

GEOLOGICAL SURVEY OF CANADA

G. M. DAWSON, C.M.G., LL.D., F.R.S., DIRECTOR

REPORT

OF THE

SECTION OF CHEMISTRY AND MINERALOGY

BY

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OTTAWA

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To

G. M. DAWSON, C.M.G., LL.D., F.R.S.,

Director of the Geological Survey of Canada.

SIR,—In handing you the accompanying report, I should mention that it does not by any means represent all the work accomplished in this Laboratory during the period which it embraces—indeed but little more than half, the balance, possessing but little or no interest save to those on whose behalf it was carried out, having been altogether excluded.

Many of the minerals, et cetera, referred to in the following pages are, as may be readily inferred from the descriptions and analyses given, of considerable economic importance, owing to their application in the Arts and Manufactures.

I have the honour to be,

Sir,

Your obedient servant,

G. CHRISTIAN HOFFMANN.

OTTAWA, November 11, 1899.

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R E P O R T

OF THE

SECTION OF CHEMISTRY AND MINERALOGY.

MISCELLANEOUS MINERALS.

1. CELESTITE.

A milk-white, pearly, translucent, radiating columnar, massive celestite, is met with, forming a vein traversing Laurentian strata, on the seventh lot of the tenth concession of the township of Bagot Renfrew county, in the province of Ontario. The vein, which has been traced for over two hundred yards, has been stripped at several points along its course for a distance of some sixty feet and found to have a width of from eight to ten feet. There are also indications, it is said, of the existence of another vein of this mineral running parallel with, and not far removed from, this one.

Mr. R. A. A. Johnston found the mineral to have a specific gravity, at 15.5° C., of 3.994, and, agreeably with the results of his analysis (employing the ammonium chromate method for the separation of the alkaline earths), the following composition (after drying at 100° C.—Hygroscopic water = 0.06 per cent)—

Sulphur trioxide.....	42.09
Strontia	48.30
Baryta.....	9.44
Lime	trace.
	99.83

Allowing for an evidently slight deficiency in the amount of sulphur trioxide found, the constitution of the mineral may be thus represented :—

Strontium sulphate ..	85.63
Barium sulphate.....	14.38
Calcium sulphate.....	trace.
	100.01

2. HÜBNERITE.

This mineral has been met with, in situ, at Emerald, on Tom Murphy's Brook—a small stream about midway between Pine and Coady brooks, and all flowing into Big Brook—about nine miles, by road, from Margaree Forks, Inverness county, in the province of Nova Scotia. It was here found, associated with small quantities of chalcoppyrite and a very little pale yellow hydrous mica, irregularly distributed through a mass of light grayish-white, translucent quartz, weighing about a ton and a half, found lying at the outcrop of a lenticular vein of a similar quartz, of some two feet and a half to three feet in width, cutting a gneissic or granitic rock of Pre-Cambrian age. The detached quartz mass afforded, it has been variously estimated, from three hundred to five hundred pounds of dressed material. The vein, however, contained but a comparatively small scattering of the mineral, and that only for about a couple of feet in.

It occurs in the quartz in the form of narrow seams and small irregular masses having a coarsely laminated structure; has a brownish-black colour, a submetallic lustre, breaks with a small subconchoidal fracture and affords a brownish-yellow streak. Mr. R. A. Johnston found it to have a specific gravity, at 15.5°C., of 6.975, and, conformably with the results of his analysis—conducted upon carefully selected material—the undermentioned composition:—

Tungsten trioxide.....	74.28
Molybdenum trioxide.....	trace.
Manganous oxide.....	22.73
Ferrous oxide.....	0.47
Lime.....	0.02
Magnesia.....	0.86
Silica.....	1.33
	99.69

3. HYDROMAGNESITE.

This species, now for the first time identified as occurring in Canada, has been met with in considerable abundance in the immediate vicinity of the 108-mile House on the Cariboo road, ninety-three miles north of Ashcroft, Lillooet district, in the province of British Columbia, where it forms three or four deposits of from fifty to one hundred feet across, standing a foot or more above the level of the surrounding surface, and is also traceable from the one to the other of these deposits over an area of probably fifty or more acres of ground. A shaft sunk on one of these deposits passed through—first, close upon five feet of the pure white material; then, a layer of about six inches of the same of a somewhat yellowish colour; then, another layer of some three feet of the pure white material; then, another layer of

about eighteen inches of the yellowish coloured material ; then, another, apparently thin, layer of the pure white material ; finally reaching, what evidently constitutes the bed of the deposit, a dark coloured mud containing a few more or less well preserved shells. On another of these deposits, a shaft was carried, it is said, to a depth of thirty feet without the bottom being reached.

The material examined consisted of a pure white, more or less firmly compacted, yet readily friable, aggregate of very fine crystalline particles with a few delicate, intermingled rootlets. Its analysis afforded Mr. R. A. A. Johnston the following results :—

Carbon dioxide....	37.03
Magnesia....	43.71
Lime.....	0.10
Alumina.....	0.02
Ferric oxide.....	0.04
Phosphorus pentoxide....	0.30
Silica, soluble.....	0.38
Water, with a little organic matter.....	17.79
Insoluble residue.....	1.53
	100.90

The insoluble residue consisted of :

Silica....	1.35
Alumina....	0.10
Ferric oxide.....	0.03
Lime.....	0.03
Magnesia.....	0.02
	1.53

The origin of these deposits of hydromagnesite may, it is conjectured, be connected with the occurrence of the later Tertiary volcanic rocks—basalts, et cetera, which, according to Dr. G. M. Dawson, are abundantly represented in the area of country above referred to.

Another series of some three or more deposits of hydromagnesite has more recently been discovered by Mr. J. C. Gwillim some 675 miles north-west of the above-mentioned locality, in a depression running north-west for about a mile back of Atlin City townsite, on the east side of Atlin Lake, in Cassiar district. Of these deposits, one, the largest, has an area of some two acres and a-half, and two have an area of about one acre, whilst the others are less extensive. As in the case of those above described, they present the appearance of raised deposits, their surfaces being two to three feet above the level of the swamp-muck or mud flat in which they lie. Nothing has been done towards ascertaining the thickness of these deposits beyond the sinking, in one instance, of a pit to the depth of five feet just outside the edge of one of the one-acre deposits, and this, as far as it went, passed only through a pure white hydromagnesite. Large exposures of

a more or less pure magnesite rock, as also of serpentized rocks occur, it may be observed, in the immediate vicinity of these deposits.

4. NATRON.

A very considerable deposit of natron, a mineral not previously recognised as occurring in Canada, has been met with in Goodenough Lake, about twenty-eight miles due north of Clinton, Lillooet district, in the province of British Columbia. The deposit, at the time of its examination—the close of the dry season—was found to cover the whole of the bottom of the lake, which has an area of not less than twenty acres, up to within eight or ten feet of its margin, and to have a fairly uniform thickness of from seven and a half to eight and a half inches, but to thin down at the edge to about two inches. It was covered by about three inches of water, but in the spring and early summer, after the melting of the snow, this is said to be increased to a depth of some three feet, more or less. The deposit would, it has been estimated, represent, approximately, twenty thousand tons of material. Natural soda also occurs in Last Chance Lake, a sheet of water some eight miles distant, in a north-east direction, from Goodenough Lake, but in this instance the soda, at present, only forms small detached masses on certain parts of the bottom of the lake, although the Indians residing in this locality state that the deposit at one time covered the entire bed of the lake to a depth, of at least, six inches. There are other shallow lakes, not far removed from these, in this section of the country, which have not, as yet, been examined, but which may not improbably also prove to be of the same character as those above referred to.

The specimen examined, a large cake of the material of close upon seven inches in thickness, was translucent and perfectly colourless, save and excepting at and a little above where it had been in contact with the clayey stratum upon which it had formed, and here it exhibited a faint greenish-white colouration. Its analysis afforded Mr. R. A. A. Johnston as follows:—

Soda.....	21·36
Ammonia, very small quantity.....	undet.
Sulphur trioxide.....	0·08
Phosphorus pentoxide.....	0·01
Boron trioxide ..	trace.
Carbon dioxide, expelled on ignition.....	0·29
Carbon dioxide, in ignited residue.....	15·17
Chlorine..	0·01
Silica....	0·01
Water (direct estimation).....	63·03

99·96

Corresponding to,—the silica being disregarded :

Sodium carbonate.....	35·54
Sodium bicarbonate.....	1·34
Sodium sulphate ..	0·14
Sodium chloride.....	0·02
Sodium metaborate.....	trace.
Sodium-hydrogen-ammonium phosphate.	0·02
Water.....	62·89
	<hr/>
	99·95

The mud, referred to above as the clayey stratum upon which the natron deposited rested, was of a dark greenish-gray colour, but on exposure to the light speedily assumed paler shades, and ultimately became light greenish-gray. Through it were distributed numerous fine grains and coarse rounded particles and fragments of colourless transparent natron. Its examination, by Mr. F. G. Wait, showed it to have, approximately, the following composition :—Water, at 100°C 42·0 ; salts removable by water, 17·0 ; salts removable by hydrochloric acid, 20·0 ; argillaceous matter with a little grit, 21·0=100·0. The portion soluble in water, contained a large quantity of soda, small quantities of potassa, lime and magnesia, and traces of alumina and ferrous oxide, together with a large quantity of carbonic acid, a somewhat large quantity of chlorine, and very small quantities of sulphuric and phosphoric acids, and a trace of silica. The chief constituent removed by water evidently being carbonate of soda. The portion removed by the after treatment with hydrochloric acid, contained a large quantity of ferrous oxide, somewhat large quantities of lime and magnesia, and a small quantity of alumina, together with a rather large quantity of carbonic acid, and a small quantity of sulphuric acid and of silica. The residue left after treatment with water and acid, proved to be a highly plastic clay, containing a large proportion of exceedingly fine scaly kaolinite, through which was disseminated small quantities of grit consisting, for the most part, of minute grains of translucent quartz, with some few others of felspar, a few equally minute crystals of hornblende, and a few scales of mica.

The analysis of the water of the lake in which this natron deposit occurs, is given beyond.—page 48.

These soda lakes, which are situate, approximately, some twenty-two miles south-south-west of the site of the hydromagnesite locality, referred to on a previous page, occupy, it may be mentioned, according to Dr. G. M. Dawson, shallow depressions in the later Tertiary basaltic plateau of this part of the interior of British Columbia.

5. POLYCRASE.

Fine examples, of what on examination by Mr. R. A. A. Johnston proved to be polycrase—a mineral not previously identified as occurring in Canada, have been found by Mr. C. W. Willimott, on the nineteenth lot of the ninth concession of the township of Calvin, district of Nipissing, in the province of Ontario, where it occurs in the form of crystalline masses—one of which weighed rather more than seven hundred grams—associated with xenotime, a highly altered, cleavable massive form of magnetite, and small quantities of a brownish-red spessartite, in a coarse granite vein of some twenty feet in width, composed of quartz, microcline, albite or oligoclase, muscovite and biotite, which is there found cutting a reddish, fine grained, hornblendic gneiss.

The mineral has a pitch-black colour; an uneven, in parts subconchoidal fracture; a resinous lustre; is brittle; and affords a grayish-brown streak. Its specific gravity, at 15.5°C., is 4.842.

A very carefully conducted qualitative analysis showed it to contain—Niobic oxide, large amount; tantallic oxide, somewhat small amount; titanic oxide, large amount; yttrium oxide, somewhat small amount; thorium oxide, small amount; stannic oxide, trace; cerous oxide, small amount; lanthanum oxide, small amount; didymium oxide, small amount; uranous oxide, small amount; ferrous oxide, small amount; magnesia, trace; water, very small amount. Zirconia was sought for, and found to be absent.

MINERALOGICAL NOTES.

- 1.—Arsenic, Native.—A fine-granular massive variety of this mineral occurs, as first observed by Mr. R. W. Brock, in reniform nodules, with arsenopyrite, pyrrhotite, pyrite, et cetera, in veins of calcite traversing a more or less quartzose gneiss, or mica-schist, at the L. H. gold claim, on Eight-mile Creek, east side of Slocan Lake, in the West Kootenay district of the province of British Columbia.
- 2.—Beryl. Large, but for the most part very imperfect, crystals of a yellow variety of this mineral have been found by Mr. C. W. Willimott, associated with black tourmaline and spessartite, in a coarse granite vein on the thirteenth lot of the fourth concession of the township of Calvin, in the district of Nipissing, province of Ontario. One of the finest specimens obtained from this vein

is in the form of a rough hexagonal prism measuring six by six and a-half centimetres in its diameters, consisting of a slightly altered beryl of a straw-yellow, in parts honey-yellow, colour, subtranslucent, and having a waxy lustre, in large part replaced by a light, at times somewhat dark, grayish-white quartz.

- 3.—Calcite. Large cleavable masses of a colourless, transparent,—in parts pale purplish and semi-transparent, calcite have been met with by Mr. C. W. Willimott, in a white, moderately coarse to coarse crystalline, more or less graphitic, limestone, occurring on the sixth lot of the second concession of the township of March, Carleton county, in the province of Ontario. This calcite, in many instances, exhibits twinning in a direction paralld with that of the basal plane and which, by frequent repetition, occasionally gives a laminated appearance to the mineral.
- 4.—Fuchsite. A bright apple-green to emerald-green chromiferous muscovite, which has been identified by Mr. R. A. A. Johnston, as fuchsite, occurs in the form of fine scaly aggregations, with small particles and masses of chromite, and grains and small irregular veins of colourless translucent quartz, distributed through a granular massive magnesite which is found in the first range of mountains on the east side of Big Salmon River, a tributary of the Lewes, just below Island Lake, in the Yukon district, North-west Territory. This variety of muscovite has also been recognized as occurring in the form of fine scales, disseminated through a massive magnesite which is found some three hundred miles north-west of the last mentioned locality, on the east side of the Yukon, about a mile and a-half above Indian River; and in a north-easterly direction from this again, it occurs, in similar fine scales, scattered through a white dolomite which is met with about a mile and a-half above the mouth of Hunker Creek, a tributary of the Klondike River—also in the Yukon district.
- 5.—Jamesonite. A steel-gray fibrous massive form of this mineral occurs, associated with pyrite and pyrrhotite, in a gangue of grayish-white crystalline dolomite, on the thirtieth lot of the second concession of the township of Clarendon, Frontenac county, in the province of Ontario.
- 6.—Magnesite. This mineral has been met with, by Mr. R. G. McConnell, in very considerable abundance, in the first range of mountains on the east side of Big Salmon River, a tributary of the Lewes, just below Island Lake, in the Yukon district,

- North-west Territory, where it occurs in the form of heavy bands—which are, in some instances, in parts, fifty feet or more in thickness—associated with dark and light coloured, partly altered, slates, greenish schists, and serpentine. The rock, which is strongly coherent, is made up of brilliant cleavable grains of a grayish-white, at times almost colourless, ferruginous magnesite, and through it irregularly distributed, occur fine scaly aggregations of a bright apple-green to emerald-green chromiferous muscovite—fuchsite, small particles and masses of chromite, and grains and small irregular veins of colourless translucent quartz. A very similar magnesite rock has also been found by Mr. McConnell, in the same district, associated with rocks of much the same character as those above referred to, some three hundred miles north-west of the foregoing locality, on the east side of the Yukon, about a mile and a-half above Indian River.
- 7.—Marl. A sample of a very pure, light grayish—when air-dried, shell marl has been received from Mr. J. Obalski, which occurs in some quantity at Lac à la Peinture, in the township of Neigette, Rimouski county, in the province of Quebec.
- 8.—Rutile. A prismatic and massive form of black rutile—possibly referable to nigrine or ilmenorutile—has been identified by Mr. R. A. A. Johnston, in some samples of auriferous quartz vein-stone, collected by Mr. E. R. Faribault, from the Irving vein or lead, in the Mooseland gold district, Halifax county, in the province of Nova Scotia.
- 9.—Stibnite. Has been met with in the form of fine granular and radiating columnar masses, distributed through a gangue of white cryptocrystalline quartz, at the Mountain Chief claim, on Cadwallader Creek, a stream flowing into Upper Bridge River, Lillooet district, in the province of British Columbia.
- 10.—Thinolite. Among other specimens collected by the Count de Sainville in the course of his exploration—1889-94, of the delta of the Mackenzie River, North-west Territory, was one found by him, immediately west of the delta, in a disintegrated clay shale of Cretaceous age. It consists of a stellar aggregate of more or less acute, quadrilateral, pyramidal forms of a pseudomorphous calcium carbonate of some six centimetres across, exteriorly of a dark brown colour and dull earthy lustre, but interiorly of a yellowish-brown colour, a vitreous lustre, and exhibiting a very finely crystalline structure.

- 11.—Titanite. Remarkably fine large lustrous contact-twins of black titanite, have been found by Mr. C. W. Willimott, in a vein composed of orthoclase, scapolite, pyroxene, and calcite, with some quartz and mica, cutting granite on the twenty-first lot of the eleventh range of the township of Litchfield, Pontiac county, in the province of Quebec.
- 12.—Tufa, Calcareous. This substance has been met with, constituting what is apparently a large deposit, on the southern slope of Connaught Mountain, about eleven miles north-east of the head of Okanagan Lake, district of Yale, in the province of British Columbia.
- 13.—Vivianite. Some very good specimens, of what on examination proved to be an earthy form of this mineral, have been received from Mr. John Blue, Superintendent of the Eustis Mining Company, with the information that the same had been met with, in a bed of laminated clay, some three or four feet or more beneath a gravelly soil, in sinking a pit on the left bank of the Massawippi River, on the twenty-fifth lot of the second range of the township of Hatley, Stanstead county, in the province of Quebec. The mineral has also been observed in other places, not far from the one in question, in an extension of the same deposit of clay, both on this and the right bank of the river. The hydrous ferrous phosphate, which is unevenly distributed through the clay, is, when first taken out, perfectly white, but on exposure to the atmosphere rapidly assumes a fine bright blue colour.

ROCKS.

- 1.—A fine-crystalline bluish-gray schist. From Sawmill Bay, Pilot Bay village, east side of Kootenay Lake, West Kootenay district, province of British Columbia. Collected by Mr. R. G. McConnell, September 7, 1897.

Its analysis afforded Mr. R. A. A. Johnston, the following results:—

Silica.....	69·50
Alumina.....	15·05
Ferric oxide.....	0·27
Ferrous oxide.....	2·38
Manganous oxide.....	trace.
Lime.....	1·10
Magnesia.....	3·20
Potassa.....	4·75
Soda.....	2·85
Water (direct estimation).....	0·50
	99·60

The specific gravity, at 15·5°C., was found to be 2·693.

LIMESTONES.

(Continued from page 21 R. of the last Annual Report of this Survey—vol. ix., 1896.)

- 1.—From McLean's quarry, Lime Brook, Springville, Pictou county, province of Nova Scotia. Geological position—Lower Carboniferous. Collected by Dr. H. M. Ami, 1896.

A faint purplish-gray, compact, massive limestone. Its analysis afforded Mr. Wait the following results:

(After drying at 100° C.—Hygroscopic water = 0.08 per cent.)

Carbonate of lime.....	97.04	
" magnesia.....	1.09	
" iron.....	0.26	
" manganese.....	0.44	
Sulphate of lime.....	0.03	} 1.39
Alumina.....	0.19	
Silica, soluble.....	0.14	
Insoluble mineral matter.....	1.01	
Organic matter.....	0.02	
		100.22

- 2.—From Mr. Robert Corkum's quarry at Goat Lake, township of Chester, Lunenburg county, province of Nova Scotia. Geological position—Lower Carboniferous. Collected by Mr. E. R. Fairbault, 1896.

A light to dark-gray, compact, massive limestone, with occasional minute veinings and small inclusions of white crystalline calcite. An analysis, by Mr. Wait, showed it to have the following composition:

(After drying at 100° C.—Hygroscopic water=0.07 per cent.)

Carbonate of lime.....	97.03	
" magnesia.....	0.92	
" iron.....	0.58	
" manganese.....	0.63	
Sulphate of lime.....	0.07	} 1.11
Alumina.....	0.34	
Silica, soluble.....	0.03	
Insoluble mineral matter.....	0.53	
Organic matter.....	0.14	
		100.27

This stone has been wrought to a considerable extent, chiefly, if not solely, for the manufacture of lime.

- 3.—From Captain Edward Lordlay's quarry at Indian Point, township of Lunenburg, Lunenburg county, province of Nova Scotia. Geological position—Lower Carboniferous. Collected by Mr. E. R. Faribault, 1896.

A somewhat light-gray, compact, massive limestone with, here and there, small inclusions of white crystalline calcite. Its composition was found, by Mr. Wait, to be as follows :

(After drying at 100° C.—Hygroscopic water = 0·12 per cent.)

Carbonate of lime.....	97·21	
" magnesia.....	0·55	
" iron.....	0·48	
" manganese.....	0·58	
Sulphate of lime.....	0·07	} 1·10
Alumina.....	0·41	
Silica, soluble.....	0·02	
Insoluble mineral matter.....	0·49	
Organic matter.....	0·11	
		99·92

This stone is used for the manufacture of lime.

- 4.—From an outcrop on the south-western side of Hemlock Lake, township of Gloucester, Carleton county, province of Ontario. Geological position—Chazy formation, Cambro-Silurian. Examined for Mr. T. M. Clark.

A very fine grained and compact, greenish-gray,—yellowish-brown and reddish-brown weathering, massive limestone. An analysis by Mr. Johnston, showed it to have the following composition :

(After drying at 100° C.—Hygroscopic water = 0·98 per cent.)

Lime.....	19·78
Magnesia.....	10·55
Alumina.....	0·75
Ferric oxide.....	0·27
Ferrous oxide.....	1·71
Manganous oxide.....	0·38
Carbonic anhydride.....	26·03
Sulphuric anhydride.....	0·07
Phosphoric anhydride.....	0·14
Silica, soluble.....	0·60
Water.....	0·20
Insoluble mineral matter ..	38·81
	99·29

The insoluble mineral matter consisting of :

Silica	24.20
Alumina	6.77
Ferric oxide.....	3.23
Magnesia.....	1.47
Potassa	1.46
Soda	0.15
Water (ignition).....	1.53
	38.81

The band from which this argillaceous magnesian limestone was taken, has been supposed to be an extension of the beds affording a cement-stone, which are worked by Mr. C. B. Wright on the thirty-fourth lot of the first concession, Ottawa Front, of Nepean township, in the above mentioned county of Carleton.

- 5.—From a quarry near Kananaskis station on the line of the Canadian Pacific Railway, north-east quarter of section 25, township 24, range 9, west of the fifth initial meridian, district of Alberta, North-west Territory. Received from Mr. William Pearce.

A light grayish, somewhat coarse crystalline, massive limestone. Its analysis afforded Mr. Wait, as follows :

(After drying at 100° C.—Hygroscopic water = 0.04 per cent.)

Carbonate of lime	98.27
" magnesia.....	1.11
" iron.....	0.05
Sulphate of lime.....	0.08
Alumina.....	0.09
Silica, soluble	0.03
Insoluble mineral matter.....	0.06
	0.26
	99.69

This stone is used for the manufacture of lime.

- 6.—From a quarry at the north end of Tunnel Mountain, district of Alberta, North-west Territory. Received from Mr. William Pearce.

A dark gray compact, massive limestone. An analysis by Mr. Wait, gave :

(After drying at 100° C.—Hygroscopic water = 0.04 per cent.)

Carbonate of lime.....	93.77
" magnesia.....	5.40
" iron.....	0.08
Sulphate of lime.....	0.07
Alumina.....	0.02
Silica, soluble.....	0.03
Insoluble mineral matter.....	1.05
Organic matter	0.16
	1.33
	100.58

This stone is employed for the manufacture of lime.

The same band of limestone is found, to the north of the above mentioned locality, in Stony Squaw Mountain, and again, in Rundle Mountain—in the same district.

IRON ORES.

- 1.—Hematite. From near the mouth of Mabou Harbour, about half a mile to a mile inland, on the north side, Inverness county, province of Nova Scotia. Examined for Mr. John McKeen.

A massive red hematite, through which was distributed a few fragments of shells. Mr. Wait found it to contain :

Metallic iron.....	38·36	per cent.
Phosphorus.....	0·60	"
Insoluble matter.....	25·94	"

- 2.—Hematite. From the same locality as the preceding specimen.

A massive red hematite, with, here and there, a few embedded fragments of shells. Determinations by Mr. Wait gave :

Metallic iron.....	48·30	per cent.
Phosphorus.....	0·40	"
Insoluble matter . . .	22·93	"

- 3.—Hematite. From the same locality as the two preceding specimens.

A massive red hematite, containing, in parts, a few embedded fragments of shells. A partial analysis by Mr. Wait showed it to contain :

Ferric oxide.....	59·51	per cent.
Manganous oxide.....	0·03	"
Phosphoric acid.....	1·28	"
Sulphur.....	trace.	
Insoluble matter.....	23·59	"
<hr/>		
Metallic iron.....	41·66	"
Phosphorus..	0·56	"

GOLD AND SILVER ASSAYS.

These were all conducted by Mr. R. A. A. Johnston.

As explanatory of the numerous instances in which no trace of either gold or silver was found, it may be mentioned that in nearly all these cases the assay was carried out by special request.

PROVINCE OF NOVA SCOTIA.

- 1.—From a vein on *Çorney Brook*, about a mile and a half from its mouth, *Inverness county*. Examined for *Mr. M. J. Doucet*.

A coarse crystalline white calcite, carrying small quantities of galena. The latter, freed from all gangue, was found to contain :

Gold.....	none.
Silver.....	.5'833 ounces to the ton of 2,000 lbs.

- 2.—From near *Whycocomagh*, *Inverness county*.

An association of white crystalline limestone with a greenish-black chloritic mineral, carrying very small quantities of iron-pyrites.

It contained neither gold nor silver.

- 3.—This, and the three following specimens are from *McPherson's farm*, *Whycocomagh*, *Inverness county*. Examined for *Mr. Charles McKay*. A rust-stained quartzite. The sample, a single fragment, weighed four ounces.

It contained neither gold nor silver.

- 4.—A conglomerate, the component pebbles of which consisted, for the most part, of white quartz and reddish-white felspar. The sample, consisting of two fragments, weighed eleven ounces.

It contained neither gold nor silver.

- 5.—A greenish-gray serpentine limestone, carrying iron-pyrites. The sample, a single fragment, weighed one pound eight ounces.

It contained neither gold nor silver.

- 6.—A conglomerate, the component pebbles of which consisted, for the most part, of quartz and felspar. The sample, consisting of six fragments, weighed eleven ounces.

It contained neither gold nor silver.

- 7.—From *Victoria county*. This, and the following specimen, was examined for *Mr. Charles Moffatt*.

An association of white quartz with a brownish-black mica, carrying small quantities of copper-pyrites. Weight of sample, a single fragment, two ounces and a half. It was found to contain :

Gold.....	trace.
Silver.....	.0'175 of an ounce to the ton of 2,000 lbs.

- 8.—From the same locality as the preceding specimen.

A white subtranslucent quartz, carrying a few particles of iron-pyrites. Weight of sample, a single fragment, an ounce and a half.

It contained neither gold nor silver.

- 9.—This, and the two following specimens are from quartz veins traversing the rocks of the George River limestone, immediately north-west of George River, Cape Breton county. They were examined for Mr. Colin Chisholm.

A white subtranslucent quartz, carrying very small quantities of iron-pyrites, copper-pyrites, and galena. The sample, consisting of six fragments, weighed three pounds four ounces.

It contained neither gold nor silver.

- 10.—A grayish-white subtranslucent quartz, carrying very small quantities of iron-pyrites, copper-pyrites, and galena. The sample consisting of seven fragments, weighed one pound two ounces.

It contained neither gold nor silver.

- 11.—A white and reddish-white subtranslucent quartz, carrying small quantities of iron-pyrites and copper-pyrites. The sample, consisting of ten fragments, weighed one pound six ounces.

It contained neither gold nor silver.

- 12.—From Bryden's Mill, right bank of Bryden's Mill Brook, Benacadie Glen, Cape Breton county. Examined for D. J. McKinnon.

An association of a white subtranslucent quartz with a little greenish-gray felspathic rock, holding a few particles of iron-pyrites. Weight of sample, consisting of seven fragments, one pound two ounces.

It contained neither gold nor silver.

- 13.—From a vein at Barasois River, about two miles north of the Barasois bridge, Englishtown, Victoria county. Examined for Mr. J. E. Burchell.

A white subtranslucent quartz, carrying small quantities of copper-pyrites and a very little iron-pyrites. The sample, consisting of ten fragments—all of which were more or less stained with hydrated peroxide of iron and green carbonate of copper weighed three pounds five ounces. Assays gave :

Gold.....	...	1.517 ounces to the ton of 2,000 lbs.
Silver.....	...	2.275 " "

- 14.—From the Rev. Mr. Sinclair's place, Loch Lomond, Richmond county. A white subtranslucent quartz, carrying small quantities of galena and copper-pyrites. The sample, consisting of several fragments, weighed seventeen pounds. Assays showed it to contain :

Gold.....	none.
Silver.....	1.225 ounce to the ton of 2,000 lbs.

Determinations of the lead and copper in this ore gave :

Lead.....	9.43 per cent
Copper.....	2.03 "

- 15.—From Cross Island, at the entrance to Lunenburg Harbour, Lunenburg county. Examined for Mr. J. W. King.

An association of white subtranslucent quartz with a yellowish-white felspar, small quantities of gray chloritic schist, and a very little calcite, carrying very small quantities of pyrrhotite and iron-pyrites. The sample, consisting of numerous fragments, weighed four pounds ten ounces.

It contained neither gold nor silver.

- 16.—This, and the following specimen, is from the LaHave River, above Bridgewater, Lunenburg county.

Specimen collected above mill. A weathered conglomerate in which the component pebbles consisted, for the most part, of a greenish-white chloritic schist. Weight of sample, twenty-five pounds.

It contained neither gold nor silver.

- 17.—Specimen collected below mill. A weathered conglomerate, the component pebbles of which consisted, for the most part, of a greenish-white chloritic schist and a grayish-white felspar. Weight of sample, twenty-nine pounds.

It contained neither gold nor silver.

- 18.—This, and the three following specimens are from a locality in Digby county.

A white, more or less rust-stained, subtranslucent quartz, carrying small quantities of iron-pyrites and brownish-black zinc-blende. Weight of sample, six ounces.

It contained neither gold nor silver.

- 19.—A white subtranslucent quartz, carrying iron-pyrites. Weight of sample, twelve ounces.

It contained neither gold nor silver.

- 20.—A white crystalline quartz, carrying iron-pyrites and copper-pyrites. Weight of sample, five ounces.

It contained neither gold nor silver.

- 21.—A white subtranslucent quartz, carrying very small quantities of iron-pyrites. Weight of sample, six ounces.

It contained neither gold nor silver.

PROVINCE OF NEW BRUNSWICK.

- 22.—From Turtle Creek, Albert county. Examined for Prof. L. W. Bailey.

A grayish-white quartz conglomerate, carrying small quantities of iron-pyrites. Weight of sample, two pounds six ounces.

It contained neither gold nor silver.

PROVINCE OF QUEBEC.

- 23.—From a large quartz vein at Upper Island Portage, Mekiskun or Bell River. This, and the seven following specimens were collected by Dr. R. Bell.

A white to grayish-white subtranslucent quartz, in parts coated with hydrated peroxide of iron, carrying very small quantities of iron-pyrites and copper-pyrites. Weight of sample, ten fragments, two pounds.

It contained neither gold nor silver.

- 24.—From a slaty quartz vein at the south-west end of Shagamog Bay, opposite the 'Wigwam,' Shabogama Lake, Mekiskun or Bell River.

It contained neither gold nor silver.

- 25.—From first portage below Shabogama Lake.

A white subtranslucent quartz with which was associated a little dark gray felspathic rock. Weight of sample, four ounces.

It contained neither gold nor silver.

- 26.—From outlet of Lake Olga.

An association of white translucent quartz with a little white granular pyroxene. The specimen, which was thickly coated with hydrated peroxide of iron, weighed one pound six ounces.

It contained neither gold nor silver.

- 27.—Also from the outlet of Lake Olga.

The material consisted of broken down siliceous rock matter. Weight of sample, one pound.

It contained neither gold nor silver.

- 28.—From a vein nearly mid-way between Long Lake and Big Lake, Broadback River.

A grayish-white subtranslucent quartz with a very little white calcite and a few scales of silver-white mica. Weight of sample, four ounces.

It contained neither gold nor silver.

- 29.—From another vein mid-way between Long Lake and Big Lake, Broadback River.

A grayish-white subtranslucent quartz through which was disseminated a few particles of iron-pyrites. Weight of specimen, five ounces.

It contained neither gold nor silver.

- 30.—Also from about mid-way between Long Lake and Big Lake, Broadback River.

A green chromiferous mica-schist, carrying a somewhat large quantity of iron-pyrites. Weight of sample, two fragments, eight ounces.

It contained neither gold nor silver.

- 31.—From a small shaft sunk on the fifth lot of the second range of the township of Calumet, Pontiac county. Collected by Mr. C. W. Willimott.

An association of white translucent quartz, a white triclinic felspar, a reddish granitic rock, and small quantities of white calcite and black augite, carrying some iron-pyrites and copper-pyrites. Weight of sample, nine ounces.

It contained neither gold nor silver.

- 32.—From lots two and three of the seventh range of the township of Calumet, Pontiac county. Collected by Mr. C. W. Willimott.

A gray quartzo-felspathic rock, carrying small quantities of iron-pyrites. Weight of sample, twelve ounces.

It contained neither gold nor silver.

NORTH-EAST TERRITORY.

- 33.—From Kan-uk-took-ya-so, Baffinland. This, and the three following specimens were collected by Dr. Bell :—

A white translucent quartz with which was associated a little reddish-gray felspar. The sample, a single fragment, weighed one pound three ounces.

It contained neither gold nor silver.

- 34.—From the same locality as the preceding specimen.

A gray subtranslucent quartz, carrying a very little iron-pyrites. The sample, a single fragment, weighed five ounces.

It contained neither gold nor silver.

35.—From the long vein in White Bluff Harbour, Baffinland.

An association of gray translucent quartz with a yellowish-gray felspar. Weight of sample, a single fragment, seven ounces.

It contained neither gold nor silver.

36.—Also from the long vein in White Bluff Harbour, Baffinland.

A coarse gray granite. The sample, a single fragment, weighed eleven ounces.

It contained neither gold nor silver.

PROVINCE OF ONTARIO.

37.—From the thirtieth lot of the second concession of the township of Clarendon, Frontenac county. Examined for Mr. John Dack.

An association of jamesonite, iron-pyrites, and pyrrhotite, in a gangue of grayish-white crystalline dolomite. The sample, consisting of numerous small fragments, weighed six ounces. It was found to contain :

Gold.....trace.
Silver.....2·800 ounces to the ton of 2,000 lbs.

38.—From what is known as the Caldwell pyrite deposit, east-half of lot eighteen, concession three, of the township of Dalhousie, Lanark county.

An association of white translucent quartz with a little grayish-white hornblende, carrying large quantities of iron-pyrites and pyrrhotite. Weight of sample, a single fragment, six pounds.

It contained neither gold nor silver.

39.—From the thirty-first lot of the sixth concession of the township of Cashel, Hastings county. Collected by Mr. A. E. Barlow.

An association of white subtranslucent quartz with small quantities of dark brown tourmaline. The sample, consisting of several fragments, weighed one pound fourteen ounces.

It contained neither gold nor silver.

40.—From the Higman mine, lot nine, concession seven, of the township of Limerick, Hastings county. Collected by Mr. A. E. Barlow.

A white translucent quartz, through which was scattered a few scales of white mica and particles of iron-pyrites. Assays gave :—

Gold.....none.
Silver.....0·175 of an ounce to the ton of 2,000 lbs.

- 41.—From the south-half of the thirty-fourth lot of the seventeenth concession of the township of Monmouth, Haliburton county. This, and the following seven specimens are examined for Mr. A. D. Miller.

A massive iron-pyrites. The sample, two fragments, weighed one pound five ounces.

It contained neither gold nor silver.

- 42.—From the twenty-eighth lot of the seventeenth concession of the township of Monmouth, Haliburton county.

A white subtranslucent quartz, in parts coated with hydrated peroxide of iron, carrying some iron-pyrites and pyrrhotite. The sample, consisting of several fragments, weighed ten ounces.

It contained neither gold nor silver.

- 43.—From the same locality as the preceding specimen.

A white translucent quartz, for the most part coated with hydrated peroxide of iron, carrying small quantities of pyrrhotite and iron-pyrites. The sample, a single fragment, weighed nine ounces.

It contained neither gold nor silver.

- 44.—From the thirty-second lot of the seventeenth concession of the township of Monmouth, Haliburton county.

An association of white translucent quartz, in parts coated with hydrated peroxide of iron, with a little flesh coloured felspar. Weight of sample, a single fragment, six ounces.

It contained neither gold nor silver.

- 45.—From the thirty-third lot of the seventeenth concession of the township of Monmouth, Haliburton county.

A gray gneissoid-rock, in parts coated with hydrated peroxide of iron, through which was disseminated small quantities of iron-pyrites. The sample, a single fragment, weighed eight ounces.

It contained neither gold nor silver.

- 46.—From the same locality as No. 42, above.

A white and greenish-white pyroxene with a very little garnet and a few scales of mica, carrying very small quantities of pyrrhotite and iron-pyrites. The sample, two fragments, weighed seven ounces.

It contained neither gold nor silver.

47.—Also from the same locality as No. 42, above.

A gray gneissoid rock, containing small quantities of iron-pyrites. The sample, consisting of two fragments, weighed six ounces.

It contained neither gold nor silver.

48.—From the thirtieth lot of the sixteenth concession of the township of Monmouth, Haliburton county.

A white and reddish-white cleavable calcite with a few crystals of brown mica and small quantities of pyrrhotite. Weight of sample, two ounces and a half.

It contained neither gold nor silver.

49.—From Kamisho's mine, Michipicoten district. This, and the nineteen following specimens were collected by Dr. R. Bell.

A granular quartzite, through which was distributed small quantities of pyrrhotite and magnetite. The sample, a single fragment, weighed ten ounces. It was found to contain :

Gold.....0·233 of an ounce to the ton of 2,000 lbs
Silver.....none.

50.—From the Jubilee mine, Michipicoten district.

An association of white translucent quartz with small quantities of green chloritic schist and white calcite, carrying small quantities of iron-pyrites. The sample, consisting of two fragments, weighed one pound eight ounces.

It contained neither gold or silver.

51.—From the east pit, Diamond Jubilee mine, Michipicoten district.

An association of white quartz with a little gray felspathic rock, holding a few disseminated particles of pyrrhotite. The sample, consisting of three fragments, weighed two pounds one ounce.

It contained neither gold or silver.

52.—From the west pit, Diamond Jubilee mine, Michipicoten district.

A white translucent quartz, holding small quantities of pyrrhotite. The sample, a single fragment, weighed one pound three ounces.

It contained neither gold or silver.

53.—From the fourth pit, Diamond Jubilee mine, Michipicoten district.

A white cryptocrystalline quartz, in parts stained with hydrated peroxide of iron, carrying small quantities of iron-pyrites. The sample, consisting of four fragments, weighed seven ounces. Assays showed it to contain :

Gold.....trace.
Silver.....none.

- 54.—Material taken from vein at mouth of shaft, Jubilee mine, Michipicoten district.

An association of grayish-white subtranslucent quartz with a very little black tourmaline, in parts coated with hydrated peroxide of iron, through which was disseminated a few particles of iron-pyrites. The sample, consisting of ten fragments, weighed three pounds fourteen ounces. It was found to contain :

Gold..... 0.875 of an ounce to the ton of 2,000 lbs.
Silver..... none.

- 55.—Material from each of the four pits on main vein, Diamond Jubilee mine, Michipicoten district.

A grayish-white subtranslucent quartz, in parts coated with hydrated peroxide of iron, through which was disseminated a few particles of iron-pyrites. The sample, consisting of four fragments, weighed three pounds three ounces. It contained :

Gold..... trace.
Silver..... none.

- 56.—From Wylie's mine, on Split-rock Portage, Magpie River, Michipicoten district.

A grayish to greenish-white translucent quartz, through which was distributed a few particles of iron-pyrites. The sample, a single fragment, weighed one pound four ounces.

It contained neither gold nor silver.

- 57.—From pit No. 1, Gananoque mine, Michipicoten district.

A white cryptocrystalline quartz, stained and coated with hydrated peroxide of iron. The sample, consisting of four fragments, weighed two pounds four ounces.

It contained neither gold nor silver.

- 58.—From pit No. 2, Gananoque mine, Michipicoten district.

A white cryptocrystalline quartz, in parts stained and coated with hydrated peroxide of iron, carrying small quantities of iron-pyrites. The sample, consisting of three fragments, weighed two pounds fifteen ounces.

It contained neither gold nor silver.

- 59.—From the Maud mine, Michipicoten district.

A grayish-white translucent quartz, stained and coated with hydrated peroxide of iron. The sample, a single fragment, weighed one pound fifteen ounces.

It contained neither gold nor silver.

60.—From the Aurora mine, Michipicoten district.

A white quartzite, stained and coated with hydrated peroxide of iron. The sample, a single fragment, weighed fifteen ounces.

It contained neither gold nor silver.

61.—From the Prescott mine, Michipicoten district.

A somewhat cavernous white translucent quartz, in parts coated with hydrated peroxide of iron. The sample, a single fragment, weighed ten ounces.

It contained neither gold nor silver.

62.—From Billings' prospect, on the new road near to Legg and Barton's shanty, Michipicoten district.

A decomposed vein matter, consisting of a white granular quartz stained with hydrated peroxide of iron. Weight of sample, one pound seven ounces.

It contained neither gold nor silver.

63.—From the Frechette mine, sixteen miles east-north-east of Gargantua Harbour, Michipicoten district.

A grayish-white translucent quartz, more or less coated with hydrated peroxide of iron, carrying small quantities of copper-pyrites. The sample, a single fragment, weighed twelve ounces. It was found to contain :

Gold..... trace.
Silver.... 0.117 of an ounce to the ton of 2,000 lbs.

64.—From the east pit, Ward's mine, Michipicoten district.

An association of white subtranslucent quartz with a little green chloritic schist, in parts coated with hydrated peroxide of iron. The sample, consisting of two fragments, weighed one pound one ounce.

It contained neither gold nor silver.

65.—From the north vein, Mackie's mine, Lake Wawa, Michipicoten district.

An association of white translucent quartz with a very little black tourmaline, in parts coated with hydrated peroxide of iron, carrying small quantities of pyrrhotite. The sample, consisting of three fragments, weighed two pounds eleven ounces. Assays gave :

Gold..... trace.
Silver..... none.

- 66.—From the south vein, Mackie's mine, Lake Wawa, Michipicoten district.

An association of white subtranslucent quartz with a little black tourmaline, carrying small quantities of pyrrhotite. The sample, a single fragment, weighed one pound five ounces. Assays showed it to contain :

Gold..... 0.175 of an ounce to the ton of 2,000 lbs.
Silver.....none.

- 67.—From a large quartz vein at the mouth of White Lake Creek, White River, Mississagi region.

A white translucent quartz, coated with hydrated peroxide of iron, through which was distributed a few particles of copper-pyrites. The sample, a single fragment, weighed fifteen ounces.

It contained neither gold nor silver.

- 68.—From near bridge across White River, Mississagi region.

A grayish-white quartzite, coated with hydrated peroxide of iron, carrying small quantities of copper-pyrites, pyrrhotite and specular iron. The sample, consisting of three fragments, weighed one pound three ounces.

It contained neither gold nor silver.

- 69.—From location L., south of Ignace, district of Rainy River. Collected by Mr. W. McInnes.

A gray subtranslucent quartz, carrying large quantities of iron-pyrites. The sample, consisting of two fragments, weighed one pound fourteen ounces.

It contained neither gold nor silver.

- 70.—From a large vein three miles east and just south of Taché station, on the line of the Canadian Pacific Railway. Collected by Mr. W. McInnes.

A white translucent quartz, stained with hydrated peroxide of iron, through which was distributed a few particles of pyrrhotite. The sample, consisting of numerous fragments, weighed four ounces.

It contained neither gold nor silver.

NORTH-WEST TERRITORY.

- 71.—From between Fort Resolution and Fort Rae, about forty miles from Fort Resolution, south side of Great Slave Lake. Examined for Mr. E. Lyon.

An association of gray mica-schist with a white subtranslucent quartz, more or less thickly coated with hydrated peroxide of iron, carrying some coarsely crystalline galena. Weight of sample, a single fragment, half an ounce. It was found to contain :

Gold.....none.
Silver.....16·012 ounces to the ton of 2,000 lbs.

The galena amounted to 41·2 per cent, by weight, of the whole ; hence, the same, freed from all gangue, would contain at the rate of 38·865 ounces of silver per ton of 2,000 lbs.

- 72.—From claim No. 10, one of a series of claims within a radius of ten miles of the mouth of Yellow Knife River, north side of Great Slave Lake. This, and the following specimen were examined for Mr. E. A. Blakeney.

A white subtranslucent quartz, in parts coated with hydrated peroxide of iron. The sample, a single fragment, weighed five ounces.

It contained neither gold nor silver.

- 73.—From claim No. 12, one of a series of claims within a radius of ten miles of the mouth of Yellow Knife River, north side of Great Slave Lake.

The material, which was said to have been taken from the above claim at a depth of fourteen feet, consisted of a weathered crystalline dolomite, carrying some iron-pyrites and a very little brown zinc-blende. The sample, consisting of several fragments, weighed five ounces. It was found, on assay, to contain :

Gold.....2·158 ounces to the ton of 2,000 lbs.
Silver.....0·408 of an ounce " "

- 74.—From between the head-waters of Cascade and Johnson Creeks, Rocky Mountains, district of Alberta. Examined for Mr. James Walker.

A finely crystalline, reddish-gray dolomite, carrying large quantities of copper-glance. The sample, consisting of two fragments, weighed one pound one ounce. It contained :

Gold.....trace.
Silver.....0·583 of an ounce to the ton of 2,000 lbs.

- 75.—From the east side of Big Salmon River, two miles below Island Lake, Yukon district. This, and the nine following specimens were collected by Mr. R. G. McConnell.

A white subtranslucent quartz, with which was associated small quantities of a green chromiferous mineral. The sample, a single fragment, weighed nine ounces.

It contained neither gold nor silver.

- 76.—From the east side of Big Salmon River, twenty-two miles below Island Lake, Yukon district.

A white subtranslucent quartz, stained and coated with hydrated peroxide of iron. The sample, a single fragment, weighed eight ounces.

It contained neither gold nor silver.

- 77.—From the west side of Big Salmon River, two miles above Island Lake, Yukon, district.

A white subtranslucent quartz. The sample, a single fragment, weighed seven ounces.

It contained neither gold nor silver.

- 78.—From the north side of Salmon River, one mile above the South Fork, Yukon district.

A grayish-white quartz porphyry. The sample, a single fragment, weighed seven ounces.

It contained neither gold nor silver.

- 79.—From Eldorado Creek, Klondike, Yukon district.

A light gray gneissoid rock. The sample, a single fragment, weighed eight ounces.

It contained neither gold nor silver.

- 80.—From Eldorado Creek, Klondike, Yukon district.

A white subtranslucent quartz, stained and coated with hydrated peroxide of iron. The sample, a single fragment, weighed eleven ounces. It was found to contain:

Gold..... trace.

Silver..... 0.117 of an ounce to the ton of 2,000 lbs.

- 81.—From near the Forks of Eldorado Creek, Klondike, Yukon district.

An association of white subtranslucent quartz with a little gray mica-schist. Weight of sample, a single fragment, four ounces.

It contained neither gold nor silver.

- 82.—From the mouth of Skookum gulch, Bonanza Creek, Klondike, Yukon district.

A light gray gneissoid rock. The sample, a single fragment, weighed seven ounces.

It contained neither gold nor silver.

- 83.—From about a mile and a half above the mouth of Hunker Creek, Klondike River, Yukon district.

An intermixture of white quartz and white dolomite with a little fine scaly fuchsite. The sample, a single fragment, weighed seven ounces.

It contained neither gold nor silver.

- 84.—From the east side of the Yukon, about a mile and a half above Indian River, Yukon district.

A slightly weathered magnesite through which was disseminated numerous fine scales of fuchsite. The sample, a single fragment, weighed one pound nine ounces.

It contained neither gold nor silver.

- 85.—From mountains west of Henry House, Athabasca River. Collected by Mr. J. McEvoy.

A somewhat cavernous white translucent quartz, coated with hydrated peroxide of iron. The sample, consisting of two fragments, weighed one pound five ounces.

It contained neither gold nor silver.

PROVINCE OF BRITISH COLUMBIA.

Of the following—

Specimens Nos.	86-90	are from the	West Kootenay district.
"	91-102	"	Interior plateau region.
"	103-106	"	Coast ranges and coast region.

- 86.—From the Lade claim, on Gainer Creek, fifteen miles from Trout Lake, West Kootenay district.

An association of white quartz and siderite, holding numerous small particles of native gold. The sample, a single fragment (most probably selected), weighed two ounces and a half. Assays gave :

Gold, at the rate of . . .	174·341	ounces to the ton of 2,000 lbs.
Silver	15·021	" "

- 87.—From the Fidelity claim, three miles from Silverton and a quarter of a mile from Slocan Lake, West Kootenay district.

A very finely crystalline galena. The sample, consisting of two fragments, weighed four ounces. It was found to contain :

Gold	trace.
Silver	220·208 ounces to the ton of 2,000 lbs.

- 88.—From the Dora Bromide claim, on Goat Mountain, about two miles from New Denver, West Kootenay district.

A reddish and grayish-white crystalline quartz, carrying small quantities of what appeared to be but galena. The sample, consisting of a single fragment, weighed eleven ounces. Assays showed it to contain :

Gold	0·350	of an ounce to the ton of 2,000 lbs.
Silver	680·633	ounces " "

- 89.—From the Antelope mine, Slocan mining area, West Kootenay district. Collected by Mr. R. G. McConnell.

A gray calcareous felspathic rock, through which was disseminated numerous small crystals of iron pyrites. The sample, a single fragment, weighed four ounces. It contained :

Gold..... trace.
Silver.... 0.350 of an ounce to the ton of 2,000 lbs.

- 90.—From the Trail Creek mining area, West Kootenay district. Collected by Mr. R. G. McConnell.

A light gray brecciated granitic rock. The sample, a single fragment, weighed ten ounces.

It contained neither gold nor silver.

- 91.—From the Morning Star claim, near Spatsum, Interior plateau region. This, and the following specimen, was examined for Mr. John Blackhall.

A weathered schistose rock, coated with hydrated peroxide of iron and green carbonate of copper, carrying small quantities of iron-pyrites, copper-pyrites, and zinc-blende. The sample, consisting of numerous fragments, weighed eleven ounces. Assays gave :

Gold.... trace.
Silver..... 0.583 of an ounce to the ton of 2,000 lbs.

- 92.—From the same claim as the preceding specimen.

A weathered schistose quartzite, carrying small quantities of zinc-blende and copper-pyrites. The sample, consisting of several fragments, weighed twelve ounces. It contained :

Gold..... trace.
Silver..... 0.233 of an ounce to the ton of 2,000 lbs.

- 93.—From Nine-mile Creek, Stikine River, Cassiar district, Interior plateau region. This, and the two following specimens were collected by Mr. R. G. McConnell.

A fine granular magnetite distributed through a silicious gangue-stone. The sample, a single fragment, weighed fourteen ounces.

It contained neither gold nor silver.

- 94.—From the same locality as the preceding specimen.

A reddish-gray granitic rock, in parts coated with green carbonate of copper, carrying some magnetite and a very little copper-pyrites. The sample, a single fragment, weighed thirteen ounces. It was found to contain :

Gold... 0.233 of an ounce to the ton of 2,000 lbs.
Silver 0.817 " " "

95.—Also from the same locality as No. 93.

A granular magnetite distributed through a silicious gangue-stone. The sample, a single fragment, weighed nine ounces.

It contained neither gold nor silver.

96.—From the Blue Bird claim, about six miles north of Sicamous, Shuswap Lake, Interior plateau region.

An association of pyrrhotite, brown zinc-blende, and copper-pyrites in a gangue composed of white quartz, white calcite and a little black hornblende. The sample, consisting of four fragments, weighed four pounds. It contained :

Gold..... none.

Silver.....0.117 of an ounce to the ton of 2,000 lbs.

97.—From the Bon Diable mine, Vernon, Interior plateau region.

An association of white translucent quartz with a dark gray chloritic schist, carrying iron-pyrites. The sample, consisting of six fragments, weighed two pounds eight ounces.

It contained neither gold nor silver.

98.—From the Blue Jay mine, one mile south-west of Swan Lake, near Vernon, Interior plateau region. Collected by Dr. G. M. Dawson.

The material, which represented the ordinary ore from tunnel and shaft, consisted of a dark gray to grayish-white quartz carrying small quantities of iron-pyrites. Assays showed it to contain :

Gold.....0.292 of an ounce to the ton of 2,000 lbs.

Silver.....1.750 ounces " "

99.—From Manson Creek, Shuswap Lake, Interior plateau region. Examined for Mr. Wentworth F. Wood.

A white subtranslucent quartz, in parts coated with hydrated peroxide of iron and green carbonate of copper, carrying small quantities of crystalline galena, copper-pyrites, and iron-pyrites. The sample, consisting of two fragments, weighed five ounces. It contained :

Gold..... 0.117 of an ounce to the ton of 2,000 lbs.

Silver.....305.958 ounces " "

100.—From mountains east of Tête Jaune Cache, Interior plateau region. This, and the following specimen, was collected by Mr. J. McEvoy.

A somewhat cavernous white subtranslucent quartz, in parts coated with hydrated peroxide of iron, carrying small quantities of coarsely crystalline galena. The sample, a single fragment, weighed six ounces. It was found to contain :

Gold..... none.

Silver..... 0.350 of an ounce to the ton of 2,000 lbs.

101.—From the same locality as the preceding specimen.

A somewhat cavernous white subtranslucent quartz, coated with hydrated peroxide of iron. The sample, a single fragment, weighed five ounces.

It contained neither gold nor silver.

102.—From a point some forty-seven miles north-east of Kamloops, on the east side of the North Thompson River, and about seven miles back, Interior plateau region. Examined for Mr. Hugh McKinnon.

The material consisted of three distinct fragments—*a.*) consisting of a brownish-gray garnet rock, coated with hydrated peroxide of iron, carrying small quantities of copper-pyrites, and weighing seven ounces:—*b.*) consisting of an association of a white crystalline felspar with some white translucent quartz, coated with hydrated peroxide of iron, carrying small quantities of iron-pyrites, and a little copper-pyrites, and weighing eight ounces:—*c.*) consisting of an association of a brownish-gray garnet, white calcite, white granular felspar, and yellowish green epidote, carrying small quantities of copper-pyrites and a few flakes of molybdenite, weighing nine ounces. A fair average of the whole was found, on assay, to contain :

Goldtrace.
Silver...	3.792 ounces to the ton of 2,000 lbs.

103.—This, and the two following specimens are from a vein fifteen feet or more in width, some three or three and a half miles by trail from the head of Fanny Bay on Phillip's Arm, Coast ranges and coast region.

A white subtranslucent quartz, carrying small quantities of iron-pyrites. The sample, a single fragment, weighed twelve ounces. It was found to contain :

Gold.....	1.806 ounces to the ton of 2,000 lbs.
Silver.....	4.550 " "

104.—A white subtranslucent quartz, carrying small quantities of iron-pyrites. The sample, a single fragment, weighed five ounces. Assays showed it to contain :

Gold.....	0.175 of an ounce to the ton of 2,000 lbs.
Silver ..	0.350 " "

105.—A white subtranslucent quartz, carrying small quantities of iron-pyrites and brownish-black zinc-blende. The sample, consisting of two fragments, weighed one pound. It contained :

Gold.....	2.742 ounces to the ton of 2,000 lbs.
Silver.....	9.917 " "

106.—From the Two Sisters and Crow Claim, Deer Creek, Clayoquot, Coast ranges and coast region. Examined for Mr. F. Jacobsen.

An association of copper-pyrites and a little pyrrhotite, together with a small amount of quartzose gangue. The sample, consisting of two fragments, weighed one pound and two ounces. Assays gave :

Gold	none.
Silver	0·817 of an ounce to the ton of 2,000 lbs.

NICKEL AND COBALT.

Estimation of, in certain ores from the undermentioned localities in the provinces of Quebec and British Columbia—Continued from p. 39 R of the Annual Report of this Survey (vol. ix.), for 1896.

1.—From the south-east half of the sixth lot of the second range of the township of Calumet (Calumet Island), Pontiac county, province of Quebec.

A quartz amphibolite, carrying a somewhat large quantity of pyrrhotite, some iron-pyrites, a small quantity of copper-pyrites and a very little zinc-blende. The pyrrhotite, freed from all gangue and associated minerals, was found by Mr. Wait to contain :

Nickel	1·48 per cent.
Cobalt	none.

2.—From the twelfth lot of the ninth range of the township of Calumet (Calumet Island), Pontiac county, province of Quebec. Examined for Mr. E. P. Cowen.

A compact, massive pyrrhotite, through which was disseminated small quantities of a quartzose gangue. An analysis by Mr. Wait showed it to contain :

Nickel	3·88 per cent.
Cobalt	0·32 "

The gangue constituted 4·30 per cent, by weight, of the whole. The metalliferous portion of the ore contained, therefore, 4·06 per cent of nickel and 0·33 per cent of cobalt.

3.—From the fourteenth lot of the sixth range of the township of Aylwin, Ottawa county, province of Quebec. Examined for Mr. Robert Joynt.

The material consisted, in part, of a compact, massive pyrrhotite, almost free from foreign admixture; and the balance of a similar pyrrhotite, distributed through a gangue composed of quartz with some felspar and mica and a little hornblende and calcite. The pyrrhotite, freed from all gangue, was found on analysis, by Mr. Wait, to contain:

Nickel.....	1.68 per cent.
Cobalt.....	none.

- 4.—From one of the Leviathan group of claims on Campbell Creek, east side of Kootenay Lake, West Kootenay district, province of British Columbia. Examined for Mr. F. W. Pettit.

An association of quartz with small quantities of felspar, hornblende and graphite, through which was distributed a small quantity of pyrrhotite and a very little copper-pyrites. Determinations by Mr. Wait gave:

Nickel.....	0.06 per cent.
Cobalt.....	none.

The gangue constituted 61.84 per cent, by weight, of the whole. The metalliferous portion of the ore contained, therefore, 0.16 per cent nickel.

- 5.—From the mineral claim R and K, situated on the range of mountains on the east side of Kootenay Lake, about a mile north of Argenta, West Kootenay district, province of British Columbia. Examined for Mr. J. Turner.

A massive pyrrhotite, in association with a very little copper-pyrites, through which was disseminated a trifling amount of gangue consisting of quartz with a very small quantity of felspar.

Mr. Wait found it to contain:

Nickel.....	0.05 per cent.
Cobalt.....	none.

- 6.—From Kennedy Lake, west coast of Vancouver Island, province of British Columbia.

A massive pyrrhotite, through which was disseminated a few particles of copper-pyrites, and a small quantity of gangue composed, mainly, of garnet and calcite with a little quartz and hornblende. An analysis, by Mr. Wait, showed it to contain:

Nickel.....	0.15 per cent.
Cobalt.....	trace.

The gangue constituted 7·50 per cent, by weight, of the whole. The metalliferous portion of the ore contained, therefore, 0·16 per cent nickel.

- 4.—From the Two Sisters and Crow claim, Deer Creek, Clayoquot, Vancouver Island, province of British Columbia. Examined for Mr. F. Jacobsen.

An association of copper-pyrites with some pyrrhotite and a small quantity of quartzose gangue. Determinations by Mr. Wait gave :

Nickel.....	0·69 per cent.
Cobalt.....	traces.

The pyrrhotite constituted, approximately, 41 per cent, by weight, of the whole, and contained, therefore, about 1·7 per cent of nickel.

NATURAL WATERS.

The analyses of these, were all conducted by Mr. F. G. Wait.

- 1.—Water from a well on the farm of Mr. W. J. O'Neill, lot fifteen, concession two, of the township of Fitzroy, Carleton county, province of Ontario. Mr. C. W. Willimott, who has visited the locality in question, informs me that the well has a diameter of eight feet, and a depth of ten : is sunk in a blue plastic clay, and that this alone has been encountered ; further, that the flow of water is but feeble—not exceeding thirty-six gallons in about forty-eight hours.

The sample received for examination contained a little white, flocculent, organic matter in suspension,—this was removed by filtration. The filtered water was perfectly clear ; had a faint brownish-yellow colour ; was odourless ; and tasted mildly saline. Reaction, neutral, both before and after concentration. Its specific gravity, at 15·5° C., was found to be 1010·48. Boiling produced a slight precipitate, consisting of carbonates of lime and magnesia, with a trace of ferric hydrate.

One thousand parts, by weight, of the filtered water, at 15·5° C., were found to contain :

Potassa.....	0·099
Soda.....	5·987
Lithia.....	trace.

Lime.....	0·344
Magnesia.....	0·753
Ferrous oxide.....	trace.
Sulphuric acid.....	0·291
Phosphoric acid.....	trace.
Boric acid.....	trace.
Carbonic acid.....	0·494
Chlorine.....	8·145
Bromine.....	trace.
Iodine.....	strong trace.
Silica.....	0·010
Organic matter.....	trace.
	<hr/>
	16·123
Less oxygen, equivalent to chlorine.....	1·835
	<hr/>
	14·288

The foregoing acids and bases may reasonably be assumed to be present in the water in the following state of combination :

The carbonates being calculated as mono-carbonates, and all the salts estimated as anhydrous.)

Chloride of potassium.....	0·157
" sodium.....	11·298
" lithium.....	trace.
" magnesium.....	1·624
Bromide of sodium.....	trace.
Iodide of sodium.....	trace.
Phosphate of soda.....	trace.
Biborate of soda.....	trace.
Sulphate of lime.....	0·495
Carbonate of lime.....	0·250
" magnesia.....	0·147
" iron.....	trace.
Silica.....	0·010
Organic matter.....	trace.
	<hr/>
	13·981
Carbonic acid, half-combined.....	0·187
" free.....	0·120
	<hr/>
	14·288

Total dissolved solid matter, by direct experiment,
dried at 180° C., = 14·05.

An imperial gallon of the water, at 15·5° C., would contain :

(The carbonates being calculated as anhydrous bi-carbonates, and the salts without their water of crystallization.)

	Grains.
Chloride of potassium.....	11·105
" sodium.....	799·148
" lithium.....	trace.
" magnesium.....	114·871

Bromide of sodium.....	trace.
Iodide of sodium.....	trace.
Phosphate of soda.....	trace.
Biborate of soda.....	trace.
Sulphate of lime.....	35·013
Bi-carbonate of lime.....	25·464
" magnesia.....	15·844
" iron.....	trace.
Silica.....	0·707
Organic matter.....	trace.
	<hr/>
	1002·152
Carbonic acid, free.....	8·488
	<hr/>
	1010·640

The water was examined for barium and strontium, and these were both found to be absent.

- 2.—Water from a boring near the mouth of Pelican River, on the Athabasca River, district of Alberta, North-west Territory. Taken from a depth of between 225 and 250 feet. Issues from the Grand Rapids Sandstones, Cretaceous.

The water contained a trifling amount of pale brown flocculent matter in suspension, which was removed by filtration. The filtered water was clear and bright; had a faint brownish-yellow colour, and a mildly saline taste. Reaction, faintly alkaline; when evaporated to a small volume, strongly so. Its specific gravity, at 15·5° C., was found to be 1003·18. Boiling produced a very slight precipitate, consisting of carbonates of lime and magnesia.

One thousand parts, by weight, of the filtered water at 15·5° C., were found to contain :

Potassa.....	0·013
Soda.....	1·587
Lithia.....	trace.
Lime.....	0·006
Magnesia.....	0·007
Ferrous oxide.....	trace.
Sulphuric acid.....	0·001
Boric acid.....	strong trace.
Carbonic acid.....	1·257
Chlorine.....	0·859
Bromine.....	trace.
Iodine.....	trace.
Silica.....	0·012
Organic matter.....	trace.
	<hr/>
	3·742
Less oxygen equivalent to chlorine.....	0·193
	<hr/>
	3·549

The foregoing acids and bases may reasonably be assumed to be present in the water in the following state of combination :

(The carbonates being calculated as monocarbonates, and all the salts estimated as anhydrous.)

Chloride of sodium	1.415
Bromide of sodium	trace.
Iodide of sodium	trace.
Sulphate of potassa	0.002
Biborate of soda	trace.
Carbonate of soda	1.433
" potassa	0.018
" lithia	trace.
" lime	0.011
" magnesia	0.015
" iron	trace.
Silica	0.012
Organic matter	trace.
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	2.906
Carbonic acid, half-combined	0.614
" free	0.029
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	3.549
Total dissolved solid matter, by direct experiment, dried at 180° C., 2.861.	

An imperial gallon of the water, at 15.5° C., would contain :

(The carbonates being calculated as anhydrous bicarbonates, and the salts without their water of crystallization.)

	Grains.
Chloride of sodium	99.365
Bromide of sodium	trace.
Iodide of sodium	trace.
Sulphate of potassa	0.140
Biborate of soda	trace.
Bicarbonate of soda	142.412
" potassa	1.685
" lithia	trace.
" lime	1.124
" magnesia	1.615
" iron	trace.
Silica	0.843
Organic matter	trace.
	<hr/>
	247.184
Carbonic acid, free	2.036
	<hr/>
	249.220

Barium and strontium were sought for, but not detected.

- 3.—Water from a boring at Victoria, on the Saskatchewan River, below Edmonton, district of Alberta, North-west Territory; taken from a depth of about 1,600 feet. It rises from beds of sandstone and shale of Cretaceous age.

The sample received for examination, contained a small quantity of suspended matter of a brownish-yellow colour which, on removal by filtration, was found to consist of argillaceous matter, together with a little hydrated peroxide of iron and small quantities of carbonates of lime and magnesia. The filtered water was clear, colourless and bright. It had a strong saline taste. Reaction, neutral—both before and after concentration. The specific gravity, at 15·5° C., was found to be 1037·81. Boiling produced no precipitate.

One thousand parts, by weight, of the filtered water, at 15·5° C., were found to contain :

Potassa.....	0·147
Soda.....	23·757
Lithia.....	trace.
Baryta.....	trace.
Strontia.....	trace.
Lime.....	1·989
Magnesia.....	1·022
Ferrous oxide.....	trace.
Sulphuric acid.....	0·003
Boric acid.....	trace.
Carbonic acid.....	0·099
Chlorine.....	31·569
Bromine.....	trace.
Iodine.....	strong trace.
Silica.....	0·005
	<hr/>
	58·591
Less oxygen, equivalent to chlorine.....	7·114
	<hr/>
	51·477

The foregoing acids and bases may reasonably be assumed to be present in the water in the following state of combination :

(The carbonate being calculated as mon carbonate, and all the salts estimated as anhydrous.)

Chloride of potassium.....	0·229
" sodium.....	44·831
" lithium.....	trace.
" calcium.....	3·818
" magnesium.....	2·426
Bromide of magnesium.....	trace.
Iodide of magnesium.....	trace.
Sulphate of potassa.....	0·006
Biborate of soda.....	trace.
Carbonate of baryta.....	trace.
" strontia.....	trace.

Carbonate of lime.....	0·112
" iron.....	trace.
Silica.....	0·005
	<hr/>
	51·427
Carbonic acid, half-combined.....	0·050
	<hr/>
	51·477
Total dissolved solid matter, by direct experiment, dried at 180° C., = 51·45L.	

An imperial gallon of the water, at 15·5° C., would contain :

(The carbonate being calculated as anhydrous bicarbonate, and the salts without their water of crystallization.)

	Grains.
Chloride of potassium.....	16·636
" sodium.....	3256·824
" lithium.....	trace.
" calcium.....	277·365
" magnesium.....	176·241
Bromide of magnesium.....	trace.
Iodide of magnesium.....	trace.
Sulphate of potassa.....	0·436
Biborate of soda.....	trace.
Bicarbonate of baryta.....	trace.
" strontia.....	trace.
" lime.....	11·769
" iron.....	trace.
Silica.....	0·363
	<hr/>
	3739·634

4.—Water from a spring at 'The Gap,' east entrance to Crow Nest Pass, township seven, range three, west of the fifth initial meridian, district of Alberta, North-west Territory.

The sample of water sent for examination had, when received a faint, yet decided, odour of sulphuretted hydrogen; and contained a very trifling amount of pale brown, flocculent, organic, apparently vegetable, matter in suspension. This was removed by filtration. The water was colourless, and tasted somewhat insipid. Reaction, neutral; after evaporation to a small volume, however, very faintly alkaline. Its specific gravity, at 15·5° C., was found to be 1000·25. Boiling produced a slight precipitate, consisting of carbonates of lime and magnesia.

One thousand parts, by weight, of the filtered water, at 15·5° C., were found to contain :

Potassa.....	trace.
Soda.....	0·015
Lithia.....	trace.
Lime.....	0·126

Magnesia	0·047
Ferrous oxide	trace.
Sulphuric acid	0·135
Carbonic acid	0·096
Chlorine..	0·003
Silica.	0·004
Organic matter.	trace.
	<hr/>
	0·426
Less oxygen, equivalent to chlorine	0·001
	<hr/>
	0·425

The foregoing acids and bases may reasonably be assumed to be present in the water in the following state of combination :

(The carbonates being calculated as monocarbonates, and all the salts estimated as anhydrous.)

Chloride of potassium	trace.
" sodium.	0·005
Sulphate of soda	0·027
" lime	0·204
Carbonate of lithia	trace.
" lime.	0·075
" magnesia	0·099
" iron	trace.
Silica.	0·004
Organic matter	trace.
	<hr/>
	0·414
Carbonic acid, in excess of that required to form monocarbonates.	0·011
	<hr/>
	0·425

Total dissolved solid matter, by direct experiment,
dried at 180° C., = 0·428.

The carbonic acid found amounted, it may be observed, to little more than that required to form neutral carbonates ; hence, but a very small proportion of these would appear to be present in the water as bicarbonates.

An imperial gallon of the water, at 15·5° C., would contain :

(The carbonates being calculated as monocarbonates, and all the salts estimated as anhydrous.)

	Grains.
Chloride of potassium	trace.
" sodium	0·350
Sulphate of soda	1·890
" lime	14·284
Carbonate of lithia.	trace.
" lime.	5·251

Carbonate of magnesia.	6·932
" iron.....	trace.
Silica.....	0·280
Organic matter.....	trace.
	<hr/>
	28·987
Carbonic acid, in excess of that required to form monocarbonates.....	0·770
	<hr/>
	29·757

Barium, strontium, boric acid, bromine and iodine, were sought for, and found to be absent.

5.—Water from Goodenough Lake, one of several soda lakes, situate some twenty-eight miles north of Clinton, Lillooet district, in the province of British Columbia. The lake in question has been more fully referred to under 'natron' on p 12., ante, where will also be found some information in regard to the conditions of the lake obtaining at the time of the collection of the sample of water, of which the following are the results of an examination.

It contained a little pale brown, flocculent, organic matter in suspension, which was removed by filtration, leaving the water perfectly clear and colourless. It was devoid of any marked odour. It tasted and reacted strongly alkaline. Its specific gravity, by hydrometer, at 15·5° C., was found to be 1108·5.

One thousand parts, by weight, of the filtered water, at 15·5° C., were found to contain :

Potassa.....	8·300
Soda.....	50·446
Ammonia, very small quantity	undet.
Lime.....	0·023
Magnesia.....	0·062
Alumina.....	0·345
Sulphuric acid.....	6·105
Phosphoric acid.....	0·576
Boric acid.....	trace.
Carbonic acid.....	42·151
Chlorine.....	7·902
Silica	0·041
Organic matter, small quantity.....	undet.
	<hr/>
	115·951
Less oxygen, equivalent to chlorine	1·780
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	114·171

The foregoing acids and bases may reasonably be assumed to be present in the water in the following state of combination :

(The carbonates being calculated as monocarbonates, and all the salts estimated as anhydrous.)

Chloride of sodium.....	13·021
Sulphate of potassa.....	13·294
Carbonate of potassa.....	1·630
" soda.....	74·236
" ammonia, very small quantity.....	undet.
" lime.....	0·041
" magnesia.....	0·130
Phosphate of soda.....	0·222
" alumina.....	0·825
Biborate of soda.....	trace.
Silica.....	0·041
Organic matter, small quantity.....	undet.
	<hr/>
	103·440
Carbonic acid, in excess of that required to form monocarbonates.....	10·731
	<hr/>
	114·171

The amount of carbonic acid found, in excess of that required to form normal carbonates, is little more than one-third that required by these to form bicarbonates, from which it would appear that only a portion of the neutral carbonates are present in the water in the latter condition.

An imperial gallon of the water at 15·5° C., would contain :

(The carbonates being calculated as monocarbonates, and all the salts estimated as anhydrous.)

	Grains.
Chloride of sodium.....	1010·365
Sulphate of potassa.....	1031·548
Carbonate of potassa.....	126·480
" soda.....	5760·342
" ammonia,—very small quantity.....	undet.
" lime.....	3·181
" magnesia.....	10·087
Phosphate of soda.....	17·226
" alumina.....	64·016
Biborate of soda.....	trace.
Silica.....	3·181
Organic matter, small quantity.....	undet.
	<hr/>
	8026·426
Carbonic acid, in excess of that required to form monocarbonates.....	832·672
	<hr/>
	8859·098

Lithium, barium, strontium, bromine and iodine, were sought for, and found to be absent.

The results of an examination of the mud forming the bottom of the lake in which this water occurs, are given on a preceding page,—see under ‘natron.’

- 6.—Water from a spring within a few miles of St. Peters, Richmond county, province of Nova Scotia. Examined for the Rev. J. Fraser.

This water, at the time of its receipt, contained a small quantity of reddish-brown suspended matter which, on removal by filtration, was found to consist of organic matter with a little hydrated peroxide of iron. The filtered water had a pale brownish-yellow colour; a distinctly saline taste; reacted neutral, both before and after concentration; and had a specific gravity, at 15.5° C., of 1009.0. It contained 11.256 parts of dissolved saline matter, dried at 180° C., in 1000 parts, by weight, of the water,—equivalent to 795.011 grains per imperial gallon.

A qualitative analysis indicated the presence of :

Soda.....	rather large quantity.
Lime.....	somewhat large quantity.
Magnesia.....	very small quantity.
Sulphuric acid.....	rather small quantity.
Carbonic acid.....	small quantity.
Chlorine.....	rather large quantity.
Silica.....	trace.
Organic matter.....	faint trace.

Boiling produced a small precipitate consisting, for the most part, of carbonate of lime, with a very little carbonate of magnesia.

- 7.—Water from a boring at Eel River Crossing, Restigouche county, province of New Brunswick. Examined for Mr. Wm. Currie.

This, when received, contained a small amount of pale brown, flocculent, suspended matter which, on removal by filtration, was found to consist of organic matter with a little hydrated peroxide of iron. The filtered water was slightly turbid and became still more so on exposure to the air at the same time assuming a brownish-yellow colour, and ultimately depositing a little ferric hydrate. It had a very mild saline taste, and a faint, yet marked putrescent odour. Reaction neutral—after concentration, however, very faintly alkaline. Its specific gravity, at 15.5° C., was found to be 1001.5. It contained 1.669 parts of dissolved saline

matter, dried at 180° C., in 1,000 parts, by weight, of the water, —equivalent to 117.04 grains per imperial gallon.

A qualitative analysis showed it to contain :

Potassa.....	trace.
Soda.....	large quantity.
Lithia.....	trace.
Lime.....	very small quantity.
Magnesia.....	very small quantity.
Ferrous oxide.....	trace.
Sulphuric acid.....	very small quantity.
Carbonic acid.....	small quantity.
Chlorine.....	rather large quantity.
Silica.....	trace.
Organic matter.....	strong trace.

Boiling produced a slight precipitate, consisting of carbonates of lime and magnesia, and hydrated peroxide of iron.

- 8.—Water from a boring at Dunsinnane, Kings county, province of New Brunswick. The main flow of the water was struck at a depth of about three hundred feet. Examined for Mr. John White.

The sample received for examination contained a trifling amount of white, flocculent, suspended matter. This was removed by filtration. The filtered water had a faint brownish-yellow colour, was odourless, and had an insipid taste. Reaction, neutral—when reduced to a small volume, however, faintly alkaline. Total dissolved saline matter, dried at 180° C., amounted to 0.114 parts per 1,000—equivalent to 7.98 grains per imperial gallon.

A qualitative analysis indicated the presence of :

Soda.....	small quantity.
Lime.....	very small quantity.
Magnesia.....	very small quantity.
Sulphuric acid.....	very small quantity.
Carbonic acid.....	very small quantity.
Chlorine.....	small quantity.
Silica.....	trace.
Organic matter.....	faint trace.

Boiling produced but a very slight precipitate, consisting, for the most part, of carbonate of lime with a very little carbonate of magnesia.

- 9.—Water from a spring on the property of Mr. Edouard Têtu, a mile and a half from Montmagny Station, on the line of the Inter-colonial Railway,—cadastral lot 184 of St. Thomas, Montmagny county, province of Quebec. Received from Mr. J. Obalski.

The sample of water received for examination, contained a small quantity of brownish flocculent matter in suspension, which, on removal by filtration, was found to consist of organic matter with a very little hydrated peroxide of iron. The filtered water had a pale brownish-yellow colour; was devoid of odour; and tasted mildly saline. Reaction, neutral, but after concentration, faintly alkaline. It had a specific gravity, at 15.5° C., of 1004.5, and was found to contain 6.180 parts of dissolved saline matter, dried at 180° C., in 1,000 parts, by weight, of the water,—equivalent to 434.55 grains per imperial gallon.

A qualitative analysis showed it to contain :

Potassa.....	trace.
Soda.....	somewhat large quantity.
Lime.....	small quantity.
Magnesia.....	small quantity.
Ferrous oxide.....	trace.
Carbonic acid.....	rather small quantity.
Chlorine.....	somewhat large quantity.
Silica.....	trace.
Organic matter.....	trace.

Boiling produced a small precipitate, consisting of carbonates of lime and magnesia with traces of hydrated peroxide of iron.

10.—Water from a spring in St. Ferdinand d'Halifax, Lake William, township of South Halifax, Megantic county, province of Quebec. Examined for Mr. A. Chambrier.

The sample of water sent for examination, contained a trifling amount of pale brownish, flocculent, organic matter in suspension. After removal of this by filtration, the water was found to be bright, colourless, odourless, and devoid of any marked taste. It reacted neutral, both before and after concentration. Its specific gravity at 15.5° C., was found to be 1000.49. It contained 0.140 parts of dissolved saline matter, dried at 180° C., in 1,000 parts, by weight, of the water,—equivalent to 9.805 grains per imperial gallon.

A qualitative analysis indicated the presence of :

Soda.....	very small quantity.
Lime.....	small quantity.
Magnesia.....	very small quantity.
Sulphuric acid.....	very small quantity.
Carbonic acid.....	small quantity.
Chlorine.....	very small quantity.
Silica.....	trace.
Organic matter.....	faint trace.

Boiling produced a very slight precipitate, consisting of carbonate of lime with a very little carbonate of magnesia.

- 11.—Water from a spring on the farm of Mr. John Kennedy, on the south half of lot one, concession A of Rideau Front, township of Nepean, Carleton county, province of Ontario. Examined for Mr. A. F. McIntyre.

The sample of water received for examination contained a small quantity of pale brown, flocculent, organic matter in suspension. This was removed by filtration. The filtered water, which was perfectly bright, had a faint brownish-yellow colour. It was devoid of any marked taste. Reaction, neutral; when evaporated to a small volume, however, strongly alkaline. Its specific gravity, at 15.5°C., was found to be 1000.47. The total dissolved saline matter, dried at 180°C., amounted to 0.440 parts per 1000,—equivalent to 30.8 grains per imperial gallon.

A qualitative analysis showed it to contain :

Potassa.....	very small quantity.
Soda.....	small quantity.
Lithia.....	trace.
Lime.....	small quantity.
Magnesia	very small quantity.
Alumina.....	trace.
Ferrous oxide.....	trace.
Sulphuric acid.....	small quantity.
Boric acid.....	faint trace.
Carbonic acid.....	rather small quantity.
Chlorine.....	very small quantity.
Silica...	trace.
Organic matter.....	trace.

Boiling produced a slight precipitate, consisting of carbonates of lime and magnesia. Baryta, strontia, bromine and iodine, were sought for, and found to be absent.

- 12.—Water from a spring on the twenty-first lot of the third concession of the township of Huntley, Carleton county, province of Ontario. Examined for Mr. James Wilson.

It contained a little brownish flocculent matter in suspension, which, on removal by filtration, was found to consist of organic matter with a little hydrated peroxide of iron. The filtered water had a faint brownish-yellow colour; was odourless; and possessed a very mildly saline taste. Reaction, neutral; when evaporated to a small volume, however, decidedly alkaline. Specific gravity, by hydrometer, at 15.5°C., 1002.0. Total dissolved saline matter, dried at 180°C., 2.715 parts per 1000,—equivalent to 190.43 grains per imperial gallon.

A qualitative analysis showed the presence of :

Soda.....	rather small quantity.
Lime.....	very small quantity.
Magnesia.....	small quantity.
Sulphuric acid.....	trace.
Carbonic acid.....	small quantity.
Chlorine.....	rather small quantity.
Silica.....	trace.
Organic matter.....	trace.

Boiling produced a slight precipitate, consisting of carbonate of lime with a little carbonate of magnesia.

13.—Water from a boring in the town of Souris, Brandon, province of Manitoba.

The sample of the water submitted to examination contained a small amount of pale brown flocculent matter in suspension which, on removal by filtration, was found to consist of hydrated peroxide of iron with a little carbonate of lime and a trifling quantity of organic matter. The filtered water was clear and colourless ; devoid of odour, and any marked taste. Reaction, neutral,—after concentration, however, strongly alkaline. Its specific gravity, at 15·5°C., was found to be 1001·5. The total dissolved saline matter, dried at 180°C., amounted to 1·522 parts per 1,000,—equivalent to 106·68 grains per imperial gallon.

A qualitative analysis indicated the presence of :

Soda.....	small quantity.
Lime.....	small quantity.
Magnesia.....	small quantity.
Ferrous oxide.....	trace.
Sulphuric acid.....	small quantity.
Carbonic acid.....	somewhat large quantity.
Chlorine.....	small quantity.
Silica.....	trace.
Organic matter....	trace.

Boiling produced a small precipitate, consisting of carbonates of lime and magnesia with a trace of hydrated peroxide of iron.

14.—Water from a spring near Nakusp, east side of Upper Arrow Lake, West Kootenay district, province of British Columbia. Examined for Mr. H. M. McCutcheon.

It contained a trifling amount of white, flocculent, organic matter in suspension. This was removed by filtration. The filtered water was devoid of odour and any marked taste. Reaction, neutral—both before and after concentration. Its specific gravity, at 15·5°C., was found to be 1000·5. It contained 0·51

parts of dissolved saline matter, dried at 180°C., in 1,000 parts, by weight, of the water,—equivalent to 35·7 grains per imperial gallon.

A qualitative analysis showed it to contain :

Potassa.....	trace.
Soda.....	very small quantity.
Lime.....	very small quantity.
Magnesia.....	very trifling quantity.
Sulphuric acid.....	small quantity.
Carbonic acid.....	trace.
Chlorine.....	very small quantity.
Silica.....	trace.
Organic matter.....	trace.

Boiling produced a scarcely perceptible precipitate.

MISCELLANEOUS EXAMINATIONS.

- 1.—Clay. From Big Pond, Cape Breton county, province of Nova Scotia. A light grayish, friable, non-calcareous, argillaceous earth, containing a somewhat large amount of very fine silicious grit, and some root fibres. In the moist condition, it is distinctly plastic. When burnt it assumes a light reddish-brown colour. It is very difficultly fusible.
- 2.—Clay. From the forty-fifth lot of the fourth range of the township of Macpès—where it occurs on a small stream called La Petite Paquette, a tributary of the Petite Neigette River,—county of Rimouski, in the province of Quebec. A brownish-yellow, slightly ferruginous, non-calcareous, plastic clay, containing but little gritty matter. When burnt it assumes a reddish-brown colour. It is very difficultly fusible at a high temperature. This clay is well suited for the manufacture of ordinary building brick and common pottery. It might also be used for the manufacture of stove-linings, or even a fire brick in which a high degree of refractoriness was not called for. The pleasing colour it assumes when burnt might likewise render it, in the opinion of many, suitable for the manufacture of terra cotta ware.