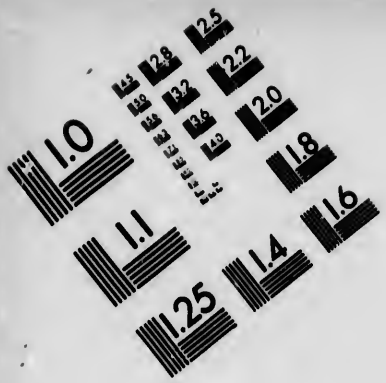

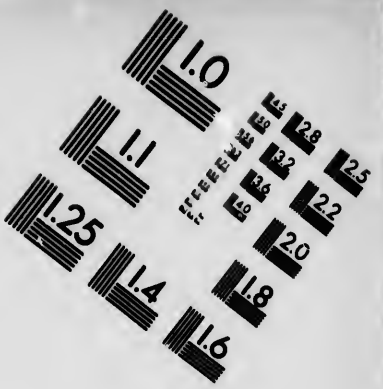

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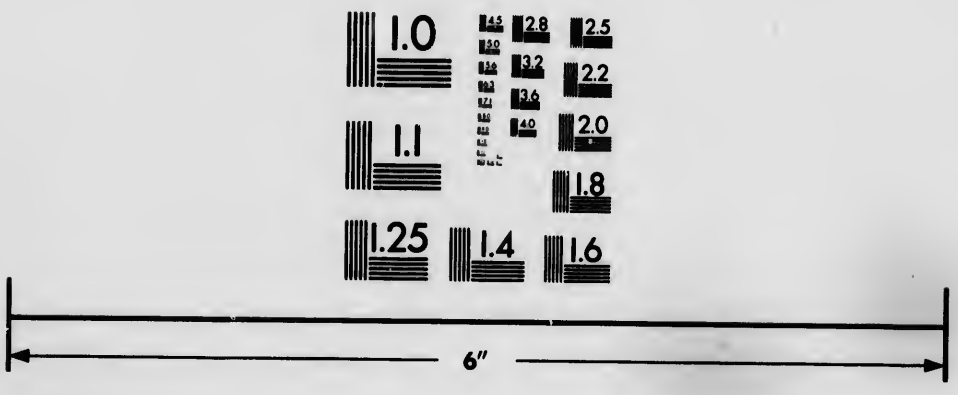

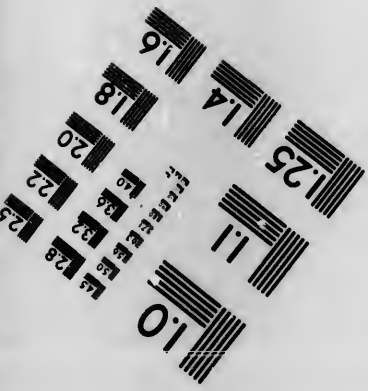

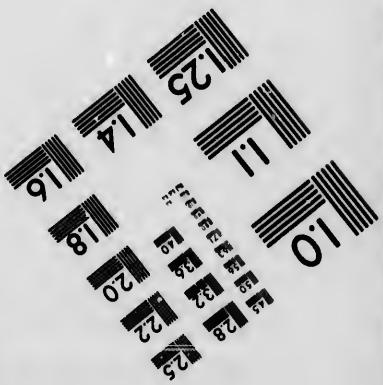

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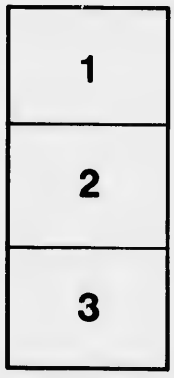

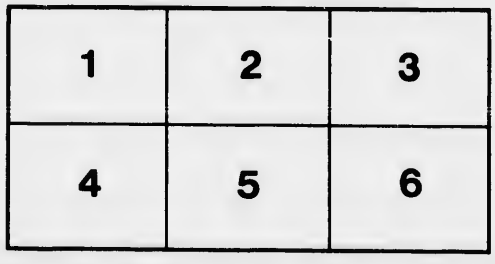

GEOLOGICAL SURVEY OF CANADA.
ALFRED R. C. SELWYN, LL.D., F.R.S., F.G.S., DIRECTOR.

CHEMICAL CONTRIBUTIONS

TO THE

GEOLOGY OF CANADA.

FROM THE

LABORATORY OF THE SURVEY.

BY

G. CHRISTIAN HOFFMANN, F. Inst. Chem.
Chemist and Mineralogist to the Survey.

PUBLISHED BY AUTHORITY OF PARLIAMENT.

Montreal:
DAWSON BROTHERS.
1883

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ALFRED R. C. SELWYN, ESQ., LL.D., F.R.S., F.G.S.,

Director of the Geological and Natural History Survey and Museum.

SIR,—I have the honor of herewith laying before you my Report upon the work carried out in the Laboratory of this Survey during the past year. It embodies only such analyses and examinations as were deemed likely to prove of general interest. Of these, such as were conducted by Assistant Chemist, Mr. Frank D. Adams, have, in all instances, been duly credited to him.

The results of an examination of a series of coals, from the North-west Territory, is in course of progress, and I trust to be in a position to hand you the results, in the form of a separate report, at an early date.

I have the honor to be,

Sir,

Your obedient servant,

G. CHRISTIAN HOFFMANN.

OTTAWA, December 30, 1882.

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CHEMICAL CONTRIBUTIONS

TO THE

GEOLOGY OF CANADA.

FROM THE

LABORATORY OF THE SURVEY,

BY

G. CHRISTIAN HOFFMANN, F. Inst. Chem.

MISCELLANEOUS MINERALS.

SAMARSKITE.

Samarskite from Berthier county, P.Q.

This interesting mineral—not hitherto met with in Canada—was found just beyond the north-western limits of the township of Brassard, county of Berthier, P.Q.

It consisted of irregular-shaped fragments without the slightest indication of crystalline form. Lustre, sub-metallic, shining. Color, brownish-black, almost black; in parts iridescent. Opaque even on the thinnest edges. Brittle. Fracture, uneven. Streak, greyish-brown. Hardness, about 6. Fuses between 4 and 4·5. Specific gravity, 4.9478. In the closed tube decrepitates and gives off a little slightly acid water. Readily and completely decomposed by heating with concentrated sulphuric acid. Analysis gave:—

Analysis of.

Columbic acid. } Tantalic Acid.. }	55.41*
Tungstic Acid	—
Stannic acid	.10
Yttrium oxide†	14.34
Cerium oxides†	4.78
Uranium oxide (UO_3)	10.75
Manganous oxide	.51
Ferrous oxide	4.83
Lime	5.38
Magnesia	.11
Potash	.39
Soda	.23
Fluorine	trace.
Water	3.21
	99.04

* Apparently in great part, if not almost entirely, columbic acid.

† The presence or absence of other members of this group was not ascertained.

A gramme of the finely pulverized mineral, decomposed by heating with sulphuric acid, with careful exclusion of air, decolorized an amount of potassium permanganate corresponding to 4.79 per cent. ferrous oxide. The water was expelled by ignition and collected in a chloride of calcium tube.

INDURATED CLAY.

Indurated clay from Manitoba.

From Souris City, Souris River, Manitoba.

Structure, compact. Color, light bluish-grey. Lustre, dull. Smooth, but meagre to the touch. Adheres strongly to the tongue. Tough. Somewhat sonorous. Hardness, about 3. Fracture, irregular, occasionally imperfectly large conchoidal. May be ground, with tolerable facility, to a soft impalpable powder, which forms with water a more or less plastic paste. Geological position, Cretaceous—(Pierre formation.)

This specimen was collected by Dr. A. R. C. Selwyn, who at the time of handing it to me expressed the opinion that it would, in all probability, prove an excellent material for the manufacture of building brick; a supposition, the correctness of which has been fully borne out by actual experiment.

For the purpose of brick making, this material requires—agreeably with the present experience—no admixture whatever. In the following experiments it was simply ground to powder—which it readily admits of—mixed into a stiff paste with water, well pugged and then the moulding of the bricks proceeded with. By employing the material in a fine state of division, and forming the bricks under pressure, an article of very close texture may be ensured. The bricks after having been thoroughly dried, were finally burned in the muffle of a cupelling furnace, at a full-red heat. On examination they were found to have retained their form well, having neither warped nor cracked; they were firm and tough; the color, a very pleasing one, may, perhaps, be best described as a very pale brownish-yellow. They were in no wise affected by protracted and repeated immersion in water.

Its adaptability for the manufacture of building and fire brick.

Other of these bricks were inserted in covered crucibles, and these latter placed in an air-furnace, the temperature of which was gradually raised, until, at the expiration of an hour, a white heat had been attained, at which temperature it was maintained for an additional two hours. On opening the crucible the bricks were found to have retained their original form intact, they had neither warped nor cracked, their edges remained perfectly sharp and showed no indication of having undergone even the most incipient fusion. Color, a very pale reddish-brown.

The foregoing experiments tend to show that this clay is well adapted for the manufacture of an excellent building brick, and further, lead to

the inference, that it could also be advantageously employed for the manufacture of a good class of fire brick.

It should be stated that this material is readily accessible, and occurs in practically unlimited quantity.

An analysis of this clay, and further experiments in regard to its employment as a refractory material, will be carried out in the course of a contemplated early investigation bearing directly upon the subject of our fire-clays.

BITUMINOUS SAND-ROCK AND MINERAL-TAR OR MALTHA.

Bituminous sand-rock and mineral-tar from the North-west Territory.

From the Athabasca or Elk River—North-west Territory. With reference to the geological position and general mode of occurrence of the above, Dr. R. Bell informs me:—

"That the deposit is of Cretaceous age, but rests directly upon limestone of the Devonian system. The bedding of the latter undulates gently, while the asphaltic sand lies in thick horizontal layers upon its surface, and in some cases fills fissures in the upper part of the limestone. The asphaltic matter has no doubt resulted from petroleum rising up out of the underlying Devonian rocks, in which evidence of its existence can be detected. In descending the Athabasca River it was first observed a few miles above the junction of the Clearwater branch, below which it becomes more conspicuous, forming the whole banks of the stream, with the exception of a few feet of limestone at the base, for a distance of many miles. These banks are sometimes about one hundred and fifty feet in height, and frequently maintain an elevation of about one hundred feet for considerable distances. Except where they have been long exposed to the weather, they generally look as black as coal. A thick tar is often seen draining out of the deposit, and in numerous places on the ground at the foot of either bank, or on terraces lower than their summits, this tar collects in pools, or flows in sluggish streams to lower levels among the peaty materials in the woods. The surface of these accumulations of tar is usually covered with a hardened pitchy crust. The boatmen on the river break through this crust in order to collect the underlying tar which they boil down and use for pitching their craft. Some parts of the banks are rendered plastic *en masse* from being over-saturated with the asphalt, and in warm weather they slide gradually down into the bed of the river incorporating the boulders and pebbles in their course."

Mode of occurrence.

BITUMINOUS SAND-ROCK.

Bituminous sand-rock.

From the Athabasca River, about six miles below its confluence with the Clearwater. Collected by Dr. R. Bell. This specimen was compact

Bituminous sand-rock, cont.

and homogeneous in appearance, and of a dull, dark brownish-black color. Specific gravity at at 60° F. 2.040. At the temperature of 50° F. it is quite firm, barely, if at all, yielding to pressure, and does not soil the hand; at 70° F. it gives somewhat to the touch, and is slightly sticky; at 100° F. it becomes quite soft and eminently soils the fingers. It is scarcely acted on by alcohol in the cold, and but very slightly at a boiling temperature; but ether, oil of turpentine, kerosene, benzine (petroleum spirit), benzol (coal-tar naphtha) and bi-sulphide of carbon, more especially the last two named, readily dissolve the bituminous matter, with formation of dark brown colored solutions, and leaving a pure or almost pure siliceous residue in the form of sand, of which apparently the bitumen had constituted the sole binding medium.

Analysis of.

The composition of this specimen of the rock was found to be as follows:—

Bitumen	12.42
Water, mechanically included	5.85
Siliceous sand	81.73
	100.

The sand consisted of colorless transparent quartz, not unfrequently presenting the bright glassy lustre of broken quartz crystal, the surfaces were, however, for the most part, more or less dulled by abrasion: it contained a few flakes of silvery mica, and, as Mr. Adams—to whom I handed a small quantity for microscopical examination—informs me, an occasional fragment of felspar. It is on the whole exceedingly fine, 52 per cent. of the same passing a sieve of ninety meshes to the linear inch; 16 per cent. one of seventy-five meshes; 15 per cent. one of sixty-six meshes, and 9 per cent. one of fifty meshes, leaving a balance of 8 per cent. as rejected by the latter.

Subsequent to the foregoing examination Mr. A. S. Cochrane, of this survey, handed me a specimen which he collected, and which differs from the above, in that it does not appear to contain so much water and the bituminous matter partakes more of the nature of asphalt. At the temperature of 65 F. it is quite hard, fragments may be chipped off with a hammer, and it is reducible in a mortar to a non-coherent pulverulent condition; at 100° F. it barely yields to pressure, and is only slightly adhesive: at 150° F. it gives to the touch and is somewhat sticky; at 200° F. it is quite soft, and may be readily moulded.

MALTHA OR MINERAL-TAR.

Maltha or mineral-tar

From the right bank of the Athabasca, about twelve miles below its confluence with the Little Red River. Collected by Mr. A. S. Cochrane.

This material also occurs at several other points further down the river, and is identical with that referred to in the prefatory remarks.

The sample in question had a pitchy-black color, in thin layers and by transmitted light, rich dark reddish-brown. The specific gravity at 60° F. was found to be 1.023; at this temperature it has the consistence of a soft extract, and will barely flow; at 70° F., flows, but sluggishly, whilst at 100° F. it has the consistence of treacle.

Economic uses of the Bituminous sand-rock.

As regards the utilization of these substances,—the most appropriate application of the former and that for which it would appear to be admirably adapted, would be for asphalting purposes. It has one of the most important qualifications of a good bituminous concrete, viz., intimate combination of the mineral and organic constituents, and this in a degree which no artificial preparation of the kind could be expected to possess. It will, in all probability be found, that a very slight treatment will render it suitable for employment in the construction of roads, foot-paths, court-yards, *et cetera*; for asphalting the flooring of granaries, basements of warehouses and the like, and further as a roofing material. Should it be deemed more expedient to separate the bitumen, this may be effected by simply boiling or macerating the material with hot water, when the bituminous matter, entering into fusion, will rise as a scum to the surface and may be removed by skimmers, whilst the sand falls to the bottom of the vessel.

Extraction of the Bitumen.

An experiment was made in order to ascertain the greatest state of purity to which the bitumen could be brought by this method; it was found, that of the 81.73 per cent. sand, 69.26 per cent. had been removed, the extracted bitumen containing 50.1 per cent. sand, and—owing to the extreme fineness of a portion of this latter, as already mentioned—it may be questioned if the purification, by this method, could be pushed much beyond this.

The sand separated by this process, when carefully conducted, is free or almost free from bitumen, and might, after being heated to redness in a reverberatory furnace—to destroy any little adhering bitumen—be advantageously employed for the manufacture of one of the better qualities of glass.

The above treatment requires but the simplest of appliances and might be readily carried out on the spot.

Economic uses of the Maltha.

The amount of maltha at my disposal was far too small to warrant any attempt at its distillation. Should it occur in sufficient quantity, it might possibly, amongst other uses, be advantageously employed as a crude material for the manufacture of illuminating and lubricating oils and parrafin.

NATURAL WATERS.

Lake and river waters from North-west Territory.

The following lake and river waters from the North-west Territory, were collected at the instance of Mr. A. S. Cochrane, whilst conducting a survey in the section of country in question, and handed to me by him for examination.

Mr. Frank D. Adams has conducted a qualitative analysis of these waters, and also estimated the amount of total dissolved solid matter contained in them. The results obtained by him were as stated below.

Examination of water from Reindeer Lake.

1.—Reindeer Lake.—This water was taken from an open space between the islands, about ten miles above the outlet of the lake. Date of collection, July 25th, 1881.

There was a small quantity of flocculent suspended matter of a yellowish-brown color. After filtration the water had a faint brownish-yellow tinge. The specific gravity at 15.5° C. was found to be 1000.04, and the total dissolved solid matter dried at 100° C., amounted to 2.02 grains to the Imperial gallon.—It contained:

Potassa and soda	A very small quantity, potassa predominating.
Lime	A slight trace.
Magnesia	A trace.
Silica	A very small quantity.
Carbonic acid	A mere trace.
Chlorine	A trace.

Examination of water from Churchill River.

2.—Churchill or English River.—This sample was taken from the centre of the river, about six miles above the Kettle Falls. Date of collection, July 28th, 1881.

There was a large quantity of flocculent suspended matter of a light brown color. After filtration the water had a pale brownish-yellow tinge. Its specific gravity at 15.5° C., was 1000.17. The total dissolved solid matter—dried at 100° C.,—amounted to 7.96 grains per Imperial gallon.—It contained:

Potassa and soda	A rather large quantity, potassa predominating.
Lime	A small quantity.
Magnesia	A very small quantity.
Silica	A somewhat large amount.
Carbonic acid	A very small quantity.
Chlorine	A small quantity.

Examination of water from Saskatchewan River.

3.—Saskatchewan River.—Taken from the centre of the river, about a quarter of a mile below the junction of the Big-Stone River. Date of collection, August 3rd, 1881.

There was a large amount of brownish-black colored flocculent matter in suspension. After filtration, the water had a pale brownish-yellow color. The specific gravity at 15.5° C., was found to be 1000.33, and the total dissolved solid water—dried at 100° C.,—amounted to 16.60 grains per Imperial gallon.—It contained: Examination of water from Saskatchewan River.

Potassa and soda	A rather large quantity, potassa preponderating.
Lime	A large quantity.
Magnesia	A rather large quantity.
Ferrous oxide	A trace.
Silica	A somewhat large amount.
Sulphuric acid	A somewhat large amount.
Carbonic acid	A large amount.
Chlorine	A very small quantity.

Of the foregoing waters that from the Reindeer Lake, is remarkable for the small amount of dissolved solid matter which it contains; in this regard it would take rank with the waters of Bala Lake, Merionethshire, Wales, and Loch Katrine, Perthshire, Scotland, the former of which contains 1.953 grains (Frankland and Odling), and the latter 1.981 grains (Wallace) of solid matter to the gallon.

IRON ORES.

HÆMATITE.

1.—From near the head of Loch Lomond, a quarter of a mile north-west of the L'Ardoise road, and a quarter of a mile south-west of McVicars road, Cape Breton county, Nova Scotia. Mr. Hugh Fletcher informs me that it is a contact deposit, and the geological position, Lower Carboniferous. Iron ores—Analyses of

Structure, compact. Color, steel-grey, in parts red. Determinations—by Mr. Frank D. Adams—of the more important constituents, gave the following results: Hæmatite from near Loch Lomond, Nova Scotia.

Ferric oxide	83.645
Ferrous oxide	7.640
Manganous oxide	.285
Phosphoric acid	.077
Sulphuric acid	.194
Water, hygroscopic	.341
Insoluble residue	7.768
Metallic iron, total amount of	64.494
Phosphorous	.034
Sulphur	.078

Should this deposit prove at all extensive, and the ore equal in quality to the above sample, it cannot fail to prove of importance.

MAGNETITE.

Iron ores—Analyses of, cont.

2.—A specimen of magnetite from the thirteenth lot of the sixth range of Bagot, county of Renfrew, Ontario, was examined by Mr. F. D. Adams, and found to contain:

Magnetite from county of Renfrew, Ont.

Metallic iron	45.87
Titanium dioxide	trace
Insoluble residue	28.56

The object of the enquiry did not call for a more extended examination.

He has also examined samples of magnetite from other lots and ranges—in this township, in order to ascertain if they contained titanium dioxide or no, and with the following results: specimens from lot five, and the east half of lot ten of the twelfth range, as also a specimen from the twelfth lot of the seventh range, were found to be quite free from the same.

Magnetite from Thunder Bay, L.S.

3.—A very fine crystalline, dark steel-grey colored magnetite from location seven, Thunder-Bay, Lake Superior, was found to contain:

Metallic iron	49.02
Insoluble residue	24.61

This specimen was perfectly free from titanium dioxide.

Magnetite from county of Frontenac, Ont.

4.—Magnetic iron ore from the seventeenth lot of the eleventh range of the township of Olden, county of Frontenac, Ontario.

Massive, structure, coarse-crystalline. Color, greyish-black-lustre, metallic. A partial analysis gave as follows:

Ferric oxide	68.146
Ferrous oxide	28.975
Water, hygroscopic	.059
Insoluble residue	1.364
Metallic iron, total amount of	70.238

This specimen was perfectly free from titanium dioxide.

CLAY IRON-STONE.

Clay iron-stone from North-west Territory.

The following seven specimens of clay iron-stone from the North-west Territory, were collected by Dr. G. M. Dawson, by whom they were submitted to me for examination, accompanied by the following notes in regard to their geological position and general mode of occurrence, in that section of country. He says:

Clay iron-stone from North-west Territory—General mode of occurrence of

"It may be stated generally, that iron-stone occurs in greater or less abundance at all horizons of the Cretaceous and Laramie or Fort Union beds, whether of marine or fresh water origin, throughout the North-west Territory.

Notwithstanding this general distribution, however, no locality yet observed is capable of yielding this ore in such great quantity as to justify a belief in its immediate commercial value.

The iron-stone occurs either in nodular masses, following certain layers of the shales, sandy-clays and clays of the formations above referred to, or in more or less regular nodular sheets intercalated between the beds. To those localities in which a considerable number of iron-stone bearing bands occur in proximity in a moderate thickness of beds, the greatest importance attaches, and in some of these it may eventually be proved profitable to work over the entire banks for their extraction. The analyses so far made tend to shew the high position which these iron-stones hold among ores of the same class, both as to percentage of iron and freedom from injurious elements.

In the Pierre shales exposed in Pembina Mountain and its vicinity, the iron-stone so far discovered is of inferior quality, and the ore is not abundant. Further west, in the Lignitic (Fort Union) formation of the Souris region, iron-stone is much more abundant and often occurs on the surface in large quantities, where it has been left as the soft containing beds were denuded away.

In the region drained by the South Saskatchewan and its tributaries, the Pierre shales contain a much larger proportion of iron-stone than they do in their eastern exposures, and in some places may yet prove to hold deposits of economic importance. Numbers 5 and 8 of the present series of analyses are of ore derived from this subdivision of the Cretaceous, the former occurring in nodules of large size and in considerable abundance in scarped banks on the Bow River, the latter in the immediate vicinity of the main coal seam on the Belly River, but in a layer only a few inches thick. Number 7 is also probably from this horizon, and occurs forming a series of beds each a few inches in thickness, which are intercalated in black shales in such great number as to form a considerable proportion of the whole. The locality is near the mouth of Kananaskis River, a short distance from the Bow River fall. Specimen number 9 is from a series of pale sandstones and sandy clays which underlie the Pierre shales, and contain in some exposures very large quantities of iron-stone nodules, remarkable from their great size and septarian character.

Clay iron-stone from North-west Territory —Analyses of

The iron-stone of this subdivision of the Cretaceous was observed to be most abundant in the high scarped banks between the mouth of the St. Mary's River and Coal Banks on the Belly River. Numbers 10 and 6 are derived from a series of beds, the precise stratigraphical position of which is yet open to some doubt. They contain estuarine fossils, and occasionally many large nodules and nodular sheets of iron-stone. The locality on the Bow River from which the specimen numbered 6 was collected, is one of those which appear most promising; here the iron-stones are very abundant and often several tons in weight. The stratigraphical position of the specimen numbered 11, is uncertain, owing to the extreme disturbance which the beds in the immediate vicinity of the mountains have suffered."

From Bow River.

5.—Bow River, eight miles above Grassy Island.

Structure, very fine granular. Color, ash-grey with a brownish tinge. Streak, ash-grey. Fracture, imperfectly conchoidal. Weathers purplish-brown.

A partial analysis of this ore gave:

Ferrous oxide	40.347
Ferric oxide	.878
Water, hygroscopic	.856
Insoluble residue	16.121
Metallic iron, total amount of	31.996

Erom Bow River.

6.—Bow River, twelve miles above Prairie Island.

Structure, compact. Color, ash-grey. Streak, pale ash-grey. Fracture, large conchoidal. Weathers, reddish-brown.

A partial analysis of this specimen gave:

Ferrous oxide	28.818
Ferric oxide	.818
Water, hygroscopic	.938
Insoluble residue	13.935
Metallic iron, total amount of	22.987

From Kananaskis River.

7.—Kananaskis or Rapid River, near its confluence with Bow River.

Structure, very fine granular. Color, dark bluish-grey. Streak, dark-grey. Fracture, imperfectly conchoidal. Weathers, brownish-red.

A partial analysis gave:

Clay iron-stone from North-west Territory —Analyses of, cont.

Ferrous oxide	13.786
Ferric oxide	.772
Water, hygroscopic	.473
Insoluble residue	66.966
Metallic iron, total amount of	11.263

8.—Belly River, at "Coal Banks."

Structure, very fine granular. Color, brownish-grey. Streak, ash-grey with a slight brownish tinge. Fracture, imperfectly conchoidal. From Belly River.

A partial analysis gave:

Ferrous oxide	41.458
Ferric oxide	.328
Water, hygroscopic	1.042
Insoluble residue	10.294
Metallic iron, total amount of	32.475

9.—Belly River, about seven miles below "Coal Banks."

Structure, fine granular. Color, pale reddish-brown. Streak, brownish-grey. Fracture, irregular. Weathers, dark reddish-brown. From Belly River.

A partial analysis gave the following results:

Ferrous oxide	30.730
Ferric oxide	1.398
Water, hygroscopic	1.272
Insoluble residue	23.754
Metallic iron, total amount of	24.880

10.—Belly River, about seventeen miles east of the mouth of the Little Bow River. From Belly River.

Structure, compact Color, pale brownish-yellow. Streak, light grey. Fracture, large conchoidal. Weathers, brownish-yellow.

A partial analysis of this specimen gave:—

Ferrous oxide	30.302
Ferric oxide	1.487
Water, hygroscopic	1.445
Insoluble residue	12.120
Metallic iron, total amount of	26.165

11.—Mill Creek, at coal outcrop, about four miles above the mill. From Mill Creek.

Structure, fine granular. Color, dark grey. Streak, ash-grey.

Fracture, irregular. Weathers dark reddish-brown. A partial analysis of this specimen gave:—

Ferrous oxide	37.985
Ferric oxide	.811
Water, hygroscopic	.634
Insoluble residue	22.511
Metallic iron, total amount of	30.112

MANGANESE ORES.

Manganese ores—Analyses of.

1.—From the Glenmore or Morrison mine, Salmon-River road, about two miles east of the head of Loch Lomond, Cape Breton county, Nova Scotia.

Pyrolusite from near Loch Lomond, Nova Scotia.

This specimen consisted almost exclusively of pyrolusite; a partial analysis of the same—after drying at 100° C.—afforded Mr. F. D. Adams, the following results:—

Manganese dioxide	91.84 per cent.
Ferric oxide	.12 " "
Insoluble residue	2.91 " "

Bog manganese from Boularderie Island, Nova Scotia.

2.—Bog Manganese, from the vicinity of Big Harbour, Boularderie Island, Cape Breton, Nova Scotia. The deposit is stated to be an extensive one.

This sample was in the form of porous friable lumps, varying in color from dark-brown to brownish and bluish black. A partial analysis, by Mr. F. D. Adams, gave the following results:—

Manganese dioxide	25.42 per cent.
Water	33.52 " "

Judging from specimens, collected in previous years, from this locality, I am disposed to regard the one in question as a picked and not an average sample of this deposit.

GOLD AND SILVER ASSAYS.

The following assays were all conducted by Mr. Frank D. *Adams:*—

PROVINCE OF NOVA SCOTIA.

Gold and Silver assays.

1.—From a large brook, a little above the Salmon River road, seven miles from the head of Loch Lomond, and six miles from Mira.

The specimen, a single fragment, weighed four and a half ounces; it consisted of a breccia through which was disseminated galena in

a very finely divided state: the galena apparently constituted but a small proportion of the whole. Assays gave:— Gold and Silver assays, cont.

Gold..... None.
Silver..... 2.879 ounces to the ton of 2,000 lbs.

Province of Nova Scotia.

2.—Canso road, nine and three quarter miles west of Canso, Guysborough county, Cape Breton.

The sample weighed a little over four pounds; it consisted of an association of copper pyrites, arsenical pyrites and iron pyrites in a gangue of greyish, translucent quartz. It was found to contain:—

Gold..... trace.
Silver..... 0.379 ounce to the ton of 2,000 lbs.

3.—This specimen was taken from an opening about two hundred feet distant from that of the preceding specimen.

It consisted of mispickel associated with a small quantity of a greyish translucent quartz.

It contained only traces of gold and silver.

PROVINCE OF NEW BRUNSWICK.

Province of New Brunswick.

4.—Elm-tree River, Gloucester county.

The specimen, a single fragment, weighed somewhat over three and a quarter pounds, and consisted of a coarsely crystalline galena, associated with copper pyrites and a small quantity of zinc blende, in a gangue of greyish, subtranslucent quartz—the latter constituting 49.8 per cent. by weight of the whole. Assays gave:—

Gold..... trace.
Silver..... 7.197 ounces to the ton of 2,000 lbs.

5.—From the so-called "Nigadoo Silver-mine," Gloucester county.

A fine crystalline galena, associated with a little zinc blende, in a more or less weathered rocky gangue. The metallic sulphides constituted but a small proportion of the whole. It contained:—

Gold..... trace.
Silver..... 5.811 ounces to the ton of 2,000 lbs.

PROVINCE OF ONTARIO.

Province of Ontario.

6.—From a small island in the Ottawa River, near Fitzroy Harbour, township of Fitzroy, Carleton county.

A coarsely crystalline galena, associated with a trifling amount of calcite. It was found to contain:—

Gold..... none.
Silver..... 0.493 oun[illegible] the ton of 2,000 l[illegible]

Gold and Silver assays, cont.

Province of Ontario.

7.—Another specimen found in close proximity to the foregoing, likewise a coarsely crystalline galena, but of a much darker color than the generality of specimens of this mineral; gave an assay:—

Gold..... None.
Silver..... 0.751 ounce to the ton of 2,000 lbs.

8.—From Hastings county.

The specimen, which weighed thirteen and a half pounds, consisted for the most part of a coarsely crystalline aggregate of quartz, felspar and mica, carrying a little iron pyrites; the lesser portion consisted of a more or less weathered, finely granular, highly quartzoze schist.

It contained neither gold nor silver.

9.—From near the Duncan Mine, W½B, Thunder Bay, Lake Superior.

A greyish siliceous rock carrying small quantities of galena and zinc blende, and a little iron pyrites; the metallic sulphides constituting but a very small proportion of the whole. This sample was found to contain:—

Gold..... None.
Silver..... 0.343 ounce to the ton of 2,000 lbs.

10.—From location 20, township of McIntyre, Thunder Bay, Lake Superior.

A coarsely crystalline calcite, associated with quarts, and carrying small quantities of zinc blende and galena, with here and there a speck of copper pyrites.

It contained neither gold nor silver.

11.—From Pie Island, Lake Superior.

A very finely crystalline galena associated with a little zinc blende, in a gangue consisting of quartz and a highly siliceous rock; the metallic sulphides constituted but a small proportion of the whole. It contained:—

Gold..... distinct trace.
Silver.....2.249 ounces to the ton of 2,000 lbs.

12.—From the same locality as the foregoing.

It consisted of finely crystalline galena associated with zinc blende, in a gangue of similar composition to that of the foregoing specimen. It was found to contain:—

Gold..... None.
Silver..... 0.343 ounce to the ton of 2,000 lbs.

13.—From the same locality as No. 11.

It consisted of zinc blende in a gangue closely resembling that of the two previous specimens. The zinc blende constituted about one-third, in bulk, of the sample; it contained precisely the same amount of silver as the preceding specimen, viz: 0.343 ounce to the ton of 2,000 lbs. Gold and Silver assays, cont.

NORTH-WEST TERRITORY.

14.—This and the three following specimens came from the Rocky Mountains, western part of the district of Alberta. North-west Territory.

This specimen consisted of an impure reddish-grey coloured dolomite.

It contained neither gold nor silver.

15.—An impure reddish-grey coloured fine granular quartzite, with which was associated a small quantity of galena. It contained:—

Gold..... None.
Silver..... 0.466 ounce to the ton of 2,000 lbs.

16.—Consisted for the most part of copper pyrites, associated with more or less green and blue carbonate of copper. Assays gave:—

Gold.....0.364 ounce to the ton of 2,000 lbs.
Silver.....28,619 " " " "

17.—This specimen consisted of chalcocite, more or less seamed and coated with green carbonate of copper.—A valuable copper ore.—

It contained neither gold nor silver.

MISCELLANEOUS EXAMINATIONS.

The following determinations were carried out by Mr. Frank D. Adams:—

1.—Zinc. According to Dr. R. Bell, an extensive deposit of sphalerite occurs nine miles and a half north of the mouth of White Sand River, which latter enters Lake Superior opposite to Simpson's Island, and consequently about the middle of the north shore of the lake. Miscellaneous examinations. Estimation of zinc in blende from White Sand River, L.S.

A specimen from this locality was found to contain:—

Zinc.....54.26 per cent.

2.—Nickel and cobalt. A specimen of pyrrhotite—associated with a little chalcopyrite and sphalerite, with a small quantity of intermingled chlorite—from Pie Island, Lake Superior, was found—after drying at 100° C.,—to contain:— Estimation of nickle and cobalt in pyrrhotite from Pie Island, L.S.

Nickel..... 0.562 per cent.
Cobalt..... 0.138 "

Miscellaneous examinations, &c.

3.—Nickel and Cobalt. A mineral specimen from Mr. Thompson's farm, St. Stephen, Charlotte county, New Brunswick. This consisted of pyrrhotite in association with chalcopyrite and a little magnetite, in a gangue of greenish-grey serpentine; the pyrrhotite constituted approximately about one-fourth by weight of the whole. The pyrrhotite carefully freed from the associated minerals was found—after drying at 100° C.,—to contain :—

Estimation of nickel and cobalt in pyrrhotite from St. Stephen, N.B.

Nickel	0.923 per cent.
Cobalt	0.394 "

Estimation of phosphoric acid in trap from Black Cape, P. Q.

4.—A highly decomposed trap from Black Cape, New Richmond, Bonaventure county, P.Q.—was examined for, and found to contain, an amount of phosphoric acid, equal to 0.594 per cent. of tribasic phosphate of lime.