CANADA
DEPARTMENT OF MINES
MINES BRANCH
HON. W. TEMPLEMAN, MINISTER; A. P. LOW, LL.D., DEPUTY MINISTER;
EUGÈNE HAANEL, PH.D., DIRECTOR.

REPORT OF ANALYSES

OF

ORES, NON-METALLIC MINERALS, FUELS, ETC.

MADE IN THE

CHEMICAL LABORATORIES

DURING THE YEARS

1906, 1907, 1908

ARRANGED BY

F. G. WAIT, M.A., F.C.S.,

Chief Chemist.

OTTAWA
GOVERNMENT PRINTING BUREAU
1909

No. 59

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To Eugene H
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Sir,—I beg
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the Mines Bra

The analys
Mr. M. F. Conn
credited to them

Ottawa, A

To EUGENE HAANEL, Ph.D.,
Director of Mines Branch,
Department of Mines.

SIR,—I beg to submit, herewith, a report of work done in the chemical laboratories of the Geological Survey during the years 1906 and 1907, and of the Mines Branch of the Department of Mines in 1906, 1907, and 1908.

The analyses recorded in the report have been made with the assistance of Mr. M. F. Connor, B.Sc., and Mr. H. A. Leverin, Ch.E., and their work has been credited to them in all instances. Any not so allotted, were done by myself.

I have the honour to be, sir,
Your obedient servant,

F. G. WAIT,

OTTAWA, April 24, 1909.

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3. Harzbur
4. Augite-b
B.C..
5. Augite-h
6. Augite-o
7. Hornble
8. Alkaline
9. Granodi
10. Monzoni
11. Dunite
Koote
12. Porphyr
13. Augite l
14. Hornble
15. Kersant
16. Monzoni
17. Olivine-
18. Basic gr
19. Augite r
20. Crushed
21. Granodi
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Moun
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26. Granodi
27. Rhombe

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CHEMICAL ANALYSES

OF

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ARRANGED BY

F. G. WAIT, M.A., F.C.S.,

Chief Chemist.

INTRODUCTORY.

The following report contains a detailed account of the more important chemical analyses of ores, non-metallic minerals, fuels, etc., made during 1906-7 in the laboratory of the Geological Survey; and from May 15, 1907, to December 31, 1908, in the laboratories of the Mines Branch: to which—on November 29, 1907—the chemical laboratory of the Geological Survey Branch was transferred.

The respective analyses represent only a minor portion of the work done within the dates indicated; for, with regard to many of the specimens and samples dealt with, it was found impossible to obtain accurate information as to the locality from whence the material was taken, or of their mode of occurrence, hence they were of interest to the sender only.

Many of the analyses recorded may be found scattered throughout the various reports issued by the Mines and Geological Survey Branches of the Department of Mines; but, for the purposes of comparison and ready reference, only those of economic interest have been extracted, classified, and systematically arranged.

ROCKS.

Names and Localities of Rocks Collected during the Seasons of 1902-5, by R. A. Daly, Ph.D., Geologist, International Boundary Commission along the Cordilleran Section of the Forty-ninth Parallel of Latitude.

Analyses by M. F. Connor, B.Sc.

No. of specimen.

1 Crushed granodiorite; 1,500 ft. contour at creek emptying into Osoyoos lake, east side, 2·5 miles north of the boundary line. Type specimen of the Osoyoos batholith.

2 Highly porphyritic olivine-syenite; on Canadian Pacific railway, at creek two miles north of Baker creek, east side of Christina lake.

3 Harzburgite (perhaps extrusive); one mile northwest of Monument 172, between Santa Rosa creek and boundary line. West Kootenay sheet.

4 Augite-biotite syenite porphyry in irregular intrusion; ridge bearing Monument 172 (between Sophie mountain and Kettle river, West Kootenay sheet).

5 Augite-biotite latite (extrusive equivalent of monzonite); Record Mountain ridge four miles north of boundary line, west of Rossland.

6 Augite-olivine (-biotite) latite; flow associated with that represented in specimen 5.

7 Hornblende-augite minette dike; west bank of Columbia river, about 300 yards south of boundary line.

ROCKS : TABLE I.

—	1	2	3	4	5	6	7
SiO_2	68·43	52·95	42·99	60·51	59·06	58·67	53·68
Al_2O_3	15·80	14·00	1·11	16·71	16·24	15·67	16·89
Fe_2O_3	1·06	2·57	1·87	1·72	0·43	2·85	1·28
FeO	1·85	5·55	5·91	3·34	4·88	3·28	5·53
MgO	1·46	7·29	43·14	2·53	3·51	3·86	3·70
CaO	4·08	6·93	0·10	3·62	5·59	5·33	6·08
Na_2O	3·47	2·73	0·29	4·64	2·84	4·77	4·03
K_2O	2·51	5·09	0·13	5·20	3·95	3·08	4·32
H_2O+	0·53	0·50	4·00	0·27	0·19	0·54	1·85
H_2O-	0·05	0·16	0·51	0·03	0·21	0·02	0·10
CO_2					0·70		
TiO_2	0·20	0·70	trace.	0·60	1·08	1·00	0·90
P_2O_5	0·07	0·47	0·04	0·16	0·21	0·16	1·05
Cr_2O_3							
NiO			0·15				
MnO	0·10	0·13	0·05	0·10	0·20	0·11	0·11
SrO	0·02	0·11		0·12	0·12	0·09	0·10
BaO	0·09	0·32		0·10	0·11	0·11	0·38
	99·72	99·50	100·29	99·65	99·32	99·54	100·00
Specific gravity	2·708	2·872	2·075	2·667	2·796	2·751	2·723

8 Alkaline biotite granite; intrusive stock four miles due east of Lake mountain (southeast of Rossland). Type of Sheppard granite.

9 Granodiorite; railway cut two miles west of Trail, West Kootenay sheet; type of Trail batholith.

10 Monzonite, facies of Coryell syenite batholith; railway cut one mile west of Coryell railway station, West Kootenay sheet.

11 Dunite intrusion; railway cut 4·5 miles west of Coryell station, West Kootenay sheet.

12 Porphyritic missourite dike, cutting Coryell syenite batholith; in col northeast of Record Mountain summit, west of Rossland.

13 Augite latite; on conical peak three miles north-northeast of Record mountain, near Rossland.

14 Hornblende-augite latite; 3,100 ft. contour due east of Sayward railway station at Columbia river.

ROCKS : TABLE II.

—	8	9	10	11	12	13	14
SiO_2	77·09	62·08	52·38	41·36	42·31	54·54	52·17
Al_2O_3	13·04	16·61	15·29	1·21	11·40	18·10	16·59
Fe_2O_3	0·82	1·53	8·99	9·18	4·07	1·14	8·32
FeO	0·26	3·72	5·53	.....	6·11	4·63	.....
MgO	0·12	2·44	5·84	42·90	11·31	4·56	3·87
CaO	0·63	5·20	7·30	1·34	11·02	5·85	8·25
Na_2O	3·11	3·18	3·68	0·04	0·82	3·38	3·91
K_2O	4·50	3·29	3·84	0·04	3·69	5·44	4·00
H_2O+	0·07	1·00	0·63	1·94	2·72	0·50	1·17
H_2O-	0·03	0·16	0·21	0·16	2·28	0·10	0·13
CO_2	.....	.....	.....	0·50	.....	.....	0·56
TiO_2	0·05	0·73	1·10	.....	2·00	0·96	0·80
P_2O_5	0·10	0·30	0·75	0·04	1·44	0·46	0·24
Cr_2O_3	.....	.....	.....	0·15	0·055	.....	S 1·37
NiO	.....	.....	.....	0·15	.....	.....	.....
MnO	trace.	0·11	0·10	0·10	0·11	0·10	0·11
SrO	.....	0·03	0·15	S 0·50	0·16	0·15	0·05
BaO	.....	0·09	0·25	.....	0·64	0·21	0·15
	99·82	100·47	100·04	99·61	100·13	100·12	101·69
Specific gravity	2·600	2·754	2·847	3·160	2·817	2·749	2·852

15 Kersantite dike; cutting limestone on ridge one mile north of Lost creek and two miles east of Salmon river, West Kootenay sheet.

16 Monzonite stock; 2·5 miles north of Lost creek and 0·7 of a mile east of Salmon river, West Kootenay sheet.

17 Olivine-augite minette; dike cutting grit one mile north of Dewdney trail, summit of Selkirk range, West Kootenay sheet.

18 Basic granodiorite, type of Bayonne batholith; at Bayonne mine, four miles due east of 7,770 ft. summit of Quartzite (Selkirk) range, and 6·5 miles north of Irene mountain, West Kootenay sheet.

19 Augite minette dike; summit of ridge 2·5 miles east-northeast of North Star mountain, West Kootenay sheet.

20 Crushed biotite (muscovite) granite (gneissic), type of Rykert batholith; about three miles from ferry over slough, Kootenay valley at Port Hill, on Boundary Creek wagon road, West Kootenay sheet.

21 Granodiorite, type of Similkameen batholith; near boundary-slash, wagon road along Similkameen river.

ROCKS: TABLE III.

—	15	16	17	18	19	20	21
SiO_2	47·95	50·66	48·33	60·27	53·32	70·78	66·550
Al_2O_3	15·65	16·91	12·56	17·17	14·16	15·72	16·210
Fe_2O_3	2·66	1·71	1·87	2·36	2·15	0·36	1·980
FeO	4·05	6·17	5·26	3·67	5·08	1·61	1·800
MgO	4·90	5·50	9·07	2·45	7·90	0·46	1·320
CaO	8·56	8·26	8·94	6·49	7·12	1·92	3·850
Na_2O	2·60	2·89	1·81	2·92	2·39	3·48	4·070
K_2O	4·10	4·45	4·67	3·25	4·80	5·23	2·840
H_2O+	2·60	1·66	2·63	0·23	1·24	0·25	0·240
H_2O-	0·30	0·14	0·97	0·15	0·26	0·10	0·010
CO_2	6·24		2·64				
TiO_2	0·70	1·32	0·81	0·63	0·90	0·20	0·400
P_2O_5	0·54	0·91	0·78	0·20	0·66	0·26	0·150
Cr_2O_3							
NiO							
MnO	0·10	0·16	0·13	0·14	0·10	0·03	0·120
SrO	0·10	0·08	0·05	0·04	0·05	trace.	0·016
BaO	0·14	0·23	0·24	0·04	0·12	0·01	0·033
	101·19	100·45	100·76	100·01	100·25	100·41	99·589
Specific gravity	2·740	2·843	2·771	2·785	2·831	2·654	2·693

22 Biotite granite, type of Cathedral batholith; Boundary Commission trail on summit of Bauerman ridge, 2,300 yards south of boundary line, Okanagan range (Cascade system).

23 Gneissic biotite granite, metamorphic phase of Remmel batholith (Eastern Phase of report); two miles southwest of Cathedral peak and two miles south of the boundary line, Okanagan range.

24 Augite-hornblende-biotite gabbro, type of Ashnola gabbro body; 4·5 miles west of Cathedral Mountain ridge and 350 yards north of the boundary line, Okanagan range.

25 Quartz-mica diorite verging on granodiorite, type of Remmel batholith (Western Phase); five miles W 15° S of Cathedral peak and 2·3 miles south of boundary line, Okanagan range.

26 Granodiorite, type of Castle Peak stock; two miles north-northeast of Castle Mountain summit and 600 yards north of boundary line, Hozameen range (Cascade system).

27 'Rhombenfeldspar' from 'rhombenporphyry,' of Rock Creek chonolithic intrusion west of Rock Creek post-office, at Kettle river, British Columbia.

ROCKS: TABLE IV.

—	22	23	24	25	26	27
SiO_2	71·21	70·91	47·76	63·30	66·55	54·60
Al_2O_3	15·38	16·18	18·58	17·64	15·79	22·17
Fe_2O_3	0·25	0·51	2·19	1·58	0·15	2·00
FeO	1·47	1·09	9·39	3·08	3·08	....
MgO	0·33	0·37	4·15	1·23	2·14	1·30
CaO	1·37	2·92	9·39	5·03	3·47	4·62
Na_2O	4·28	1·33	3·61	4·56	4·39	4·46
K_2O	4·85	5·53	0·47	1·16	2·80	5·58
H_2O+	0·43	0·12	0·53	0·51	0·05	2·33
H_2O-	0·02	0·03	0·12	0·14	0·40	0·17
CO_2	....	....	....	....	....	....
TiO_2	0·16	0·20	2·26	0·50	0·60	0·60
P_2O_5	0·05	0·11	0·78	0·27	0·04	....
Cr_2O_3	....	....	....	....	....	....
NiO	....	....	....	....	....	....
MnO	0·06	0·04	0·29	0·47	0·06	....
SrO	....	....	0·03	0·005	0·01	0·80
BaO	0·09	0·10	0·02	0·05	0·03	1·09
	99·95	99·44	99·51	99·52	99·56	99·72
Specific gravity	2·621	2·654	2·957	2·721	2·678	....

COALS AND LIGNITES.

1. *Lignite*—from an unsurveyed area some ten miles south of Lac LaRonge, Saskatchewan.

An analysis, by fast coking, gave:—

Moisture	13·25
Volatile combustible matter	28·97
Fixed carbon	34·56
Ash	23·22
	100·00
Coke	57·78
Ratio of volatile combustible matter to fixed carbon	1: 1·19

It yields, by fast coking, a non-coherent coke. Colour of the ash, pale yellowish-white. Its powder imparts an intense brownish-red colour to a boiling solution of caustic potash.

2. *Lignite*—from Bow river, at a point twenty miles south of Brooks Station, (Canadian Pacific railway) Alberta.

An analysis, by fast coking, gave:—

Moisture	15·07
Volatile combustible matter	34·84
Fixed carbon	43·64
Ash	6·45
	100·00
Coke	50·09
Ratio of volatile combustible matter to fixed carbon	1: 1·25

It yields, by fast coking, a non-coherent coke. The ash is of a reddish-brown colour. The powdered material imparts a deep brownish-red colour to a boiling solution of caustic potash.

3. *Lignite*—from Sec. 9, Tp. 71, R. 17, west of the 4th meridian, Alberta.

An analysis, by fast coking, gave:—

Moisture	13·36
Volatile combustible matter	35·87
Fixed carbon	44·41
Ash	6·36
	100·00
Coke	50·77
Ratio of volatile combustible matter to fixed carbon	1: 1·24

It yields, by fast coking, a non-coherent coke. Colour of ash, light reddish-brown. Its powder imparts a deep brownish-red colour to a boiling solution of caustic potash.

4. *Lignite*—from Sec. 30, or 34 (?), Tp. 38, R. 23, west of the 4th meridian, Alberta.

An analysis, by fast coking, gave the following results:—

Moisture	10·75
Volatile combustible matter	30·66
Fixed carbon	48·61
Ash	9·98
	100·00
Coke	58·59
Ratio of volatile combustible matter to fixed carbon	1: 1·58

By fast coking, it yields a non-coherent coke. Colour of ash, light reddish-white. Its powder imparts a deep brownish-red colour to a boiling solution of caustic potash.

The twenty-three specimens next following were collected by Mr. D. B. Dowling, in 1908.

5. *Lignite*—from hole No. 2, sunk by the N.W. Gas and Oil Co., on Jasper Ave., Edmonton, Alberta. Taken from a depth of 1,440 feet.

Its composition, as shown by a proximate analysis, was as follows:—

Moisture	6·67
Volatile combustible matter	38·26
Fixed carbon	49·92
Ash	5·15
	100·00
Coke—non-coherent	55·07
Ratio of volatile combustible matter to fixed carbon	1: 1·30

It imparted a deep brownish-red colour to a boiling solution of caustic potash.

6. *Lignite*—from the property of the Parkdale Coal Company, Limited, on river lots 22 and 24, Edmonton, Alberta.

A proximate analysis gave the following results:—

Moisture	17·09
Volatile combustible matter	34·39
Fixed carbon	38·45
Ash	10·07
	100·00
Coke—non-coherent	48·52
Fuel ratio	1: 1·12

It imparted a deep brownish-red colour to a boiling solution of caustic potash.

7. *Lignite*—from a 5 ft. seam in the Standard mine, on river lot 26, Edmonton, Alberta.

The results of a proximate analysis, by fast coking, are as follows:—

Moisture	16·49
Volatile combustible matter	37·24
Fixed carbon	40·40
Ash	5·87
	100·00
Coke—non-coherent	46·27
Fuel ratio	1: 1·09

Colour of boiling solution of caustic potash—deep reddish-brown.

8. *Lignite*—from a 5′-1″ seam in the Strathcona mine, on river lot No. 7, Strathcona, Alberta.

A proximate analysis, by fast coking, gave the following results:—

Moisture	18·37
Volatile combustible matter	36·73
Fixed carbon	40·40
Ash	4·50
	100·00
Coke—non-coherent	44·90
Fuel ratio	1: 1·10

It imparted a deep brownish-red colour to a boiling solution of caustic potash.

9. *Lignite*—from a 5 ft. seam, taken at a depth of 161 feet in the Twin City Coal Company's mine, on river lot 19, Strathcona, Alberta.

Its composition, as shown by a proximate analysis, by fast coking, was as follows:—

Moisture	16·61
Volatile combustible matter	37·24
Fixed carbon	39·10
Ash	7·05
	100·00
Coke—non-coherent	46·15
Fuel ratio	1: 1·05

Colour of boiling potash solution—deep brownish-red.

10. *Lignite*—from a 5 ft. seam in Rakowski's mine on Sec. 18, Tp. 48, R. 19, west of the 4th meridian, Alberta.

A proximate analysis, by fast coking, gave the following results:—

Moisture	11·78
Volatile combustible matter	38·71
Fixed carbon	46·20
Ash	3·31
	100·00
Coke—non-coherent	49·51
Fuel ratio	1: 1·19

It gave a deep brownish-red colour to a boiling solution of caustic potash.

11. *Lignite*—from a 4 ft. seam in Bower's mine at Canmore, on Sec. 28, Tp. 46, R. 20, west of the 4th meridian, Alberta.

Its composition, as shown by a proximate analysis, was as follows:—

Moisture	8·32
Volatile combustible matter	42·13
Fixed carbon	45·80
Ash	3·75
	100·00
Coke—non-coherent	49·55
Fuel ratio	1: 1·08

Potash solution—deep brownish-red.

12. *Lignite*—from a 3′-8″ seam in the Ben Nevis mine, on Sec. 12, Tp. 38, R. 22, west of the 4th meridian, Alberta.

Its composition was as follows:—

Moisture	11·40
Volatile combustible matter	33·32
Fixed carbon	44·95
Ash	9·73
	100·00
Coke—non-coherent	54·68
Fuel ratio	1: 1·33

Potash solution—deep brownish-red.

13. *Lignite*—a second sample from the same locality as the preceding specimen, but from a different part of the same seam, yielded by proximate analysis, by fast coking, the following results:—

Moisture	16·03
Volatile combustible matter	35·56
Fixed carbon	41·48
Ash	6·93
	100·00
Coke—non-coherent	48·41
Fuel ratio	1: 1·17

It imparted a deep brownish-red colour to a boiling solution of caustic potash.

14. *Lignite*—from the lowest seam, 9″ in thickness, in Gillmuth's mine, on Sec. 34, Tp. 38, R. 23, west of the 4th meridian, Alberta.

A proximate analysis, by fast coking, gave the following results:—

Moisture	10·01
Volatile combustible matter	42·39
Fixed carbon	34·85
Ash	12·75
	100·00
Coke—non-coherent	47·60
Fuel ratio	1: 0·82

It imparted a deep brownish-red colour to a boiling solution of caustic potash.

15. *Lignite*—from the upper, or 4″ seam, at the same locality as the preceding specimen, gave these results when submitted to a proximate analysis, by fast coking:—

Moisture	14·44
Volatile combustible matter	35·42
Fixed carbon	41·71
Ash	8·43
	100·00
Coke—non-coherent	50·14
Fuel ratio	1: 1·18

Colour of potash solution—deep brownish red.

16. *Lignite*—average sample from the Threehills mine, situated on Sec. 22, Tp. 31, R. 24, west of the 4th meridian, Alberta.

A proximate analysis, by fast coking, gave the following results:—

Moisture	7·70
Volatile combustible matter	35·36
Fixed carbon	48·60
Ash	8·34
	100·00
Coke—non-coherent	56·94
Fuel ratio	1: 1·38

Potash solution—deep brownish-red.

17. *Lignite*—from the Shaft mine, Threehills, Alberta, being on Sec. 26, Tp. 31, R. 24, west of the 4th meridian.

Its composition was found to be as follows:—

Moisture	8·08
Volatile combustible matter	34·94
Fixed carbon	47·60
Ash	9·38
	100·00
Coke—non-coherent	56·98
Fuel ratio	1: 1·36

Potash solution—deep brownish-red.

18. *Lignite*—from a 15″ seam in Cardiff mine, on the NW ¼ of Sec. 24, Tp. 55, R. 24, west of the 4th meridian, Alberta.

A proximate analysis, by fast coking, gave the following results:—

Moisture	9·44
Volatile combustible matter	38·87
Fixed carbon	45·25
Ash	6·44
	100·00
Coke—non-coherent	51·69
Fuel ratio	1: 1·16

Potash solution—deep brownish-red.

19. *Lignite*—from the upper part of the seam of the Cardiff mine, at Morinville, Alberta, on the NW ¼ of Sec. 24, Tp. 55, R. 24, west of the 4th meridian.

The composition of this specimen was as follows, as shown by proximate analysis:—

Moisture	17·74
Volatile combustible matter	36·66
Fixed carbon	39·91
Ash	5·69
	100·00
Coke—non-coherent	45·60
Fuel ratio	1: 1·09

Potash solution—deep brownish-red.

20. *Lignite*—from the lower part of the same seam as in the preceding specimen, but belonging to the Alberta Coal Mining Company, Morinville, Alberta, on the NE ¼ of Sec. 23, Tp. 55, R. 24, west of the 4th meridian.

Its composition was as follows:—

Moisture	18·11
Volatile combustible matter	36·64
Fixed carbon	41·90
Ash	3·35
	100·00
Coke—non-coherent	45·25
Fuel ratio	1: 1·14

Potash solution—deep brownish-red.

21. *Lignite*—average sample of a 40'-10" seam in Curwen and Kelly's mine in Sturgeon valley, being on the SE ¼ of Sec. 8, Tp. 55, R. 24, west of the 4th meridian, Alberta.

An analysis, by fast coking, gave the following results:—

Moisture	17·42
Volatile combustible matter	37·02
Fixed carbon	40·83
Ash	4·73
	100·00
Coke—non-coherent	45·56
Fuel ratio	1: 1·10

It imparted a deep brownish-red colour to a boiling solution of caustic potash.

22. *Lignite*—from a different part of the same seam, at the same locality as the preceding specimen.

A proximate analysis, by fast coking, gave:—

Moisture	9·51
Volatile combustible matter	39·05
Fixed carbon	46·78
Ash	4·66
	100·00
Coke—non-coherent	51·44
Fuel ratio	1: 1·20

Potash solution—deep brownish-red.

23. *Lignite*—from a 5′-8″ seam in White Star mine, on White Mud river, Strathcona, being on Sec. 25, Tp. 51, R. 25, west of the 4th meridian, Alberta.

The material of this sample shows a woody structure. Its composition was found to be as follows:—

Moisture	15·95
Volatile combustible matter	35·41
Fixed carbon	41·82
Ash	6·82
	100·00
Coke—non-coherent	48·64
Fuel ratio	1: 1·18

Potash solution—deep brownish-red.

24. *Lignite*—from the same locality as the preceding specimen, but from the lower part of a 5 ft. seam.

Its composition, as determined by a proximate analysis, by fast coking, was as follows:—

Moisture	16·75
Volatile combustible matter	35·17
Fixed carbon	45·09
Ash	2·99
	100·00
Coke—non-coherent	48·08
Fuel ratio	1: 1·28

Potash solution—deep brownish-red.

25. *Lignite*—a third sample from the White Star mine, showing woody structure and taken from the lower bench, was found to possess the following composition, when submitted to proximate analysis, by fast coking:—

Moisture	16·40
Volatile combustible matter	37·04
Fixed carbon	40·88
Ash	5·68
	100·00
Coke—non-coherent	46·56
Fuel ratio	1: 1·10

Potash solution—deep brownish-red.

26. *Lignite*—being the average of 7 to 8 ft. seam on the property of the Clover Bar Coal Company, lying along the west bank of the river, above the Grand Trunk Pacific Railway bridge, on the NW ¼ of Sec. 7, Tp. 23, R. 53, west of the 4th meridian, Alberta.

It yielded the following as the results of a proximate analysis, by fast coking:—

Moisture	19·82
Volatile combustible matter	35·04
Fixed carbon	39·91
Ash	5·23
	100·00
Coke—non-coherent	45·14
Fuel ratio	1: 1·14

Potash solution—deep brownish-red.

27. *Lignite*—taken from a boulder of coal meauring 30 x 30 x 10 feet, lying at or near the southeast corner of Strathcona town site, on Sec. 22, Tp. 24, R. 52, west of the 4th meridian, Alberta.

Its composition, as shown by a proximate analysis, by fast coking, was as follows:—

Moisture	17·08
Volatile combustible matter	38·36
Fixed carbon	41·02
Ash	3·54
	100·00
Coke—non-coherent	44·56
Fuel ratio	1: 1·07

Potash solution—deep brownish-red.

28. *Lignite*—from south bank of Bragg creek, about 4 miles up from Elbow river, on Sec. 7, Tp. 23, R. 5, west of the 5th meridian, Alberta. Edmonton formation. Width of seam 2′-6″. An average sample of the whole outcrop.

A proximate analysis, by fast coking, gave as follows:—

Moisture	9·31
Volatile combustible matter	35·59
Fixed carbon	41·72
Ash	13·38
	100·00
Coke—non-coherent	55·10
Fuel ratio	1: 1·17

It imparts a deep brownish-red colour to a boiling solution of caustic potash.

29. *Lignite*—from the 4 ft. seam in Kootanie coal measures, exposed near the top of Forgetmenot ridge, one-half mile north of Elbow river, on Sec. 25, Tp. 21, R. 7, west of the 5th meridian, Alberta—an average sample of the outcrop.

A proximate analysis, by fast coking, gave the following results:—

Moisture	6·68
Volatile combustible matter	20·68
Fixed carbon	64·71
Ash—light grey	7·93
	100·00
Coke—non-coherent	72·64
Ratio of volatile combustible matter to fixed carbon	1: 3·13

30. *Lignite*—from a 5′-4″ seam, at the same locality as the preceding specimen.

A proximate analysis gave the following results:—

Moisture	7·77
Volatile combustible matter	18·58
Fixed carbon	39·98
Ash—faint reddish white	33·67
	100·00
Coke—non-coherent	73·65
Ratio of volatile combustible matter to fixed carbon	1: 2·15

It imparted a deep brownish-red colour to a boiling solution of caustic potash.

It is to be noted, as regards Nos. 28, 29, and 30, that owing to the somewhat lengthy interval which necessarily elapsed between the date of their collection and time of examination; and also to the fact of their having been put up in canvas bags, it is reasonable to infer that they had parted with more or less of their moisture, and volatile combustible matter, and that the amounts indicated in the foregoing analyses do not correctly represent their content of these constituents, when mixed.

31. *Lignite*—from Sec. —, Tp. 52, R. 7, west of the 5th meridian, Alberta.

An analysis, by fast coking, gave:—

Moisture	10·87
Volatile combustible matter	33·46
Fixed carbon	51·70
Ash	3·97
	100·00
Coke	55·67
Ratio of volatile combustible matter to fixed carbon	1: 1·55

It yields, by fast coking, a non-coherent coke. Ash, brownish yellow. In powder, it imparts a dark brownish-red colour to a boiling solution of caustic potash.

32. *Lignite*—from Jocks crossing, Pincher river, Tp. 53, R. 7, west of the 5th meridian, Alberta.

The results of a proximate analysis, by fast coking, are as follows:—

Moisture	10·21
Volatile combustible matter	38·17
Fixed carbon	43·52
Ash	8·10
	100·00
Coke	51·62
Ratio of volatile combustible matter to fixed carbon	1: 1·14

It yields, by fast coking, a non-coherent coke. Colour of ash—brownish-yellow. It imparts a dark brownish-red colour to a boiling solution of caustic potash.

33. *Lignite*—from Sec. 27 and 28, Tp. 53, R. 7, west of the 5th meridian, Alberta. An analysis, by fast coking, showed it to possess the following composition:—

Moisture	14·58
Volatile combustible matter	34·82
Fixed carbon	47·60
Ash	3·00
	100·00
Coke	50·60
Ratio of volatile combustible matter to fixed carbon	1: 1·37

Character of coke—non-coherent. Colour of ash—brownish-yellow. It imparts, when powdered, an intense brownish-red colour to a boiling solution of caustic potash.

34. *Lignite*—an average sample, from across the outcrop of a 13 ft. seam, above the burnt shale outcrop, on the east bank of the Pembina river, about 400 yards above the crossing of the river, SE ¼ of Sec. 33, Tp. 53, R. 7, west of the 5th meridian, Alberta.

Analysis, by fast coking, gave the following results:—

Moisture	12·93
Volatile combustible matter	31·96
Fixed carbon	45·11
Ash—light reddish-brown	10·00
	100·00
Coke—non-coherent	55·11
Ratio of volatile combustible matter to fixed carbon	1: 1·411

Colour imparted to a boiling solution of caustic potash—deep brownish-red.

35. *Lignite*—taken across the outcrop of a 13 ft. seam, nearest to the crossing of the Pembina river, on the east bank of the stream, NE¼ of Sec. 33, Tp. 53, R. 7, west of the 5th meridian, Alberta.

An analysis, by fast coking, gave:—

Moisture	13·78
Volatile combustible matter	32·01
Fixed carbon	47·35
Ash—light reddish-brown	6·86
	100·00
Coke—non-coherent	54·21
Ratio of volatile combustible matter to fixed carbon	1: 1·479

It imparts a deep reddish-brown colour to a boiling solution of caustic potash.

36. *Lignite*—from across the outcrop of a 6 ft. seam on the west bank of the Pembina river at the crossing, NE ¼ of Sec. 33, Tp. 53, R. 7, west of the 5th meridian, Alberta.

An analysis, by fast coking, gave:—

Moisture	13·07
Volatile combustible matter	32·03
Fixed carbon	47·56
Ash—light reddish-brown	7·34
	100·00
Coke—non-coherent	54·90
Ratio of volatile combustible matter to fixed carbon	1: 1·485

It imparts a deep brownish-red colour to a boiling solution of caustic potash.

37. *Lignite*—from Wolf creek, Tp. 52, R. 15, west of the 5th meridian, Alberta.

An analysis, by fast coking, yielded the following results:—

Moisture	8·57
Volatile combustible matter	40·39
Fixed carbon	46·74
Ash	4·30
	100·00
Coke	51·04
Ratio of volatile combustible matter to fixed carbon	1: 1·15

It yields a non-coherent coke, by fast coking. Ash—pale yellowish-brown. It imparts a dark brownish-red colour to a boiling solution of caustic potash.

38. *Lignite*—this and the three following specimens are from what has been described as unsurveyed territory, in the foot-hills of the Rockies, some 200 miles west of Edmonton, Alberta.

Sample from lower part of seam number 6.

An analysis, by fast coking, gave the following:—

Moisture	14·04
Volatile combustible matter	30·13
Fixed carbon	34·15
Ash	21·68
	100·00
Coke—non-coherent	55·83
Ratio of volatile combustible matter to fixed carbon	1: 1·13

It imparts a deep brownish-red colour to a boiling solution of caustic potash.

39. *Lignite*—from the same locality as the preceding specimen, from the middle portion of seam number 6.

An analysis, by fast coking, gave the following results:—

Moisture	14·76
Volatile combustible matter	30·66
Fixed carbon	38·64
Ash	15·94
	100·00
Coke—non-coherent	54·58
Fuel ratio	1: 1·23

It imparts a deep brownish-red colour to a boiling solution of caustic potash.

40. *Lignite*—from the upper part of seam number 6, at the same locality as that of the two preceding specimens.

Analysis, by fast coking, gave the following results:—

Moisture	16·08
Volatile combustible matter	31·50
Fixed carbon	41·00
Ash	11·42
	100·00
Coke—non-coherent	52·42
Fuel ratio	1: 1·30

It also imparts a deep brownish-red colour to a boiling solution of caustic potash.

41. *Lignite*—from the same locality as the three preceding specimens, but from seam number 7.

It yielded, by fast coking, the following results on analysis:—

Moisture	18·69
Volatile combustible matter	33·06
Fixed carbon	42·69
Ash	5·56
	100·00
Coke—non-coherent	48·25
Fuel ratio	1: 1·29

It imparts a deep brownish-red colour to a boiling solution of caustic potash.

42. *Lignite*—from a tunnel on Similkameen river (worked by the Vermilion Forks Mining Company), B.C.

An analysis, by fast coking, gave:—

Moisture	16·17
Volatile combustible matter	37·58
Fixed carbon	41·67
Ash	4·58
	100·00
Coke	46·25
Ratio of volatile combustible matter to fixed carbon	1: 1·106

Character of coke—pulverulent, non-coherent. Colour of ash—brownish-yellow; imparts a deep brownish-red colour to a boiling solution of caustic potash.

43. *Lignite*—from a 12 ft. seam, at the bottom of 350 ft. slope, on Sourdough mine, twelve miles up Coal creek, which empties into the Yukon six miles below Fortymile river, below Dawson. Collected by Mr. D. D. Cairnes, Geological Survey.

An analysis, by fast coking, gave as follows:—

Moisture	14·46
Volatile combustible matter	33·94
Fixed carbon	40·52
Ash	11·08
	100·00
Coke	51·60
Ratio of volatile combustible matter to fixed carbon	1: 1·19

44. *Lignite*—an average sample from the outcrop of a 6 ft. seam on Tantalus butte, opposite Tantalus mine, on Lewes river, midway between Whitehorse and Dawson, Yukon.

A proximate analysis, by fast coking, gave the following results:—

Moisture	12·87
Volatile combustible matter	31·72
Fixed carbon	49·51
Ash—yellowish-brown	5·90
	100·00
Coke—non-coherent	55·41
Ratio of volatile combustible matter to fixed carbon	1: 1·56

In powder it imparts a deep brownish-red colour to a boiling solution of caustic potash.

45. *Lignite*—from the same locality as the preceding specimen, an average sample from the outcrop of an 11 ft. seam.

An analysis, by fast coking, gave as follows:—

Moisture	16·32
Volatile combustible matter	31·72
Fixed carbon	42·13
Ash—pale brownish-yellow	9·83
	100·00
Coke—non-coherent	51·96
Ratio of volatile combustible matter to fixed carbon	1: 1·33

Its powder imparts a deep brownish-red colour to a boiling solution of caustic potash.

46. *Lignite*—an average sample from the outcrop of an 8 ft. seam, at the same locality as the two preceding specimens.

An analysis, by fast coking, gave the following results:—

Moisture	13·64
Volatile combustible matter	31·83
Fixed carbon	51·84
Ash—pale reddish-brown	2·69
	100·00
Coke—non-coherent	54·53
Ratio of volatile combustible matter to fixed carbon	1: 1·63

In powder it imparts a deep brownish-red colour to a boiling solution of caustic potash.

47. *Lignite*—an average sample from a 5 ft. outcrop, at Tantalus butte, across the Yukon river from Tantalus mines, Yukon.

A proximate analysis, by fast coking, gave the following results:—

Moisture	9·48
Volatile combustible matter	32·28
Fixed carbon	53·51
Ash—light brownish-red	4·73
	100·00
Coke—non-coherent	58·24
Fuel ratio	1: 1·66

It imparts an intense brownish-red colour to a boiling solution of caustic potash.

48. *Lignite*—from a point about four miles west of the sixty-ninth mile-post, from Whitehorse, on the Whitehorse and Dawson wagon road, Yukon district.

The sample was an average of the outcrop of an 18″ seam.

An analysis, by fast coking, gave the following results:—

Moisture	8·98
Volatile combustible matter	29·62
Fixed carbon	48·30
Ash	13·10
	100·00
Coke—non-coherent	61·40
Ratio of volatile combustible matter to fixed carbon	1: 1·63

Its powder imparts an intense brownish-red colour to a boiling solution of caustic potash.

49. *Lignite*—an average sample from a 7′-6″ seam, at the same locality as the preceding specimen.

A proximate analysis, by fast coking, gave the following results:—

Moisture	12·02
Volatile combustible matter	34·28
Fixed carbon	42·56
Ash	11·14
	100·00
Coke—non-coherent	53·70
Fuel ratio	1: 1·24

It imparts an intense brownish-red colour to a boiling solution of caustic potash.

50. *Lignitic coal*—from the first exposure, at Genest's first stake, on Coal creek, a tributary of Prairie creek, the latter an affluent of the Athabaska river, Alberta. Seam 30″ thick.

An analysis, by fast coking, gave the following results:—

Moisture	5·23
Volatile combustible matter	33·87
Fixed carbon	43·54
Ash	17·36
	100·00
Coke—coherent, but tender	60·90
Fuel ratio	1: 1·29

In powder it imparted a brownish-yellow colour to a boiling solution of caustic potash.

51. *Lignitic coal*—from an 8" seam, on Coal creek, Prairie creek, Athabaska river, Alberta. Exact point of occurrence not specified.

Its analysis, by fast coking, yielded the following results:—

Moisture	10·01
Volatile combustible matter	35·14
Fixed carbon	49·11
Ash	5·74
	100·00
Coke—non-coherent	54·85
Ratio of volatile combustible matter to fixed carbon	1: 1·40

It imparted a dark brownish-red colour to a boiling solution of caustic potash.

52. *Lignitic coal*—from the N ½ of Sec. 28, Tp. 15, R. 27, west of the 4th meridian, Alberta.

A proximate analysis, by fast coking, gave:—

Moisture	7·59
Volatile combustible matter	37·96
Fixed carbon	46·93
Ash	7·52
	100·00
Coke—firm, coherent	54·45
Fuel ratio	1: 1·23

It imparted a brownish-yellow colour to a boiling solution of caustic potash. Colour of ash—reddish-brown.

53. *Lignitic coal*—The four samples here tabulated were taken from different points, none of which were well defined, in unsurveyed territory, in the foot-hills of the Rockies, some 200 miles west of Edmonton.

	1	2	3	4
Moisture	8·94	9·46	10·25	9·91
Vol. combustible matter	35·55	34·70	35·62	33·78
Fixed carbon	47·43	49·18	46·77	45·46
Ash	8·08	6·66	7·36	10·85
	100·00	100·00	100·00	100·00
Coke—slightly fritted	55·51	55·84	54·13	56·31
Fuel ratio	1:1·33	1:1·40	1:1·31	1:1·34

They all impart a brownish-red colour to a boiling solution of caustic potash.

54. *Lignitic coal*—from subsection 3, Sec. 16, Tp. 6, R. 30, west of the 4th meridian, Alberta.

A proximate analysis, by fast coking, gave:—

Moisture	4·82
Volatile combustible matter	34·54
Fixed carbon	51·66
Ash—light grey	8·98
	100·00
Coke—firm, coherent	60·64
Ratio of volatile combustible matter to fixed carbon	1: 1·496

It imparts a brownish-yellow colour to a boiling solution of caustic potash.

55. *Lignitic coal*—from the centre of valley, east of Elk lake, B.C. (near station A 10, Survey). Coll. 11, 7·05.

The results of a proximate analysis, by fast coking, are as follows:—

Moisture	4·90
Volatile combustible matter	30·06
Fixed carbon	56·60
Ash—faint reddish-white	8·44
	100·00
Coke—slightly fritted	65·04
Ratio of volatile combustible matter to fixed carbon	1: 1·86

The powdered material imparts a deep brownish-red colour to a boiling solution of caustic potash.

56. *Lignitic coal*—from Collins gulch, near Granite creek, Tulameen river, B.C. From an 8 ft. seam, some two miles back from the river.

Its analysis, by fast coking, gave the following results:—

Moisture	3·26
Volatile combustible matter	43·33
Fixed carbon	49·70
Ash	3·71
	100·00
Coke—coherent, but tender	53·41
Fuel ratio	1: 1·15

It imparted a brownish-red colour to a boiling solution of caustic potash. Colour of ash—brownish-red.

57. *Coal*—from Cariboo cove, Cape Breton county, Nova Scotia. Sample from the 200 ft. level.

Analysis, by fast coking, gave:—

Moisture	0.98
Volatile combustible matter	25.68
Fixed carbon	52.10
Ash—brownish-red	21.24
	100.00
Coke—firm, coherent	73.34
Ratio of volatile combustible matter to fixed carbon	1: 2.03

58. *Coal*—from the 8 ft. seam, Mabou coal mines, Inverness county, N.S.

It afforded, by fast coking, the following results:—

Moisture	5.29
Volatile combustible matter	41.87
Fixed carbon	50.08
Ash—reddish-brown	2.76
	100.00
Coke—firm, coherent	52.84
Ratio of volatile combustible matter to fixed carbon	1: 1.196

It imparted a brownish-yellow colour to a boiling solution of caustic potash.

59. *Coal*—from Big Marsh, Antigonish county, Nova Scotia. Collected by Mr. Hugh Fletcher.

The first analysis was made upon material representing an average sample, taken from top to bottom, of a 5′-8″ seam. The second shows the composition of selected portions from the same seam.

An analysis, by fast coking, gave as follows:—

	No. 1.	No. 2.
Moisture	1.12	0.66
Volatile combustible matter	21.58	28.39
Fixed carbon	30.84	41.55
Ash	46.46	29.40
	100.00	100.00
Coke—firm, compact	77.30	70.95
Fuel ratio	1: 1.43	1: 1.46

Both samples were slightly pyritiferous, but no determinations of sulphur were made.

Both samples were slightly pyritiferous, but no determinations were made.

60. *Coal*—from the Richmond mine, situated 3½ miles northeast of Port Richmond, Richmond county, Nova Scotia

A proximate analysis, by fast coking, gave the following results:—

Moisture	0·83
Volatile combustible matter	26·39
Fixed carbon	46·12
Ash	18·10
Sulphur	8·56
	100·00
Coke—firm, coherent	68·50
Fuel ratio	1: 1·75

It imparted a very pale brownish-yellow colour to a boiling solution of caustic potash. Ash—dark brownish-red.

The sample submitted for examination was highly pyritiferous, the sulphur found by analysis—8·56 per cent—representing 16·05 per cent by weight of iron pyrites in the sample.

61. *Coal*—The six specimens here tabulated are from as many different seams, or different parts of the same seam, of the W. Gamble claim, on the south branch of the Brazeau river, a tributary of the Saskatchewan, in Sec. 10, Tp. 40, R. 19, west of the 5th meridian, Alberta.

The results of the analyses are as follows:—

	Seam No. 1. Top.	Seam No. 1. Lower.	Seam No. 2. 3'-11".
Moisture	1·10	0·63	1·27
Volatile combustible matter	23·79	24·43	23·87
Fixed carbon	66·40	64·22	64·75
Ash	8·71	10·72	10·11
	100·00	100·00	100·00
Coke—firm, coherent	75·11	74·94	74·86
Fuel ratio	1: 2·79	1: 2·63	1: 2·71

All imparted a brownish-yellow colour to boiling potash.

	Seam No. 4. —	Seam No. 5. 6 ft.	Seam No. 6. —
Moisture	1·29	2·90	3·18
Volatile combustable matter	23·17	24·20	21·80
Fixed carbon	71·55	66·89	65·07
Ash	3·99	6·01	9·95
	100·00	100·00	100·00
Coke—firm, coherent	75·54	72·90	*75·02
Fuel ratio	1: 3·26	1: 2·76	1: 2·99

Colour imparted to boiling potash—brownish-yellow.

*Coke only slightly fritted

62. *Coal*—from an 11′-9″ seam on the Daly claim, at the same locality as the preceding six specimens, in Sec. 10, Tp. 40, R. 19, west of the 5th meridian.

Its composition, as shown by a proximate analysis, was as follows:—

Moisture	1·27
Volatile combustible matter	22·49
Fixed carbon	69·37
Ash	6·87
	100·00
Coke—firm, coherent	76·24
Fuel ratio	1: 3·39

It imparted a pale brownish-yellow colour to boiling potash.

63. *Coal*—from an 8 ft. seam, southeast of the Big seam, on the south branch of the Brazeau river, in Sec. 2, Tp. 40, R. 19, west of the 5th meridian, Alberta.

Its composition is as follows:—

Moisture	1·98
Volatile combustible matter	24·17
Fixed carbon	62·79
Ash	11·06
	100·00
Coke—firm, coherent	73·85
Fuel ratio	1: 2·59

It imparts a brownish-yellow colour to a boiling solution of caustic potash.

64. *Coal*—from three different seams of the H. B. McGiverin claim, on the Bighorn river, a tributary of the Saskatchewan, on Sec. 27, Tp. 39, R. 17, west of the 5th meridian, Alberta.

A proximate analysis, by fast coking, gave the following results:—

	Seam No. 1.	Seam No. 2.	Seam No. 3.
Moisture	2·20	0·98	0·89
Volatile combustible matter	25·27	22·89	21·95
Fixed carbon	59·00	67·53	70·52
Ash	13·53	8·60	6·64
	100·00	100·00	100·00
Coke—firm, coherent	72·53	76·13	77·16
Fuel ratio	1: 2·33	1: 2·95	1: 3·21

Each of the above samples imparted a pale brownish-yellow colour to a boiling solution of caustic potash.

65. *Coal*—Two samples—from Sec. 9, Tp. 7, R. 3, west of the 5th meridian, Alberta.

Their composition, as shown by a proximate analysis, was as follows:—

	Sample 1.	Sample 2.
Moisture	0·50	0·75
Volatile combustible matter	35·33	28·58
Fixed carbon	56·10	61·04
Ash	8·07	9·63
	100·00	100·00
Coke—firm, coherent	64·17	70·67
Fuel ratio	1: 1·89	1: 2·13

Neither imparted any perceptible colour to a boiling solution of caustic potash.

A third sample from the same locality carried 47·76 per cent of shale associated with it.

66. *Coal*—from a 7 ft. seam, on a tributary of the Brazeau, in the Bighorn coal basin, on Sec. 28, Tp. 42, R. 19, west of the 5th meridian, Alberta.

A proximate analysis, by fast coking, gave the following results:—

Moisture	1·04
Volatile combustible matter	22·61
Fixed carbon	68·89
Ash	7·46
	100·00
Coke—firm, coherent	76·35
Fuel ratio	1: 3·05

Potash solution—pale brownish-yellow.

67. *Coal*—from a 4 ft. seam on Wapiabi creek, in the Bighorn coal basin, in Sec. 34, Tp. 40, R. 18, west of the 5th meridian, Alberta.

Its composition, as shown by a proximate analysis, is as follows:—

Moisture	0·96
Volatile combustible matter	30·80
Fixed carbon	64·88
Ash	3·36
	100·00
Coke—firm, coherent	68·24
Fuel ratio	1: 2·30

Potash solution—all but colourless.

68. *Coal*—described as coming from Crowsnest pass, two miles from Frank, Alberta.

An analysis, by fast coking, gave:—

Moisture	0·71
Volatile combustible matter	29·78
Fixed carbon	61·49
Ash—white	8·02
	100·00
Coke—firm, coherent	69·51
Ratio of volatile combustible matter to fixed carbon	1: 2·07

It imparts but a slight coloration to a boiling solution of caustic potash.

69. *Coal*—from a point southwest of Frank, Alberta, along the line of the Crows Nest Pass railway.

A proximate analysis, by fast coking, gave:—

Moisture	5·32
Volatile combustible matter	37·83
Fixed carbon	39·61
Ash	17·24
	100·00
Coke—firm, coherent	56·85
Ratio of volatile combustible matter to fixed carbon	1: 1·05

70. *Coal*—from Kootanie coal measures at Thorn mine, at head of Bragg creek, in Sec. 8, Tp. 23, R. 6, west of the 5th meridian, Alberta. Average outcrop sample from an 18″ seam, being top seam in the measures.

A proximate analysis, by fast coking, gave:—

Moisture	1·86
Volatile combustible matter	19·23
Fixed carbon	76·07
Ash—light reddish-brown	2·84
	100·00
Coke—slightly fritted	78·91
Ratio of volatile combustible matter to fixed carbon	1: 3·95

It imparts a brownish-red colour to a boiling solution of caustic potash.

71. *Coal*—from Shaw's coal mine, on south branch of Fish creek, NW ¼ of Sec. 7, Tp. 22, R. 3, west of the 5th meridian, Alberta. An average sample of the outcrop. Width of seam 2 feet. Edmonton formation.

A proximate analysis, by fast coking, gave the following results:—

Moisture	3·76
Volatile combustible matter	33·91
Fixed carbon	56·37
Ash—reddish-brown	5·96
	100·00
Coke—firm, coherent	62·33
Ratio of volatile combustible matter to fixed carbon	1: 1·66

Colour of potash solution—brownish-yellow.

72. *Coal*—an average sample from the outcrop of a 7 ft. seam, exposed on north bank of south branch of Sheep creek, Sec. 30, Tp. 19, R. 4, west of the 5th meridian, Alberta. Edmonton formation.

An analysis, by fast coking, gave:—

Moisture	2·50
Volatile combustible matter	35·88
Fixed carbon	56·64
Ash—light reddish-brown	4·98
	100·00
Coke—firm, coherent	61·62
Ratio of volatile combustible matter to fixed carbon	1: 1·58

Colour of potash solution—pale brownish-yellow.

73. *Coal*—from Kootanie coal measures, exposed on north bank of the south branch of Sheep creek, Sec. 36, Tp. 19, R. 5, west of the 5th meridian, Alberta. The sample represents an average of the outcrop of a 3 ft. seam.

A proximate analysis, by fast coking, gave as follows:—

Moisture	0·69
Volatile combustible matter	19·98
Fixed carbon	73·12
Ash—light grey	6·21
	100·00
Coke—firm, coherent	79·33
Ratio of volatile combustible matter to fixed carbon	1: 3·66

It imparts no colour to a boiling solution of caustic potash.

74. *Coal*—an average sample from the outcrop of a 5 ft. seam in the Edmonton formation, exposed in the south bank of the south branch of Sheep creek, in Sec. 20, Tp. 19, R. 4, west of the 5th meridian.

The results of a proximate analysis, by fast coking, are:—

Moisture	2·16
Volatile combustible matter	34·65
Fixed carbon	56·42
Ash—reddish-brown	6·77
	100·00
Coke—firm, coherent	63·19
Ratio of volatile combustible matter to fixed carbon	1: 1·63

It imparts a very pale brownish-yellow colour to a boiling solution of caustic potash.

75. *Coal*—from unsurveyed territory in the foothills of the Rockies, some 200 miles west of Edmonton, Alberta.

Its composition was as follows:—

Moisture	5·14
Volatile combustible matter	36·58
Fixed carbon	45·83
Ash	12·45
	100·00
Coke—firm, coherent	58·28
Fuel ratio	1: 1·25

Potash solution—brownish-yellow.

76. *Coal*—from a 24 ft. seam, dipping west, on the banks of a stream running from the headwaters of the Brazeau, to the northwest of McLeod river, near McEvoy's trail, Alberta.

It was of the following composition, as determined by a proximate analysis:—

Moisture	4·32
Volatile combustible matter	33·43
Fixed carbon	56·94
Ash	5·14
Sulphur	0·17
	100·00
Coke—coherent, but tender	62·16
Fuel ratio	1: 1·70

77. *Coal*—'Dockrill' coal—from Morice river, Skeena mining division, B.C. Sample from seam No. 1.

Its analysis, by fast coking, yielded the following results:—

Moisture	4·32
Volatile combustible matter	28·86
Fixed carbon	54·62
Ash	12·20
	100·00
Coke—non-coherent	66·82
Fuel ratio	1: 1·89

It imparted a brownish-red colour to a solution of boiling caustic potash. Colour of ash, reddish-brown.

78. *Coal*—'Dockrill' coal—from the same locality as the preceding specimen, but from the upper part of seam No. 2.

Its composition was found to be as follows:—

Moisture	4·48
Volatile combustible matter	25·91
Fixed carbon	55·57
Ash	14·04
	100·00
Coke—slightly fritted	69·61
Fuel ratio	1: 2·18

This sample imparted a brownish-yellow colour to a boiling potash solution. Its ash was of a pale reddish-brown colour.

79. *Coal*—'Dockrill' coal, the third sample, from the same locality as the two preceding specimens. Taken from the bottom of seam No. 2.

A proximate analysis, by fast coking, gave the following results:—

Moisture	3·59
Volatile combustible matter	28·18
Fixed carbon	53·94
Ash	14·29
	100·00
Coke—coherent, but tender	68·23
Fuel ratio	1: 1·91

Colour imparted to boiling caustic potash—brownish-yellow; ash, reddish-brown.

80. *Coal*—from the west side of Okanagan lake, at a point opposite its south end, and about a mile and a quarter back from the shore. Specimen collected by Mr. Charles Camsell.

Its composition was as follows:—

Moisture	1·59
Volatile combustible matter	33·95
Fixed carbon	55·36
Ash	9·10
	100·00
Coke—coherent, but tender	64·46
Fuel ratio	1: 1·69

Colour of potash solution—brownish-yellow; of the ash, reddish-brown.

81. *Coal*—from a boring at a depth of 540-544 feet, on the northwest quarter of the Indian reserve, Nicola valley, B.C.

An analysis, by fast coking, gave:—

Moisture	1·32
Volatile combustible matter	29·01
Fixed carbon	41·47
Ash—light reddish-brown	28·20
	100·00
Coke—firm, coherent	69·67
Ratio of volatile combustible matter to fixed carbon	1: 1·43

Potash solution—pale brownish-yellow.

82. *Coal*—from the bank of a stream flowing into Elk river, on the east side of Mount Fox, B.C. Collected by Mr. D. B. Dowling.

A proximate analysis, by fast coking, gave:—

Moisture	3·36
Volatile combustible matter	45·27
Fixed carbon	47·70
Ash—reddish-white	3·67
	100·00
Coke—moderately firm, coherent	51·37
Ratio of volatile combustible matter to fixed carbon	1: 1·05

It imparts a dark brownish-red colour to a boiling solution of caustic potash.

83. *Coal*—from Goat creek, in the Omineca mining division, B.C.

A proximate analysis, by fast coking, gave:—

Moisture	4·53
Volatile combustible matter	28·18
Fixed carbon	53·14
Ash	14·15
	100·00
Coke	67·29
Fuel ratio	1; 1·87

84. *Coal*—from a prospect tunnel on a coal seam on the north side of Aldrich creek, Elk river, B.C. Collected by Mr. D. B. Dowling.

A proximate analysis, by fast coking, gave:—

Moisture	1·60
Volatile combustible matter	32·47
Fixed carbon	63·44
Ash—light reddish-brown	2·49
	100·00
Coke—firm, coherent	65·93
Ratio of volatile combustible matter to fixed carbon	1: 1·96

Colour of potash solution—pale brownish-yellow.

Samples 85-89 were collected by Mr. D. D. Cairnes, in 1906.

85. *Coal*—an average sample of the outcrop of a 10′-4″ seam in Whitehorse coal fields, situated about twelve miles west of Dugdale siding, Yukon.

An analysis, by fast coking, gave the following results:—

Moisture	3·78
Volatile combustible matter	10·06
Fixed carbon	38·38
Ash—light reddish-brown	47·78
	100·00
Coke—non-coherent	86·16
Ratio of volatile combustible matter to fixed carbon	1: 3·81

Colour of potash solution—brownish-yellow.

86. *Coal*—an average sample from the bottom seam, 8 feet thick, at the end of the 700 ft. tunnel at Tantalus coal mines, Lewes river, Yukon.

The results of a proximate analysis by fast coking are as follows:—

Moisture	0·75
Volatile combustible matter	23·61
Fixed carbon	55·21
Ash—reddish-white	20·43
	100·00
Coke—firm, coherent	75·64
Ratio of volatile combustible matter to fixed carbon	1: 2·34

Potash solution—colourless.

87. *Coal*—An average sample from the middle seam, 6′-11″ thick, at the end of the 350 ft. tunnel at Tantalus mines, Lewes river, Yukon.

A proximate analysis, by fast coking, gave the following results:—

Moisture	0·76
Volatile combustible matter	24·74
Fixed carbon	58·60
Ash—reddish-white	15·90
	100·00
Coke—firm, coherent	74·50
Ratio of volatile combustible matter to fixed carbon	1: 2·37

Potash solution—colourless.

88. *Coal*—an average sample from the top seam, 3 feet thick, at the end of the 700 ft. tunnel at Tantalus coal mine, Lewes river, Yukon.

As shown by a proximate analysis, by fast coking, its composition is as follows:—

Moisture	0·82
Volatile combustible matter	25·12
Fixed carbon	66·03
Ash—very light reddish-brown	8·03
	100·00
Coke—firm, coherent	74·06
Ratio of volatile combustible matter to fixed carbon	1: 2·63

Potash solution—colourless.

89. *Coal*—an average sample from a 2 ft. seam at the bottom of a 500 ft. slope at Five Fingers mine, Lewes river, Yukon.

The results of a proximate analysis, by fast coking, were as follows:—

Moisture	4·26
Volatile combustible matter	40·26
Fixed carbon	44·67
Ash—light brownish-red	10·81
	100·00
Coke—firm, coherent	55·48
Ratio of volatile combustible matter to fixed carbon	1: 1·11

Potash solution—colourless.

The two following samples were collected by Mr. D. D. Cairnes, of the Geological Survey, in the summer of 1907:—

90. *Coal*—an average sample of the best 20″ in a 4 ft. seam, at the bottom of a 783 ft. slope, on Five Fingers mine, above Five Fingers rapids, Lewes river, Yukon.

A proximate analysis, by fast coking, gave as follows:—

Moisture	5·95
Volatile combustible matter	40·46
Fixed carbon	45·16
Ash—reddish-brown	8·43
	100·00
Coke—firm, coherent	53·59
Ratio of volatile combustible matter to fixed carbon	1: 1·11

It imparts a brownish-yellow colour to a boiling solution of caustic potash.

91. *Coal*—average sample of a 5 ft. seam, at the bottom of a 26 ft. winze, sunk in slope, 450 feet down, Five Fingers mine, Lewes river, Yukon.

The results of a proximate analysis, by fast coking, are as follows:—

Moisture	5·29
Volatile combustible matter	36·14
Fixed carbon	40·12
Ash—brown	18·45
	100·00
Coke—firm, coherent	58·57
Ratio of volatile combustible matter to fixed carbon	1: 1·11

Potash solution—colourless.

92. *Anthracitic coal*—from Kootanie coal measures, exposed at the head of Bragg creek, taken from a point one-quarter of a mile north of the creek opposite to, and three-quarters of a mile from Thorn mine. An average sample from a 7'-6" seam. Collected by Mr. D. D. Cairnes, in 1905.

A proximate analysis, by fast coking, gave the following results:—

Moisture	1·17
Volatile combustible matter	13·54
Fixed carbon	69·77
Ash—white	15·52
	100·00
Coke—non-coherent	85·29
Ratio of volatile combustible matter to fixed carbon	1 : 5·15

Colour of potash solution—pale brownish-yellow.

93. *Anthracitic coal*—from seam No. 6, Canmore mine, Alberta, 20 feet in on the slope from the outcrop, 350 feet horizontally from seam No. 5. Collected by Mr. D. B. Dowling, in 1905.

A proximate analysis, by fast coking, gave the following results:—

Moisture	0·49
Volatile combustible matter	16·04
Fixed carbon	81·14
Ash—reddish-white	2·33
	100·00
Coke—firm, coherent	83·47
Ratio of volatile combustible matter to fixed carbon	1 : 5·06

Potash solution—very pale brownish-yellow.

94. *Anthracitic coal*—from Coxcomb mountain, south of Jumpingpound creek, Sec. 34, Tp. 20, R. 7, west of the 5th meridian, Alberta—an average sample from the outcrop of a 3 ft. seam. Collected by Mr. D. D. Cairnes, in 1905.

A proximate analysis, by fast coking, gave:—

Moisture	1·64
Volatile combustible matter	14·26
Fixed carbon	82·01
Ash—reddish-brown	2·09
	100·00
Coke—non-coherent	84·10
Ratio of volatile combustible matter to fixed carbon	1 : 5·75

It imparted a pale brownish-yellow colour to a boiling solution of caustic potash.

95. *Anthracitic coal*—from Sec. 1, Tp. 25, R. 11, west of the 5th meridian, Alberta.

A proximate analysis, by fast coking, gave the following results:—

Moisture	1·80
Volatile combustible matter	14·71
Fixed carbon	76·77
Ash	6·72
	100·00
Coke—non-coherent	83·49
Fuel ratio	1: 5·22

Potash reaction—all but colourless.

96. *Anthracitic coal*—from Hudson Bay mountain, B.C. Specimen collected by Mr. W. W. Leach.

A proximate analysis, by fast coking, gave the following results:—

Moisture	9·16
Volatile combustible matter	5·63
Fixed carbon	74·70
Ash	10·51
	100·00
Coke—non-coherent	85·21
Fuel ratio	1: 13·27

It imparted a very pale brownish-yellow colour to a boiling solution of caustic potash.

97. *Anthracitic coal*—an average sample from the outcrop of a 30″ seam at the Whitehorse coal fields, twelve miles west of Dugdale siding, Yukon. Collected by Mr. D. D. Cairnes, in 1906.

A proximate analysis, by fast coking, gave:—

Moisture	3·76
Volatile combustible matter	8·34
Fixed carbon	62·50
Ash—light reddish-brown	25·40
	100·00
Coke—non-coherent	87·90
Ratio of volatile combustible matter to fixed carbon	1: 7·49

It imparts a pale brownish-yellow colour to a boiling solution of caustic potash.

98. *Anthracitic coal*—from the same locality as the preceding sample, an average outcrop sample of a 6 ft. seam. Also collected by Mr. D. D. Cairnes, in 1906.

The following results were obtained by a proximate analysis, by fast coking:—

Moisture	2·35
Volatile combustible matter	6·65
Fixed carbon	42·27
Ash—light reddish-brown	48·73
	100·00
Coke—non-coherent	91·00
Ratio of volatile combustible matter to fixed carbon	1: 6·36

Colour of potash solution—faint brownish-yellow.

99. *Anthracitic coal*—an average sample taken from a 16″ seam at a point one-quarter of a mile east of the roadway, opposite the 114th mile-post from Whitehorse, on the Whitehorse and Dawson wagon road, Yukon district.

Its composition, as shown by a proximate analysis, is as follows:—

Moisture	4·68
Volatile combustible matter	15·59
Fixed carbon	72·26
Ash	7·47
	100·00
Coke—non-coherent	79·73
Fuel ratio	1: 4·64

Potash reaction—pale brownish-yellow.

100. *Semi-Anthracite*—an average outcrop sample from an 8′-8″ seam, taken from P. Burns' coal mine, near the head of the south branch of Sheep creek, on Sec. 11, Tp. 19, R. 7, west of the 5th meridian, Alberta, Kootanie coal measures. Collected by Mr. D. D. Cairnes, in 1905.

A proximate analysis, by fast coking, gave:—

Moisture	0·74
Volatile combustible matter	11·51
Fixed carbon	74·71
Ash—white	13·04
	100·00
Coke—non-coherent	87·75
Ratio of volatile combustible matter to fixed carbon	1: 6·49

It imparts no colour to a boiling solution of caustic potash.

101. *Semi-anthracite*—from the same locality as the preceding specimen, an average sample from a 10′-4″ seam, at the end of a 50 ft. tunnel. Collected by Mr. D. D. Cairnes, in 1905.

The results of a proximate analysis, by fast coking, are:—

Moisture	0·52
Volatile combustible matter	13·19
Fixed carbon	76·00
Ash—white	10·29
	100·00
Coke—coherent, but tender	86·29
Ratio of volatile combustible matter to fixed carbon	1: 6·49

Potash solution—colourless.

102. *Anthracite*—an average sample of a 9′-6″ seam, at the end of 75 ft. tunnel, Whitehorse coal fields, twelve miles west of Dugdale siding, Yukon. Collected by Mr. D. D. Cairnes, in 1906.

A proximate analysis, by fast coking, gave the following results:—

Moisture	2·15
Volatile combustible matter	6·01
Fixed carbon	69·86
Ash—light reddish-brown	21·98
	100·00
Coke—non-coherent	91·84
Ratio of volatile combustible matter to fixed carbon	1: 11·62

It imparted no colour to a boiling solution of caustic potash.

PEAT.

Ontario.

Material collected by Mr. E. Nystrom, M.E., at the undermentioned localities in Ontario, and fully described by him in Bulletin No. 1 of the Mines Branch, has been examined by Mr. H. A. Leverin, with the following results:—

1. From the Mer Bleue peat bog, situated in the townships of Gloucester, Carleton county, and Cumberland, Russell county. Area of bog, 5,004 acres.

Material dried at 100° C. (212° F.) gave the following results:—

PEAT: TABLE I.

Number of Sample.	1.	2.	3.	4.	5.	6.	7.
Volatile matter	65·90	67·57	68·40	63·22	68·76	68·73	69·49
Fixed carbon	24·22	25·25	25·00	24·86	25·73	26·27	26·04
Ash	9·88	7·18	6·60	11·92	5·51	5·00	4·47
	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Phosphorus—P	....	0·026	....	....	....	0·024	....
Sulphur—S	....	0·314	....	....	....	0·317	....
Nitrogen—N	....	1·400	....	....	....	1·130	....
Calorific value, B.T.U. per lb.	8821	9021	....	8805	9126	9441	9301

2. From the Alfred peat bog, in the townships of Alfred and Caledonia, Prescott county. Area of bog, 6,800 acres.

Material dried at 100° C. (212° F.) gave the following results, by proximate analysis:—

PEAT: TABLE II.

Number of Sample.	1.	2.
Volatile matter	68·13	68·72
Fixed carbon	26·56	24·22
Ash	5·31	7·06
	100·00	100·00
Phosphorus—P	0·029	0·022
Sulphur—S	0·292	0·375
Nitrogen—N	1·230	1·920
Calorific value, B.T.U. per lb.	8730	9058

3. From the Welland peat bog, in the townships of Humberstone and Wainfleet, Welland county, covering an area of 4,900 acres.

Material dried at 100° C. (212° F.) yielded, by proximate analysis, the following results:—

PEAT: TABLE III.

Number of Sample.	1	2	3
Volatile matter	67·14	70·90	70·53
Fixed carbon	26·48	24·84	24·28
Ash	6·38	4·26	5·19
	100·00	100·00	100·00
Phosphorus—P	0·027	0·024	
Sulphur—S	0·317	0·248	
Nitrogen—N	1·130	1·740	
Calorific value, B. T. U. per lb	9118	8596	8667

4. From the Newington peat bog, in the townships of Cornwall, Osnabruck, and Roxborough, all in Stormont county.

The area of this bog is estimated at 3,800 acres.

Material dried at 100° C. (212° F.) contained:—

PEAT: TABLE IV.

Number of Sample.	1	2	3	4	5	6	7
Volatile matter	66·75	67·07	68·84	71·32	69·54	65·77	66·97
Fixed carbon	25·77	26·27	26·65	24·44	26·75	27·30	26·70
Ash	7·48	6·66	4·51	4·24	3·71	6·93	6·33
	100·00	100·00	100·00	100·00	100·00	100·00	100·00
Phosphorus	0·028	0·030	.....	0·032			
Sulphur	0·530	0·494	.....	0·345			
Nitrogen	1·850	1·800	.....	1·630			
Calorific value, B.T.U. per lb	8721	8465	8877	8636	9102	8210	8312

5. From the Perth peat bog, in the township of Drummond, Lanark county, covering an area of 3,800 acres.

Material thoroughly dried at 100° C. (212° F.) gave the following results, on proximate analysis:—

PEAT: TABLE V.

Number of Sample.	1.	2.	3.
Volatile matter	70·34	71·51	64·80
Fixed carbon	25·35	24·60	21·74
Ash	4·31	3·89	13·46
	100·00	100·00	100·00
Phosphorus	0·030	0·027	....
Sulphur	0·405	0·334	.....
Nitrogen	1·660	1·940	.....
Calorific value, B.T.U. per lb.	9067	9148	8219

6. From the Victoria Road peat bog, covering some 67 acres in the townships of Carden and Bexley, in Victoria county, Ont.

Material dried at 100° C. (212° F.) yielded the following results, on proximate analysis:—

PEAT: TABLE VI.

Number of Sample.	1.
Volatile matter	69·52
Fixed carbon	25·18
Ash	5·30
	100·00
Calorific value, B.T.U. per lb.	8649

These several deposits have been more fully described in Mines Branch Bulletin No. 1, entitled 'Investigation of the Peat Bogs and Peat Industry of Canada during the season 1908-9,' by E. Nystrom, M.E., and A. Anrep, peat expert.

LIMESTONES AND DOLOMITES.

British Columbia.

LIMESTONE: TABLE I.

Nos.	$CaCO_3$	Equivalent to CaO	$MgCO_3$	Equivalent to MgO	Fe_2O_3 and Al_2O_3	Insoluble Residue.
1.....	96·54	54·16	1·47	0·71	0·78	1·17
2.....	96·98	54·31	0·67	0·33	0·49	0·96
3.....	92·41	.....	3·63	.....	1·30	1·31

Locality of Occurrence.

1—[1]Texada island—Collected by Mr. E. Lindeman.
2—Vancouver island—Nimpkish—Collected by Mr. E. Lindeman.
3—Vicinity of Trail—Collected by Mr. W. W. Leach.

Ontario.

4. *Limestone*—from the uppermost bed, which has a thickness of 2 feet, in a quarry on the southwest quarter of lot 27, con. V, of Kenyon tp., Glengarry co., Ont.

After drying at 100° C. (hygroscopic water=0·03 per cent), its composition was found to be:—

Calcium carbonate			94·02
Magnesium carbonate			1·99
Ferrous carbonate			0·32
Alumina		0·18	
Silica, soluble		0·06	
Carbonaceous matter		0·63	
Insoluble matter, consisting of:			3·87
Silica	2·72		
Alumina, with a trace of ferric oxide	0·70		
Lime	0·01	3·60	
Magnesia	0·05		
Alkalis, by difference	0·12		
			100·20

4a. *Limestone*—from lot 3—recorded number 1347—of Timagami district, Ontario. Collected by Mr. B. F. Haanel.

It contained:—

Calcium carbonate	75·63
Magnesium carbonate	4·91
Iron and alumina	8·56
Insoluble matter	10·76
	99·86

[1] Summary Report of Mines Branch for 1907–8, p. 42.

Quebec.

5. *Limestone*—from a quarry on lots 9-13, range II, of Montcalm, Argenteuil county, Que.

A somewhat coarse-crystalline, greyish white limestone, through which are irregularly distributed very small quantities of graphite, and of pyrrhotite, and a somewhat large quantity of gangue, composed principally of quartz, with numerous small rounded grains of pyroxene.

A partial analysis, embracing only the more important constituents, gave the following results:—

Calcium carbonate	74·71
Magnesium carbonate	3·86
Insoluble mineral matter	16·00

6-9. *Limestone*—The four following limestones, from the undermentioned localities, all in Wolfe co., Que., were collected and forwarded by Mr. Joseph Blais, Manager of the Royal Lime Co., of Lake Weedon, Que.

Nos. 6 and 7 are from lot 22, range VII, of the Canton of Weedon.

Nos. 8 and 9 are from lots 194, 195, and 196, of the village of Lake Weedon, Wolfe co., Quebec.

Their composition was as follows:—

	No. 6.	No. 7.	No. 8.	No. 9.
Calcium carbonate	94·20	96·20	88·16	93·75
Magnesium carbonate	0·84	1·40	1·30	1·47
Ferrous carbonate	0·56	0·43	0·11	0·36
Alumina	traces.	traces.	traces.	traces.
Insoluble mineral matter	5·22	2·72	10·37	5·14
	100·82	100·75	99·94	100·72

Nova Scotia.

10. *Limestone*—Fossiliferous limestone, from a large outcrop at Morrison's mill, on the north branch of the Sydney river, one mile and a half south of East Bay P.O., Cape Breton co., N.S.

A very fine-crystalline, almost compact, ash-grey to bluish grey, fossiliferous limestone, of Carboniferous age.

After drying at 100° C. (hygroscopic water = 0·15 per cent), its composition was found to be as follows:—

Calcium carbonate			94·49 per cent.
Magnesium carbonate			0·57 "
Ferrous carbonate			0·47 "
Manganous carbonate			0·52 "
Calcium sulphate		0·07	
Calcium phosphate		0·04	
Alumina		0·19	
Silica, soluble		0·15	
Organic matter		0·27	4·25
Insoluble matter, consisting of:—			
Silica	2·87		
Alumina and a trace of ferric oxide	0·96		
Lime	0·02	3·53	
Magnesia	0·04		
Alkalis, by difference	0·14		
			100·30

11. *Limestone*—from an extensive deposit of lower Carboniferous limestone, in contact with the Devonian, at the (*a*) Churchill quarry, near the mouth of Walton river; and (*b*) at the Stephens manganese mines, about three-quarters of a mile west of the Churchill quarry, in Hants county, Nova Scotia.

A fine-crystalline, massive, purplish-grey and brownish-grey, mottled limestone.

An average sample, prepared from equal weights taken from each of five specimens, from as many different points in the above-mentioned deposits, gave, on analysis:—

After drying at 100° C. (hygroscopic water = 0·08 per cent).

Calcium carbonate			78·43 per cent.
Magnesium carbonate			0·34 "
Ferrous carbonate			0·18 "
Manganous carbonate			0·49 "
Calcium sulphate		0·27	
Calcium phosphate		0·04	
Alumina		0·02	
Silica, soluble		0·06	
Insoluble matter, consisting of:—			20·75
Barium sulphate	12·57		
Silica	3·35		
Alumina	1·28		
Ferric oxide	0·49		
Manganous oxide	0·04	20·36	
Lime	0·09		
Magnesia	0·15		
Organic matter	0·34		
Alkalis, by difference	2·05		
			100·19

The 172 partial analyses of limestones and dolomites next following, arranged in tabular form, were made by Mr. Leverin, upon material collected at the different localities indicated by Dr. J. E. Woodman.

LIMESTONE: TABLE II.

ANTIGONISH COUNTY.

Number.	$CaCO_3$	Equivalent to CaO	$MgCO_3$	Equivalent to MgO	Fe_2O_3, and Al_2O_3.	Insoluble Residue.
12	92·41	51·75	1·71	0·82	2·00	2·19
13	87·23	48·84	9·36	4·48	2·34	7·12

Locality of occurrence.

12—Arisaig. Louis McDonald's property. From along brook.
13— " 1 mile west of McAras brook.

LIMESTONE: TABLE III.

CAPE BRETON COUNTY.

Number.	$CaCO_3$	Equivalent of CaO	$MgCO_3$	Equivalent of MgO	Fe_2O_3 and Al_2O_3	Insoluble Residue
14	84·10	47·10	8·65	4·14	1·38	6·24
15	92·19	51·63	5·09	2·44	0·52	2·56
16	77·23	43·25	16·04	7·67	1·00	5·52
17	97·14	54·40	1·31	0·63	0·36	0·40
18	79·82	44·40	13·08	6·26	1·42	0·16
19	90·27	50·50	2·19	1·05	1·20	4·70
20	89·91	50·35	2·73	1·31	0·94	4·60
21	93·21	52·20	0·94	0·45	0·64	3·06
22	64·37	38·85	2·60	1·25	1·60	26·16
23	91·34	51·15	3·97	1·90	0·88	3·04
24	92·21	51·65	.....	.....	1·52	4·00
25	70·43	39·44	1·71	0·82	0·30	27·68
26	95·09	53·25	1·21	0·58	0·26	2·16
27	92·82	51·90	1·23	0·60	0·90	4·64
28	94·19	52·75	1·37	0·66	0·40	4·00
29	54·55	30·55	43·89	21·00	0·50	1·28
30	96·78	54·20	2·11	1·01	0·22	1·00
31	95·62	53·55	1·21	0·58	0·40	2·00
32	96·39	53·98	1·52	0·73	0·36	1·40
33	69·82	39·10	15·17	7·26	1·44	10·92
34	95·62	53·55	1·27	0·61	0·38	2·32
35	94·19	52·75	1·80	0·87	0·56	2·80
36	93·39	52·30	1·79	0·86	0·24	3·60
37	91·07	51·00	1·37	0·55	0·48	5·40
38	92·59	51·85	0·29	0·14	0·52	7·28
39	94·46	52·91	1·26	0·59	0·86	2·44
40	86·14	48·24	3·11	1·49	0·80	10·12
41	87·32	48·90	10·23	4·90	1·00	2·52
42	70·43	39·44	1·71	0·82	0·30	27·68
43	86·94	48·69	7·72	3·70	0·88	4·82

Locality of occurrence.

14—Barachois, McPherson iron pit. Best at big pit.
15— " Across a 40 ft. trench, in limestone belt, 1 mile S.W. of iron mine.
16— " From dolomite belt, in field outcrop, 150 feet wide, 50 yards N.E. of trench.
17—Ben Eoin. General sample along 750 feet of rear zone of limestone, 100 feet wide.
18— " Sample across breadth of front zone limestone.
19—Bull creek. Average sample of ledge behind hill and ¼ mile E. of French Vale road.
20— " D. Guthrie's property. From small quarry along roadside.
21— " Off old dam. Selected samples, best of D. I. & S. Co.'s quarry.
22— " Calcareous grit. Largely shell fragments.
23— " Scotch road. Boulders from ledge crossing road.
24—Catalone. Robertson property. Drift below railway bridge.
25—Crane cove. Eskasoni Indian reserve. From a small dump.
26—Dixon point. From an 8 ft. bed of Carboniferous limestone on water front.
27—East Bay, Morley brook. Average of a 75 yard exposure, at centre of a 1 mile wide deposit.
28—East Bay, Morley brook. Average of 100 feet square, near west side of deposit.
29— " " 1st grade white dolomite, main part of quarry.
30— " " Location No. 1.
31— " " Location No. 2.
32— " " Location No. 4.
33— " " Location No. 6.
34— " " Location No. 7. Boulders near road.
35— " " Location No. 9.
36— " " Location No. 10.
37— " " Location No. 11. Contact with conglomerate.
38— " north side. McKinnon property, 2 miles up McIntosh brook.
39—Eskasoni, upper side of road. General samples from ledge and boulders. From 100 ft. ledge, E. of mouth of McIntosh brook.
40— " east side of Indian reserve. Drift boulders.
41— " west side of Indian reserve. From old quarry.
42— " Crane cove. From a small dump.
43— " 1¼ miles N.E. of shore. From many boulders.

LIMESTONE: TABLE III.—*Continued.*

CAPE BRETON COUNTY.

Number.	$CaCO_3$	Equivalent to CaO	$MgCO_3$	Equivalent to MgO	Fe_2O_3 and Al_2O_3	Insoluble Residue.
44	87·32	48·90	10·61	5·08	0·68	1·60
45	77·85	43·60	10·20	4·88	1·22	11·44
46	96·87	54·25	1·17	0·56	0·46	1·04
47	50·18	28·10	45·37	21·17	0·88	4·12
48	86·87	48·65	5·01	2·40	0·68	7·12
49	95·28	53·36	0·54	0·26	0·56	0·76
50	82·85	46·40	1·00	0·48	1·80	12·80
51	92·05	51·55	1·67	0·80	0·44	6·00
52	95·71	53·60	1·10	0·53	0·28	2·32
53	90·60	50·40	1·23	0·59	1·00	5·60
54	93·31	52·25	1·04	0·49	0·60	3·38
55	95·33	53·50	0·71	0·34	0·60	1·50
56	8·78	45·80	0·33	0·16	4·04	12·00
57	74·10	41·50	22·15	11·06	0·72	2·00

Locality of occurrence.

44—George river. Boulders at foot of mountain N.W. of Routledge's quarry.
45— " Dolomite underlying Carboniferous limestone in bottom of Routledge's lower quarry.
46— " Routledge's quarries, upper and lower, half from each. General sample of stone as shipped.
47— " D. I. & S. Co.'s quarry. Average of present shipments. Taken from a chute of loose rock.
48—Grand Mira creek. Taken from Carboniferous limestone, ¼ mile wide.
49—Irish cove. Sample from limestone above 1,000 ft. cliff at shore.
50—Leitch creek. From a small opening near Forester lake.
51— " From refuse in a caved in quarry, N.E. of middle road, leading from Leitch's to Ballerk's.
52—Rudderham creek. Upper 3 feet of ledge.
53—Point Edward, west of new quarry of N.S. Steel Co. Sampled across whole of first or lower bench.
54— " west or new quarry of N.S. Steel Co. Across middle bench.
55— " west or new quarry of N.S. Steel Co. Across upper bench.
56— " boulders near road running N. from Crawley creek. Same limestone as N.S. Steel Co.'s quarries.
57— " boulders near turn in road running from Crawley creek to Sidney River bridge. Same limestones as in N.S. Steel Co.'s quarries.

LIMESTONE: TABLE IV.

COLCHESTER COUNTY.

Number.	$CaCO_3$	Equivalent to CaO	$MgCO_3$	Equivalent to MgO	Fe_2O_3 and Al_2O_3	Insoluble Residue.
59..	96·60	54·10	1·31	0·63	0·72	0·30
60..	54·64	30·60	40·80	19·52	2·64	2·24
61..	94·55	52·95	1·40	0·67	1·21	1·04
62..	80·53	45·10	3·15	1·51	1·00	13·72
63..	92·77	51·95	1·42	0·68	0·60	3·46
64..	90·62	50·75	1·25	0·60	5·60	2·30

Locality of occurrence.

59—Brookfield, west of. General sample from hanging walls in quarry north of road. Thickness 25 feet.
60—Johnsons Crossing, west of. General sample representing two kinds of limestone, beside brook and west of station.
61—Johnsons Crossing and McNut creek, between. Quarry west of road.
62—Kempton. General sample of 51 feet of limestone on east bank of river nearly opposite cemetery, argillaceous bands being excluded.
63—Lanark. McDonald's quarry. General sample of loose rock.
64—Shubenacadie river. Anthony Rose property. General sample of upper 15 feet of limestone.

LIMESTONE: TABLE V.

CUMBERLAND COUNTY.

Number.	$CaCO_3$	Equivalent to CaO	$MgCO_3$	Equivalent to MgO	Fe_2O_3 and Al_2O_3	Insoluble Residue.
65..	92·60	51·86	0·94	0·45	1·08	3·96
66..	86·34	48·35	1·42	0·68	1·12	10·00
67..	94·82	53·10	0·81	0·39	0·36	3·56

Locality of occurrence.

65—Upper Pugwash. G. Dewar's property. General sample from small quarry.
66— " A. Wilson's property. General sample of a 15 ft. bed of white limestone in quarry.
67— " A. Wilson's property. General sample of a 10 ft. bed of dark limestone in quarry.

LIMESTONE: TABLE VI.

GUYSBOROUGH COUNTY.

Number.	$CaCO_3$	Equivalent to CaO	$MgCO_3$	Equivalent to MgO	Fe_2O_3 and Al_2O_3	Insoluble Residue.
68..	87·50	49·00	2·34	1·12	2·00	8·60
69..	84·82	47·50	1·14	0·55	0·72	12·60
70..	85·09	47·65	0·91	0·44	1·00	11·32
71..	94·10	52·70	0·33	0·16	0·44	4·44

Locality of occurrence.

68—Lime cove, south of.
69—Steep creek, Mulgrave. Sea face, south half.
70— " " Sea face, north half.
71— " " 3/16 of a mile up the brook, red limestone.

LIMESTONE : TABLE VII.

HANTS COUNTY.

Number.	$CaCO_3$	Equivalent to CaO	$MgCO_3$	Equivalent to MgO	Fe_2O_3 and Al_2O_3	Insoluble Residue.
72	83·91	46·99	3·19	1·53	3·72	9·05

Locality of occurrence.

72—Selmah. General sample of limestone quarry.

LIMESTONE : TABLE VIII.

INVERNESS COUNTY.

Number.	$CaCO_3$	Equivalent to CaO	$MgCO_3$	Equivalent to MgO	Fe_2O_3 and Al_2O_3	Insoluble Residue.
73	95·18	53·30	2·19	1·05	0·40	0·70
74	87·77	49·15	4·07	1·95	1·00	5·90
75	90·41	50·63	7·71	3·69	0·72	1·40
76	95·62	53·55	1·40	0·67	0·28	1·80
77	84·10	47·10	9·09	4·35	1·46	5·00
78	87·32	48·90	3·51	1·68	1·40	6·68
79	93·93	52·60	1·04	0·50	0·52	3·28
80	58·39	32·70	38·62	18·47	0·68	2·40
81	53·93	30·20	41·80	20·07	0·90	3·72
82	55·58	31·25	37·91	18·14	1·04	3·64
83	57·14	32·00	35·74	17·10	1·32	5·28
84	52·69	29·51	34·36	16·44	0·76	9·10
85	86·14	48·24	3·72	1·78	2·52	7·56
86	80·15	44·90	4·20	2·01	1·52	12·34
87	52·50	29·40	36·99	17·70	2·12	8·90
88	80·09	44·85	3·65	1·75	2·60	12·56
89	90·62	50·75	6·47	3·10	0·50	2·56
90	85·44	47·85	5·68	2·72	1·20	7·08
91	92·41	51·75	1·88	0·90	0·40	4·00
92	56·51	31·65	39·22	18·76	0·56	0·76

Locality of occurrence.

73—Glencoe. A. Campbell's property. Part of blue limestone, 200 to 400 feet sampled.
74— " D. Campbell's farm. Average of 500 feet measured south from road.
75— " From a 250 ft. outcrop along the road W. of Campbell's farm.
76— " A. McAskill's farm. Average from a 500 ft. belt N. of clearing
77—Lime Hill. N. McMullen property. Average across limestone belt.
78— " D. McAulay property. Average across limestone belt.
79— " D. McAulay property. Blue limestone, from hill S. of brook.
80— " Campbell's farm. From a 650 ft. outcrop along road.
81— " Sample of dolomite for 125 feet along brook.
82— " Sample of dolomite in brook.
83— " J. Campbell's property. Average of wide dolomite belt.
84— " A. Campbell's farm. Average across a 300 ft. belt.
85— " K. Campbell's property. Average across a 200 ft. belt on hill.
86— " McKinnon's east grant, blue limestone, across end of exposure.
87— " McInnes' grant, E. branch of Dallas brook. From boulders.
88— " " " " From 30 ft. cliff.
89— " McInnes brook. From 20 ft. face of blue limestone in old quarry.
90— " N. McKinnon's E. and W. grants. From 100 ft. belt of blue limestone.
91— " between McKinnon and McLeod grants. From 250 ft. belt.
92— " Hillside E. of Campbell's house. From boulders.

LIMESTONE: TABLE VIII.—*Continued.*

INVERNESS COUNTY.

Number.	$CaCO_3$	Equivalent to CaO	$MgCO_3$	Equivalent to MgO	Fe_2O_3 and Al_2O_3	Insoluble Residue.
93	83·21	46·60	14·06	6·73	0·48	1·36
94	93·75	52·50	4·93	2·36	0·72	1·20
95	89·28	50·00	5·39	2·58	1·22	4·60
96	97·94	54·85	1·04	0·50	0·46	0·64
97	95·30	53·35	1·08	0·52	0·72	2·88
98	87·94	49·25	1·37	0·66	0·84	8·20
99	61·00	34·20	36·82	17·62	1·36	1·38
100	55·69	31·18	43·33	20·73	0·64	0·48
101	51·16	28·65	46·21	22·26	1·28	0·94
102	86·16	48·25	8·69	4·16	0·86	4·20
103	81·43	45·60	7·81	3·74	1·00	5·28
104	91·69	51·35	1·75	0·84	0·68	5·26
105	95·89	53·70	0·64	0·31	0·48	2·24
106	66·25	37·10	23·72	11·35	0·92	8·98
107	68·75	38·50	24·28	11·62	0·44	5·32
108	60·80	34·05	26·01	12·44	0·44	3·82
109	96·16	53·85	1·69	0·82	0·44	0·84
110	91·96	51·50	2·50	1·20	0·60	1·96
111	95·89	53·70	2·46	1·18	0·24	0·96
112	84·46	47·30	14·88	7·12	0·40	1·20
113	88·30	49·45	2·17	1·04	0·98	7·74
114	83·93	47·00	10·28	4·82	1·40	4·12
115	91·69	51·35	2·08	1·00	0·56	5·20
116	87·50	49·00	1·71	0·82	0·98	9·08
117	90·71	50·80	1·88	0·90	0·88	5·24
118	92·41	51·75	1·54	0·74	0·40	4·66
119	76·25	42·70	4·13	1·98	3·18	17·10
120	90·27	50·55	4·30	2·06	0·52	5·04
121	92·50	51·85	2·88	1·38	0·56	4·00
122	86·96	48·70	10·24	4·90	0·44	2·44
123	84·28	47·20	14·65	7·04	0·40	0·86

Locality of occurrence.

93—North mountain. Squire McDonald's claim. Easternmost exposure on back range.
94— " Squire McDonald's claim. Across a 60 ft. dip on McDonald lake.
95— " D. McDonald's west grant. Ledge 50 yards E. of mountain trail.
96— " D. McDonald's west grant. Squires cave.
97— " K. McPhie grant. North 100 ft. faces of N. belt.
98— " J. McPhie property, W. side. From 800 feet of bluff.
99— " McRae grant, W. side. Average of N. half of dolomite quarry.
100— " " Small pit on N. side of deposit. Average.
101— " " From 75 feet on face of ledge, close to the S. side.
102— " " Average sample from 70 yards on N. band.
103— " " Average sample of N. band, taken E. of road.
104— " " Average sample of white part of S. belt, over 75 yards from bluff to south edge.
105— " " Average sample of blue limestone from the W. part of the N. side of the second belt, measured along bluff and south for 40 yds.
106—Lime Hill. Best along shore, in front of Campbell property.
107— " East of McKenzie's, on McPhie grant. From boulders.
108— " East of McKenzie's. Sample taken 250 yards from N. edge of belt.
109— " Morrison quarry. Boulders in W. end in front of trap.
110— " From a 10 to 15 ft. exposure of blue limestone on N. side of brook.
111— " Dallas brook, W. side, 100 feet northward. Blue limestone.
112— " McKenzie grant. Sample across 75 feet at trail.
113— " " From 200 yards E. of new mountain trail.
114—Marble mountain, Matheson property. Blue limestone on hill N. of Matheson's house.
115— " " " White limestone on hill N. of Matheson's house.
116— " " " Surface limestone, N. of road.
117— " " " Sample from roadside.
118— " D. I. & S. Co.'s quarry. Pink limestone.
119— " " " Sample from waste dump.
120— " " " Beach north of waste dump.
121— " " " From stock pile.
122— " " " Outcrop on hill back of quarry.
123— " " " White, coarse-crystalline.

LIMESTONE: TABLE VIII.—*Continued.*

INVERNESS COUNTY.

Number.	$CaCO_3$	Equivalent to CaO	$MgCO_3$	Equivalent to MgO	Fe_2O_3 and Al_2O_3	Insoluble Residue.
124	92·14	51·60	6·56	3·14	0·32	0·82
125	93·78	52·53	2·34	1·12	0·30	3·60
126	87·32	48·90	10·42	4·98	0·60	2·04
127	95·18	53·20	1·21	0·58	0·28	3·28
128	89·46	50·10	2·71	1·30	1·16	6·60
129	68·21	38·20	9·82	4·70	6·00	16·28
130	93·39	52·30	2·38	1·14	0·68	3·84
131	94·82	53·10	1·58	0·76	1·10	2·26
132	82·14	46·00	14·02	6·71	1·96	3·28
133	87·23	48·85	8·38	4·10	0·72	2·44
134	87·32	48·90	2·21	1·06	1·62	6·72
135	91·71	51·40	5·49	2·63	0·36	2·64
136	82·41	46·15	7·29	3·49	1·34	9·04
137	80·75	45·20	3·10	1·48	1·56	14·28
138	87·85	49·20	3·97	1·90	1·36	6·80
139	82·14	46·00	1·58	0·76	0·90	14·76
140	84·73	47·45	3·07	1·47	0·90	3·84
141	82·41	46·15	0·86	0·42	1·00	15·56
142	79·64	44·60	14·75	7·06	1·50	4·56
143	89·64	50·20	8·23	3·94	0·34	1·04
144	94·55	52·95	3·13	1·50	0·32	1·80
145	95·18	53·30	1·85	0·89	0·32	1·78
146	91·43	51·43	4·45	2·13	0·86	3·36
147	56·78	31·80	40·47	19·36	0·60	3·20
148	55·35	31·00	41·84	20·02	1·60	2·16
149	91·78	51·40	3·88	1·86	0·56	3·48
150	87·41	48·95	2·17	1·03	1·20	8·44
151	49·82	27·90	42·01	20·10	0·41	18·20

Locality of occurrence.

124—Marble mountain, D. I. & S. Co.'s quarry. Fine-grained variety.
125— " " " " Dark blue variety.
126— " " " " Grey variety.
127— " " " " From Lime Co.'s quarry.
128— " McPhie property, east quarry. Blue and white crystalline.
129— " " east quarry. Cheesy white stone.
130— " " west quarry, 50 feet of white stone at centre.
131— " " Sample from dump of pits.
132— " McAskill's east grant. Taken across 100 feet of stone.
133— " McLachland's property. Main or N. part of North belt. White.
134— " " " S. side of N. belt. Blue limestone.
135— " D. I. & S. Co.'s quarry. Across 200 feet of N. band, S. of lake.
136— " " " W. side of Bras d'Or lake, 600 feet of N. belt.
137— " K. D. McPhie's farm. From boulders.
138— " " grant. Boulders near east quarry.
139— " " property. Along 200 feet from N. to S. on rear of line near house.
140— " " property. Across a 200 ft. exposure of bluish grey limestone.
141— " D. McLeod grant. McLachland's property. Across a 100 ft. hill.
142— " From a 75 ft. belt near the N. edge of, and one-third of the way from E. line across Campbell's grant.
143—Upper River Denys. D. McPhail property. From a 40 ft. belt on McPhail brook.
144— " " Ungranted land. From a 100 ft. belt in gorge near McPhail brook.
145— " " A. McAskill's property. Average of a 500 ft. outcrop at falls on E. branch of McPhail brook.
146— " " McLeod property. From a 1,000 ft. outcrop on road to Glencoe.
147—West Bay marshes.
148— " " Campbell property. Sample taken along brook.
149— " " McMillan property. Best of belt near house.
150— " " McMillan property. 200 ft. bluff N. of brook. Average.
151— " " McCushyrie brook. Average of a 50 ft. bed.

LIMESTONE : TABLE VIII.—*Continued.*

INVERNESS COUNTY.

Number.	$CaCO_3$	Equivalent to CaO	$MgCO_3$	Equivalent to MgO	Fe_2O_3 and Al_2O_3	Insoluble Residue.
152	59·19	33·15	30·50	14·60	1·40	9·60
153	59·64	33·40	35·47	16·97	0·76	4·84
154	63·66	35·65	31·60	15·12	1·56	4·02
155	58·57	32·80	38·12	18·24	1·06	2·00
156	56·52	31·65	41·80	20·00	0·80	0·90
157	77·72	45·41	8·73	4·18	8·31	4·78

Locality of occurrence.

152—West Bay Marshes. D. McKenzie property. Average of lower ledge and drift on side of hill.
153— " " D. McKenzie property. Drift from a 250 ft. belt at top of hill.
154— " " Ross property. Average of drift on hillside N. of road.
155— " " " White limestone on west end of hill.
156—Whycocomagh, McDonald's quarry: an average sample.
157— " General sample from dolomite belt.

LIMESTONE : TABLE IX.

RICHMOND COUNTY.

Number.	$CaCO_3$	Equivalent to CaO	$MgCO_3$	Equivalent to MgO	Fe_2O_3 and Al_2O_3	Insoluble Residue.
158	85·50	47·85	6·70	3·21	1·08	6·48
159	89·02	49·85	0·33	0·16	1·68	6·00
160	92·32	51·70	2·04	0·98	1·12	2·80
161	93·57	52·40	0·96	0·46	1·12	2·32
162	96·60	54·10	0·87	0·42	0·52	0·76
163	90·89	50·90	7·14	3·42	1·08	0·76
164	94·41	52·87	0·33	0·16	0·64	2·44
165	85·18	47·70	1·71	0·82	2·48	10·18
166	77·84	43·59	1·33	0·63	3·20	15·14
167	87·50	49·00	2·50	1·20	2·44	7·84

Locality of occurrence.

158—Corbett cove near McLean's marble quarry. Average sample from two vertical sections of face of quarry, 75 × 25 feet.
159—Dundee. McIntosh property. Sample from drift.
160— " Morrison property. Sample from small dump near road.
161— " " " Average sample taken across a 300 ft. face of limestone.
162—Lennox Ferry. C. B. Kaulbach's property. Average sample of a 50 ton dump of shell limestone.
163—Lennox Ferry. Shannon property. General sample from 50 ton dump.
164—Red Islands limestone quarry. General sample across 100 feet.
165—Robertson cove, Barra Head. Sample of best or darkest limestone.
165—St. Peters. Average sample, taken at 1 to 2 ft. intervals across a 50 ft. quarry face.
167— " Sandy point. McDougall property. Average sample of ledge.

LIMESTONE : TABLE X.

VICTORIA COUNTY.

Number.	$CaCO_3$	Equivalent to CaO	$MgCO_3$	Equivalent to MgO	Fe_2O_3 and Al_2O_3	Insoluble Residue.
						%
168	91·78	51·40	2·13	1·02	0·56	3·52
169	95·18	53·30	1·14	0·55	0·56	2·12
170	62·32	34·90	37·01	17·71	0·68	0·48
171	51·78	29·00	39·86	19·07	1·80	6·44
172	49·19	27·55	40·84	19·54	1·54	8·64
173	73·18	40·98	14·54	6·96	1·16	10·88
174	75·85	42·48	21·32	10·29	0·52	2·44
175	63·66	35·65	35·22	16·85	0·32	1·20
176	92·23	51·65	1·98	0·95	0·54	3·56
177	94·10	52·70	2·13	1·02	0·40	2·64
178	95·27	53·35	1·50	0·72	0·28	2·28
179	94·37	52·85	1·62	0·78	0·30	3·00
180	83·48	46·75	2·17	1·04	1·24	11·60
181	80·62	45·15	2·11	1·01	1·28	13·06
182	54·64	30·60	41·09	19·66	1·00	1·20
183	61·34	34·55	32·64	15·62	1·50	5·00

Locality of occurrence.

168—Cape Dauphin. Fairy Hole. Sample from a 20 ft. section, beside and below hole.
169— " From a 35 ft. section, upward from water's edge.
170— " From 50 feet of shell dolomite on W. side of lower Carboniferous on N. shore, next to conglomerate.
171—New Campbellton. Dolomite quarry. Best grade blue dolomite.
172— " " Blue dolomite in front of quarry, 6 feet thick.
173— " " Kelly cove. Carboniferous limestone at road.
174— " " Kelly cove. Sampled across 100 feet near E. side of limestone.
175— " " Kelly cove. From W. side of limestone stratum, for 63 yards at turn of road.
176— " " Kelly cove. Sample across a 95 yard exposure
177— " " Kelly cove. Sample across a 125 yard exposure at a point 200 yards S. of preceding sample.
178— " " Kelly cove. Average of 155 yards at S. end of ridge, and 200 yards S. of preceding
179— " " Kelly cove. Northernmost exposure.
180— " " Jubilee. Farm W. of M. W. McLeod's grant. From a 4 ft. bed on bank of stream, on N. W. side of the deposit.
181— " " Jubilee. M. W. McLeod's grant. Boulders lying N. of house and E. of brook.
182— " " Iron deposits at W. end of mountain.
183— " " P. MacNeil's property. Taken near shore.

IRON ORES.

Yukon.

1. *Yellow ochre*—From the immediate vicinity of the Takhini mineral spring, Yukon Territory. Collected by Mr. D. D. Cairnes.

From an ochreous deposit surrounding a hot spring, and consisting of an intimate mixture of calcium carbonate, calcium sulphate, ferric hydrate, and a small quantity of argillaceous matter.

It was found to contain:—

	Per cent.
Metallic iron	11·83
Insoluble mineral matter	5·20

British Columbia.

The following analyses—31 in number—were conducted by Mr. Leverin, upon material collected in 1907 by Mr. E. Lindeman, M.E. Full particulars of the deposits from which these samples were taken may be found in Mr. Lindeman's Report on the Iron Ore Deposits of Vancouver and Texada Islands.

IRON ORES.—MAGNETITE: TABLE I.

VANCOUVER AND TEXADA ISLANDS.

Number.	Iron.	Sulphur.	Phosphorus.	Insoluble.	Silica.	Alumina.	Lime.	Magnesia.
1	58·30	2·750	0·013	8·88				
2	56·57	2·750	0·121	8·52				
3	67·09	1·600	0·009	4·51				
4	66·17	0·017	0·016	.....	6·10	0·35	1·15	0·44
5	64·23	0·233	0·008	4·12				
6	63·89	0·017	0·008	.....	5·30	1·74	0·80	1·86
7	56·45	0·530	0·014	.....	7·00	2·07	3·77	1·25
8	59·77	0·533	0·024	11·00				
9	59·37	0·716	0·006	13·36				
10	39·82	0·170	0·030	33·36				
11	52·09	0·230	0·025	16·52				

Locality of occurrence.

1—Vancouver island. Gordon River dist. From tunnel on Baden-Powell mineral claim.
2— " " Sirdar claim.
3— " " Conqueror mineral claim on Bugaboo creek.
4— " Head bay, Nootka sound.
5— " Klaanch river. Iron Crown mineral claim.
6— " " " "
7— " Quinsam river. From a 60 ft. tunnel.
8— " " From face of bluff.
9— " Sechart, Bald Eagle mineral claim.
10— " Blue Bird mineral claim.
11— " Copper island in Barclay sound.

IRON ORES.—MAGNETITE: TABLE I.—*Continued.*

VANCOUVER AND TEXADA ISLANDS.

Number.	Iron.	Sulphur.	Phosphorus.	Insoluble.	Silica.	Alumina.	Lime.	Magnesia.
12	48·06	0·623	0·006	23·22				
13	63·86	0·070	0·004	4·00				
14	64·39	0·040	0·062	5·75				
15	63·97	1·000	0·010	3·70				
16	66·89	0·060	0·024	4·37				
17	50·96	0·083	0·004	25·95				
18	54·85	2·876	0·014	5·52				
19	63·07	0·043	0·016	7·64				
20	60·89	0·763	0·004	3·81				
21	66·49	0·040	0·042	5·55				
22	59·69	0·040	0·016	12·76				
23	64·48	1·886	0·002	CuO,0·22	4·47	0·66	1·32	1·13
24	63·27	0·347	0·006	CuO,0·09	4·37	1·18	2·58	1·05
25	62·57	0·403	0·024	6·46				
26	58·76	0·113	0·011	12·00				
27	59·57	0·137	0·024	CuO,0·08	8·30	1·71	3·82	1·05

Locality of occurrence.

12—Vancouver island. Sechart, Crown Prince mineral claim.
13— " Klaanch river.
14— " Lord of the Isle mineral claim. Sechart district.
15— " Nimpkish.
16— " Defiance mineral claim, N. shore of Alberni canal.
17— " Smith landing. Darby and Joan claims.
18— " Letitia mineral claim.
19— " Kennedy lake.
20— " Sarita river. From 120 ft. tunnel on S. bank.
21— " Ingersoll River district.,
22— " Sechart, Western Steel mineral claim.
23—Texada island. Paxton mine. Sample along 45 ft. tunnel.
24— " Prescott mine. Sample from tunnel.
25— " " Second level.
26— " " Third level.
27— " Lake mine. From open-cut.

IRON ORES.—LIMONITE (BOG IRON ORE): TABLE II.

Number.	Iron.	Sulphur.	Phosphorus.	Insoluble.	Silica.	Alumina.	Lime.	Magnesia.
1	43·87	1·087	0·012	3·12				
2	46·23	0·977	0·026	2·25				
3	56·97	0·447	0·038	1·40				
4	54·46	0·150	0·038	2·32				

Locality of occurrence.

1—Vancouver island. Quatsino sound.
2— " "
3— " "
4— " "

Alberta.

1. *Magnetite*—from a point some two miles north of Burmis siding, Alberta.

A slightly weathered magnetite.

It contained:—

Metallic iron	37·35
Insoluble mineral matter	12·20
Titanium dioxide	None.

2. *Limonite*—from Red Deer river, east of Kneehill, Alberta.

It was found on analysis to contain:—

Metallic iron	49·45
Insoluble mineral matter	7·20
Titanium dioxide	None.

3. *Clay ironstone*—from Bow river, some twenty miles north of Brooks, Alberta.

A light, clove brown, compact, massive ironstone. It yielded on analysis:—

Metallic iron	57·22
Insoluble mineral matter	7·36
Titanic dioxide	None.

4. *Clay ironstone*—from a short distance east of Bellevue, on the line of the Crows Nest Pass railway.

A brownish-grey, reddish-brown weathering, compact, massive ironstone, with which is associated a small quantity of limonite.

It was found to contain:—

Metallic iron	36·63
Insoluble mineral matter	12·20
Titanium dioxide	None.

Saskatchewan.

1. *Clay ironstone*—from Pas mountain, Sask., collected by Mr. W. McInnes.

An analysis, conducted by Mr. M. F. Connor, showed it to contain:—

Metallic iron	29·10
Insoluble mineral matter	9·20

Manitoba.

Hematite—from along the line of the Canadian Northern railway, near Deepdale, west of Roblin, Manitoba.

A bedded siliceous hematite.

It contained:—

Metallic iron	46·08
Insoluble matter	30·20
Titanium dioxide	None.

Ontario.

1. *Magnetite*—from a point some eighty miles west of Port Arthur, on the line of the Canadian Northern railway.

A fine-grained, massive magnetite, in association with which was a somewhat large quantity of actinolite.

It was found to possess the following composition:—

	Per cent.
Ferric oxide	37·18
Ferrous oxide	20·92
Manganous oxide	0·14
Lime	2·50
Magnesia	2·26
Alumina	2·78
Silica	32·80
Phosphoric anhydride	0·35
Sulphur	0·04
Titanium	None.
Water—hygroscopic, loss at 100° C.	0·44
Water—combined loss above 100° C.	0·58
Alkalis—by difference	0·01
	100·00
Iron—present as Fe_2O_3	26·03
Iron—present as FeO	16·27
Total metallic iron	42·30
Phosphorus—P	0·15

2. *Magnetite*—from southeast quarter of lot 1, con. IV, of Homer tp., Ont., north of Lake Superior.

A fine crystalline-granular, massive magnetite.

It was found on analysis to contain:—

Metallic iron	60·82
Insoluble siliceous residue	7·40
Titanium dioxide	None.

3. *Magnetite*—from the northeast quarter of lot 1, con. II, of Homer township, Ont.

An association of fine granular, massive magnetite, and quartz; is slightly pyritiferous.

It contains:—

Metallic iron	32·29
Insoluble siliceous residue	53·39
Titanium dioxide	None.

4. *Magnetite*—from a point ten miles west of Savant lake, Thunder Bay district. Collected by Mr. W. H. Collins.

An association of magnetite, with some hematite, together with a large quantity of quartzose gangue.

It contained:—

Metallic iron	30·74
Insoluble siliceous residue	55·70
Titanium dioxide	None.

5. *Magnetite*—40 samples—from claims 1346, 1347, and 1348, of the Huron Mountain mine, Timagami district, Ontario. Collected by Mr. B. F. Haanel, B.Sc.

Their composition is shown in the following table:—

IRON ORES.—MAGNETITE: TABLE III.

Number.	Iron. (Fe)	Sulphur. (S)	Phosphorus. (P)	Silicon. (Si)	Manganese. (Mn)	Lime. (CaO)	Aluminium. (Al)
5	38·42						
6	61·92						
7	55·65						
8	57·97						
9	60·80						
10	58·55						
11	51·15						
12	56·57	0·024	trace	6·40	0·20	6·00	0·16
13	45·82						
14	62·37						
15	50·55						
16	36·95						
17	38·42						
18	27·67						
19	58·72						
20	52·10						
21	50·78	0·027	0·002	6·00	0·33	5·30	0·04
22	51·62						
23	43·67						
24	35·35	0·540	0·022				
25	43·92	0·080	0·010				
26	46·52	0·030	trace				
27	60·87	0·005	"				
28	67·02						
29	65·55						
30	57·92						
31	67·65	0·018	trace	2·22	0·22	8·00	0·21
32	57·92						
33	56·05						
34	45·60	0·012	trace				
35	55·02	trace	"				
36	50·27	"	"				
37	60·82	0·022	"				
38	51·02	0·014	"				
39	48·40	trace	"				
40	21·82	0·008	"				
41	52·22	0·007	"				
42	50·15	none	none	7·55			
43	50·77	trace	trace	7·08			
44	42·50	0·007	"				

IRON ORES.—HEMATITE: TABLE IV.

Number	Iron.	Sulphur.	Phosphorus.	Silica.	Alumina.	Lime.	Magnesia.	TiO_2
1	52·10	0·195	0·046	22·25	1·04	0·10	0·55	trace

Locality of occurrence.

1—Gunflint lake. Thunder Bay district. Specular iron.

2. *Hematite*—from the farm of Mr. William Stewart, Somerville tp., Victoria co., Ont.

A fine, crystalline-granular, massive hematite.

It contained:—

Metallic iron	65·08
Insoluble siliceous residue	6·20
Titanium dioxide	None.

3. *Hematite*—from a point northeast of Wabamush (most probably intended for Wabinosh) river, some ten miles south of the Grand Trunk Pacific railway, at the northwest part of Lake Nipigon.

Massive, siliceous hematite.

It contained:—

Metallic iron	49·72
Insoluble siliceous residue	28·30
Titanium dioxide	None.

A second sample from the same locality, consisting of specular iron in association with a somewhat large quantity of siliceous (in part, jaspery) gangue, contained 36·76 per cent of insoluble mineral matter.

4. *Limonite*—chreous. From lot F, con. XIX, of the township of Tiny, Simcoe county. Collected by Mr. B. F. Haanel. Analysis by Mr. H. A. Leverin. Colour—light yellow.

Its composition was as follows:—

	Per cent.
Metallic iron	37·520
Sulphur	0·122
Phosphorus	0·150

5. *Limonite*—ochreous. From the same locality as the preceding specimen. Collected by Mr. B. F. Haanel.

This sample, which was of a dark reddish-brown colour, was found to contain, as shown by an analysis by Mr. H. A. Leverin:—

	Per cent.
Metallic iron	38·060
Sulphur	0·102
Phosphorus	0·179

The five following analyses were conducted by Mr. M. F. Connor:—

6. *Limonite*—from lot 26, con. III, of the township of Oakley, Muskoka district, Ontario.

It contained:—

Metallic iron	45·60
Insoluble mineral matter	29·00

7. *Limonite*—from lot 27, con. III, of Oakley, Muskoka district, Ontario.

It contained:—

Metallic iron	53·50
Insoluble mineral matter	3·60

8. *Limonite*—from lot 28, con. III, of Oakley, Muskoka district.

Analysis showed it to contain:—

Metallic iron	29·30
Insoluble mineral matter	45·90

9. *Limonite*—from lot 29, con. III, of Oakley, Muskoka district.

It was found to contain:—

Metallic iron	27·40
Insoluble mineral matter	49·10

10. *Limonite*—var. bog ore. From lot 29, con. V, of Oakley, Muskoka district.

Its composition was found to be as follows:—

	Per cent.
Metallic iron	50·31
Insoluble mineral matter—clay and sand	16·50

11. *Limonite*—from lot 17, con. III, of Draper, Muskoka district.

Partial analysis gave the following results:—

Metallic iron	54·70
Insoluble mineral matter	4·00

Quebec.

1. *Hematite*—from lot 6, range I, of Dunham, Missisquoi county, Quebec.

A dark purplish-brownish-red, very fine granular, almost compact, schistose, massive hematite. Examined for Mr. John F. Yeats.

It was found to contain:—

Ferric oxide[1]	92·74
Manganous oxide	Trace.
Alumina	3·69
Lime	0·51
Magnesia	0·18
Silica	3·27
Phosphorus[2]	0·04
Sulphur	Trace.
Titanic acid	None.
	100·43

[1] = Fe 64·92. [2] = P_2O_5 0·09.

The deposit from which the above sample of ore was taken is said to be quite an extensive one, it having been traced over a considerable area. In addition to its occurrence on the above-mentioned lot and range, it has also been found, amongst other places, on lots 1 and 2 of range III, and lot 2 of range II, of the same township. A specimen of the same from the deposit occurring on the property of Mr. Levi J. Blake, on the aforementioned lot 1 of range III, was found to contain 89·58 per cent of ferric oxide, equivalent to 62·71 per cent of metallic iron.

2. *Magnetite*—from the head of Big Pipestone rapids, on the Quinze river, Pontiac county, Quebec.

Magnetite and quartzite banded.

An average sample of the specimen furnished was submitted to analysis, and found to contain:—

Metallic iron	34·47
Insoluble siliceous matter	51·50
Titanium dioxide	None.

The forty-four tabulated, partial analyses, next following, were made by Mr. Leverin, upon material collected by Mr. Fritz Cirkel, M.E., and referred to by him in his report on Iron Ore Deposits along the Ottawa and Gatineau rivers.

IRON ORES.—HEMATITE: TABLE V.

OTTAWA COUNTY.

Number	Iron.	Sulphur.	Phosphorus	Titanic Acid.	Silica.	Lime.	Magnesia.
3	65·56	0·004	0·012	3·52	3·00	0·10	0·60
4	61·15	0·008	0·001	8·10	.....	.....	.....
5	65·74	0·009	0·003	6·00	1·33	0·08	0·36
6	47·23	0·009	0·006	0·90	10·50	3·90	2·30
7	50·78	0·018	0·047	1·76	11·41	0·55	3·69
8	62·37	0·036	0·065	2·96	5·55	0·15	0·53
9	66·92	0·036	0·010	5·95	0·96	0·25	0·41
10	50·98	.....	.....	13·58	.....	.....	.....
11	58·21	.....	.....	16·80	.....	.....	.....
12	59·70	0·046	0·006	5·97	1·86	0·25	0·30
13	64·72	0·004	0·179	0·25	3·96	0·27	0·33

Locality of occurrence.

3—Haycock Iron mine. Lot 1, R. XI of Hull township, and lots 26 and 27, R. VI of Templeton township. Pit No. 1.
4— " " " Pit 3.
5— " " " Pit No. 4. 125 feet W. of Pit 3.
6— " " " Pit No. 5. 30 feet N. of Pits 1 and 2.
7— " " " Pit No. 7. S.W. of Pit No. 1. Average of 18 inches.
8— " Pit No. 8. W. of Pit No. 7. Average of 20 inches.
9— " Pit No. 9. 1,200 feet S.W. of Pit No. 1.
10—Viau's property. Lot 3, R. X of Hull township.
11—Darley property. Lot 1, R. XI of Hull township, outcrop.
12—Lot 22, R. IX of Templeton township.
13—Lot 23, R. VII of Templeton township.

IRON ORES.—MAGNETITE: TABLE VI.

OTTAWA COUNTY.

Number	Iron.	Sulphur.	Phosphorus.	Insoluble.
14	56·69	0·263	0·006	11·00
15	62·98	0·173	0·012	6·78
16	63·46	0·170	0·006	5·36
17	58·26	0·054	0·018	15·38
18	63·87	0·200	0·012	7·68
19	56·56	0·075	0·010	6·00
20	56·65	0·440	0·026	16·00
21	54·71	0·230	0·004	14·16
22	53·88	0·370	0·004	11·58
23	54·39	0·567	0·010	19·30
24	60·46	0·390	0·014	11·00
25	57·13	1·971	0·040	17·22
26	62·12	0·473	0·006	8·00
27	65·14	0·023	0·001	SiO_2 0·250 TiO_2 2·98 CaO 1·10 MgO 0·59

Locality of occurrence.

14—Baldwin mine. Lot 14, R. VI of Hull township. Pit No. 1. Most westerly.
15— " " " Pit No. 2. 70 feet E. of No. 1.
16— " " " Pit No. 3. 80 feet N.E. of No. 2.
17— " " " Pit No. 4. 540 feet N.E. of No. 3.
18— " " " Below Pit No. 5, 100 feet from No. 4.
19—Forsyth mine. Lot 11, R. VII of Hull township. From lower cut.
20— " " " From big cut.
21— " " " From dump at big cut.
22— " " " From lower cut.
23— " " " "
24—Scott's property, near Forsyth mine on lot 12, R. VII of Hull township.
25— " " " "
26— " " "
27—Lot 23, R. VI of Wakefield township.

IRON ORES.—MAGNETITE AND HEMATITE: TABLE VII.

PONTIAC COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Titanic Acid.	Silica.	Manganous Oxide.	Lime.	Magnesia.
28	54·25	0·310	0·007	0·20	17·12	.....	1·66	3·70
29	51·58	1·350	0·010	0·12	17·24	.....	1·10	4·53
30	61·48	0·846	trace.	0·10	8·83	.....	0·65	0·80
31	58·61	0·767	0·004	0·25	8·99	.....	0·80	2·00
32	55·93	0·559	0·003	0·10	12·20	.....	0·60	1·30
33	60·39	0·696	0·006	0·12	9·37	.....	0·10	2·04
34	52·17	0·747	0·011	0·11	17·65	.....	1·15	1·59
35	43·76	1·233	0·015	0·18	.....	.....	.....	.....
36	43·86	0·128	0·005	0·25	28·40	.....	1·97	1·85
37	56·03	2·484	0·006	0·25	16·00	.....	0·05	0·60
38	34·25	0·063	6·003	11·78	.....	.....	.....	.....
39	54·94	0·800	0·001	7·23	7·84	1·92	0·86	1·76
40	39·08	0·023	0·001	Trace.	7·77	0·32	12·23	6·95
41	55·98	0·921	0·008	13·03	4·00	0·90	0·07	2·08
42	53·68	0·078	0·010	15·75	2·75	0·40	0·57	1·16
43	47·92	0·084	0·004	15·44	.....	.....	.....	.....
44	60·71	0·221	0·007	5·91	2·20	.....	0·10	0·06
45	32·65	0·122	0·004	Trace.	50·03	Trace.	1·25	0·35
46	52·67	0·038	0·010	0·25	22·00	.....	0·10	0·06

Locality of occurrence.

28—Bristol mine, lot 21, R. II of Bristol township. Pit No. 1.
29— " " " Pit No. 1.
30— " " " Pit No. 1.
31— " " " Pit No. 2.
32— " " " Pit No. 3.
33— " " " Pit No. 4.
34— " " " Pit No. 5.
35— " " " Pits Nos. 6 and 7.
36— " " " Pit No. 9.
37— " " " Pit No. 10.
38—Lot 22, R. I of Bristol township.
39—Lot 27, R. VII of Clarendon township.
40—Lot 12, R. I " "
41—Lot 12, R. V of Litchfield township.
42—Lot 10, R. VIII " "
43—Lots 4 and 5, R. X " "
44—Lots 12 and 13, R. VI of Sheen township.
45—Hematite—lot 25, R. II of Clarendon township.
46— " 13, R. VII of Calumet.

New Brunswick.

The 79 analyses, next following, relate to samples taken from a deposit of iron ore situated at or near the confluence of Austin brook with Nipisiguit river, on lot 12, range XVII, of the township of Bathurst, Gloucester county, N.B.

Reference to this deposit will be found in the summary report of Mr. E. Lindeman, as published in the Annual Report of the Superintendent of Mines for 1907.

IRON ORES.—MAGNETITE AND HEMATITE: TABLE VIII.

GLOUCESTER COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Insoluble.	Manganese.
1.	42·49	0·026	1·197	34·60	
2.	47·3	0·05	0·640	26·30	1·0
3.	48·01	0·107	0·949	17·54	
4.	50·49	0·100	1·007	15·50	
5.	45·64	0·070	0·870	21·20	
6.	45·54	0·429	0·686	18·42	
7.	50·89	0·091	0·486	16·18	
8.	51·57	0·699	0·865	8·04	
9.	39·60	0·101	0·852	24·72	
10.	51·67	0·047	0·790	12·30	
11.	44·55	0·078	0·755	20·92	
12.	41·28	0·134	0·569	27·74	
13.	53·95	0·650	0·737	12·64	
14.	57·22	0·687	0·865	11·90	
15.	49·80	0·780	0·936	16·64	
16.	55·74	0·305	0·764	8·40	
17.	49·86	0·035	0·740	25·56	
18.	58·12	0·152	0·582	17·10	
19.	58·70	0·026	0·700	13·32	
20.	49·66	0·170	0·912	23·64	
21.	44·46	0·268	0·832	12·38	
22.	51·69	0·274	0·600	19·04	
23.	50·08	0·040	0·880	19·64	
24.	48·26	0·194	0·716	16·00	
25.	50·08	0·096	0·708	16·44	
26.	52·00	0·580	0·972	14·60	
27.	45·05	18·21	1·080	10·12	
28.	35·00	31·97	0·528	15·22	
29.	44·05	37·08	0·500	6·92	

Locality of occurrence.

All from Group No. 1.

1—Specimen from surface at a point 100 feet N. of Nipisiguit river.
2—From the surface, 230 feet from the northern end of the deposit.
3—From borehole No. 1, 250 feet from north end of deposit at a depth of 40 feet.
4— " " " " 50 "
5— " " " " 60 "
6— " " " " 70 "
7— " " " " 80 "
8— " " " " 90 "
9— " " " " 100 "
10— " " " " 110 "
11— " " " " 120 "
12— " " " " 130 "
13— " " " " 140 "
14— " " " " 150 "
15— " " " " 160 "
16— " " " " 162 "
17—From borehole No. 2, 950 feet from northern end of deposit at a depth of 50 feet.
18— " " " " 60 "
19— " " " " 70 "
20— " " " " 72 "
21— " " " " 90 "
22— " " " " 100 "
23— " " " " 110 "
24— " " " " 120 "
25— " " " " 130 "
26— " " " " 140 "
27— " " " " 150 "
28— " " " " 160 "
29— " " " " 162 "

IRON ORES.—MAGNETITE AND HEMATITE: TABLE VIII.—*Continued.*

GLOUCESTER COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Insoluble.	Manganese.
30	44·23	0·045	0·385	28·05	.....
31	42·52	0·086	0·732	24·04	.....
32	48·55	0·046	0·981	17·31	.....
33	45·36	0·056	1·000	16·12	.....
34	46·72	0·082	1·080	16·25	.....
35	50·78	0·150	0·870	14·76	.....
36	50·07	0·750	1·130	15·28	.....
37	.....	19·400	.....	.....	.....
38	.....	10·800	.....	.....	.....
39	45·99	0·050	1·210	21·57	.....
40	46·60	0·020	1·040	24·70	1·76
41	43·41	0·020	0·820	25·21	.....
42	43·60	0·007	0·400	33·10	0·50
43	44·55	0·035	0·827	28·52	.....
44	47·50	0·054	0·650	22·70	1·20
45	61·70	0·026	0·119	7·21	.....

Locality of occurrence.

Group I (continued). From the core of a diamond drill. From borehole No. 4, situated 500 feet west of borehole No. 2, on the property of the Twin Tree Mining Co.

30—Depth 434 feet to 444 feet, average.
31— " 444 " 454 " "
32— " 454 " 464 " "
33— " 464 " 474 " "
34— " 474 " 484 " "
35— " 484 " 494 " "
36— " 494 " 504 " "
37— " 504 " 514 " "
38— " 514 " 524 " "
39—Group II, east of Austin brook, from deposit No. 1.
40— " " " " " " 2, south end.
41— " " " " " " 2, north end.
42— " " " " " " 4.
43—Group III, 1,600 feet north of Group II, surface specimen.
44— " " " " " "
45— " " " " " "

IRON ORES.—MAGNETITE AND HEMATITE: TABLE VIII.—*Continued.*

GLOUCESTER COUNTY.

Number.	Depth.	Iron.	Sulphur.	Phosphorus.	Insoluble.
	Feet.				
1	23 to 32	50·52	0·093	0·900	17·80
2	33 „ 42	52·17	0·030	1·612	10·75
3	43 „ 52	52·06	0·037	1·031	13·80
4	53 „ 62	52·83	0·037	0·520	14·10
5	63 „ 72	55·82	0·043	0·900	10·50
6	73 „ 82	48·81	0·063	1·042	18·00
7	80 „ 92	50·16	0·057	0·955	18·00
8	93 „ 102	41·65	0·040	0·372	22·50
9	103 „ 112	42·97	0·040	0·810	20·45
10	113 „ 122	39·52	0·033	1·222	23·10
11	123 „ 132	51·09	0·040	0·975	15·00
12	133 „ 132	54·08	0·060	0·530	15·00
13	143 „ 152	42·74	0·347	0·900	17·85
14	153 „ 162	41·73	0·117	0·640	18·50
15	163 „ 172	45·11	0·070	0·879	18·00
16	173 „ 182	46·97	0·107	1·181	17·51
17	183 „ 192	47·92	1·383	0·735	16·85
18	193 „ 202	38·24	1·492	0·960	21·81
19	203 „ 212	47·92	0·093	0·620	12·65
20	213 „ 222	51·63	0·143	0·915	13·80
21	223 „ 232	49·52	2·433	0·965	16·65
22	233 „ 242	53·51	0·080	0·810	13·41
23	243 „ 252	56·52	0·080	0·675	12·65
24	253 „ 262	55·33	0·135	0·695	7·92
25	263 „ 272	48·54	0·130	1·095	15·32
26	273 „ 282	42·65	0·093	0·710	19·07
27	283 „ 292	47·96	0·030	0·891	17·36
28	293 „ 302	45·47	0·071	0·785	21·10
29	303 „ 312	51·48	0·050	0·975	13·75
30	313 „ 322	52·29	0·030	1·075	13·00
31	323 „ 332	54·90	0·062	0·929	13·35
32	333 „ 342	50·71	0·370	0·785	14·65
33	343 „ 347	59·49	0·200	0·725	6·52
34	348 „ 353	.....	18·20	.....	.....

Locality of occurrence.

Group III. From the core of a diamond drill, at the depths indicated, from borehole No. 5, on the property of the Twin Tree Mining Co., at Austin Brook.

Nova Scotia.

The 191 partial analyses, arranged in tabulated form, were made upon material collected by Dr. J. E. Woodman, at the several undermentioned localities, and referred to by him in his Report on the Iron Ore Deposits of Nova Scotia, Part I.

IRON ORES.—HEMATITE: TABLE IX.

ANNAPOLIS COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Silica.	Alumina.	Lime.	Magnesia.
1	40·52						
2	55·10	0·003	1·07	8·83	4·00	2·50	0·28
3	48·92	0·008	1·27	16·74	3·50	2·85	0·58
4	54·11	0·004	1·31	9·36	3·50	2·50	0·43
5	46·61	0·004	1·28	14·40	4·13	5·98	0·62
6	47·62	0·054	1·17	17·81	5·23	2·35	0·45
7	30·81						
8	33·10						
9	30·22						
10	44·20						
11	43·13						
12	54·22	0·019	0·90	11·86	3·12	0·90	0·25
13	45·31	0·119	1·48	2·00	3·67	3·40	0·52
14	43·87						
15	39·21						
16	17·45						
17	49·80	0·002	1·32	11·32	7·00	2·80	0·55
18	48·71	0·006	1·68	17·07	2·16	4·55	0·43
19	43·20						
20	52·25	0·017	1·44	10·40	5·20	2·65	0·33
21	36·81						
22	31·90						

Locality of occurrence.

1—Torbrook. Wheelock shaft. Sampled from a train load of ore.
2— " Hoffman shaft. General sample from ore pile.
3— " Pit 28, first E. of Hoffman shaft. Best ore obtainable.
4— " Pit 27, second E. of Hoffman shaft. From a 1½ ton dump.
5— " Holland property. From a shaft on Shell vein.
6— " Holland property. East pit, Leckie mine.
7— " Pit on Stanley Brown's property.
8— " Josephine Wheelock's property. From a core, upper 2 feet of a 60 ft. bed.
9— " Josephine Wheelock's property. From a core, lower 10 feet of a 60 ft. bed.
10— " Edward Martin's property. From a 5 ton dump.
11— " Edward Martin's property. From a 4'-5" belt.
12— " Leckie mine. Sample from loaded cars.
13— " Leckie mine. From underhand slope, level No. 6.
14— " Messenger vein, Pit No 2. S. Mountain bed. Average of 500 lbs.
15— " Messenger vein, Pit No. 1. S. Mountain bed. Average of 200 lbs.
16— " Clementsvale, Milkway farm. From dump on S. side.
17— " E. Bank's estate. Pit on Shell vein. Average of a 7 ft. belt.
18— " Allen property, E. side. Northernmost of two pits.
19— " Allen property. Sample across belt.
20— " H. P. Wheelock's property, Pit 44. From shallow pit in trench.
21— " J. Parker's property. From a small dump.
22— " Uhlman property, near Canaan Mountain road. Average of 1 ton.

IRON ORES.—MAGNETITE: TABLE X.

ANNAPOLIS COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Silica.	Alumina.	Lime.	Magnesia.
23.	46·21	0·064	1·160	19·93	5·22	3·08	0·50
24.	46·21	0·004	1·090	20·93	4·33	2·20	0·37
25.	34·92						
26.	35·83						
27.	43·40						
28.	48·03	0·005	1·320	19·11	6·20	2·95	0·38
29.	47·09	0·051	1·390	20·20	3·70	4·55	0·45
30.	45·82	0·010	1·440	22·16	4·93	4·15	0·42
31.	49·51	0·009	0·745	19·56	5·46	2·15	0·90
32.	54·53	0·003	1·000	12·68	2·50	0·95	0·43
33.	36·41						
34.	38·52						
35.	36·41						
36.	34·73						
37.	22·11						
38.	24·72						
39.	23·61						
40.	19·60						
41.	28·80						
42.	47·70	0·018	1·270	8·07	3·62	8·80	0·90
43.	9·80						
44.	40·90						
45.	52·33	0·003	1·920	9·37	0·35	7·80	0·75
46.	53·32	0·005	1·310	9·68	4·69	2·75	0·65
47.	53·52						
48.	48·52	0·017	1·690	13·73	5·00	4·40	0·55
49.	45·62	0·365	1·105	10·98	7·02	8·65	0·96
50.	47·36	0·505	1·115	9·00	6·00	8·72	1·00

Locality of occurrence.

23—Torbrook. Whitfield Wheelock property. Timbered pit on mountain bed.
24— " Stanley Brown's property. Pit No. 6, South Mountain bed. Old timbered shaft.
25— " Stanley Brown's property. South Mountain bed. Picked sample.
26— " I. J. Whitman's property. South Mountain bed. Average of 100 lbs.
27— " Obadiah Brown's property. South Mountain bed. From a 15 ft. trench.
28— " E. and M. Baker's property, No. 1 pit. South Mountain bed. Average of 1 ton.
29— " E. and M. Baker's property, No. 2 pit. South Mountain bed.
30— " Baker, No. 1 pit. General sample of ore in cross section.
31— " Baker, No. 2 pit. General sample of ore of 4'-5" bed.
32— " S. McConnell property, No. 1 pit, South Mountain bed. Average of 2 tons.
33— " S. McConnell property. No. 3 pit, South Mountain bed. Average of 3 tons.
34— " S. McConnell property. Core.
35— " McConnell property. No. 1 pit. Selected sample of belt.
36— " McConnell property. No. 3 pit. Average sample of 4 ft. belt.
37— " M. and E. Armstrong's property. Best in a 6 to 7 ton dump of ore and waste.
38— " M. and E. Armstrong's property. Least slaty ore from pit.
39— " Pit No. 19, on left bank of river, ¼ mile N. of South Mountain bed. Selected.
40— " Hoffman & Bidito's property. Least siliceous in a 10 ton dump.
41— " Ward property. From a pit, south of the western end of the trench.
42— " Ward property. East pit. Best ore from a 10 ton dump.
43— " Ward property. East pit. Most calcareous ore.
44— " Fletcher Wheelock's property. General sample from dump.
45— " Edward Martin's property. Average from surface pit on a 4 ft. belt.
46— " Edward Martin's property. Shell vein. Average of a ¼ ton dump.
47— " Edward Martin's property. Shell vein. Average of a 3'-8" belt.
48— " Near Goucher and Wheelock's property. From a 6 ft. belt.
49— " Fletcher Wheelock's property. Average sample from an old dump.
50— " Fletcher Wheelock's property. Average sample from No. 1 level

IRON ORES.—MAGNETITE : TABLE X.—*Continued.*

ANNAPOLIS COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Silica.	Alumina.	Lime.	Magnesia.
51	42·41						
52	18·20						
53	24·81						
54	32·62						
55	31·12						
56	30·32						

Locality of occurrence.

51—Torbrook. Fletcher Wheelock's property. Average sample from No. 2 level.
52— " Wheelock shaft. General sample across Leckie vein in north cross-cut.
53— " Page and Stearns' property. Doane ore.
54— " Page and Stearns' property. From small ore dump.
55— " Heatley pit. West of Nictaux river.
56— " J. B. Foster property. From small dump derived from two pits.

IRON ORES.—HEMATITE : TABLE XI.

ANTIGONISH COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Silica.	Alumina.	Lime.	Magnesia.
57	29·70						
58	38·82						
59	25·81						
60	25·29						
61	39·23						
62	36·45						
63	38·10						
64	34·97						
65	37·09						
66	40·07						
67	37·37						
68	26·32						
69	38·91						
70	40·09						
71	39·52						
72	46·38	0·012	0·715	23·56	4·83	1·65	0·22
73	39·10						

Locality of occurrence.

57—Arisaig. Doctor brook, east branch. Average sample of a 5 ft. belt.
58— " " " " " of a 3'-9' belt.
59— " " " " " from face.
60— " " " West side.
61— " " " " Average from face.
62— " " " " Second sample.
63— " " " East side. Average from belt.
64— " " " General sample of belt.
65— " " " East side. Sample of belt.
66— " " east side. General sample from belt.
67— " " east branch, east bank. Best ore obtainable.
68— " " " " Best in 1 ton dump.
69— " " 5th branch, west bank. Selected dump sample.
70— " " east branch, east bank. Selected from 500 lb. dump.
71— " " " west bank. Selected from 4 ton dump.
72— " " " " Selected from 20 ton dump.
73— " " " oolitic ore from a 6 ton dump.

IRON ORES.—HEMATITE: TABLE XI.—*Continued.*

ANTIGONISH COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Silica.	Alumina.	Lime.	Magnesia.
74.	34·95						
75.	31·93						
76.	35·81						
77.	37·23						
78.	46·00	0·012	0·700	18·63	8·70	2·70	0·86
79.	42·32						
80.	46·52	0·011	0·785	14·68	6·23	4·90	1·12
81.	40·23						
82.	26·31						
83.	41·10						
84.	39·61						
85.	45·00	0·015	0·530	28·40	0·84	1·05	0·42
86.	38·82						
87.	35·26	0·019	0·850	17·60	7·00	11·75	0·42
88.	35·62						
89.	21·21						
90.	29·51						
91.	44·00						
92.	32·81						
93.	28·42						
94.	24·22						
95.	51·80	0·007	0·705	15·06	5·53	1·65	0·62
96.	9·20						
97.	34·85						
98.	40·93						
99.	22·32						
100.	49·06	0·003	0·585	16·13	7·27	1·60	0·28
101.	43·62						
102.	35·31						

Locality of occurrence.

74—Arisaig. Iron brook. General sample from belt.
75— " " South side. General sample from belt.
76— " " West side. General sample of face belt.
77— " " A dump sample.
78— " Ross brook. General sample from face of belt.
79— " Gilles brook. From a new opening on east bank. Average sample.
80— " " From an old exposure on brook bed.
81— " Grants brook. Lower pit. Average sample of least siliceous ore.
82— " " Upper opening.
83— " McInnes brook, just west of. Average of an 8 ft. bed of oölitic ore.
84— " " east branch, east bank. Average of a 3 ton dump.
85— " " east branch, east bank. From a 4 ft. lead.
86— " " short distance from. From a 10 ft. lead S. of tunnel lead.
87— " Trunk Road, N.E. pit. General sample of belt.
88— " " S.W. pit. General sample of belt.
89— " D. McKenzie proporty, east opening. Average of whole, except 3′ on S. wall.
90— " D. McKenzie property, west opening.
91— " " " E. of Doctor brook. From 500 lb. dump at west end.
92— " " " " From 500 lb. dump at east exposure.
93— " " " " Average of lead, S. of McKenzie lead.
94— " " " " Pit 34. Best from 1,000 lb. dump.
95— " John McPherson's property. Average of 4 feet of good ore on hanging wall.
96— " " " Average of 2′-4′ siliceous belt, S. of foot-wall.
97—Arisaig. John McPherson's property, W. of McInnes brook. Average sample.
98— " Louis McDonald's property. General sample of belt.
99— " " " " "
100— " " " Sample from dump of tunnel.
101— " " " Selected sample from dump.
102— " " " " " "

IRON ORES.—HEMATITE: TABLE XI.—*Continued.*

ANTIGONISH COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Silica.	Alumina.	Lime.	Magnesia.
103	43·62						
104	47·58	0·007	0·725	17·50	6·73	2·20	0·56
105	40·23						
106	53·27	0·013	0·840	12·00	7·26	2·00	0·32
107	43·45	0·004	1·23	24·60	5·33	3·90	0·12
108	52·37	0·013	0·486	13·64	6·36	1·30	0·46
109	48·50	0·047	0·815	16·13	8·50	1·80	0·50
110	47·15	0·003	0·720	18·19	7·80	1·65	0·72
111	24·02						
112	41·40						
113	33·52						
114	34·51						
115	28·71						
116	27·18						

Locality of occurrence.

103—Arisaig. R. McDonald's property. Average sample of belt.
104— " Alex. McDonald's property, W. of McInnes brook. Average of 5 ft. belt.
105— " " " " " " Drift boulder.
106— " Andrew McDonald's property, E. of McInnes brook. Pit S. of tunnel lead.
107— " " " " " " Pit in tunnel lead.
108— " " " " " " From tunnel leading E.
109— " Alex. McDonald's property. From 14″ of good ore on south wall.
110— " John McDonald's property, E. of McInnes brook. Pit in tunnel lead.
111— " Angus McIsaac's property. Average sample of 4 ft. belt.
112— " John McInnes' property. A dump sample.
113— " " " W. of McInnes brook. Average.
114— " " " " "
115— " " "
116— " From a 2½ ft. vein of ore, north of pit No. 1.

IRON ORES.—HEMATITE: TABLE XII.

CAPE BRETON COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Insoluble.	Silica.	Alumina.	Lime.	Magnesia.
117	24·50							
118	43·58							
119	32·62							
120	48·70	0·087	0·065	.....	4·62	1·90	9·25	0·68
121	35·00							
122	62·97	0·020	0·010	7·20				
123	55·56	0·005	0·060	16·02				
124	56·79	0·022	0·008	12·75				
125	42·51							

Locality of occurrence.

117—Barachois. Ingraham property. Westernmost trench of small body of ore.
118— " " " Pit No. 3, N.E. of big pit. Sample of face.
119— " " " " " " From 3 ton dump.
120— " " " Big pit. Average of surface of 500 ton dump.
121— " " " Lower pit. Average of spathic and specular ores.
122—Ben Eoin. Simon Gillies' property.
123—Big Pond. Pit on McIntyre's farm. Best ore on the dump.
124—East Bay. Currie property. Average from large ore dump.
125— " Campbell property. Average from ½ ton dump.

CAPE BRETON

Number.	Iron
126	56·6
127	62·1
128	56·3
129	62·4
130	64·1
131	60·8
132	63·2
133	62·3
134	53·7
135	59·0
136	59·4
137	62·4
138	34·0
139	59·6
140	52·1
141	62·7
142	53·2
143	60·7
144	55·0
145	54·7
146	60·4
147	65·1

126—Enon. J. A.
127— " A. M
128— " McI
129—Gabarus. V
130—Grand Mira
131— "
132— "
133— "
134— "
135— "
136— "
137—Lorraine. S
138—Marion Brid
139— "
140— "
141— "
142— "
143— "
144—St. George c
145—Sydney river
146—Upper Beefr
147— "

IRON ORES.—HEMATITE: TABLE XII.—*Continued.*

CAPE BRETON COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Insoluble.	Silica.	Alumina	Lime.	Magnesia.
126	56·60	0·110	0·008	10·00				
127	62·12	0·030	0·007	9·70				
128	56·37	0·022	0·007	11·93				
129	62·47	0·137	0·187	9·28				
130	64·17	0·016	0·244	6·60				
131	60·82	trace.	0·419	9·48				
132	63·22	0·010	0·251	8·70				
133	62·35	0·007	0·113	7·24				
134	53·76	0·030	0·206	15·84				
135	59·03	0·004	0·726	12·75				
136	59·40	.....	.....	9·35				
137	62·47	0·173	0·568	8·48				
138	34·00	0·002	0·118	(MnO 1·69)	11·98	3·38	16·48	0·73
139	59·63	.....	.....	8·00				
140	52·12	.....	.....	18·60				
141	62·70	0·040	0·007	(MnO 0·13)	5·52	2·31	0·38	0·12
142	53·23	.....	.....	8·80				
143	60·72	.....	.....	7·80				
144	55·09	trace.	0·216	12·72				
145	54·70	0·013	0·012	6·98				
146	60·47	0·023	0·012	9·20				
147	65·19	trace.	0·023	4·40				

Locality of occurrence.

126—Enon. J. A. McVicar's property. Best ore on a 100 lb. dump.
127— " A. McVicar property. Best ore on a ½ ton dump.
128— " McIntyre brook. Sample from combined output of two pits.
129—Gabarus. Vein of red hematite, west of Rouses point.
130—Grand Mira. James Gillies' property. Pit 21. Selected sample from dump.
131— " John Gillies' property. Selected from ore on dump.
132— " L. Gillies' property. Average sample from 100 lbs.
133— " " " " " "
134— " " " Pit 20. Sample of a 3″ bed.
135— " McKinnon property. Pit No. 1. From dump. Ore selected.
136— " " " Pit No. 2. Across a 5″ bed of ore.
137—Lorraine. Sample taken from many drift boulders.
138—Marion Bridge. H. Brown's property. Pit No. 2. Culled from dump.
139— " " " Pit No. 1. Sample from dump.
140— " C. McKeigan's property. Average of small ore bed.
141— " J. McKeigan's property. Pit No. 2. Sample from dump.
142— " " " Pit No. 1. Sample from dump.
143— " " " Near the bridge. Average of a 7″ bed.
144—St. George channel. Smith mine. Selected sample from dump.
145—Sydney river, north side. Average of a ½ ton dump.
146—Upper Beefroy lake, west side. From a contact deposit in Pre-Cambrian slates.
147— " " east side. From a vein in felsite.

IRON ORES.—MAGNETITE: TABLE XIII.

CAPE BRETON COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Insoluble.	Silica.	Alumina.	Lime.	Magnesia.
148	55·47	0·024	0·030	.....	7·06	1·96	0·30	9·16
149	30·40							
150	48·38	0·254	0·040	.....	9·60	2·12	2·15	8·62
151	32·32							
152	43·39							
153	40·63							
154	49·07	0·837	0·040	.....	9·60	2·57	1·60	10·06
155	26·72							
156	25·51							
157	40·52							
158	38·29							
159	62·08	trace.	0·368	6·62				
160	61·09	0·021	6·340	7·68				
161	59·46	trace.	0·013	7·36				

Locality of occurrence.

148—Barachois. McPherson's property. General sample from big pit near road.
149— " " " Pit No. 1. Nearest road.
150— " " " Pit No. 2. Average of 10 ton dump.
151— " " " Pit No. 2. Average of 200 pounds.
152— " " " Pit No. 2. From a cut on N. end.
153— " " " Pit No. 4. Average of a 20 ton dump.
154— " " " Pit No. 5. Average of a 5 ton dump.
155— " " " Easternmost pit.
156— " " " From 200 lb. dump, highly sulphurous.
157— " Sheriff Ingraham's property, Pit No. 1.
158— " " " Pit No. 2.
159—Grand Mira, John Gillies' property. From ore on dump.
160— " L. Gillies' property. Samples of dark siliceous ore on dump.
161— " " Pit 29, selected from dump.

IRON ORES. HEMATITE AND MAGNETITE: TABLE XIV.

COLCHESTER COUNTY.

(*a*) Hematite.

Number.	Iron.	Sulphur.	Phosphorus.	Silica.	Alumina.	Lime.	Magnesia.
162	55·77	0·016	0·085	9·96	1·81	0·40	0·22 MnO_2 0·28
163	10·71						
164	14·80						
165	14·80						
166	15·84						
167	39·20						
168	39·82						
169	43·62						

(*b*) Magnetite.

170	56·09	0·500	0·210	17·18	0·10	0·15	2·02 CuO 0·15

Locality of occurrence.

(*a*) Hematite.

162—Clifton. General sample of ore from dump by shaft.
163—Londonderry. Sample of paint in drift, Miller brook.
164— " Old Mountain mine, ankerite stock pile.
165— " Old Mountain and East mines, siderite stock piles.
166— " " " general sample.
167— " " mine. From paint, fine limonite stock pile.
168— " " mine. A mixture of specular, siderite, and limonite.
169— " Roger's pits. Average of No. 1 ore from stock pile.

(*b*) Magnetite.

170—Londonderry. Gerrish mountain. Sample of a 30 ton dump. Diorite gangue.

IRON ORES. HEMATITE: TABLE XV.

CUMBERLAND COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Insoluble.
171	41·18	.....	.....	20·10
172	49·62	trace.	0·301	6·48

Locality of occurrence.

171—Pugwash Junction. Tuttle property. From large dump.
172— " " From small dump.

IRON ORES.—HEMATITE : TABLE XVI

GUYSB ROUGH COUNTY.

Number.	Iron.	Sulphur.	Phosphorus	Insoluble.
173	67·20	0·008	0·018	2·16

Locality of occurrence.

173—Guysborough. Intervale. Drumphy brook. Drift and dump at mouth of tunnel.

IRON ORES.—HEMATITE AND LIMONITE : TABLE XVII.

HANTS COUNTY.

(*a*) Hematite.

Number.	Iron.	Sulphur.	Phosphorus.	Silica.	Alumina.	Lime.	Magnesia.	
174	58·86	0·012	0·045	5·79	1·80	3·05	0·18	Mn_2 0·63
175	56·88	0·011	0·055	5·99	1·81	3·12	0·20	Mn_2 0·48

(*b*) Limonite.

176	37·91							Mn_2 2·13
177	34·41							Mn_2 0·66

Locality of occurrence.

(*a*) Hematite.

174—Selma. Ells property. General sample of ore dump of Sweeney pit.
175— " " " 15 ton dump near old shaft.

(b) Limonite.

176—Cambridge. Tomlinson property. Samples from an old dump.
177— " Goshen mine.

IRON ORES.—MAGNETITE AND HEMATITE : TABLE XVIII.

INVERNESS COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Insoluble.	Silica.	Alumina.	Lime.	Magnesia
178	62·45	0·234	0·024		7·20	1·19	1·75	0·58
179	38·81							
180	57·05	0·006	0·490		11·16	5·20	1·80	1·66
181	53·40	0·016	0·770		12·92	4·41	2·05	1·60
182	47·40	0·128	0·570		23·70	3·40	1·55	1·74
183	56·60	0·009	0·805		9·00	7·96	1·95	1·68
184	56·70	0·127	0·506		15·07	3·52	1·16	1·70
185	46·20	0·020	0·100		25·77	5·01	0·55	0·42
186	48·70	0·017	0·525		24·30	4·62	1·95	1·00
187	50·10	0·060	0·003	10·00				

Locality of occurrence.

178—Whycocomagh. Iron brook. Sample from dump on S. bank Campbell brook.
179— " " From an old opening in dried up stream.
180— " " From boulders lying in front of lower tunnel.
181— " " Drummond area, close to S. side. Surface of 150 ton dump.
182— " " Drummond area. Average sample of back of tunnel.
183— " " Drummond area. Average sample from centre of vein, back of tunnel.
184— " " Drummond area. Average sample from small tunnel.
185— " " Logans glen. General sample from a depth of 20 feet.
186— " " Skye mountain.
187— " " Drummond mine. Best ore from a recent working.

IRON ORES.—HEMATITE : TABLE XIX.

RICHMOND COUNTY.

Number.	Iron.	Sulphur.	Phosphorus.	Insoluble.
188	48·92	1·850	0·092	7·20
189	45·10	0·009	0·554	8·40
190	63·57	0·137	0·014	5·57
191	60·19	trace	0·025	10·20

Locality of occurrence.

188—Barra Head. Micmac mine. Leonard shaft. From dump.
189— " " Best ore obtainable at old shaft.
190—Loch Lomond, east shore. Sample taken from boulders.
191—Madame island. Mackerel cove. Selected sample.

192. *Hematite*—from East Roman valley, Guysborough county, Nova Scotia.

Hematite, carrying an occasional minute particle of pyrite, with which is associated a very small quantity of siliceous gangue.

Its composition was found to be as follows:—

	Per cent.
Metallic iron	67·960
Insoluble mineral matter	2·17
Sulphur	0·016
Titanium dioxide	None.

193. *Hematite*—from Ben Eoin, on the shore of Great Bras d'Or lake, Cape Breton county, N.S. Examined for Mr. Daniel MacLean.

Hematite, with a little red ochre, in association with a small quantity of gangue, composed for the most part of calcite and quartz.

It contained:—

Metallic iron	53·64
Insoluble siliceous matter	8·62
Titanium dioxide	None.

194. *Hematite*—impure—from a point some two miles from Dorchester Corners, Westmorland county, N.B.

Massive, earthy hematite, in association with a large proportion of siliceous and argillaceous gangue.

Its analysis yielded the following results:—

Metallic iron	30·81
Insoluble mineral matter	54·84
Titanium dioxide	None.

195. *Limonite*—from the head of Indian harbour, Guysborough county, N.S.

An average sample prepared from the specimen sent—some five pounds in weight—was found, on analysis, to contain:—

Metallic iron	48·29
Insoluble mineral matter	5·20
Titanium dioxide	None.

196. *Limonite*—from the river bank, below George Clark's, near the mouth of Black brook, where it empties into West river St. Mary, Caledonia, Guysborough county, N.S.

An average sample was found to contain:—

Metallic iron	45·63
Insoluble mineral matter	16·20
Titanium dioxide	None.

197. *Clay ironstone*—from the township of Falmouth, about four miles south-east of the town of Windsor, Hants county, N.S.

It contained:—

Metallic iron	26·77
Insoluble mineral matter	11·90

Another sample from the same locality, but from a different bed, contained:—

Metallic iron	23·81
Insoluble mineral matter	14·90

CHROME IRON ORE.

The following partial analyses, 27 in number, were made by Mr. H. A. Leverin, upon material collected by Mr. Fritz Cirkel, C.E., at the undermentioned localities, in Megantic and Wolfe counties, Quebec.

Mr. Cirkel's report—Chrome Iron Ore: Its Properties, Refining, and Uses—contains full particulars of the deposits from which these samples were taken.

CHROME IRON ORE: TABLE I.

MEGANTIC COUNTY.

Number	Chromic oxide (Cr_2O_3)	Equivalent of Chromium.	Alumina (Al_2O_3)	Ferrous oxide (FeO)	Magnesia (MgO)	Lime (CaO)	Silica (SiO_2)
1	43·57	29·83	13·90	17·61	3·86	0·20	12·62
2	41·20	28·21					
3	51·18	35·00					
4	7·47	5·10					
5	43·29	29·64					
6	34·86	23·87					
7	0·07	0·05	1·36	8·36	46·86	0·10	38·34
8	45·95	31·46	8·90	22·50	4·90	0·12	7·68
9	45·39	31·28					
10	3·23	2·21					
11	2·76	1·91	6·90	12·47	20·92	0·90	27·48
12	6·42	4·39					
13	.....	20·71					
14	.....	trace					
15	30·80	20·75					
16	43·24	29·47	7·12	17·74	4·60	14·17	8·26
17	43·82	30·00					
18	18·57	12·24	4·79	15·30	24·72	0·10	25·22
19	0·73	0·50					
20	43·44	29·87	6·45	19·42	6·50	0·12	11·28
21	35·90	24·58	8·72	16·96	10·20	0·10	16·00
22	45·87	31·39	12·39	16·32	6·20	0·15	6·64
23	41·35	28·31					

Locality of occurrence.

1—Crude ore, main shaft, Black Lake Chrome & Asbestos Co., near Black Lake.
2— " " " " " Picked samples.
3— " " " " " "
4—Tailings from mill, Black Lake Chrome & Asbestos Co.
5—Crude ore, main pit, Standard Asbestos Co., Black Lake.
6—Disseminated ore, main pit, Standard Asbestos Co., Black Lake.
7—Serpentine from main pit, lot 16, range A, of Coleraine, Canadian Chrome Co.
8—Crude ore from main pit, lot 16, range A, of Coleraine, Canadian Chrome Co.
9—No. 1, concentrates from the mill of The Canadian Chrome Co.
10—Tailings from the same mill.
11—Coleraine, lot 6, range B, pit No. 7. Picked ore, American Chrome Co.
12— " lot 7, range B. Fibred hornblende, American Chrome Co.
13— " lot 26, range B. Disseminated ore.
14— " lots 25 and 26, range II. Serpentine from main pit, Dominion Chrome Co.
15— " lots 25 and 26, range II. Disseminated ore, main cut on Ross lot.
16— " lot 26, range II. No. 1, crude ore, Dominion Chrome Co.
17— " lot 8, range XIII. Indian reserve, crude ore.
18— " lot 5, range IV. Disseminated ore.
19— " lot 19, N.W. Dr. Reid's property. Serpentine.
20— " " " " Crude ore from open-cut.
21— " block A, near Black Lake, Frechette's property. Crude ore.
22—Ireland tp., lot 28, range II. Crude ore.
23— " " " Disseminated ore.

CHROME IRON ORE: TABLE II.

WOLFE COUNTY.

Number.	Chromic oxide (Cr_2O_3)	Equivalent of Chromium.	Alumina (Al_2O_3)	Ferrous oxide (FeO)	Magnesia (MgO)	Lime (CaO)	Silica (SiO_2)
24	23·27	15·80	6·52	15·20	17·75	0·10	21·30
25	27·55	18·89	8·10	15·82	12·96	0·10	20·76
26	32·51	22·26	6·28	16·84	23·40	0·20	7·78
27	32·51	22·26	9·20	18·12	16·92	0·15	15·69

Locality of occurrence.

24—Garthby tp., lots 36 and 37, range V. Crude ore from main pit of Brousseau mine.
25— " " 36 and 37, " " " " "
26— " " 36 and 37, " " " " "
27— " " 36 and 37, " " " " "

Chromite—from Black Lake, Quebec, two samples.[1] Their composition was found by Mr. M. F. Connor to be as follows:—

—	Sample A.	Sample B.
Chromium trioxide	45·30	48·20
Alumina	10·34	11·24
Ferrous oxide	13·94	15·66
Manganous oxide	0·32	0·36
Lime	2·50	1·50
Magnesia	16·70	15·66
Titanic oxide—TiO_2	0·12	0·12
Silica	6·54	4·10
Carbonic anhydride	2·46	1·45
Water—loss at 110° C	0·12	2·05
" " above 110° C	2·03	
	100·37	100·34

[1]Collected by Mr. J. A. Dresser, M.A., and refefred to by him in his Report on the Asbestos and Chromite deposits of a Portion of the Eastern Townships of Quebec.

COPPER ORE.

British Columbia.

1. From Moresby island, Pacific coast.
Sample marked 'Ruth No. 1, 14 ft. level.'
Quartz carrying very little copper pyrites.
It was found to contain:—

	Per cent.
Metallic copper	1·58

2. Another sample, marked 'Ruth No. 2, 28 ft. level,' similar in character, from the same locality, contained:—

	Per cent.
Metallic copper	9·88

Ontario.

3. From lot 10, con. V, of Cobden, Algoma district, Ont.
Quartz, carrying copper pyrites.
It contained:—

	Per cent.
Metallic copper	20·00

4. From lot 2, con. VI, of James, in Nipissing district, Ont.
An association of calcite and copper pyrites.
It contained:—

	Per cent.
Metallic copper	15·62

5. From SE ¼ of lot 6, con. VI, of James, Nipissing district.
Siliceous rock, carrying a somewhat large quantity of copper pyrites.
It contained:—

	Per cent.
Metallic copper	10·28
	Oz. per ton.
Silver	1·25

6. From lot 2, con. III, of Field tp., Nipissing district, Ont.
Feldspar, carrying copper pyrites.
It contained:—

	Per cent.
Metallic copper	12·40

Quebec.

7. From the SW ¼ of lot 14, range XIV; and the SW ¼ of lot 14 B, range XIII, of Leeds, Megantic county, Que.

Copper pyrites, and a very little bornite, in association with a somewhat large proportion of siliceous gangue, composed mainly of quartz, mica, chloritic schist, and a trifling quantity of feldspar.

An average of the whole sample was found to contain:—

	Per cent.
Metallic copper	19·36

GOLD AND SILVER ASSAYS.

Yukon Territory.

1. From the Dome, thirty miles from Dawson.

White quartz.

It contained:—

Gold.. .. .. 0·46 of an ounce.
Silver.. .. .. 0·14 of an ounce to the ton of 2,000 lbs.

2. Also from the Dome.

Quartz carrying a small quantity of galena.

It contained:—

Gold.. .. .. 0·06 of an ounce.
Silver.. .. .. 1·58 ounces to the ton of 2,000 lbs.

British Columbia.

3. Black sand from hydraulic workings, fifty miles southeast of Lillooet, on Alexander creek, a tributary of Bridge river, which flows into the Fraser.

The material of this sample was separable into a magnetic portion consisting of magnetite, and a non-magnetic portion consisting of small particles of hematite, garnet, prase, white quartz, and feldspar. These portions were separately examined for the presence of platinum, but that metal was found to be absent.

4. From Butterfly claim, situated near Beaverdell, Yale district.

Quartz, in part crystalline, carrying a small quantity of zinc blende and of iron pyrites.

It contained:—

Gold.. .. .. 0·33 of an ounce.
Silver.. .. .. 1·00 ounce to the ton of 2,000 lbs.

5. From Lyon claim, Skeena district.

Quartz, carrying a small quantity of mispickel.

It yielded on assay:—

Gold.. .. .. 0·52 of an ounce.
Silver.. .. .. 0·40 of an ounce to the ton of 2,000 lbs.

6. From O'Hara claim, Skeena district.

Quartz, carrying a small quantity of mispickel.

It contained:—

Gold.. .. .. 0·24 of an ounce.
Silver.. .. .. 0·08 of an ounce to the ton of 2,000 lbs.

7. From Moresby island, on the Pacific coast. Sample marked 'Ruth No. 1, 14 ft. level.'

Quartz, carrying a small quantity of copper pyrites.

It contained:—

Gold.. .. .. 0·01 of an ounce per ton.
Silver.. .. .. 3·00 ounces per ton.
Copper.. .. .. 1·58 per cent.

8. A second sample from the same locality, marked 'Ruth No. 2, 28 ft. level,' and of the same general character, was found on assay to contain:—

Gold	Trace.
Silver	1·13 ounces per ton.
Copper	9·88 per cent.

9. From the Tulameen river.

This sample, collected by Mr. R. W. Brock, consisted principally of magnetite.

It contained:—

Platinum	0·024 of an ounce to the ton of 2,000 lbs.

10. A second sample—green serpentine—from the same locality as the preceding specimen, contained only a trace of platinum.

11. From a claim on the west side of Clearwater river, a tributary of the Thompson.

Calcite, carrying small quantities of zinc blende, and of galena.

It contained:—

Gold	None.
Silver	1 ounce to the ton of 2,000 lbs.

12. Teslin river.

Four samples of black magnetic sand, obtained by washing the gravels of the river bed at the following points:—

(1) From a bar at Sixmile cabin, six miles from the mouth of the river.

(2) From O'Brien and Cumming's bar, about forty to forty-two miles from the river mouth.

(3) From a point about sixty miles up stream, and one mile below the mouth of Boswell river.

(4) About seventy miles up from the mouth of the river.

Content, expressed in grains per cubic yard of gravel, calculated on the basis of 125 pans per cubic yard:—

Sample.	Gold.	Silver.	Platinum.	Osmiridium.
(1)	98·6	20·2	2·30	Trace
(2)	18·8	2·8	1·20	0·025
(3)	20·8	4·4	0·34	
(4)	15·6	2·4		

The eight following specimens are from the several claims as indicated below, which are all situated in Hudson Bay Mountain district, in the Omineca mining division.

13. From 'Humming Bird' mine.

Granitic rock, carrying galena.

Result of assay:—

Gold	0·03 of an ounce per ton.
Silver	10·37 ounces per ton.

14. From the Hastings claims.

Granitic rock, carrying galena.

It contained:—

Gold	0·29 of an ounce per ton
Silver	12·40 ounces per ton.

15. From another of the Hastings claims.

Quartz, carrying mispickel.

Assay showed it to contain:—

Gold	0·18 of an ounce per ton.
Silver	0·55 " "

16. From the Coronado mine.

Granitic rock.

Content:—

Gold	0·70 of an ounce.
Silver	3·00 ounces per ton.

17. Coronado mine.

Galena.

It was found to contain:—

Gold	0·06 of an ounce per ton.
Silver	62·63 ounces per ton.

18. Another similar sample from the same locality as the preceding contained:—

Gold	0·22 of an ounce per ton.
Silver	36·47 ounces per ton.

19. From the Victor mine. First sample.

Galena.

This contained:—

Gold	Trace.
Silver	43·33 ounces per ton.

20. Also from the Victor mine. Second sample.

Galena.

Assays gave the following:—

Gold	0·01 of an ounce per ton.
Silver	39·30 ounces per ton.

Saskatchewan.

21. From Sec. 27, Tp. 49, R. 22, west of the 3rd meridian.

Iron pyrites, in association with quartz and argillaceous matter.

Assays showed it to contain neither gold nor silver.

22. From the vicinity of Lac LaRonge.

Quartz.

It yielded, on assay, the following result:—

Gold	0·01 of an ounce per ton.
Silver	Trace.

23. A second specimen from Lac LaRonge, consisting of a pyritiferous granitic rock, was assayed and found to contain:—

Gold	0·04 of an ounce per ton.
Silver	3·00 ounces per ton.

Ontario.

24. From the border of Trout lake, near the Edeson mine, Nipissing district.

An association of quartz and calcite, carrying small quantities of galena and of chalcopyrite.

Assay showed it to contain:—

Gold	Trace.
Silver	0·7 of an ounce to the ton of 2,000 lbs.

25. From the south half of lot 14, con. V, of Coleman, Nipissing district.

An association of quartz and feldspar, chlorite and dolomite, through which are distributed small quantities of galena, copper pyrites, and iron pyrites. Weight of sample, 9 ounces.

It contained:—

Gold	None.
Silver	0·4 of an ounce to the ton of 2,000 lbs.

26. From the so-called Monetteville mine, situated on lot 6, con. V, of Maitland township, Nipissing district.

An association of quartz and feldspar, with small quantities of calcite and chlorite, carrying occasional minute particles of pyrite and copper pyrites.

It contained neither gold nor silver.

27. From Sargenson's claim, at Portage bay, southeast of Lake Timagami, Nipissing district.

Calcite, carrying small quantities of cobaltite and of niccolite.

It yielded on assay:—

Gold	None.
Silver	0·50 of an ounce to the ton of 2,000 lbs.

28. From Dreany location, claim south of T.R. No. 169, seventy-six and a-half miles from North Bay, on the line of the Timiskaming and Northern Ontario railway, Nipissing district.

Quartz, carrying small quantities of molybdenite and copper pyrites.

It contained neither gold nor silver.

29. From near the apex of the south bend of Montreal river, seven miles north of Indian chute and two miles west of Wilson township.

vein 35 feet in width.

This specimen, consisting entirely of smoky quartz, was representative of a

It contained neither gold nor silver.

30. From unsurveyed territory two miles south of the southwest arm of Larder lake.

An association of quartz, with smaller quantities of feldspar and hornblende, and a very little partially altered mica, carrying a small quantity of specular iron.

It contained neither gold nor silver.

31. Another specimen from the same locality as the preceding specimen, consisting of an association of quartz, calcite, and chlorite, carried a small quantity of iron pyrites.

It contained neither gold nor silver.

32. From the northwest shore of Larder lake, two miles from Larder city.

An association of quartz and chlorite.

It contained neither gold nor silver.

33. From a point about three miles north of the Narrows of Gold lake (Larder lake), Nipissing district.

An association of quartz, with a small quantity of chlorite, carrying a little chalcopyrite.

It contained neither gold nor silver.

34. From lot 1, con. II, of Bucke township.

An association of quartz, feldspar, and chlorite, carrying a very little pyrite. Sample weighed 11 ounces.

It contained:—

Gold	None.
Silver	Trace.

35. From Ohlman's claim on the southwest side of Cripple creek, which flows into the northeast angle of Larder lake.

Quartz, carrying small quantities of pyrite, copper pyrites, and chalcocite.

It contained:—

Gold	Trace.
Silver	None.

36. From a point seven miles east of Cobalt, in Lorrain township, Nipissing district.

Vein matter consisting of quartz and calcite, with a little chlorite, carrying small quantities of zinc blende and copper pyrites.

It contained:—

Gold	Trace.
Silver	0·1 of an ounce to the ton of 2,000 lbs.

37. From lots 9 and 10, con. V, of Coleman, Nipissing district.

An association of galena and pyrite, together with a small quantity of calcareous gangue.

It contained:—

Gold	None.
Silver	Trace.

38. From a point situated four miles west and four miles north of Missinaibi station, Canadian Pacific railway, Algoma district.

Grey quartz, carrying a small quantity of pyrite.

It contained neither gold nor silver.

39. From lot 5, con. I, of Mack, Algoma district.

An association of quartz with small quantities of feldspar and chlorite, carrying a little copper pyrites and a few particles of iron pyrites. The fragments of this specimen were slightly weathered and rust-stained, and, in parts, coated with a very little green carbonate of copper.

It contained neither gold nor silver.

40. From lot 14, con. V, of Lount, Parry Sound district.

Quartz, carrying some chalcopyrite and iron pyrite, the whole being more or less weathered and rust-coated.

It contained neither gold nor silver.

41. From a point situated two miles north of the northeast corner of township 83, southwest of Sudbury, on the Whitefish Indian reserve, Nipissing district.

An association of quartz and iron pyrites.

It contained neither gold nor silver.

42. From the south shore of Lake Penage, near the middle of township 91, Nipissing district.

An association of quartz, a very little calcite, and a small quantity of feldspar, carrying some partially decomposed iron pyrites.

It contained neither gold nor silver.

43. From mining location 8586, Larder Lake district.

One piece, an association of white calcite and grey slate, carrying a small quantity of iron pyrites; and one piece of white quartz in association with grey chloritic schist, carrying iron pyrites.

An assay by Mr. M. F. Connor showed it to contain neither gold nor silver.

44. From lot 2, con. I, of James township, Nipissing district.

An association of small quantities of galena, of cobaltite, and of erythrite, and a very little native silver with quartz, the whole forming narrow veins in a coarse diabase.

An assay showed it to contain:—

Gold	None.
Silver	25·08 ounces per ton of 2,000 lbs.

45. From the SE ¼ of the S ½ of lot 6, con. VI, of James township, Nipissing district, Ont.

Copper pyrites, distributed through a quartzose gangue.

It contained:—

Metallic copper	10·28 per cent.
Gold	Trace.
Silver	1·25 of an ounce per ton.

46. From lot 4, con. VI, of Otto township, Nipissing district.

Quartz, carrying a small quantity of iron pyrites.

Assay showed it to contain:—

Gold	None.
Silver	Trace.

47. Locality—unsurveyed territory situated on the northeast corner of Willet township, Nipissing district.

Niccolite.

It was found, on assay, to contain:—

Silver	0·5 of an ounce to the ton.

48. From mining location 249, on lot 1, con. I, of the township of James, Nipissing district.

Diabase, carrying some argentite and native silver.

Assays showed it to contain:—

Silver	1081·64 ounces per ton.

49. From the same locality as the preceding specimen.

Smaltite.

It contained:—

Silver	1021·2 ounces per ton.

50. From lot 1, con. I, of James township. Mining location or claim not stated.

Assays showed it to contain:—

Gold	None
Silver	Trace.

51. From the shore of the northeast arm of Sturgeon lake, Rainy River district, Ontario.

It was found, on assay, to contain:—

Silver.. .. ..at the rate of 7·4 ounces per ton.

52. From the immediate vicinity of St. Joseph, on the shore of Lake Huron, Huron county, Ont.

Black sand—magnetic iron sand.

It contained:—

Gold.. .. .. None.
Silver.. .. .. None
Platinum.. .. .. Trace.

Quebec.

53. From St. Margaret mine, St. Margaret parish, Lotbinière county.

A weathered schistose rock, carrying small quantities of magnetite and of copper pyrites.

It contained neither gold nor silver.

54. The three following specimens are from the township of Matapedia, Bonaventure county.

An association of garnet and calcite, with small quantities of epidote and quartz, carrying a very little pyrite.

It contained:—

Gold.. .. .. None.
Silver.. .. .. 0·3 of an ounce to the ton of 2,000 lbs.

55. An association of quartz and calcite, carrying very small quantities of pyrite and chalcopyrite. The specimen was somewhat weathered and rust-stained.

It contained:—

Gold.. .. .. None.
Silver.. .. .. 0·02 of an ounce to the ton of 2,000 lbs.

55*a*. Weathered and rust-stained quartz, carrying a small quantity of copper pyrites.

It contained:—

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

56. From the vicinity of St. Damien, Berthier county.

A siliceous schist, associated with a small quantity of weathered, brown mica, carrying a very little iron pyrites.

It contained:—

Gold.. .. .. Trace.
Silver.. .. .. None.

57. From lot 19, range IX, of Chester, Arthabaska county.

An association of quartz and iron pyrites.

It contained:—

Gold.. .. .. Trace.
Silver.. .. .. Trace.

58. From lot 12, range V, of Litchfield, Pontiac county.

A siliceous rock, in association with a little calcite.

It was found, on assay, to contain:—

Gold.. .. .. Trace.
Silver.. .. .. None.

59. From Lorrainville, near Ville Marie, Pontiac county.

Quartz, carrying a small quantity of iron pyrites.

It contained:—

Gold	Trace.
Silver	0·6 of an ounce to the ton of 2,000 lbs.

60. From a point some eight miles above Maniwaki, near Eagle river, on the farm of Martin Daly.

An association of quartz and hornblende, carrying a small quantity of iron pyrites.

It contained neither gold nor silver.

61. From Pike lake, Ottawa county.

An association of quartz, feldspar, and black mica, all more or less weathered.

It contained neither gold nor silver.

62. From the vicinity of Chapeau, Pontiac county.

An association of pyrite with smaller quantities of pyrrhotite and of molybdenite, and a little copper pyrites.

Assays of the mixed sulphides and of the pyrite were separately made, and in neither was any gold or silver found.

63. From Rock island, in Quinze river, directly opposite North Timiskaming village, Pontiac county.

Quartz, carrying a very little pyrite.

It contained:—

Gold	Trace.
Silver	0·25 of an ounce to the ton of 2,000 lbs.

64. From the property of the Pontiac Mining and Smelting Co., situated in the township of Fabre, Pontiac county.

An association of calcite, with a little feldspar, carrying small quantities of galena and a trifling quantity of iron pyrites.

It contained:—

Gold	None.
Silver	3·12 ounces to the ton of 2,000 lbs.

65. From the vicinity of Orford mountain, in Castle Brook township, Sherbrooke county, Quebec.

Quartz, carrying small quantities of iron and of copper pyrites.

It was found, on assay, to contain:—

Gold	None.
Silver	None.
Copper	1·80 per cent.

66. From Moe River valley, Compton county, Quebec.

Quartz.

It contained:—

Gold	Trace.
Silver	Trace.

67. From the west shore of Lake Massawippi, Stanstead county, Quebec.

Quartz.

It yielded on assay:—

Gold	Trace.
Silver	Trace.

68. From lot 21, range X, of Eardley township, Ottawa county, Quebec.
Red jasper.
Assay showed it to contain neither gold nor silver.

69. From lot 2a, range B, of Wright township, Ottawa county, Quebec.
Calcite, carrying a small quantity of galena.
It contained:—
Silver.. .. .. A trace.

70. From lot 8, range VII, of Bristol township, Pontiac county, Quebec.
Quartz.
It contained neither gold nor silver.

71. From lot 6, range II, of Chichester, Pontiac county, Quebec.
Quartz.
It contained neither gold nor silver.

New Brunswick.

72. From an unspecified locality in Albert county.
An association of copper pyrites and bornite, with a small quantity of gangue, composed principally of barite.
It contained:—

Gold..	None.
Silver..	1·64 ounces to the ton of 2,000 lbs.
Copper—metallic..	7·10 per cent

Nova Scotia.

73. From Wagamatcook gold district, Middle river, Victoria county, N.S. Examined by Mr. J. P. Joy.
An association of quartz, with a small quantity of iron pyrites.
It contained neither gold nor silver.

74. Also from Middle river, Victoria county, N.S. Examined for E. W. McCurdy.
Quartz, carrying a small quantity of pyrite.
It contained:—

Gold..	0·01 of an ounce.
Silver..	0·40 of an ounce to the ton of 2,000 lbs

75. From St. Ann, North river, Victoria county, N.S.
Quartz, carrying a small quantity of oxide of iron.
It contained neither gold nor silver.

76. From rear of Beaver cove, Cape Breton county, N.S.
An association of galena, with a small quantity of pyrite, and a rather small quantity of quartzose gangue.
It was found, on assay, to contain:—

Silver..	25 ounces to the ton of 2,000 lbs.
Gold..	None.

77. From Margaree, Inverness county, N.S.
Quartz, carrying a small quantity of iron pyrites.
It contained neither gold nor silver.

NATURAL WATERS.

British Columbia.

1. From a spring on the bank of the Shuswap river, about eight miles north of Enderby, Yale district, B.C.

At the time of its receipt the water was perfectly clear, bright, and colourless. On removing the stopper of the vessel, however, there was a somewhat brisk disengagement of carbonic acid, and the water gradually became turbid, and after the lapse of a few hours deposited a very appreciable sediment, consisting of carbonates of calcium and magnesium, with a very little ferric hydrate. It was odourless, had an agreeably acidulous (piquant) taste, which, however, subsequently gave place to a faintly bitter one; reacted faintly acid, when evaporated to a small volume, and was decidedly alkaline. Its specific gravity at 15·5° C. was found to be 1002·4. Boiling produced a small precipitate of calcium and magnesium carbonates, with a very little ferric hydrate.

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

Potassa	0·013
Soda	0·273
Lime	0·231
Magnesia	0·234
Ferrous oxide	0·023
Sulphuric anhydride	0·510
Carbonic anhydride	2·960
Chlorine	0·012
Silica	0·055
Organic matter	Trace.
	3·841
Less oxygen equivalent to chlorine	0·003
	3·838

Lithia, baryta, strontia, bromine, iodine, and boric acid were not sought for.

Hypothetical combination:—

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

Potassium sulphate	0·022
Potassium chloride	0·002
Sodium chloride	0·018
Sodium carbonate	0·451
Calcium carbonate	0·413
Magnesium carbonate	0·491
Ferrous carbonate	0·037
Silica	0·085
Organic matter	Trace.
	1·519
Carbonic anhydride, half combined	0·640
Carbonic anhydride, free	1·680
	3·839
Total dissolved saline matter by direct experiment, dried at 180° C.	1·642

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

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

	Grains.
Potassium sulphate	1·54
Potassium chloride	0·14
Sodium chloride	1·26
Sodium bicarbonate	44·76
Calcium bicarbonate	41·75
Magnesium bicarbonate	52·49
Ferrous bicarbonate	3·58
Silica	5·96
Organic matter	Trace.
	151·49
Carbonic anhydride free	117·88
	269·37

2. From a spring some 900 feet above sea-level, on a mountain side on Vancouver island, B.C.

This water was collected by and examined for Mr. W. A. Robertson, of Victoria, B.C., who says that the temperature of the spring is 48° F., while that of the surrounding air is 60° F.

As received, the water contained a trifling quantity of pale-brown, flocculent organic matter in suspension, which was removable by filtration, after which operation the filtered water was clear, bright, and colourless. It was odourless and devoid of marked taste; reacted neutral both before and after concentration. Its specific gravity, at 15·5° C., was 1000·5—pure water being 1000. The total dissolved saline matter, dried at 180° C., in 1000 parts by weight of the filtered water, amounted to 0·92 of a part—equivalent to 6·446 grains in one imperial gallon.

It was found, by a qualitative examination, to contain:—

Soda	very small quantity.
Potassa	trace.
Ferrous oxide	trace.
Lime	small quantity.
Magnesia	very small quantity.
Sulphuric anhydride	very small quantity.
Carbonic anhydride	small quantity.
Chlorine	very small quantity.
Silica	trace.
Organic matter	trace.

Boiling produced a very small precipitate, consisting principally of calcium carbonate, with a very small quantity of magnesium carbonate and a trace of ferrous carbonate.

The limited quantity of water sent did not admit of search being made for any of the more rarely occurring constituents.

Saskatchewan.

3. Brine from a spring situated some twenty yards from the left bank of Carrot river, two miles above its junction with Sipanok channel, in Tp. 53, R. 2, west of the 2nd meridian, Saskatchewan.

This sample was collected by Mr. William McInnes, of the Geological Survey staff, who writes as follows of the occurrence: 'The pool is about six feet in

diameter, and is fringed with a border of the little red salt plant, *Sali cornea herbaceæ,* and the salt-loving *Triglochin maritinum.* The water in the spring is slightly milky in appearance, strongly saline to the taste, and gives off a very noticeable odour of sulphuretted hydrogen.'

As received, the water, about one quart, contained a trifling quantity of pale-brownish-white, flocculent, organic matter in suspension, which was removable by filtration. The filtered water was clear, bright, and colourless. To the taste it was strongly saline. It was devoid of any distinctive odour, and reacted neutral, both before and after concentration.

Its specific gravity at 15·5° C. was found to be 1024; pure water being 1000.

The total dissolved saline matter, dried at 180° C., in 1,000 parts by weight of the filtered water, amounted to 28·14 parts; equivalent to 2017·07 grains per imperial gallon.

A qualitative examination showed the presence of:—

Potassa	very small quantity.
Soda	large quantity.
Ferrous oxide	trace.
Lime	small quantity.
Magnesia	small quantity.
Sulphuric anhydride	rather small quantity.
Carbonic anhydride	small quantity.
Chlorine	large quantity.
Silica	very small quantity.
Organic matter	not detected.

Boiling produced a small precipitate consisting, principally, of calcium carbonate, with a little magnesium carbonate, and a trace of ferrous carbonate.

The quantity of water available was too limited to admit of search being made for the presence of bromide, iodine, baryta or strontia, or boric acid.

The principal saline constituent of the water is sodium chloride. A proximate determination of the chlorine showed that 100 parts by weight of the water contains 15·465 parts of that element; which quantity is equivalent to 25·48 parts of sodium chloride. Portions of the chlorine may, not improbably, be combined with the calcium or magnesium, but this can only be definitely determined by a complete quantitative examination. For this there was not sufficient water available in the sample submitted to me.

Ontario.

4. From spring No. 2, situated on the southwest quarter of lot 22, concession X, of the township of Clarence, Russell county, Ontario.

The sample, as received, contained a trifling quantity of light coloured, flocculent, organic matter in suspension. After removal of this by filtration, the water was clear, bright, and of a faint brownish-yellow colour. It was quite odourless; had a very mild saline taste; reacted faintly alkaline; and when evaporated to a small volume, strongly so. Its specific gravity, at 15·5° C., was 1003·35.

Boiling produced a slight precipitate, consisting principally of magnesium hydrate, with a little calcium carbonate and magnesium carbonate, and a trace of ferric hydrate.

One thousand parts by weight of the filtered water, at 15·5° C., contained:—

	Parts.
Potassa	0·630
Soda	1·901
Ferrous oxide	Trace.
Lime	0·027
Magnesia	0·162
Carbonic anhydride	0·719
Chlorine	2·434
Silica	0·020
Organic matter	very small quantity.
	5·893
Less oxygen, equivalent to chlorine	0·548
	5·345

It may be reasonably assumed that the foregoing acids and bases exist in the water in the following states of combination:—

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

	Parts
Potassium chloride	0·998
Sodium chloride	3·228
Sodium carbonate	0·326
Ferrous carbonate	Trace.
Calcium carbonate	0·048
Magnesium carbonate	0·340
Silica	0·020
Organic matter—small quantity	undet.
	4·960
Carbonic anhydride, free and half combined	0·385
	5·345
Total dissolved saline matter by direct experiment, dried at 180° C.	4·756

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

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

	Grains.
Potassium chloride	70·104
Sodium chloride	226·751
Sodium bicarbonate	32·383
Ferrous bicarbonate	Trace.
Calcium bicarbonate	4·867
Magnesium carbonate	36·387
Silica	1·405
Organic matter	undet.
	371·877
Carbonic anhydride, free	3·582
	375·459

The limited quantity of water sent did not admit of any examination being made for the presence of baryta, strontia, lithia, bromine, iodine, or boric anhydride.

Eight other samples of water, from as many different springs on the same lot and in the immediate vicinity of No. 2, were qualitatively examined, and were found to possess the same general characters, while differing in the amount of saline constituents.

5. Water from well, sunk 10 feet in earth and 8 feet in rock, on lot 9, con. I, of Finch, Stormont co. Received from Mr. A. A. McLean.

The sample, as received, contained a trifling quantity of pale brown, flocculent matter in suspension. This was removed by filtration, and found to consist, for the most part, of organic matter, with a very little ferric hydrate.

The filtered water was just perceptibly turbid, and, when viewed in a column two feet in length, of a brownish-yellow colour.

It was devoid of distinctive odour, and of marked taste, and reacted neutral, both before and after concentration.

Its specific gravity, at 60° F., was 1002.

The total dissolved saline matter, dried at 180° C., amounts, in one imperial gallon, to 101 grains.

A qualitative examination showed the presence of:—

Soda	small quantity.
Ammonia	very small quantity.
Ferrous oxide	trace.
Lime	rather small quantity.
Magnesia	small quantity.
Sulphuric anhydride	small quantity.
Carbonic anhydride	somewhat large quantity.
Chlorine	very small quantity.
Silica	trace.
Organic matter	small quantity.

The principal constituents of the water are: bicarbonates, with small quantities of sulphates, and very small quantities of chlorides of lime, magnesia, iron, and soda.

In addition to the above-mentioned constituents, it is especially noted that the water gives a strong reaction for ammonia, and also possesses a high oxygen consuming power, both of which place it under grave suspicion, if it is intended to be used as a beverage or for domestic purposes.

Boiling produced a copious precipitate of calcium carbonate, with a smaller quantity of magnesium carbonate, and a trace of ferric hydrate.

6. From an artesian well, 100 feet in depth, situated on lot 28, con. VI, of Cambridge township, Russell county, Ontario.

After filtering from a small quantity of suspended argillaceous matter, the water of this sample was all but clear, and of a faint brownish-yellow colour. It was odourless, possessed a mildly saline taste, reacted neutral, but when evaporated to small volume became strongly alkaline. Its specific gravity, at 15·5° C., was 1005, and the total dissolved saline matter, the principal constituent of which is sodium chloride, dried at 180° C., in one thousand parts by weight of the filtered water, amounted to 5·423 parts, which is an equivalent of 381·5 grains per imperial gallon.

The results of a qualitative examination were as follows:—

Potassa	trace.
Soda	rather large quantity.
Lime	small quantity.
Magnesia	small quantity.
Sulphuric anhydride	very small quantity.
Carbonic anhydride	rather small quantity.
Chlorine	rather large quantity.
Silica	trace.
Organic matter	trace.

Boiling produced a small precipitate consisting of carbonates of lime and of magnesia, in apparently nearly equal proportions.

7. From what is known as the Timagami spring, vicinity of Cobalt, Nipissing district, Ontario.

The water, as received, was very faintly turbid, owing to the presence of a trifling quantity of slightly ferruginous, argillaceous matter. The filtered water was clear, bright, and colourless. It was devoid of odour, or any marked taste; reacted neutral, but when evaporated to a small volume was very faintly alkaline. Its specific gravity, at 15·5° C., was 1000·5; and the total dissolved saline matter, dried at 180° C., contained in 1,000 parts, by weight, of the filtered water, amounted to 0·3343 of a part, which is equivalent to 23·413 grains in one imperial gallon.

A qualitative analysis showed the presence of:—

Soda	very small quantity.
Lime	small quantity.
Magnesia	very small quantity.
Sulphuric anhydride	very small quantity.
Carbonic anyhdride	small quantity.
Chlorine	trace.
Organic matter	faint trace.

Boiling produced a small precipitate, consisting of calcium carbonate, with a very little magnesium carbonate.

The principal constituent of this water would appear to be calcium bicarbonate.

This water is well adapted for all domestic purposes, and, by reason of its high organic purity, represents an excellent beverage.

Quebec.

8. From an artesian well, 45 feet deep, at or near the junction of Duvernay and Lévis streets, in Ste. Cunegonde, a suburb of Montreal.

As received, the water contained a trifling quantity of suspended organic and mineral matters, which were removable by filtration. The filtered water was clear, bright, and colourless. It was odourless, tasteless, and reacted neutral, both before and after concentration. Its specific gravity, at 15·5° C., was 1000·5, pure water under similar conditions being 1000.

Boiling produced a small precipitate, consisting principally of calcium carbonate, with some magnesium carbonate.

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

Potassa	0·0222
Soda	0·0208
Lime	0·2370
Magnesia	0·0495
Sulphuric anhydride	0·1530
Carbonic anhydride	0·3970
Chlorine	0·0285
Silica	0·0165
Organic matter	Trace.
	0·9245
Less oxygen equivalent to	0·0064
	0·9181

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

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

Potassium chloride	0·0090
Sodium chloride	0·0392
Potassium sulphate	0·0314
Calcium sulphate	0·2356
Calcium carbonate	0·2500
Magnesium carbonate	0·1039
Silica	0·0165
Organic matter	trace.
	0·6856
Carbonic anhydride:—	
Half combined	0·1644
Free	0·0682
	0·9182
Total dissolved saline matter dried at 180° C.	0·6820

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

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

	Grains.
Potassium chloride	0·630
Sodium chloride	2·745
Potassium sulphate	2·199
Calcium sulphate	16·500
Calcium bicarbonate	25·213
Magnesium bicarbonate	11·087
Silica	1·155
	59·529
Carbonic anhydride, free	4·776
	64·305

9. Water from what is known as L'Epiphanie spring, situated on the banks of Achigan river, one mile from L'Epiphanie village, L'Assomption county, Quebec.

The sample sent for examination was clear, bright, and colourless. It was odourless, had a mildly saline, faintly bitter taste; reacted neutral, both before and after concentration, and had a specific gravity, at 15·5° C., of 1008·12. Boiling produced a slight precipitate, consisting of calcium carbonate, with a little magnesium carbonate and a trace of ferrous carbonate.

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

	Parts.
Potassa	0·0744
Soda	4·6612
Lithia	trace.
Ferrous oxide	trace.
Lime	0·3042
Magnesia	0·4280
Carbonic anhydride	0·6690
Chlorine	5·9995
Bromine (very small quantity)	undet.
Iodine (very small quantity)	undet.
Silica	0·0095
Organic matter	trace.
	12·1458
Less oxygen equivalent to chlorine	1·3520
	10·7938

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

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

	Parts.
Potassium chloride	0·1178
Sodium chloride	8·7962
Lithium chloride	trace.
Magnesium chloride	0·8103
Magnesium bromide	undet.
Magnesium iodide	undet.
Calcium carbonate	0·5432
Magnesium carbonate	0·1823
Ferrous carbonate	trace.
Silica	0·0095
Organic matter	trace.
	10·4593
Carbonic anhydride, half combined	0·3345
	10·7988
Total dissolved saline matter, by direct experiment, dried at 180° C.	10·2340

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

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

	Grains
Potassium chloride	8·313
Sodium chloride	620·734
Lithium chloride	trace.
Magnesium chloride	57·162
Magnesium bromide	undet.
Magnesium iodide	undet.
Calcium bicarbonate	55·190
Magnesium bicarbonate	19·604
Ferrous bicarbonate	trace.
Silica	0·670
Organic matter	trace.
	761·693

Boric anhydride, baryta, and strontia were sought, but with negative results.

10. From a boring near Breckenridge station (Canadian Pacific railway), on lot 7, range V, of Eardley, Ottawa county, Quebec.

The water comprising this sample was slightly turbid, owing to the presence of a trifling quantity of suspended argillaceous matter. After removal of this by filtration, the water was found to be clear, bright, and of a faint yellow colour. It was devoid of marked odour, and possessed a very mild saline taste. It reacted neutral, but after evaporation to a small volume it became slightly alkaline. Its specific gravity, at 15·5° C., was found to be 1002. The total dissolved saline matter, dried at 180° C., amounted to 2·604 parts in 1,000 parts by weight of the filtered water, equivalent to 182·644 grains per imperial gallon.

A qualitative analysis showed it to contain:—

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

Potassa and lithia were sought for, but with negative results.

Boiling produced a small precipitate, consisting principally of calcium carbonate, with some magnesium carbonate.

11. From a spring on lot 6, range VIII, of Eardley, Ottawa county, Quebec.

The sample submitted for examination contained a very small quantity of pale brown, flocculent, organic matter in suspension. After removal of this by filtration, the water was clear, bright, and of a pale brownish-yellow colour. It was odourless, and possessed a taste which was just perceptibly saline. It reacted neutral, but when evaporated to a small volume, became decidedly alkaline. Its specific gravity, at 15·5° C., was 1001·5. The total dissolved saline matter in one thousand parts by weight of the filtered water was 2·569 parts, equivalent to 180·1 grains per imperial gallon.

A qualitative examination showed the presence of:—

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

Potassa and lithia were sought for, but were not detected in the small quantity of water comprising the sample.

The principal saline constituent is sodium chloride, and it amounts to, approximately, three-fourths, by weight, of the total saline matter.

Boiling produced a small precipitate, consisting mainly of carbonates of lime and of magnesia, with a trace of ferric hydrate.

BRICK AND POTTERY CLAYS.

British Columbia.

1. *Brick clay*—from Cascade mountain, B.C. Specimen taken from the mountain side, some 400 feet from its base.

A rather feebly plastic clay, containing a large proportion of fine siliceous sand, a very small quantity of finely divided magnetite, and a few minute scales of yellow mica. It disintegrates rapidly on immersion in water; is rather strongly ferruginous, slightly calcareous, and somewhat highly magnesian. When moulded into a form and burnt it yields a strong but easily fusible product. It might be employed in the manufacture of ordinary building bricks.

Alberta.

2. *Clay*—from the Morden estate, situated on Sec. 22, Tp. 30, R.—, west of the 4th meridian, Alberta.

The first sample, taken from the west side of the townsite of Pincher Creek, was a light brownish-grey, feebly plastic clay, which disintegrated rapidly when immersed in water. It contained a somewhat large proportion of fine siliceous grit. When moulded into a form and burnt, it yielded a strong but readily fusible product.

The second sample, from the same locality as the preceding, but from the east side of the townsite of Pincher Creek, was a slightly greenish weathering dark brownish-grey clay. It was strongly plastic, and disintegrated very slowly on immersion in water. It contained a rather small quantity of fine siliceous grit, and yielded, when burnt, a strong but readily fusible product.

An analysis, made upon air-dried material, showed them to have the following composition:—

——	No. 1.	No. 2.
Silica	60·40	55·04
Titanic oxide—TiO_2	0·60	0·60
Alumina	10·23	14·89
Ferric oxide	2·05	3·64
Ferrous oxide	0·82	1·10
Lime	7·10	3·50
Magnesia	4·32	2·20
Carbonic anhydride	7·60	2·60
Water—loss at 100° C	2·98	5·48
" —loss above 100° C	4·65	8·50
Alkalis by difference	..	2·45
	100·75	100·00

3. From Sec. 9, Tp. 31, R. 23, west of the 4th initial meridian, Alberta.

A bluish-ash coloured clay, which was found to be slightly calcareous, slightly ferruginous, and rather feebly plastic, and to carry a rather small quantity of fine siliceous grit, and a little coaly matter. It yields a weak, readily fusible brick, of a dull reddish-brown colour.

4. A dark greenish-grey clay from Sec. 15, Tp. 29, R. 23, west of the 4th meridian, Alberta.

It was found to be slightly calcareous, slightly ferruginous, and rather feebly plastic, and to carry a small quantity of fine siliceous grit. It yields, when burnt, a strong reddish-brown coloured, readily fusible brick. It might be employed in the manufacture of ordinary building brick.

5. *Clay*—from the north bank of the South Saskatchewan river, six miles above Medicine Hat.

Colour, brownish-grey; is rather highly ferruginous, somewhat highly calcareous, and rather strongly magnesian. It carries a small quantity of fine siliceous grit, and is only moderately strongly plastic. When moulded into a form and burnt, it yields a strong, but readily fusible product.

6. *Underclay*—from a coal seam in the Crockford mines, situated on the south bank of the South Saskatchewan river, six miles above Medicine Hat. Collected by Dr. R. Chalmers.

A light greenish-grey, rather strongly ferruginous clay, which is also slightly calcareous and slightly magnesian, and contains a rather large proportion of fine siliceous grit, approximately 30 per cent by weight of the whole. It is rather feebly plastic and affords a moderately strong and difficultly fusible brick.

7. *Underclay*—from a coal seam on the south bank of the South Saskatchewan river, three and a half miles above Medicine Hat. Collected by Dr. R. Chalmers.

A dark brown, highly ferruginous and highly siliceous clay. It is slightly calcareous, and slightly magnesian, and only feebly plastic. When moulded into a form and burnt, it yields a strong, but easily fusible product.

8. *Claystone*—from the southeast quarter of Sec. 32, Tp. 30, R. 3, west of the 4th initial meridian, Alberta.

It proved to be somewhat highly calcareous, slightly magnesian, and slightly ferruginous, and to contain a small quantity of siliceous grit. When reduced to powder and moistened it formed a feebly plastic mass, which, when burned, assumed a light reddish-brown colour. It is readily fusible, affords a strong brick, and might be employed for the manufacture of ordinary building brick.

Saskatchewan.

9. *Clay*—from a point about twenty miles south of Moosejaw station, on the line of the Canadian Pacific railway, in the Province of Saskatchewan.

On examination this clay proved to be non-calcareous, slightly ferruginous, and rather strongly plastic, and to have distributed through it a large proportion of fine siliceous grit. It yields a weak brick, fusible only at a high temperature.

10. *Clay*—from Roche Percee, near Souris coal mine, Sask.

This is a rather highly calcareous, somewhat strongly magnesian, slightly ferruginous, strongly plastic, easily fusible clay, through which is disseminated a very small quantity of fine siliceous grit. It affords a strong brick, of a light reddish-brown colour. This material might very well be employed for the manufacture of ordinary building brick, drain tile, and most, if not all, kinds of common earthenware.

11. *Clay*—described as coming from that section of country lying north and west of Cumberland lake, Sask.

One sample—greenish-grey in colour—was found to be strongly calcareous, rather strongly magnesian, slightly ferruginous, and easily fusible. It contained only a trifling quantity of siliceous, gritty matter; and yielded, when burned, a strong brick, of a reddish-brown colour.

Another sample, from a different deposit in the same area, proved to be but slightly calcareous and very slightly ferruginous, and to be strongly plastic. It carried a very small quantity of fine, disseminated, siliceous grit, and a little carbonaceous matter. It gave a strong brick which was white in colour, and very difficultly fusible. It would make a fairly refractory firebrick.

12. *Clay*—two samples—from Sec. 14, Tp. 2, R. 8, west of the 2nd initial meridian, Sask.

(1) from an 8 ft. seam, underlying a seam of lignite.

A very slightly calcareous, somewhat strongly ferruginous, rather strongly plastic, readily fusible, light greenish-grey clay, through which is distributed a small quantity of fine siliceous grit. When moulded into a form and burned, it yields a strong brick of a light reddish-brown colour.

(2) From a 2 ft. seam interposed between two beds of lignite.

This clay is slightly calcareous, slightly ferruginous, rather strongly plastic, and readily fusible, and of an ash-grey colour. It carries a somewhat large quantity of fine siliceous grit, and assumes, on burning, a light reddish-brown colour.

Both the foregoing ought to prove well adapted for the manufacture of building brick and for some of the commoner kinds of cheap earthenware.

13. *Clay*—from the northeast quarter of Sec. 28, Tp. 36, R. 7, west of the 3rd initial meridian, Sask.

A slightly calcareous, somewhat strongly magnesian, rather strongly ferruginous, feebly plastic clay, through which is disseminated a large proportion of fine siliceous grit, and a few root fibres. It affords, on suitable treatment, a strong reddish-brown coloured brick, which is readily fusible.

14. From the east half of Sec. 28, Tp. 12, R. 24, west of the 2nd initial meridian, Saskatchewan.

In 1886, a sample of the clay from this deposit was sent to the Geological Survey by Mr. W. H. Stevenson, of Regina, for examination. In reporting upon it at that time, Dr. Hoffmann, then chemist to the Survey, wrote as follows:—'Colour, pale bluish-greyish-white; is non-calcareous; highly plastic; burns white, or nearly so; is very difficultly fusible at a high temperature. It is well

suited for the manufacture of ordinary building brick, stove-linings, and would make a fairly refractory firebrick; it could also be used for the manufacture of pottery, including the finer varieties of stoneware.'

Another sample, from the same deposit, was sent, in 1905, by Mr. E. C. Matthews, of Moosejaw. It possessed the same physical characters as that above described, and on analysis was found to have the following composition (see Report of Section of Chemistry and Mineralogy, No. 958, page 64.):—

Silica	62·30
Alumina	22·24
Ferrous oxide	2·07
Lime	0·60
Magnesia	0·18
Alkalis (by difference)	3·21
Water (ignition)	9·40
	100·00

In order to ascertain the nature and amount of the siliceous grit, with a view to the employment of this material in the manufacture of pottery, a third sample was collected, in 1906, by Mr. D. Divers, of Ottawa. By elutriation and subsequent sieving of material from the upper stratum, it was found that:—

A sieve of 16 meshes to the linear inch retained only a few particles.						
"	20	"	"	"	0·023	per cent of grit.
"	40	"	"	"	0·310	" "
"	60	"	"	"	1·647	" "
"	80	"	"	"	20·893	" "
"	100	"	"	"	22·110	" "
"	128	"	"	"	38·571	" "

Of the grit (38·57 per cent) separated by the sieve having 128 meshes to the linear inch, there passed consecutively:—

16·46	per cent through a sieve of	100	meshes	to	the	linear	inch.
1·22	" " "	80	"	"	"	"	
19·24	" " "	60	"	"	"	"	
1·34	" " "	40	"	"	"	"	
0·29	" " "	20	"	"	"	"	
Leaving 0·02	per cent retained by a sieve of	20	"	"	"	"	
38·57							

Material from the lower stratum, on like treatment, yielded the following results:—

A sieve of 16 meshes to the linear inch retained but a few particles.					
"	20	"	"	"	0·011 per cent of grit.
"	40	"	"	"	0·937 " "
"	60	"	"	"	8·411 " "
"	80	"	"	"	37·154 " "
"	100	"	"	"	38·383 " "
"	128	"	"	"	49·143 " "

Of the 49·143 per cent separated by a sieve of 128 meshes to the linear inch, there passed consecutively:—

10·76	per cent	through a sieve of	100	meshes.
1·23	"	" "	80	"
28·74	"	" "	60	"
7·47	"	" "	40	"
0·93	"	" "	20	"
Leaving 0·01	per cent	retained by a sieve of	20	"
49·14				

Manitoba.

15. *Brick clay*—from the property of the Canadian Northern railway, near Riding mountain, Manitoba.

This material, which it was surmised by the sender might prove to be a natural cement stone, was in reality a slightly ferruginous, strongly calcareous, highly magnesian clay. It contains a small quantity of fine siliceous grit, disintegrates rapidly on immersion in water, and is rather feebly plastic. It yields on burning, a strong, but readily fusible product, but is not, *per se*, a cement stone. It might be utilized in the manufacture of bricks and coarse pottery.

16. Two samples from Sec. 12, Tp. 5, R. 20, east of the principal meridian, Manitoba.

The portion designated 'umber' clay is strongly plastic, slightly calcareous, slightly magnesian, and slightly ferruginous. It carries only a small quantity of fine siliceous silt, and yields a strong, but easily fusible brick.

The 'green' clay is also strongly plastic, is slightly magnesian and slightly ferruginous, and readily fusible. It differs from the 'umber' clay in being much more strongly calcareous, and in carrying a larger quantity of fine siliceous gritty matter.

Both the foregoing clays might be utilized in the manufacture of building bricks, and, if mixed with the proper proportion of carbonate of lime, of cement.

17. *Brick and pottery clays*—from six different strata, on the property of the Pressed Brick and Tile Co., at LaRivière, Lisgar county, Manitoba.

A partial analysis of each was made, and the following results were obtained. Material dried at 100° C. was found to contain:—

No. of specimen.	Lime.	Magnesia.
1.	0·42	0·89
2.	0·58	1·13
3.	0·71	1·28
4.	1·39	1·56
5.	0·49	1·22
6.	0·96	1·23

Ontario.

18. *Clay*—from the east half of lot 9, con. XI, of Greenock township, Bruce county, Ontario.

This material, together with a sample of marl, of dolomite, and of peat, was taken from a lake bottom, and it was thought by the sender—Mr. Freeman Taylor, of Cargill, Ont.—that one or other might be petroliferous.

The sample of clay was found to be highly calcareous, highly magnesian, and slightly ferruginous, and to carry a small quantity of fine siliceous grit. It was rather strongly plastic, and yielded, on burning, a strong, but readily fusible brick. It might well be utilized in the manufacture of brick and tile. It did not contain any oil.

19. Sub-soil from Whitefish river, ten miles and a half north of Lake Abitibi.

A faintly yellowish, light-grey, very slightly calcareous and slightly ferruginous, rather feebly plastic clay, through which is distributed a rather small quantity of very fine siliceous silt, and some root fibres. It is readily fusible at a somewhat elevated temperature. Yields a weak, reddish-brown coloured brick.

20. From lot 17, con. III, of the township of March, Carleton county, Ontario.

A strongly plastic, slightly ferruginous, strongly calcareous, highly magnesian clay, containing a small quantity of fine siliceous grit. It is easily fusible, and yields a strong brick of light reddish-brown colour. It is adapted for the manufacture of building brick and drain tile.

21. *Clay*—from a point just west of Bell river, on the line of the Grand Trunk Pacific railway. Collected by Mr. W. J. Wilson.

It is rather strongly plastic, slightly ferruginous, slightly calcareous, and somewhat strongly magnesian. It carries little or no siliceous grit or silt, and when moulded into form and burnt yields a strong, but readily fusible product. It might be utilized in the manufacture of ordinary building brick.

Quebec.

22. From lot 14, range IX, of Hull, Ottawa county, Quebec

A greenish-grey, somewhat highly calcareous, rather strongly ferruginous, strongly plastic clay, through which is distributed a somewhat large quantity of very fine siliceous grit, and numerous minute scales of mica. It yields a strong, reddish-brown, readily fusible brick. It constitutes an excellent clay for the manufacture of ordinary building brick, and all kinds of common earthenware.

New Brunswick.

23. From a lake bottom in the parish of Salisbury, Westmorland county, N.B. It is slightly calcareous, slightly magnesian, slightly ferruginous, rather strongly plastic and readily fusible. Through it is disseminated a large proportion of very fine siliceous grit—not less than 38 per cent—and a very small quantity of pyrite. It yields a very strong brick of a dingy reddish-brown colour. This clay is suitable for the manufacture of ordinary building brick, drain tile, and similar ware.

24. From the Minto mining district, Sunbury county, N.B. This and the following sample were collected by Mr. W. C. Hunter, manager of the New Brunswick Coal and Railway Co.

First sample—colour, reddish-brown. A slightly calcareous, non-magnesian, rather strongly ferruginous, somewhat strongly plastic, readily fusible clay, through which is distributed a rather large proportion of fine siliceous grit. It affords a strong brick of reddish-brown colour. Such a clay would be well adapted for the manufacture of ordinary building brick and drain tile.

Second sample—from the same locality as the preceding specimen. Colour, greenish-grey. A slightly calcareous, slightly magnesian, rather strongly ferruginous, somewhat feebly plastic, easily fusible clay, carrying a small quantity of fine, disseminated particles of iron pyrites, and a trifling quantity of fine siliceous grit. It yields, on burning, a strong brick of a somewhat light, reddish-brown colour. It would serve for the manufacture of ordinary building brick.

25. These two samples were collected by Mr. W. B. Evans, of the Rothwell Coal Co.

(*a*) First sample—found underlying the coal on the farm of Fred. Sypher, Flowers cove, Grand lake, Queens county, N.B., is a slightly calcareous, slightly ferruginous, but very slightly magnesian, rather strongly plastic clay, through which is disseminated a somewhat large proportion of fine siliceous grit. It yields a strong, difficultly fusible brick, of a light reddish-brown colour.

(*b*) Second sample—found underlying the seam of coal in shaft No. 2 of the Rothwell Coal Company's mine, is a very slightly calcareous, slightly ferruginous, very slightly magnesian, rather feebly plastic clay, through which is disseminated a small quantity of fine siliceous grit. It yields a strong, somewhat difficultly fusible brick, of a light reddish-brown colour.

Of the foregoing, it will be observed that No. 1 is the more difficultly fusible, and might be employed in the manufacture of a firebrick in which a high degree of refractoriness was not called for. Both might be used for the manufacture of stove linings. They would make a good building brick, and might also be employed, No. 1 more especially, for the manufacture of common pottery.

Nova Scotia.

26. *Clay*—from a bed on Diogenes brook, River Denys district, Inverness county, N.S.

A slightly ferruginous and slightly calcareous, strongly plastic clay, carrying a small quantity of fine siliceous grit. When moulded into form and burnt it yields a strong, and all but infusible, white product. It would furnish a fairly refractory firebrick, and would be well adapted for the manufacture of certain grades of pottery.

27. From John McDonald's farm, Cross Roads, Leitches Creek, Cape Breton county, N.S.

Colour, brownish-red; is highly calcareous, rather strongly ferruginous, feebly plastic, and contains a somewhat large quantity of fine siliceous grit. Burns reddish brown, is readily fusible at an elevated temperature. Might be employed for the manufacture of ordinary building brick.

MISCELLANEOUS EXAMINATIONS.

1. *Quartz sand*—from a deposit, some fifty acres in extent, occurring in part on lot 48 and in part on lot 49, of concession I, of the township of Oneida, Haldimand county, Ontario.

A very fine, light greyish sand, composed essentially of translucent to sub-transparent rounded grains of quartz.

Its composition was found to be as follows:—

Silica	99·067
Ferric oxide	0·570
Alumina	0·058
Lime	0·135
Magnesia	0·032
Manganous oxide	Trace.
Loss on ignition	0·138
	100·000

2. *Graphitic shale*—from Frenchvale, two miles southwest of Guthro lake, Cape Breton county, N.S.

This particular sample, which was in a much broken down condition, contained 12·39 per cent of graphite.

Analyses of two samples from this locality—one made in 1878 and the other in 1898—showed respectively 38·34 and 45·43 per cent of graphite.

3. *Graphitic shale*—from vicinity of West bay, Cape Breton county, N.S.

After drying at 100° C. (hygroscopic water=3·20 per cent), it was found to contain:—

Rock matter	67·28
Carbon	32·72
	100·00

4. *Carbonaceous shale*—from Stewart brook, Pictou county, N.S.

A black, argillaceous shale, of Carboniferous age, through which is evenly distributed a small quantity of carbonaceous matter. It yields, on destructive distillation, a very small quantity of tarry, bituminous matter, with water and combustible gases.

Its proximate composition was as follows:—

Moisture—loss on drying at 100° C.	0·45
Bituminous matter, soluble in benzol	0·30
Volatile and combustible substances	13·96
Ash—rock matter, shale, etc.	85·29
	100·00

It is not an oil-bearing shale, as was thought by the sender might be the case.

APPENDIX.

DESCRIPTION OF COMMERCIAL METHODS AND APPARATUS FOR THE ANALYSIS OF OIL-SHALES

BY

Harold Leverin, Ch.E.

The commercial value of oil-shales depends chiefly on the amount of crude oil and ammonium sulphate—per ton of shale—obtainable therefrom. With a view to providing for the accurate determination of the amount of these products in Canadian oil-shales, methods have been adopted which have been carefully checked, and are found to be in accord with the latest improved manufacturing methods. The following is a brief description of the methods adopted and apparatus installed in the chemical laboratory of the Mines Branch, Department of Mines, Ottawa, for the distillation, etc., of oil-shales.

DETERMINATION OF CRUDE OIL.

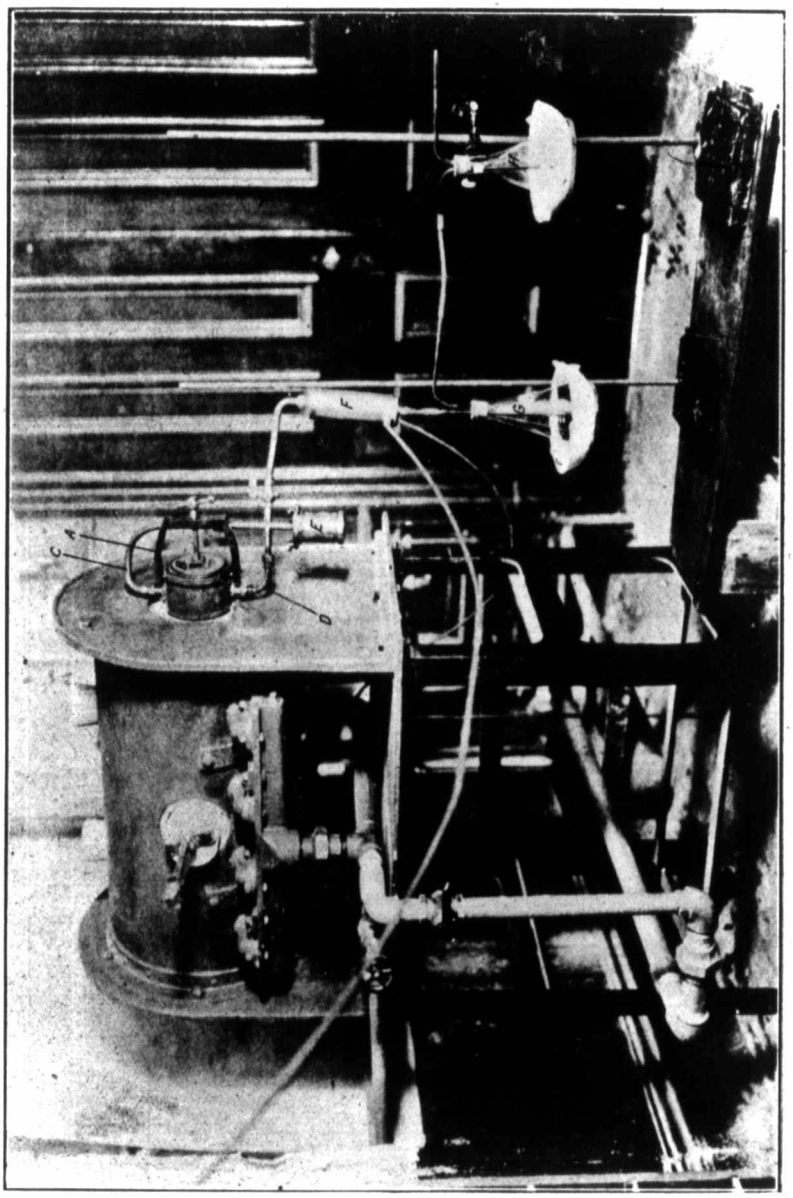
Hitherto, the nature of the carbonaceous matter in oil-shales has not been determined; but it can be affirmed with certainty that it does not exist in the shale in the same condition as the substances obtained by destructive distillation of the shale; since none of these substances can be extracted by solvents, such as petrolic ether, benzine, etc., but are formed by destructive distillation.

The apparatus for this determination (Plate I) consists of a malleable iron tube, 2½″ inside diameter × 36″ long, closed at one end with an iron cap, and at the other by a disc B, secured by means of a clamp A, and packed with a lead washer in order to seal the retort perfectly. The retort is inclined at a convenient angle to enable the oil to run off. The oils, in both gaseous and liquid state, pass through tubes C and D, the oils already condensed being collected in the copper receptacle E. The others pass through condenser F into flask G, which is connected to flask H. Both the flasks are immersed in ice water. Generally, two-thirds of the distilled oils are received in receptacle E, the remainder in flask G, except a few drops, occasionally, in flask H. The retort is heated in a gas tube furnace of the American Gas Furnace Company's make.

The process of destructive distillation (Plate II) is comparatively simple. One pound of shale, crushed into pieces ½″ square, is placed in the retort, and heated gradually to a dull red heat, great care being exercised not to raise the temperature too suddenly or higher than a dull red heat, otherwise considerable losses will occur. At lower temperatures the hydrocarbons of the fatty series are

PLATE I.

PLATE I.



Apparatus for the determination of crude oil.

evolved; but at higher, those of the aromatic. When the temperature is too high, a white smoke is readily noticed in the glass flask, so that it is comparatively easy to keep the right temperature in the retort. The time generally required for distillation is 2½ hours, after which the oil obtained is cooled, separated from water, measured, and its specific gravity determined.

When the chemist has not at his disposal the apparatus described above, the following simple and cheaper arrangement may be used instead:—

The tube used is made of a ½ inch wrought iron tubing, 2″ inside diameter × 6′-0″ long. The tube is sealed at one end by an iron cap, the other end remaining open. No condenser is used, but the oil is collected as it runs out of the tube. The method of procedure is the same as mentioned above.

Although this method is used extensively in Scotch oil-shale works, and is suitable for most practical purposes, it is capable of giving only approximate results; as the lighter oils and naphtha are lost, and cannot be collected except by passing them through a condenser.

DETERMINATION OF AMMONIUM SULPHATE.

The method of analysis adopted for the determination of ammonium sulphate obtainable from oil-shale is known as the Bailey method. This method has been checked against the manufacturing process in which the 'Pumpherston' retort is used, and gives like results; but as improvements are made in manufacturing, this method of analysis will have to be changed accordingly.

It seems a reasonable deduction that a determination of the nitrogen present in oil-shale, and calculation of the equivalent ammonium sulphate, would give the possible amount of ammonium sulphate obtainable from the shale; but in manufacturing considerable losses occur, a large part of the nitrogen is evolved as uncombined nitrogen, a smaller amount as cyanogen, while the balance remains in the spent shale. The 'Henderson' retort yielded 16 to 20 pounds of ammonium sulphate from a shale containing nitrogen—equivalent to 74 pounds of ammonium sulphate per ton of shale; the 'Young and Beilby' retort, twice as much; while the 'Pumpherston' retort gave a still greater return—calculated at 52 pounds. It is evident that the Bailey method can only be applied to the process in which the 'Pumpherston' retort is used.

The possibility of extracting nitrogen in the form of ammonium sulphate by the Bailey method was tested as follows:—

A sample of oil-shale from Taylorville, Westmorland county, N.B., was carefully analysed, the results being:—

Volatile matter	37·46
Fixed carbon	4·34
Ash	58·20
	100·00
Nitrogen	1·21

By destructive distillation, and by Bailey's method, the following values were found:—

Crude oil..	45·000 imperial gallons per ton (2,240 lbs.).
Specific gravity of oil..	0·905
Ammonium sulphate....	89·300 pounds per ton (2,240 lbs.).
Nitrogen..	0·850 per cent.

Nitrogen in the shale was determined by the Kjeldahl method, and the shale was found to contain 1·21 per cent of nitrogen—equivalent to 5·70 per cent or 127·7 pounds of ammonium sulphate per ton of shale. The coke remaining in the tube was analysed by the same method, and showed 0·16 per cent of nitrogen—equivalent to 0·75 per cent or 17 pounds of ammonium sulphate per ton of spent shale; which is a rather inconsiderable amount: only 0·10 per cent of nitrogen in the oil-shale; the spent shale containing 95·55 per cent of ash.

Thus, 70·2 per cent of the nitrogen in oil-shale can be obtained by the Bailey method, the loss being 29·8 per cent. Of this loss 8·2 per cent remained in the spent shale, 21·6 per cent being volatilized as uncombined nitrogen, and a smaller part as cyanogen.

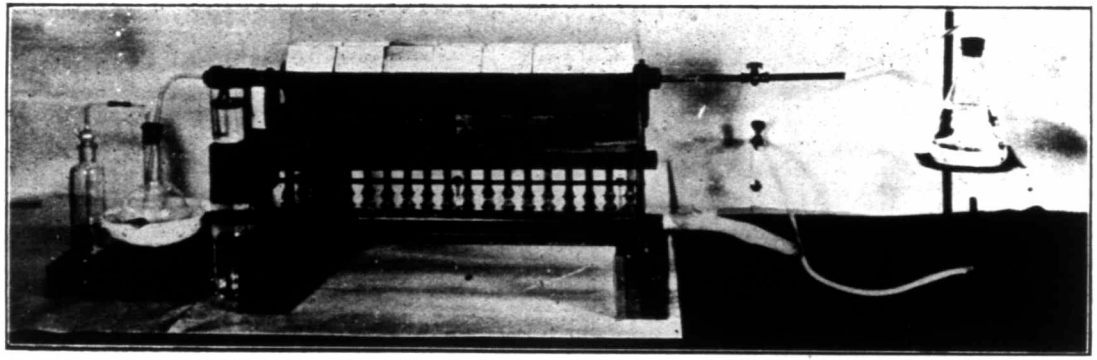
The Bailey Method: 30 grammes of shale in small pieces are heated in a malleable iron tube to bright redness, and subjected to a current of steam for one hour and a half, the resulting gases being led into a flask containing 2 N, sulphuric acid. In this solution, ammonia is determined either by nitrometer or by redistilling with caustic soda.

The apparatus used consists of a malleable iron tube, ¾″ inside diameter × 28″ long, one end being closed by an iron cap, through which passes a brass tube, while the other end is connected with the steam supply. Pieces of previously ignited firebrick—about 5 millimetres in diameter—are dropped into the tube, so as to occupy about 8″ of the tube next to the stop-cock. Then, 30 grammes of shale—3 millimetres in diameter—are dropped into the tube, which is placed in the combustion furnace, with the portion containing the shale well in the centre of the furnace, so that it may readily be heated to a bright red. Into the open end of the tube next to the shale is fitted a cork, through which a glass delivery tube passes into a 600 c.c. flask containing 50 c.c. of 2 N sulphuric acid. A second flask may be used to catch any ammonia that may be carried over. These flasks are immersed in ice water.

To start operations, the furnace is lighted, and the tube heated as rapidly as possible to bright redness, the time being noted when this is attained. It is essential that the time should not exceed 10 to 15 minutes. As soon as vapours begin to show in the glass tube, the stop-cock is opened and a moderate current of steam allowed to pass through the tube. The proportion of steam should be such that after 1½ hours' heating to bright redness, about 400 c.c. of liquid are contained in the first flask. During operation the end of the iron tubes should be kept cold by wet lint or cloths wrapped around and kept moist in order to prevent charring the cork.

After 1½ hours the apparatus is disconnected, care being taken that neither then nor at any time does any of the liquid go back into the tube, owing to reduc-

PLATE II.



Apparatus for the Determination of Ammonium Sulphate.

tion in pressure. The flasks are then rinsed out. To the liquid is added petrolic ether or other solvent for oil, thoroughly shaken and the oil and liquid separated after standing for a few minutes. The liquid is made up to a volume of 500 c.c., or other convenient quantity, and then thoroughly mixed by shaking.

A measured portion of this liquid—say 250 c.c.—is evaporated in a porcelain dish on a water bath, until its volume is reduced to 5 or 6 cubic centimetres, and this residue is rinsed into the cup of a nitrometer, precaution being taken that all ammonia salts are transferred into the cup. Excess of sodium hypobromite is then added, the nitrometer is shaken, and the volume of nitrogen, temperature, and pressure is read off with all necessary corrections, from which data the total volume of nitrogen from 30 grammes of shale is calculated. One c.c. of nitrogen at N. T. P. is equivalent to 0·001562 grammes ammonia, from which the yield of ammonium sulphate per ton of shale may be readily calculated.

Sodium hypobromite is made by dissolving 5 c.c. bromine in 50 c.c. concentrated sodium hydrate solution. This solution is of such an unstable nature, however, that a fresh mixture has to be made for each determination.

Instead of using the nitrometer, a redistillation of the liquid with sodium hydrate may be made in the usual way: collecting the free ammonia in N sulphuric acid, and titrating the excess of acid with N alkali, using cochineal as indicator.

The assertion made by other chemists, that organic bases distil over with the ammonia, and hence render the resulting percentage of the latter too high, is not confirmed by the Mines Branch distillation tests; for this method was found to be quite accurate.

The following is a statement of Mines Branch analyses, compared with those made in the laboratory of the College of New York,[1] under the direction of Dr. Charles Baskerville:—

Sample from	(Hamor) Nitrometer Method.	(Levering) Distillin Method.
	Lbs. Am. Sulp. per ton.	Lbs. Am. Sulp. per ton.
No. 1—Baizley's farm	110	112
" 2—E. Stephens	67	70
" 3—Adam's farm	93	96
" 4—Taylor's farm	110	104

[1] See Mines Branch Report on Oil-shales, by Dr. R. W. Ells—Part I., p. 17, 1909.

ANALYSES OF OIL-SHALE

(LEVERIN.)

Locality.	Crude Oil Imper. Gal.	Specific Gravity of Oil.	Ammon. Sulp.
	Per ton.		Lbs. per ton.
1. Baizley's farm, Baltimore, Albert co., N. B	52·0	0·904	112·2
2. Stephens, Albert co., N.B	45·5	0·892	70·0
3. Turtle creek, "	56·8	0·891	30·5
4. Stellarton, Pictou co., N.B	44·8	0·875	14·5
5. Albert mine, Quarry I, Albert co., N.B	22·2	0·892	28·0
6. Albert mine, Quarry II, Albert co., N.B	48·5	0·898	82·8
7. Albert No. 2, Albert co., N.B	38·8	0·892	60·3
8. " " 3, " "	45·5	0·891	48·0
9. " " 4, " "	43·5	0·896	56·8
10. " " 6, " "	27·0	0·895	49·1
11. Albert mine, (Albertite) Albert co., N.B	112·0	0·857	93·5
12. Taylorville, Westmorland co., N.B	42·3	0·897	96·5
13. " "	47·3	0·901	88·7
14. " "	46·8	0·902	85·0
15. " "	45·0	0·903	104·0

1. M

2. Gr

3. In

4. Ra

5. On

7. Lir

8. Cla

9. Hy

10. Mic

11. Asb

12. Zinc

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