difficulty. Hearthstones, planed slabs and shelving, however, can readily be obtained. Operations were suspended at this quarry owing to the want of proper machinery.—*Laurentian.*

Rankin Hill Slate Quarry, Acton, Q., lot 25, range 5 ..... *Geological Survey.*

75. Red slates.

This quarry is situated about four miles east of Actonvale Station, on the Grand Trunk Railway. Most of the slate is red, the green occurring in large patches, having no relation to the bedding or the cleavage. The rock is easily quarried, and the quarry has the advantage of being near the Railway. It is used for ornamental work in slate roofing.

Though imperfectly represented in the present collection, very extensive deposits of excellent slate occur in the district south of Montreal, generally known as the Eastern Townships. Several quarries have been opened and worked, and the supply is only limited by the demand.

Melbourne, Q., lot 23, range 4 .... *New Rockland Slate Co., Montreal, Q.*

632. Two large slate blackboards.
„ *a*. „ „ slabs.
„ *b*. Stationary slate wash tubs (two sizes).
„ *c*. Slate sink.
„ *d*. Roofing slate (several sizes).
„ *e*. Large specimens of rough slate.

Flagstones.

Dudswell, Q., lot 15, range 5 ..... *Geological Survey.*

67. Flagstone (limestone).

At this quarry the beds have been worked to a depth of about twenty-five

feet, and are found to be admirably adapted for flagging purposes. The flags may be obtained of any thickness from two to eight inches. They are all used in Montreal.

Common Lime.

Saanich, near Victoria, B.C. ....*Jos. Wrigglesworth, Victoria, B.C.*

543. Limestone.
543*a*. Lime.

The lime made from this stone is used to some extent in Victoria, B.C.

Colborne, O., lot 1, range 1 ..... *Thomas Good, Colborne, O.*

302. Limestone.
302*a*. Lime.

A bluish fossiliferous limestone, extensively developed on the Maitland River. The lime is produced at the rate of 10,000 bushels a year, and sells at 20 to 25 cents per bushel, or in larger lots at 16 cents per bushel.

Winchester, O., lot 5, range 5 ..... *D. A. Summers, Winchester, O.*

316. Limestone.
316*a*. Lime.

Lime has been burned at this kiln for the last thirty-six years. The annual production is about 14,000 bushels. It is retailed at the kiln at 20 cents per bushel.

Marlbank, Hastings county, O., lot 35, range 3 ..... } ..... *W. G. Allen & Sons, Marlbank, O.*

523. Lime.

About 3,000 bushels of lime annually are made. It is sold at 18 cents per bushel.

Lanark, O., lot 21, range 10 ..... *J. Hogg, Almonte, O.*

168. Limestone.
168*a*. Lime.

A beautiful banded grey and white crystalline limestone. The lime is employed only for local use, and sells at 25 cents per bushel.—*Laurentian.*

Ramsay, O. ..... *John Paul, Ramsay, O.*

332. Limestone.
332*a*. Lime.

A white crystalline limestone. About 2,000 bushels of lime are made annually. The price at the kiln is from 20 to 30 cents per bushel.—*Laurentian*

Ross, O., lot 21, range 4. ..... *P. Ferguson, Haly's Station, Renfrew, O.*

167. Limestone.
167*a*. Lime.

A grey crystalline limestone exposed for a thickness of eighteen feet. The lime is used in the locality, and sells at 20 cents per bushel.—*Laurentian.*

McNab, O., lot 7, range 13 ..... *Wm. Baker, Arnprior, Renfrew, O.*

170. Limestone.
170*a*. Lime.

A banded crystalline limestone. The lime sells at 25 cents per bushel.—*Laurentian.*

Horton, O., lot 13, range 3 ..... *J. A. Jamieson, Renfrew, O.*

171. Limestone.
171*a*. Lime.

A greyish white crystalline limestone well developed near the town of Renfrew. A Dominion Champion Draw Kiln is employed, producing 150 bushels of lime every twenty-four hours. The amount shipped from this kiln in 1885 may be estimated at 25,000 bushels. The lime sells at 25 cents per bushel.—*Laurentian.*

Hull, Q. ..... *C. B. Wright, Hull, Q.*

166. Limestone.
166*a*. Lime.

A fine-grained limestone which underlies the city of Hull. Five kilns are kept constantly at work, four of which are "set kilns," with an aggregate capacity of 1,200 bushels, and one "draw kiln" which supplies 200 bushels a day. The lime is retailed at 20 cents per bushel.—*Trenton formation, Cambro-Silurian.*

Dudswell, Q., lot 18, range 7 .. *Dudswell Marble & Lime Co., Marbleton, Q.*

199. Limestone.
199*a*. Lime.

At this quarry the rock has been worked for the last ten years, exclusively,

for the manufacture of lime, the quarry now showing a worked face of 100 by 30 feet. The stone, which is of uniform dove colour, is burnt in five "draw kilns," each having a capacity of 1,000 bushels. About 300 bushels are drawn from each kiln every twenty-four hours. Between the months of January and July of 1885, 480 car-loads of twelve tons to a car were shipped, and 1,475 bushels were retailed at the kiln at 25 cents per bushel. In 1884 about 5,000 cords of wood were burned in the kilns.—*Silurian.*

L'Acadie, St. John's, Q. .....*F. Brosseau, L'Acadie, St. John's, Q.*

264. Limestone
264*a*. Lime.

A grey limestone of Cambro-Silurian age is burnt for lime by several persons in the neighbourhood of St. John's. The lime sells at 20 cents per bushel.

St. John's, Q.....*D. Breault & Sons, St. John's, Q.*

265. Limestone.
265*a*. Lime.

Hydraulic Lime.

Nepean, O. .....*C. B. Wright, Hull, Q.*

169. Rock from which cement is made.
169*a*. Prepared cement.

Although the rock occurs in Nepean, the cement is usually known as Hull cement, as it has been manufactured for several years by Mr. Wright, of Hull. The rock is a limestone holding about twelve per cent. of carbonate of magnesia, yields a strong and lasting cement. The bed from which it is obtained has been traced for nearly 100 miles, preserving a very uniform character. The works can produce 100 barrels per day. The price, in lots of over fifty barrels, is $1·25 per barrel; in smaller lots, $1·50 per barrel.—*Chazy formation, Cambro-Silurian.*

Magdalen River, Gaspe, Q. .....*Geological Survey.*

633. Rock from which cement is made.

These specimens of black dolomite were obtained from the Mountain Portage, about five miles from the mouth of the Magdalen River. The stone occurs in beds from two to four inches thick, interstratified with black graptolitic shales. It yields a very strong hydraulic cement, setting under water in a few minutes to a very hard and tenacious mass of a yellowish colour. Similar bands occur at the Grande Coupe, six miles below Great Pond River.
Cambro-Silurian.

Bricks and Brick-Clays.

The manufacture of bricks is very extensively carried on in the vicinity of the cities and in the more thickly inhabited districts of the provinces of Ontario and Quebec. In Manitoba and the fertile districts of the North-west Territory brick-making is yet in its infancy, but will doubtless soon become a very important industry, not only because of the scarcity of good building stone, but also on account of the abundance of clay admirably suited for this purpose.

In Ontario two sorts of clays are employed: one blue when moist, and whitish or yellowish after burning, known geologically as the *Erie clay;* the other of a more recent formation, brownish in the raw state, but usually burning red, and which has been designated as the *Saugeen clay.* The Erie clay is sometimes found in beds as much as sixty feet thick, while the Saugeen clays are in thinner deposits. Both of them contain a considerable quantity of carbonate of lime. The white bricks command a higher price than the red, and are made in large quantities in a number of places between Brockville on the east, and Lake Huron on the west. In that part of Ontario between the St. Lawrence and Ottawa, as well as in the province of Quebec, bricks are usually made from a truly marine clay overlying the boulder-clay, and geologically known as the Leda clay, and are always of a red colour.

In New Brunswick and Nova Scotia clays representing the Leda clay are employed, and at a distance from the coast, clays, also of glacial age, but not clearly marine, are also used. In Prince Edward Island Triassic or Upper Carboniferous clays, and modern alluvial deposits formed from these rocks, are employed. These are red both before and after baking.

In Manitoba the materials hitherto employed in brick-making are silts and silty clays, the deposits of a great lake which occupied the Red River valley towards the close of the glacial period. These produce cream-coloured bricks. In the North-west Territory clays of the glacial age are often available, but in addition to these the friable deposits of the Laramie and Cretaceous formations are capable of affording a great variety of clays and silts applicable, not only to ordinary brick-making, but also to the manufacture of fire-bricks and tiles of superior quality, as well as of ordinary earthenware. The frequent association of these clays with lignites and coals will render them in future particularly valuable.

In British Columbia materials, like the last-mentioned, are often abundant, but the clays so far used (chiefly in the vicinity of Victoria, New Westminster and Nanaimo) are those overlying the boulder-clay, and which produce red bricks of fair quality.

The bricks exhibited are chiefly from the province of Ontario. For convenience of reference, they are arranged in the annexed table by counties.

	Price per 1,000.	Quantity made annually.	Machine used.	Depth of clay.	Exhibitor.	Remarks.
ONTARIO.						
County of Lambton.						
Bosanquet, O., lot 23, range 3	...	...	...	...	Jonas Cornell	In addition to drain-tiles, 100,000 red and white stock bricks were made in 1884.
228. Clay	...	...	...	20 feet		
„ *a.* Seven-inch drain-tile ...	$45					
„ *b.* Five „ „	$24		Kell's			
„ *c.* Four „ „	$15	...	Brick & Tile			
„ *d.* Three „ „	$10		Machine.			
„ *e.* Two-and-half-inch drain-pipe	$8					
County of Elgin.						
St. Thomas, O	...	...	...	...	M. C. Freek	
190. Clay	...	...	...	12 feet		
„ *a.* Machine-pressed brick (white)	$6·50	2,000,000				
„ *b.* Six-inch drain-tile „	$35		Freek's			
„ *c.* Five „ „ „	$25		Brick & Tile			
„ *d.* Four „ „ „	$16	300,000	Machine.			
„ *e.* Three-inch „ „	$10					
County of Middlesex.						
Ekfrid, O., lot 2, range 6	...	...	...	...	F. H. Wader	These bricks are made in wooden dies lined with cloth.
191. Clay.						
„ *a.* Machine-pressed brick (white)	$5	400,000	Freek's	35 feet		
Ekfrid, O., lot 12, range 4	...	...	...	...	William M. Dobie	
192. Clay	...	...	...	20 feet		
„ *a.* Machine-made stock brick ...	$5·25	150,000				
„ *b.* Six-inch drain-tile	$30	...				
„ *c.* Four „ „	$14·50	...	Darvill's			
„ *d.* Two-and-half-inch drain-tile	$8·50	...				
Parkhill, West Williams, O.	...	...	...	20 to 30 feet	Erastus Miller	
318. Clay from surface	...	...	...		...	
„ *a.* „ 16 feet below surface						
„ *b.* Hand-made slop brick (white)	$5·00	300,000				

London, O., lot 32, range 10	...	...	...	...	B. Robson	
217. Clay	...	...	...	...	,,	The drain-tiles made by Mr. Robson range in size from 2 to 6 inches.
,, *a.* Three-and-half-inch drain-tiles						
225. Clay	...	...	...	10 feet		
,, *a.* Three-inch drain-tile ...	$11·00					
,, *b.* Two-and-half-inch drain-tile	$9·00	130,000	Darvill's			
,, *c.* Two-inch drain-tile	$7·00					
London, O.	...	...	...	...	Jas. Johnson	
177. Clay	...	...	...	30 feet		
,, *a.* Machine-made stock brick ...	$6·00	800,000	Martin's			
County of Bruce.						
Port Elgin, Saugeen, O.	...	...	...	...	Henry Smith	
187. Clay	...	...	...	30 feet		
,, *a.* Machine-made stock brick ...	$6·00	800,000	Martin's			
Brant, O.	...	...	...	...	Chas. Scarborough	
185. Clay	...	...	...	30 feet	...	This clay, without the addition of one-third sand, is said to be too strong for bricks but is employed alone in the manufacture of drain-tiles.
,, *a.* Machine-made stock brick ...	$5·50	500,000	Martin's			
186. Clay	...	...	...	30 feet		
,, *a.* Four-inch drain-tile	$20·00					
,, *b.* Three ,, ,, ...	$15·00	20,000				
,, *c.* Two ,, ,, ...	$8·00					
Southampton, Saugeen, O.	...	...	...	...	R. Gibbons	
262. Clay	...	...	...	30 feet		
,, *a.* Hand-made stock brick ...	$6·00	300,000				
County of Oxford.						
Tilsonburg, O.	...	...	...	...	Edwin D. Tillson	
181. Clay	...	...	...	12 feet		
,, *a.* Machine-made stock brick ...	$6·00	900,000	Close's			
County of Perth.						
Blanchard, O., lot 3, range 7	...	...	...	...	Joseph Pegler	
189. Clay (Blue)	...	...	...	14 feet		
,, *a.* ,, (Brown)	...	...	...	6 feet		
,, *b.* Six-inch drain-tile	$42·00					
,, *c.* Five-inch ,, ...	$32·00					
,, *d.* Four-inch ,, ...	$22·00					
,, *e.* Three-and-half-inch drain-tile	$17·00	160,000	Tiffany's			
,, *f.* Three-inch drain-tile	$13·00					
,, *g.* Two-and-half-inch drain-tile...	$11·00					
,, *h.* Two ,, ,, ...	$10·00					

BRICKS AND DRAIN-TILES—*continued.*

	Price per 1,000.	Quantity made Annually.	Machine used.	Depth of clay.	Exhibitor.	Remarks.
County of Wentworth.						
Hamilton, O.						
64. Ornamental brick	...	...	Townsley's	7 feet	George Frid	About two million machine-made stock bricks are also made annually, and sold for $5·50 per thousand.
Hamilton, O.	...	...	...	...	H. Ollmann	
176. Clay	...	...	...	8 feet		
„ *a.* Machine-made stock brick ...	$6·00	900,000	Townsley's			
„ *b.* Pressed brick	$12·00					
„ *c.* Angle „						
„ *d.* Plinth „						
County of Welland						
Welland, O.	...	...	...	...	T. W. Hooker	
218. Clay	...	...	...	3 feet		
„ *a.* Machine-made stock brick (red)	$6·00	800,000	Martin's	...	...	A small number of drain-tiles in sizes from two to six inches are also made.
Bertie, O.	...	...	...	...	A. Deterling	
182. Clay	...	...	...	6 feet		
„ *a.* Machine-made stock brick (white)	$6·00	250,000	Townsley's			
183. Clay						
„ *a.* Machine-made stock brick (red)						
County of Lincoln.						
Clinton, O., lot 22, range 1	...	...	...	...	Wm. Tallman & Son	About three months in the year are devoted to brick-making, and five months to tile making. The tiles are from two to eight inches in diameter.
130. Machine-made stock brick (red)	$6·00	500,000	Martin's			
„ *a.* Drain-tiles	...	400,000	Tiffany's			
„ *b.* Clay	...	...	...	3 feet		
County of York.						
Carleton West, O.	...	...	...	...	...	Mr. Townsley, in 1884, manufactured about 1,500,000 machine-made stock bricks and 10,000 sewer-pipes 4, 6 and 9 inches in diameter.
59. Pressed brick (red)	...	...	Townsley'	3 feet	George Townsley	
60. Machine-made stock brick (red)	$6·00	1,000,000	Martin's	3 feet	Joseph Brown	
61. Pressed brick (red)	...	...	„	3 feet	Thos. Robertson	1,000,000machine-made stock bricks were made in 1884.
62. Machine-made stock brick (red)	$6·00	2,000,000	„	3 feet	Booth & Pears	

Toronto, O.						
54. Machine-made stock brick	(white)	$6·25	2,000,000	Martin's	25 feet	T. Nightingale	Drain-tiles are also extensively made.
„ *a.* „ „ „	(red)	$6·50	2,000,000		3 feet		
55. „ „ „	(red)	$6·50	350,000	Townsley's	3 feet	J. Harrington	350,000 white bricks are also made.
56. „ „ „	(white)	$6·50	800,000	Martin's	25 feet	J. Sheppard	About 200,000 drain-tiles are also made annually.
57. „ „ „	(white)	$6·25	700,000	Townsley's	25 feet	J. Gibson	
58. „ „ „	(white)	$6·25	900,000	„	25 feet	Wm. Greensides.	800,000 red bricks are also made.
66. „ „ „	(red)	$6·00	1,000,000	Martin's	4 feet	John Jones	
70. „ „ „	(grey)	$6·00	450,000	Townsley's	10 feet	John Price	
„ *a.* „ „ „	(red)	$6·00	450,000		3 feet		
Agincourt, Scarborough, O.		...	...	...	...	John Walton	
230. Clay		...	...	...	4 feet		
„ *a.* Three-inch drain-tile		$12·00	...	Excelsior			
„ *b.* Two „ „		$8·00					
COUNTY OF SIMCOE.							
Penetanguishene, O.		...	...	...	...	C. Beck & Co.	
216. Clay		...	...	...	16 feet		
„ *a.* Machine-made stock brick	(red)	$6·00	400,000	Martin's			
COUNTY OF NORTHUMBERLAND.							
Warkworth, Percy, O.							
213. Clay, ten feet below surface...				...			
„ *a.* Machine-made stock brick	(red)	$6·00	400,000	Martin's	35 feet	D. S. Pickworth	A few thousand drain-tiles, ranging in size from two to four inches, are also made.
214. Clay, twenty feet below surface				...			
COUNTY OF PETERBOROUGH.							
Otonabee, O., lot 32, range 12 ...		...	...	...	...	M. Curtis & Sons	
226. Clay		...	...	...	8 feet		
„ *a.* Machine-made stock brick (white)		$7·50	650,000				
„ *b.* Machine-made plinth brick (white)		...					
„ *c.* Six-inch drain-tile		$40·00					
„ *d.* Four „ „		$22·00	140,000	Canada			
„ *e.* Three-inch „		$13·00					
„ *f.* Two-and-half-inch drain-tile ...		$10·00			2 feet		
227. Clay		...	...				
„ *a.* Machine-made stock brick	(red)	$7·50	650,000				

BRICKS AND DRAIN-TILES—*continued.*

	Price per 1,000.	Quantity made annually.	Machine used.	Depth of clay.	Exhibitor.	Remarks.
County of Prince Edward.						
Bloomfield, Hallowell, O.	...	...	...	...	A. B. Saylor	
184. Clay	...	...	...	3 feet		
„ *b.* Hand-made stock brick (red)	$6·00	200,000	Bulmer and Sheppard's			
„ *c.* Machine „ „ „	$6·00	400,000				
County of Hastings.						
Thurlow, O., lot 11, range 1	...	...	...	4 feet	Nelson Lingham	
52. Hand-made stock brick (red)	$7·00	1,200,000				
„ *a.* Pressed brick	$9·00	300,000				
Thurlow, O.	...	...	...	4 feet	C. H. La Roche & Co., Bellville, O.	In 1884 this company manufactured about 2,000,000 machine-made and 700,000 hand-made bricks.
53. Pressed brick (red)	$9·00	350,000	Martin's			
Rawdon, O., lot 12, range 1	...	...	...	...	R. Langman	
229. Clay	...	...	...	3 feet		
„ *a.* Machine-made stock brick (red)	$6·50	250,000	Townsley's			
County of Frontenac.						
Kingston, O., lot 15, range 3	...	...	...	3 feet	Johnson Day	
49. Hand-made stock brick (red)	$9·00	300,000	...			
Cataraqui, Kingston, O.	...	...	...	...	Edward Riley	
178. Clay	...	..	...	3 feet		
„ *a.* Hand-made stock brick (red)	$7·00	300,000				
County of Leeds.						
Brockville, O.	...	...	...	...	A. Odell	
212. Clay, for white bricks ...	...	...	...	18 feet		
„ *a.* „ red „						
„ *b.* brick (white)	$8·00	1,200,000	Hall's Patent			
„ *c.* brick (red)						
County of Renfrew.						
Stafford, O., lot 30, range 1	...	...	...	...	James Johnson, Pembroke, O.	Mr. Johnson makes annually about 500,000 red hand-made bricks, which are sold at $7·50 per 1,000.
161. Clay	...	...	...	7 feet		

Pembroke, O.	...	...	...	...	Thos. Cashmore	
163. Clay	...	...	...	6 feet		
„ *a.* Hand-made stock brick (red)	$8·00	600,000				
McNab, O., lot 7, range 13	...	...	...	...	Wm. Baker, Arnprior, O.	About 20,000 drain-tiles, in sizes of two inches to eight inches, were made in 1884, and about 400,000 machine-made red stock bricks in 1885.
165. Clay	...	...	...	15 feet		
„ *a.* Three-inch drain-tile... ...	$15·00	...	Freek's			
COUNTY OF LANARK.						
Ramsay, O., lot 20, range 8	...	...	...	...	David Moore, *Almonte, O.*	
164. Clay	...	...	...	...		
Beckwith, O., lot 17, range 11 ...	...	...	...	...	W. Willoughby. *Carleton Place, O*	In the summer of 1885, machine-made red bricks were produced at the rate of 9,000 a-day, and sold at $10.00 per 1,000.
162. Clay	...	...	...	5 feet		
Montague, O., lot 6, range A ...	...	...	...	...	Wm. Nicholson.	
211. Clay	..	...	...	10 feet		
„ *a.* Machine-made stock brick (red).	$7.00	250,000	Ontario			
„ *b.* „ „ „ „ (grey).						
COUNTY OF CARLETON.						
Richmond, Goulbourn, O	...	...	...	...	H. McElroy & Son.	
215. Clay	...	...	...	30 feet		
„ *a.* Machine-made stock brick (red).	$7.50	400,000	Bulmer and Sheppard's			
Nepean, O.	...	...	...	...	W. C. Odell. *Ottawa, O.*	
160. Clay	...	...	...	14 feet		
„ *a.* Machine-made stock brick (red).	$8.25	2,000,000	Bulmer and Sheppard's—Adams' patent			
COUNTY OF RUSSELL.						
Russell, O., lot 10, range 5	...	...	...	...	H. Rombaugh.	
236. Clay	...	...	...	76 feet		
„ *a.* Machine-made stock brick (red).	$7.00	200,000	Bulmer and Sheppard's			
COUNTY OF DUNDAS.						
Matilda, O.	...	...	...	...	R. Hanes.	About 200,000 machine-made red bricks are produced annually, and sell at the kiln for $6·00 per 1,000.
200. Clay	...	...	...	9 feet		

BRICKS AND DRAIN-TILES—*continued.*

	Price per 1,000.	Quantity made Annually.	Machine used.	Depth of clay.	Exhibitor.	Remarks.
COUNTY OF STORMONT.						
Cornwall, O., lot 18, range 1	...	...	...	...	J. A. Shearer.	
237. Clay for white bricks.						
„ *a.* Machine-made stock brick (white)	$7.00	600,000	Bulmer and Sheppard's	40 feet		
238. Clay for red bricks						
„ *a.* Machine-made stock brick (red)						
COUNTY OF GLENGARRY.						
Kenyon, O., lot 3, range 20	...	...	...	...	D. McGillivray	
193. Clay.						
„ *a.* Machine-made stock brick (red)	$6.00	250,000	Bulmer and Sheppard's	5 feet		
QUEBEC.						
COUNTY OF HOCHELAGA.						
Montreal, Q.						
119. Bricks—bevelled (red) ...	...	...	...	...	Bulmer & Sheppard, *Montreal, Q.*	
„ *a.* „ moulded „						
„ *b.* „ square.						
„ *c.* Drain-tiles.						
NEW BRUNSWICK.						
COUNTY OF NORTHUMBERLAND.						
Nelson, N.B.	...	...	...	...	Geo. A. Flett	500,000 machine-made stock bricks are also produced, and sell at the kiln for $6·00 per 1,000.
297. Clay	...	...	..	20 feet		
„ *a.* Hand-made stock brick (red)...	$8.00	50,000	Brewer's			
COUNTY OF YORK.						
Fredericton, N. B.	...	...	...	...	M. Ryan	
295. Clay	...	...	...	20 feet		
„ *a.* Machine-made stock brick (red)	$7.50	600,000	Ontario			
„ *b.* Ornamental brick	$20					
„ *c.* Three-and-half inch drain-tile	$	...	Ontario			Mr. Ryan makes about 35,000 drain-tiles annually, in sizes of 2 to 6 inches; they are sold at $10 to $50 per 1,000.
„ *d.* Three „ „ „	$	...				
„ *e.* Two „ „ „	$10.00	...				

County of Westmorland.						
Moncton, N.B.	...	...	...	...	Wm. H. Cummings	
296. Clay	...	...	...	12 feet		About the same number machine-made stock bricks are produced, and are sold for $6·00 per 1,000. Mr. Cummings also makes about 100,000 pressed bricks and 200,000 sewer bricks annually, the former selling from $15 to $20 per 1,000, and the latter at $10.00 per 1,000.
„ *a.* Hand-made stock brick (red)	$7.00	500,000	Tiffany's			
County of Kings.						
Sussex, N.B.	...	...	...	...	T. Heffer.	Mr. Heffer also manufactures about 500,000 hand-made stock bricks, which are sold for the same price as the machine-made bricks
294. Clay from surface	...	...	...	10 feet.		Drain-tiles from two to four inches sell at $10 to $30 per 1,000, and are made at the rate of 12,000 annually.
„ *a.* „ below surface	...	...	...			
„ *b.* Machine-made stock brick (red)	$8·00	500,000	Darvill's.			
„ *c.* Pressed brick (red)	$15·00	100,000				
County of St. John.						
St. John, N.B.	...	...	...	...	John Lee & Co.	About 200,000 sewer bricks are made annually, and sold for $12·00 per 1,000. Ornamental bricks of every description are also made, and bring $14 to $20 per 1,000.
289. Clay	...	...	...	10 feet.		
„ *a.* Machine-made stock brick (red)	$6·00	1,000,000	Freek's.			
„ *b.* Pressed brick	$12·00	100,000				
„ *c.* Ornamental brick						
„ *d.* Flooring tile						
NOVA SCOTIA.						
County of Kings.						
Avonport, Horton, N.S.	...	...	...	...	Jacob Walton.	
290. Clay	...	...	...	great		
„ *a.* Machine-made slop brick (red)	$6·00	900,000				
„ *b.* Pressed brick (red)	$16·00	60,000				
„ *c.* Four-inch drain tile	$20·00					
„ *d.* Three-inch „ „	$12·00					
„ *e.* Two-inch „ „	$8·00					
„ *f.* One-and-half inch	$8·00					
Canning, N.S.	...	...	...	...	G. Connors & Sons.	
313. Clay						
„ *a.* Three-inch round drain-tile...						
„ *b.* Two-and-half inch rd. drain-tile						
„ *c.* One-and-half inch rd. „						
„ *d.* Three-and-half inch oval „						
„ *e.* Two-and-half inch oval „						
„ *f.* One-and-half inch oval „						
„ *g.* Three-and-half inch drain-tile collar.						
„ *h.* Three-inch drain-tile collar.						

VIII.

REFRACTORY MATERIALS.

Graphite or Plumbago.

Workable deposits of graphite occur in the provinces of Ontario, Quebec, and New Brunswick, and are confined, so far as is known, to rocks of Laurentian age. The mineral occurs, both in veins and disseminated through beds of limestone or gneissic rock. The most important deposits yet found occur in the province of Quebec north of the Ottawa river, in the townships of Buckingham, Lochaber, and Grenville. In a series of experiments, carried out by Mr. Hoffmann in the laboratory of the Geological Survey, with a view to ascertaining the suitability of Canadian graphites for the manufacture of crucibles, the Canadian mineral was found to be as incombustible as that of Ceylon, and quite equal to it for this purpose. (Report of Progress of the Geological Survey, 1876–77, p. 510.

Buckingham, Q. ..... *W. H. Walker, Ottawa, Q.*

372. Large specimens of disseminated graphite, taken from a bed twenty-seven feet thick.
„ *a.* Disseminated graphite from quarry.
„ *b.* Large blocks of pure graphite, taken from pits.
„ *c.* Specimens of pure graphite from fifteen different veins, contains ninety-seven per cent. of carbon.
„ *d.* Prepared stocks of the following grades :—

For electrotyping and pencils.
„ lubricating and pencils.
„ „ paints, powder, shot, etc.
„ crucibles, lubricating, etc.
„ „ „ stove polish, etc.
„ Foundry facings, castings, etc.

„ *e.* Pencil leads.
„ *f.* Specimens of pencils in different stages of manufacture.
„ *g.* Collection of pencils, including lumber pencils ; universal, carpenters' ; round black, round felt, and black and satin finish round English drawing ; hexagon gilt; maroon and satin finish standard hexagon, natural polish ; phonographic (three grades), specially prepared for reporters. (Diploma and gold medal awarded at Paris for collection.)
„ *h.* Collection of crucibles for steel and other metals, covers, nozzles, stoppers, etc. The crucibles have numbers representing their

capacity stamped on the bottom of each. The steel crucibles represent about two pounds to each number. Brass and other crucibles from three to five pounds each number ; thus, No. 50 represents a crucible in which may be melted about 150 lbs. of brass, 180 lbs. of silver, and 250 lbs. of gold.

372*i*. Stove and grate polish.

The mines and works are situated in the township of Buckingham, Ottawa county, province of Quebec. They were formerly owned by "The Dominion of Canada Plumbago Co.," but are now the sole property of Mr. Walker. The country is here well timbered and watered, and the facilities for mining are unsurpassed. The mines are twenty-four miles from Ottawa, four miles from railway communication, and eight miles from water communication. The graphite is found both in beds and veins, the principal veins, so far as is known, being on lot twenty-one in the seventh range, while the most important beds are on lot twenty in the eighth range. Some idea of the size of the masses of plumbago which can be obtained may be formed from the fact that one of the specimens exhibited weighs 4,870 lbs. Operations are at present suspended.—*Laurentian.*

Buckingham, Q. . . . . *Geological Survey.*

63. Graphite.

Grenville, Q., lot 10, range 5 . . . . . *Geological Survey.*

260. Graphite.

On this lot five beds or veins of more or less pure graphite occur in a belt from five to eight feet wide ; they are from five to twenty-two inches thick, and are enclosed in a gangue, from which the graphite may be readily separated. This gangue consists of pyroxene, wollastonite, felspar, and quartz, with smaller quantities of sphene, phlogopite, zircon, garnet, and idocrase. The country-rock is white crystalline limestone. The deposit has been opened for sixty feet of its course to a depth of thirty feet, and some of the graphite has been exported. It is said that it yielded thirty-four pounds of shipping "ore" for every cubic foot excavated.

It was estimated that some of the blocks broken up for shipping weighed from 700 to 1,500 lbs.—*Laurentian.*

St. John, N.B. . . . . *S. S. Mayes, St. John, N.B.*

564. Graphite.

From near the Suspension Bridge, St. John, N.B.

Portland, St. John county, N.B. . . . . *George Botsford, Fredericton, N.B.*

519. Graphite.

Soapstone (Steatite, Compact Talc).

Wolfstown, Q., lot 19, range 1..... *Calvin Carter, Belmina, Wolfe, Q.*

282. Soapstone.
282*a*. „ powdered.
282*b*. „ pencils.

The bolted powder, in bags containing 150 lbs. each, is delivered at the nearest railway station, which is sixty miles from Quebec, for $8 per ton (2,000 lbs.). The stone, in blocks, is delivered at the same place for $5 per ton, and the pencils for $3·35 per thousand. These are wholesale prices. Large slabs of fine quality can be obtained. The exhibitor also manufactures "tailors' chalk" from the soapstone.—*Pre-Cambrian.*

Potton, Q., lot 16, range 5 ..... *Geological Survey.*

32. Soapstone.

Among the metamorphic rocks at the base of the palæozoic formations in the province of Quebec, soapstone or steatite occurs in great abundance. Beds of it, varying in thickness from one to sixteen feet, can be traced for long distances, and are usually associated with serpentine, dolomite, or magnesite, sometimes apparently replacing one or other of these rocks. In general the soapstone is remarkably pure, but occasionally crystals of bitter-spar or of actinolite are disseminated through it. At Potton the bed is thirty feet thick, and the soapstone is interstratified with potstone and dolomite.—*Pre-Cambrian.*

Bolton, Q ..... *Geological Survey.*

123. Soapstone.

Potstone (Compact Chlorite).

Bolton, Q., lot 26, range 2..... ..... *Geological Survey.*

41. Potstone, dressed.
41*a*. Turned card receiver of potstone.

Great thicknesses of the strata underlying the Eastern Townships of the province of Quebec, consist of chloritic slates, which appear to occupy a somewhat higher stratigraphical position than the more magnesian strata just mentioned. Bands of pure compact chlorite or potstone occur interstratified with the more magnesian strata, and some of these are of considerable thickness, the one in Bolton, from which the specimens were derived, having a width of about twenty feet.—*Pre-Cambrian.*

Mica Rock.

Shipton, Q., lot 18, range 5 ..... *Geological Survey.*

314. Mica rock, dressed.

In nearly the same stratigraphical horizon as the potstone, there occurs in some localities in the Eastern Townships a compact hydrous mica which so much resembles potstone as to have been mistaken for it. Where the specimens were obtained, a breadth of five feet of the mica rock is exposed; the full thickness of the band, however, is supposed to be much greater.

Mica.

120 Miles North-East of Clinton, B.C. ..... *J. W. Foster, Clinton, B.C.*

541. Mica, cut to various sizes.

A large deposit of mica is said to occur at this locality. The specimens exhibited, having been obtained from the surface, are somewhat weathered.

Magnesia mica or phlogopite occurs abundantly in small scales, and sometimes in crystals sufficiently large to be of economic importance, in the crystalline limestones of the Laurentian system. These generally occur interstratified with or near bands of quartzite, or of pyroxenic gneiss, and usually contain a number of mineral species. Among these, in addition to quartz, pyroxene, and felspar, the species loganite, wollastonite, apatite, sphene, iron pyrites, idocrase, garnet, tourmaline, zircon, etc., occasionally occur, and sometimes corundum is found. In Grenville, where the mica is imbedded in massive pyroxene rock, associated with a band of crystalline limestone, crystals of mica have been obtained, giving sheets measuring as much as twenty-four by fourteen inches. Mica has been worked at various localities in the Laurentian area.

North Burgess, O., lot 17, range 9 ..... *W. A. Allan, Ottawa, O.*

73. Mica, uncut.
73*a*. „ „ cut and dressed (two sizes).

Plates have been obtained here twenty-four inches square. The average price of marketable sizes is about $4 per lb.—*Laurentian.*

Villeneuve, Q., lots 30 and 31, range 1 ..... *W. A. Allan, Ottawa, O.*

87. Mica (muscovite).
87*a*. „ „ cut and dressed (several sizes).

This mica occurs in a coarse pegmatite vein, which cuts a greyish garnetiferous gneiss. The vein is composed of quartz (white and brownish), mica, orthoclase or microcline, and occasionally garnet and black tourmaline. The

property is now held by the British and Canadian Mica and Mining Company—L. H. Shirley, Esq., Buckingham, Q., Managing Director. (See No. 300.)—*Laurentian.*

Mica Hill, near Neils Harbour, Cape Breton, N.S. ..... } *A. G. Ross, North Sydney, Cape Breton, N.S.*

481. Mica.

Cape North, N.S. ..... *W. Copeland, North Sydney, Cape Breton, N.S.*

299. Mica.

North Shore of Hudson Strait, N.E.T. ..... *Geological Survey.*

526. Mica.

Mica, like that exhibited, appears to be abundant on the north shore of Hudson's Strait in the neighbourhood of the Upper Savage Islands. The Eskimo carry specimens of it to any stranger who may visit that region, and it is said that quantities of it have been taken to New England by American whalers. All the specimens seen by the officers of the Geological Survey were of a pale brown or amber colour. It resists the heat well, and is admirably adapted for stove windows. From what could be learned it probably occurs in veins of coarse granite which cut the gneiss of that region.—*Laurentian.*

Asbestus (Fibrous Serpentine, Chrysotile.)

Serpentines occur in the province of Quebec at many points in the belt of the so-called "altered Quebec group" (Pre-Cambrian) through a range of over 120 miles in length. The character of the rock varies considerably, being in some places apparently, as yet, in a transition stage between the original rock, from which it is derived, and a true serpentine, having still almost the hardness of felspar, while it has the general aspect and colour of the serpentine, which varies from light grey to dark green. Although asbestus is found at nearly every place where true serpentine occurs, its profitable extraction is as yet confined to three or four districts, among which are the townships of Thetford, Coleraine, and Danville. Considerable exploratory work which bids fair to give profitable results has also been done at Belmina, in the county of Wolfe, and in the vicinity of Brompton Lake, where large areas of serpentine occur. The mines at Thetford have so far disclosed the largest veins, which are sometimes nearly seven inches thick. The larger veins do not yield fibre of such fine quality as the smaller ones. Excellent *cotton* is however, obtained, as much as four and five inches in length. The veins are very irregular in character and distribution, a small vein at the surface often developing into a large one a short distance down. Large masses of dioritic rock having the aspect of dykes are found in most of the quarries, and may possibly represent

portions of the original rock not yet altered to serpentine. Though of comparatively recent date, asbestus mining bids fair to become one of the most important and remunerative industries of the province of Quebec.

Quebec, Q..... { *The Asbestus Mining and Manufacturing Co. of Canada, Quebec, Q.*

483. Asbestus, crude.
„ powdered.
„ carded.
„ rope and wick.
„ mill-board.

This company has just fitted up a very large and complete factory at Quebec with the most improved machinery for the manufacture of asbestus goods.

Thetford, Q..... { *Anglo-Canadian Asbestus Co. (Limited), Montreal, Q. London Offices*, 110, *Cannon Street* (*R. H. Jones, Sec.*)

Crude Asbestus from Eureka and Emelie mines in the township of Thetford, Q.

489. Asbestus, crushed and carded (special quality).
„ „ „ (No. 1. quality).
„ powder for manufacture of paints, etc.
„ engine packing.
„ wick or valve packing.
„ yarn—single to six ply.
„ cloth.
„ mill-board.
„ metallic joints.
„ casket or flange joints.
„ and india-rubber joints.
„ „ „ woven tape.
„ „ „ sheeting.

Danville, Richmond, Q..... *W. H. Jeffrey, Danville, Richmond, Q.*

131. Asbestus (chrysotile).

Thetford, Q., lot 27, range 6 .....*Johnson & Co., Thetford Mines, Q.*

88. Asbestus (chrysotile).

This mine has been in operation for the last seven years, and has produced in that time about 2,000 tons of asbestus. The last shipment sold for $80 a ton.

Thetford, Q.....*King Bros., Quebec, Q.*

124. Asbestus (chrysotile).

Thetford, Q., lot 27, range 5..... { *Boston Asbestus Packing Co., Thetford Mines, Q.*

197. Asbestus (chrysotile).
286. „ (picrolite).

This deposit, first opened in 1878, has since been continuously worked, and has produced up to date about 2,000 tons of asbestus. (See No. 129.)

Thetford, Q., lot 27, range 5 ..... *Fenwick and Sclater, Montreal, Q.*

129. Asbestus, crude and manufactured.

These specimens are manufactured by the Boston Asbestus Packing Co., from the asbestus mined on lot 27, range 5, of Thetford. Messrs. Fenwick and Sclater are the agents in Canada.

Thetford, Q., lot 27, range 6..*Ross, Ward Bros. & Co., Thetford Mines, Q.*

315. Asbestus (chrysotile).

This deposit has only lately been opened, but, judging from present indications, it promises to become as remunerative as the adjoining ones.

Fire Clay, &c.

Joliette, Q..... *W. Dupuis, Joliette, Q.*

518. Fire clay.

Laxton, O., lots 3 and 4, range 11..... *Elizabeth Griffen, Coboconk, O.*

221. Kaolin.

This kaolin occurs in patches in a granitic rock, and results from the decomposition of a green felspar (amazon stone).—*Laurentian.*

Wentworth, Hants county, N.S. ..... *Geological Survey.*

512. Kaolin.—*Lower Carboniferous.*

McBride's Corners, O..... *James Howley, Montreal, Q.*

44. Sandstone for furnace linings.

IX.

MATERIALS FOR GRINDING AND POLISHING.

Whetstones.

Nottawasaga, O., lot 24, range 11 ..... *Geological Survey.*

496. Whetstones.

The rock from which these are made is in every way suited for superior scythe-stones, although they have never yet been manufactured from it.—*Medina formation, Silurian.*

Hatley, Massawippi Lake, Q. ..... *Geological Survey.*

497. Whetstones.

Kingsley, Q., lot 7, range 2 ..... *Geological Survey.*

517. Whetstones.

In the "Eastern Townships" of the province of Quebec rocks suitable for the manufacture of good whetstones are found in several places.

Johnson's Crossing, near Truro, N.S. ..... *T. B. Smith, Truro, N.S.*

634. Whetstone.

Tripolite.

New Brunswick ..... *William Murdock, St. John, N.B.*

568. Siliceous earth in raw state.
568a. „ „ calcined.

The price of the raw earth is five dollars, and of the calcined earth ten dollars, per ton.

Fountain Lake, Cumberland county, N.S. - *Alex McKenzie, Montreal, Q.*

291. Infusorial earth (tripolite).

This lake is about eight miles from the Intercolonial Railway, and near the summit of the Cobequid Mountain range; the deposit is from two to fifteen feet deep, and the earth is remarkably pure.—*Alluvion.*

Merigonish, Pictou county, N.S..... *Alex McKenzie, Montreal, Q.*

293. Infusorial earth (tripolite).
This deposit is thought to be from five to twenty feet thick.—*Alluvion.*

Pollet Lake, Mechanic Settlement, King's County, N.B. } *Alex McKenzie, Montreal, Q.*

292. Infusorial earth (tripolite).

This deposit is said to be from four to twenty feet thick. Some of the earth was examined by Mr. Hoffmann in the laboratory of the Survey, and found to have the following composition (air dried):—

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 and organic matter	13·321

On treatment with caustic potash the air-dried material left an insoluble residue of only 7·994 per cent.—Report of Progress of the Geological Survey, 1878–79, p. 6, H.

The deposit would appear to be of fresh-water origin. It contains siliceous spicules of *Spongilla* in great abundance, also quantities of frustules of diatomaceæ, mostly detached, among which the following genera can be recognised—*Pinnularia, Surirella, Stauroneis, Himantidium.*

Several deposits of Infusorial Earth are now known to occur both in New Brunswick and Nova Scotia, which in purity and value of the earth far exceed that imported from Germany. Some of these are so favourably situated for working, and with such facilities for shipment, that there should be no difficulty in entirely controlling the American market if properly handled. Besides the localities mentioned above, two others are known to exist in New Brunswick, viz., one at Pleasant Lake, about six miles south-west of Pollet Lake, and another about seven miles east of St. John. In Nova Scotia a very accessible deposit occupies the bed of Folly Lake, over which the Intercolonial Railway passes. Other lakes along the Cobequid Mountain range and in Cape Breton contain deposits of greater or less extent, and it

is also stated to occur in King's county and in the vicinity of Halifax in the lakes from which the water supply of that city is derived.—*Alluvion.*

Polishing Powder.

Westbury, Q. ..... *T. W. Constable, Westbury, Q.*

635. Crude polishing powder.

The same refined, and put up in packages for sale under the name of "Diatomic Polishing Powder."

X.

MINERALS APPLICABLE TO THE FINE ARTS AND TO JEWELERY.

Lithographic Stone.

At Marmora the Laurentian rocks are overlaid by about twenty feet of brownish-grey and light brownish-buff unfossiliferous compact limestone, having a conchoidal fracture. Several beds of this would be well suited for the manufacture of lithographic stones, were it not for small imbedded crystals of calcite, which when abundant, render the stone unfit for such a purpose. One of the beds, however, which is two feet thick, and of impalpable grain, is a lithographic stone of excellent quality, and has been commended by many lithographers who have tried it. The lower half is much better than the upper, which contains some of the crystals of calcite referred to above. The band to which this bed belongs crops out at intervals all the way from Hungerford to Rama, a distance of 100 miles. Stone which appears to be suitable for the manufacture of lithographic stones has also been observed elsewhere in Canada, but has not yet been thoroughly examined.

Madoc, O., lot 7, range 5 .....*D. E. K. Stewart, Madoc, O.*

364. Lithographic stone, dressed.

On this property a trial pit has been sunk through the horizontal beds of this rock. The pit is eighteen feet deep, and the beds three to sixteen inches thick.—*Black River formation, Cambro-Silurian.*

Harvey, O., lot 14, range 15 .....*H. Grundy, Peterborough, O.*

333. Lithographic stone, dressed.

Here an excavation, twenty by forty feet, has been made in beds from a few inches to four feet thick, and apparently free from objectionable inclusions. The material has not yet been sufficiently tested to prove its value as a lithographic stone.—*Black River formation, Cambro-Silurian.*

Porphyries.

Grenville, Q., lot 3, range 5 .....*Geological Survey.*

353. Porphyry, dark green with red crystals.

Chatham, Q., lot 7, range 7 ..... *Geological Survey.*

467. A specimen of porphyry, polished, showing red crystals in a dark-coloured base.

In the townships of Grenville and Chatham, the Laurentian limestones and gneisses are cut by dykes of diabase, which are cut off by intrusive masses of syenite, these in their turn being penetrated by quartz porphyry. All of these rocks are older than the Silurian. The porphyry (of which these are specimens) has a compact, apparently homogeneous base, containing crystals of orthoclase (sometimes twinned according to the Baveno system), and more rarely, crystals of quartz.

Scapolite.

Augmentation of Grenville, O., lot 3, range 3 ..... *Geological Survey.*

235. Scapolite, polished.

This mineral occurs as large cleavable masses in a limestone, and is associated with lilac-coloured crystals of pyroxene. When free from this mineral it takes a good polish.—*Laurentian.*

Wilsonite.

Bathurst, O..... *Geological Survey.*

506. Wilsonite, polished.

Beautiful specimens of this mineral occur associated with scapolite, and masses may often be found showing a gradual passage of one mineral into the other.—*Laurentian.*

Labradorite.

Labrador ..... *Geological Survey.*

486. Labradorite, cut and polished.

The opalescent Labradorite, obtained from the Laurentian rocks in a number of places, embraces several varieties known as "fire-coloured," &c. The best come from St. Paul's Island, and the adjacent shores in the vicinity of Nain, on the coast of Labrador, where it occurs in veins.—*Laurentian.*

Albite (Peristerite).

Bathurst, O., lot 19, range 9 ..... *Geological Survey.*

377. Albite, cut and polished.

This mineral, called Peristerite by Thompson, on account of its beautiful bluish opalescence, is a variety of albite. In this locality it occurs in large cleavable masses, containing disseminated grains of quartz, in veins cutting Laurentian strata. A vein of the same character occurs on the north side of Stony Lake, near the mouth of Eel Creek, in Burleigh, intersecting a white crystalline limestone, which is interstratified with blackish-grey gneiss. Here the vein consists of a fine-grained mixture of reddish white albite and quartz, in which are enclosed large cleavable masses of the opalescent albite, and occasionally some black tourmaline.—*Laurentian.*

Perthite.

Burgess, O., lot 3, range 6 ..... *Geological Survey.*

378. Perthite, cut and polished.

Occurs in large cleavable masses in thick pegmatite veins cutting Laurentian strata. It consists of orthoclase and albite, interlaminated with one another, the reddish bands being the orthoclase.—*Laurentian.*

Garnet.

Skeena River, B.C. .. { *H. C. Beeton, Agent for British Columbia, London, England.*

571. Specimen of schist holding large garnet crystals.

Jasper Conglomerate.

Bruce Mines, Lake Huron, O. ..... *Geological Survey.*

367. Pedestal of jasper conglomerate, polished.

This remarkable and beautiful rock occurs in thick beds, constituting in fact mountain masses, associated with the white quartzite of the Huronian system. The matrix consists of white quartzite and the pebbles of red and black jaspers and smoky chalcedony. It runs for miles through the country north of the Bruce Mines and on the north side of Goulais Bay, Lake Superior, and is exposed on the shore of the St. Mary's River, about four miles west of Campement d'Ours, and at two places on the east shore of Lake George. Boulders of it are abundant along the lake and river shores in this region. A ridge showing several varieties of the rock runs within half a mile of the northern extremity of Goulais Bay. Some varieties of the rock contain numerous small drusy cavities, and might make good millstones.—*Huronian.*

Jasper.

Hull, Q. ..... *Geological Survey.*

522. Jasper, polished specimen.—*Laurentian.*

Amethystine Quartz.

Amethyst Harbour, Lake Superior, O. ..... *Geological Survey.*

370. Amethyst crystals.

Nearly every vein cutting the cherty and argillaceous slates around Thunder Bay contains more or less of this mineral. At Amethyst Harbour openings have been made on several of the veins, for the purpose of obtaining these crystals, which here constitute almost the entire vein.—*Animikie series.*

Thunder Bay, near Port Arthur, O. . . *Thomas A. Keefer, Port Arthur, O.*

408. Amethyst.

Lake Superior, O. ..... *Sir Charles Tupper, London, England.*

578. Amethyst crystals (large specimen).

North Shore of Lake Superior, O. . . . . *Thomas A. Keefer, Port Arthur, O.*

412. Quartz crystals.

Agates.

Queen Charlotte Islands, B.C. ..... *Geological Survey.*

507. Chalcedonic pebbles, cut and polished.

These pebbles occur abundantly in some localities, and are derived from the Miocene Tertiary rocks of the islands. The specimens exhibited were presented by the Marquis of Lorne.

North Shore of Lake Superior, Thunder Bay district, O. ..... *Thos. A. Keefer, Port Arthur, O.*

409. Agate, cut and polished.

Michipicoten Island, Lake Superior, O..... *Geological Survey.*

468. Agates, cut and polished.

These agates occur on the north and south shores of Lake Superior, particularly on the Island of St. Ignace, and on Simpson's Island to the east of it; but the largest and best are derived from the trap of Michipicoten Island, where they are found on the shore in great abundance. On this island chalcedony and agate occur not only in the form of nodules in the trap, but in veins filling cracks and dislocations which traverse the trap, and run in several directions.

Gaspe, Q. ..... *Geological Survey.*

508. Jasper pebbles, cut and polished.

Bay of Fundy and Basin of Minas, N.S..... *Geological Survey.*

469. Agates and jasper, cut and polished.

Between Digby and Scot's Bay, on the south shore of the Bay of Fundy, handsome chalcedonic varieties of agate, both in veins or nodules, are of frequent occurrence in the basaltic rocks. At Scot's Bay rocks often exhibit large surfaces studded with these minerals. Partridge Island and Blomidon Island, in the Basin of Minas, have also from time to time afforded handsome specimens.

XI.

MISCELLANEOUS.

Special Collections of Minerals and Ores.

British Columbia..... *Oppenheimer Brothers, Victoria, B.C.*

435. Cabinet of minerals and ores from the province, with map showing the localities where the specimens exhibited occur.

North Shore of Lake Superior, O..... *Thos. A. Keefer, Port Arthur, O.*

400. Pyramid of ores from various mines.

North Shore of Lake Superior, O..... *Thos. A. Keefer, Port Arthur, O.*

403. Cabinet of economic minerals and building materials from various mines and properties in the neighbourhood.

403*a*. Cabinet of building, useful, ornamental, and precious stones.

Nova Scotia..... *J. W. F. Egan, Halifax, N.S.*

480. Cabinet of minerals.

Nova Scotia ..... *Thos. Snow, Halifax, N.S.*

504. Collection of minerals.

Canada ..... *Geological Survey.*

636. Small collection of some of the more characteristic minerals of the Dominion—pyroxenes, scapolites, chrome garnets, sodalites, zircons, &c.

North Shore of Lake Superior, O..... *Thos. A. Keefer, Port Arthur, O.*

411. Spheroidal argillaceous concretions from the silver-bearing rocks of the Animikie series.

Felspar.

Villeneuve, Q., lots 31 & 32, range 1 ..... *W. A. Allan, Ottawa, O.*

383. Potash felspar (microcline).

This felspar occurs in a vein exposed for a width of about 200 feet, and is associated with mica, quartz, tourmaline, &c. It might be utilized in the manufacture of porcelain, and large quantities can easily be obtained.—(See No. 87.)—*Laurentian.*

Soils.

Port Arthur, District of Thunder Bay, Lake Superior, O. { *Thos. A. Keefer, Port Arthur, O.*

413. Soil from neighbourhood of the Huronian Gold and Silver mine.

413*a*. Soil from near the town of Port Arthur, O.

Fossils.

Medicine Hat, N.W.T. ..... *F. Stewart, Toronto, O.*

112. Silicified wood.

Sydney Mines, Cape Breton, N.S. .. { *R. H. Brown, Sydney Mines, Cape Breton, N.S.*

440. Fossil Plant (carboniferous).

Gowrie Mine, Cape Breton, N.S. .... { *Gowrie Coal Co., Cow Bay, Cape Breton, N.S.*

449. Carboniferous fossils.

Petite Nation and other localities ..... *Geological Survey.*

395. Series of specimens illustrating the structure and mode of occurrence of *Eozoon Canadense*, prepared by Mr. T. C. Weston.

1 to 5. Micro-photographs, showing canal system as seen in decalcified specimens magnified about thirty diameters.—*Petite Nation Seigniory, Q.*

6. Nature print from decalcified specimen.—*Petite Nation Seigniory, Q.*

7. Photograph of specimen with matrix of pyroxene, one-half natural size.—*Petite Nation Seigniory, Q.*

8. Micro-drawing, showing canal system, &c., magnified 100 diameters.—*Petite Nation Seigniory, Q.*

9 & 10. Weathered specimens in serpentine and calcite.—*Petite Nation Seigniory, Q.*
11. Decalcified specimens showing canal system.—*Petite Nation Seigniory, Q.*
12. Loganite and calcite.—*North Burgess, O.*
13. Decalcified specimen, showing fine canal system.—*Petite Nation Seigniory, Q.*
14 to 16. Weathered specimens in calcite and serpentine.—*Petite Nation Seigniory, Q.*
17 to 20. Decalcified specimens.—*Petite Nation Seigniory, Q.*
21 & 22. Micaceous limestone.—*Gatineau River, Q.*
23. Polished slab.—*Gatineau River, Q.*
24 & 25. Decalcified specimens showing tubuli.—*Petite Nation Seigniory, Q.*
26 to 33. Microscopic sections showing canal systems, proper walls of chambers, &c.—*Petite Nation Seigniory, Q.*
34 & 35. Decalcified specimens showing tubuli.—*Petite Nation Seigniory, Q.*
36. Polished slab, showing serpentine, calcite and pyroxene.—*Petite Nation Seigniory, Q.*

Rocks of the Laurentian System associated with Eozoon.

37. Chrysotile veins in serpentine	*Grenville,*	*Q.*
38. Diorite	*Petite Nation Seigniory,*	*Q.*
39. Syenite	*Grenville,*	*Q.*
40. Gneiss	„	„
41. Gneiss	„	„
42. Plumbaginous limestone	„	„
43. Tremolite	„	„
44. Ophiolite	„	„
45. Pyroxene and serpentine	„	„
46. Mica	„	„

The laminæ of white calcite are the walls of the test of the animal, and the green serpentine fills the spaces originally occupied by its gelatinous sarcode.

Indian Implements, &c., in Stone.

Queen Charlotte Islands, B.C. ..... *Dr. George M. Dawson, Ottawa, O.*

397. Collection of Indian Carvings, made of indurated carbonaceous shale.
a. 6 oval platters.
b. 1 round platter.
c. 1 box.
d. 2 oval dishes.
e. 1 model of Totem Post.
f. 3 groups of figures.
g. 2 figures representing medicine men.

The shale from which these objects are made is associated with the Cretaceous anthracite-bearing rocks of Skidegate, Queen Charlotte Islands. It is homogenous in character, easily worked, and has long been used by the Haida Indians for the manufacture of certain useful or ornamental articles. Of late years, a ready sale having been found for such articles, considerable numbers have been produced, the work being carried on chiefly during the winter, when out of door occupations are few. Many articles are now made which were not formerly manufactured, such as boxes and groups of figures. The patterns designed on these are sometimes copied from European models, but are more usually purely native in character, and in the latter case afford excellent examples not only of the neat beaded work which these people produce, but also of the highly conventionalized art which has been theirs from time immemorial.

Victoria, B.C. ..... *W. S. Bowman, Victoria, B.C.*

550. Old Indian canoe or net anchor, found in a gravel-pit at Victoria.

North Shore of Lake Superior, O. .... *Thos. A. Keefer, Port Arthur, O.*

407. A collection of stone implements supposed to have been used by ancient miners.

North Shore of Lake Superior, O. ..... *Thos. A. Keefer, Port Arthur, O.*

425. Indian arrow heads (4).
„ *a.* Indian war clubs (3).
„ *b.* Indian pipes (4).
„ *c.* Sheath-knife.

Pearls.

Province of Quebec .... *G. Seifert, Quebec, Q.*

573. Canadian pearls.

These pearls are obtained from the freshwater mussel or Unio (*Margaritana margaritifera L.*), abundant in some of the rivers of the province of Quebec.

Archæn Rocks.

637. Collection of about four hundred specimens of Archæn rocks from the following localities :—

Lake St. John District, Q.
District North of Montreal, Q.

Eastern Townships, Q.
Shickshock Mountains, Q.
Lake of the Woods District, O.
New Brunswick.
Nova Scotia.

Collection of Reports and Maps published by the Geological Survey of Canada, as well as the following Manuscript Maps:—

Dominion of Canada, showing occurrence of Economic Minerals. Scale 27½ miles to the inch.

Dominion of Canada, geologically coloured, showing results of geological explorations up to January, 1886.

Map of the Eastern Townships of the Province of Quebec, showing the occurrence of Economic Minerals. Scale 4 miles to an inch.

Map of the Eastern Townships of the Province of Quebec, geologically coloured. Scale 4 miles to an inch.

Map of Nova Scotia, showing occurrence of Economic Minerals. Scale 3 miles to an inch. (Exhibited by Government of Nova Scotia.)

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ILLUSTRATIONS.