

X.—MINERALS FOR THE PARIS EXHIBITION.—BY E. GILPIN, JR.,
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(Communicated 12th February, 1900.)

The Government of Nova Scotia having decided to assist the Canadian Geological Survey in the preparation of the Canadian Mineral Exhibit at the Paris Exhibition, the work of collection was assigned to the Mines Office. In the process of collection opportunity has been afforded of procuring some interesting information. I do not contemplate giving a detailed account of each mineral locality represented, as that would occupy an undue space in the Transactions, but will confine myself more especially to those exhibits which were accompanied by descriptive matter, analyses, etc. It may be remarked that no trouble has been spared by the Survey to make the mineral exhibit a leading feature of the Canadian representation at Paris, so that all the mining districts will undoubtedly receive a most important and valuable advertisement. It is to be regretted that so many mining men have neglected the opportunity offered of presenting not only their own operations, but also those of their country to the gaze of the world. At no time has there been on the continent of Europe so marked a difficulty in procuring the raw material, and the unworked metals, and there is also a great demand for opportunities for investment of capital. This interest is not confined to the precious metals, but extends to every mineral that can be utilized in the arts. In many cases, the Department, instead of receiving samples from mine owners only too pleased to have their products exhibited, was obliged to send to the quarries, etc., and procure specimens, while the owners showed no interest whatever. Paternalism may be good, but the individual should show an interest in his own welfare.

Coal.

As would be expected the coal fields are well represented. The Springhill coals were shown in their different forms as

presented for consumption. These coals are largely used for steam purposes, especially in locomotives, they are also good coking and domestic coals. In recent communications to the Institute I have given a number of analyses of these coals, showing the increase of their steam values, etc., as they have been followed to the dip.

The Dominion Coal Company exhibited the various forms of round, run of mine, slack, pea, nut coals, etc., required by the trade. This company also presented a column of coal, a section of the Phalen seam, which attains a thickness of nine feet. This column is to stand by a similar one from British Columbia, an illustration of the resources of Canada on the Pacific and on the Atlantic. In my last paper I drew attention to the interesting diminution in ash and sulphur in the Phalen seam as it was followed away from its outcrop. I also gave a summary of the tests of coal made at Glassport, Pa., U. S. A. I now give, as an interesting comparison, the results of similar tests of the Phalen and Hub seams made at the Solway ovens, in Syracuse, New York, U. S. A. Owing to rainy weather the car loads were saturated with moisture. Allowing for the moisture the sample of the Phalen seam weighed 405 tons, and that from the Hub seam weighed 307 tons. There were obtained from these coals respectively 302 tons, 74.68 per cent; and 224.74 tons, 72.37 per cent, of dry coke and breeze.

The Phalen seam yielded 11,012 cubic feet of gas per long ton. Of the gas 55.47 per cent was used under the ovens. The average calorific power of the gas was 571.85 B. T. U. The average illuminating value of the gas, with a fishtail burner was 9.9 candle power, with a Welsbach burner, 54.34 candle power.

The following is the average analysis of the gas:—

Carbon dioxide.....	2.7 per cent.	Marsh gas	32.3 per cent.
Illuminants.....	2.9 “	Hydrogen	51.1 “
Oxygen .....	.13 “	Nitrogen	5.07 “
Carbon monoxide..	5.8 “		
		Total.....	100.0

The Hub seam yielded 10,539 cubic feet of gas per long ton, of which 55.46 per cent was used under the ovens. The average calorific power of the gas was 576.54 B. T. U. The average illuminating value of the gas with a fishtail burner was 9.8 candle power, with a Welsbach burner 54. candle power.

The average analysis of the gas was as follows:—

Carbon dioxide	3.1 per cent.	Hydrogen	50.7 per cent.
Illuminants	2.7 “	Marsh gas	30.9 “
Oxygen . . . . .	.2 “	Nitrogen	5.0 “
Carbon monoxide	7.4 “		
		Total	100.0

The Phalen seam yielded per ton 32.91 lbs. of ammonium sulphate, and the yield from the Hub seam was 32.24 lbs. In commercial estimates a deduction of from 5 to 10 per cent should be made for loss of ammonia during the process of concentration.

The Phalen seam yielded per ton 12.89 gals. of tar, 128.9 lbs., and the Hub seam yielded 13.89 gals. of tar, 138.9 lbs. The Phalen seam yielded .103, and the Hub seam .111 gals. of benzole.

In considering the illuminating power and composition of the gases given above it must be remembered that they are averages. It was pointed out in my last paper that the gas obtained from the first portion of the period of coking is much higher in illuminating power, etc., than that given off during the latter portion of the period of coking.

The General Mining Association.—This company has a large number of valuable coal seams, but has hitherto confined its operations to one, known as the Sydney Main Seam. This seam has been worked for over one hundred years, and still remains one of the most valuable assets of the Province. The average thickness of the seam is five feet two inches. The annual output 271,000 tons. The portion of the seam now being worked is entirely under the Atlantic Ocean, the samples exhibited being taken from a point 2,200 yards from the nearest land, and at a depth of 1,000 feet below the bottom of the ocean.

The following analyses made at different periods will show the general uniformity of the seam :

(1871.) *Analysis by Dr. How.*

Moisture	3.04	Average Coke	70.30
Volatile Combust. Matter.	31.14	Theoretical Evapora-	
Fixed Carbon	61.50	tive power.....	9.06 lbs.
Ash	4.32	Sulphur	1.24
	<hr/>	Specific Gravity	1.30
	100.00		

(1890.) *Analysis by the Writer.*

	Slow Coking.	Fast Coking.
Moisture .....	.420	.420
Volatile Combustible Matter.....	34.962	37.110
Fixed Carbon	59.993	57.845
Ash	4.625	4.625
	<hr/>	<hr/>
	100.000	100.000
Sulphur .....	.95	.95

(1891.) *Average Samples from Five Sections of the Mine.*

Moisture	1.536	Fixed Carbon	57.008
Volatile Combustible		Ash.....	5.084
Matter	36.372	Sulphur.....	1.894

Of the underlying seams in the North Sydney district, not much can yet be said. The General Mining Association has recently proved them by a shaft to the fourth seam. These seams are of good quality, and from three to four feet thick. I append an analysis of the third seam, made a few years ago, from samples taken from the openings of the North Sydney Mining Company, along its outcrop:—

Moisture	2.06	Ash	7.46
Volatile Combustible			<hr/>
Matter	30.16		100.00
Fixed Carbon	60.32	Sulphur .....	.84

These seams are now receiving attention at the hands of the Sydney Coal Company, and, although thinner than the main seam, will undoubtedly in the near future prove valuable from their uniformity and proximity to deep water.

The coals of Pictou County are represented by samples from the mines of the Acadia Coal Company. These deposits have long been worked. Samples of coal are also shown from the Chignecto, Joggins and Springhill Collieries. Interesting analyses, etc., of the seams found at the last-named district have been furnished by me in late numbers of the Transactions of the Institute.

Manganese.

At present the production of manganese is at a low ebb in this province. For many years the Tenny Cape Mines had a world-wide reputation for the production of small amounts of extremely pure ore. For some time past little ore has been mined. It is not doubted that the resources of the district are exhausted; but the researches of the chemist have pointed out methods for the production of pure manganese oxide as a by product, which have lessened the demand for a native ore almost chemically pure. However the demand for manganese for steel making purposes has again offered a market for manganese ores, high in grade, and phosphorus free. Attention is now being directed to the ores of this district, and with modern appliances for prospecting and mining it is anticipated that Tenny Cape will again become a producer. The samples collected exhibit well the celebrated crystalline pyrolusite characterising the district.

The following analysis will serve to show the character of the ores of this district, which occur in lower carboniferous limestones:—

	I.	II.
Moisture	1.66	2.05
Water of Composition.....	3.63	....
Iron peroxide .....	.603	2.55
Oxygen	7.036	....
Baryta .....	.724	1.12
Insoluble	1.728	2.80
Phosphoric acid .....	....	1.029
Manganese oxides	84.620	....
Peroxide of manganese .....	....	90.15
Lime.....	....	trace.

Ores less crystalline but equally pure occur at Loch Lomond in Cape Breton County, at the Moseley Mines. The ore is found in both the crystalline and amorphous forms in a red shale of lower carboniferous age about five feet thick. It is presented as layers and beds from one to eighteen inches in thickness. The enclosing material being soft it is readily extracted. The position of the mine has necessitated unfavorable conditions for shipment, but the construction of the railway now under contract between the Strait of Canso and Louisburg will furnish a ready access to admirable shipping facilities.

The following analyses will serve to show its quality:—

	I.	II.	III.
Peroxide of manganese (available)	91.84	87.64	92.65
Peroxide of iron	12	trace.	4.14
Insoluble	2.71	8.51	trace.

The ores of this metal occur in workable amounts in Onslow, near Truro, as veins, and in the partings of the lower carboniferous sandstones.

During the past few months New Ross, in the northern part of Lunenburg County, has promised to become a producer of manganese ores. Miner T. Foster has opened a number of veins which are of high grade, and available for economic extraction. A few tons have been shipped, and have found a ready sale. The extent of the manganeseiferous ground, and the age of the strata holding the ores, has, I believe, not yet been worked out. Explorations made during the past season, have shown that the Dean and Chapter lands adjoining the Foster properties contain, at several points, deposits which promise to be valuable. The ores of this district have, so far as I can learn, not been exhaustively analysed. They contain, however, manganese in amount suitable for steel and chemical purposes.

The Mineral Products Company of Bridgeville, Pictou County, also exhibit samples of manganite, and of manganeseiferous limonite. It is reported that recent developments in the iron ore mines of this locality have shown the presence of considerable amounts of the latter mineral.

Gold Ores.

The collection of gold specimens procured for the exhibition although not as rich as could be desired, may be termed representative of a number of the best known districts. I will refer briefly to the districts represented. The department contributed a set of Montagu specimens, valued at \$1,200.00, at present on exhibition at the Imperial Institute, London, also specimens from Renfrew, Mt. Uniacke, and Waverly. Another handsome set, approaching in value that first named, was secured from Messrs. Jack & Bell. Another sample was from the famous "Plough Lead" at Isaacs Harbor.

The following parties also contributed samples, some of which were very handsome, accompanied by samples of concentrates, wall rocks, photos, etc.:

J. J. Withrow	.....	South Uniacke	.....	Gold-bearing quartz.
"	.....	"	.....	Concentrates.
J. Hirschfield	.....	Goldenville	.....	"
Guffey Jennings	.....	Caribou	.....	Gold-bearing quartz.
W. C. Sarre	.....	Cow Bay	.....	"
Cashon & Hines	.....	Leipsigate	.....	"
"	.....	"	.....	Concentrates.
Elk Mining Co.	.....	Caribou	.....	Gold-bearing quartz.
"	.....	"	.....	Concentrates.
Montreal & London Gold				
Dev. Co.	.....	Salmon River	.....	Gold-bearing quartz.
Gue & Wilson	.....	Waverley	.....	"
R. R. McLeod	.....	Malaga	.....	"
J. H. Townsend	.....	Lawrencetown	.....	"
"	"	"
"	.....	"	.....	Wall rocks, etc.
W. L. Libbey	.....	N. Brookfield	.....	Gold-bearing quartz.
"	.....	"	.....	Wall rocks.
"	.....	"	.....	Concentrates.

Note.—At this mine there is a successful chlorination plan, the first in the Province.

J. D. Huntingdon.....	Yarmouth.....	Gold-bearing quartz.
“	“	Concentrates.
W. C. Anderson.....	Montagu.....	Gold-bearing quartz.
Jack & Bell.....	“	“
Cunningham & Curren.	Mount Uniacke.....	“
“	“	Concentrates.
J. D. McGregor.....	Fifteen Mile Stream.	Gold-bearing quartz.

Lead.

As yet the development of our lead ores has not reached the productive stage.

In Inverness County, in Laurentian felsites, at many points, are visible the effects of solfataric action, in deposits of copper, lead and zinc ores, often noticeably enriched with gold and silver. Some measure of development has been attained at Cheticamp by Halifax capitalists, who have opened a promising silver lead deposit. It is expected that these ores will be shipped to the smelter at Pictou, or to Swansea. Openings show the deposit to be from 3 to 10 feet thick, and to continue for several hundred feet. Roughly speaking, the ore carries one ounce of silver for each unit of lead, some samples showing as high as 78 per cent. of lead and 80 ounces of silver. Gold also shows in quantities varying from 3 to 14 dwts. per ton of 2,000 lbs. Similar results in gold and silver have been obtained from the Silver Cliff deposits and from zinc blende deposits in the same locality.

As yet the auriferous alluvium in the Cheticamp River has not received systematic attention. If there are gravels in the river worth working, they will be found where the river leaves the mountain, and not in its narrow gorges subject to frequent and severe freshets. No free gold veins have yet been reported, and the alluvial gold which attracted so much attention some time ago is probably derived from the felsites, which are reported to occasionally show fine flakes of gold.

At Red Head, a few miles to the north, some development work has been done on copper deposits, also auriferous. Galena

ore running high in lead and silver occurs at Caledonia, Guysboro County, and at Smithfield, Hants County.

Graphite.

The upper or slate division of the Nova Scotia gold fields frequently shows beds highly carbonaceous, but I am not aware that they have been practically tested. In the precambrian felsites and gneisses of Cape Breton, plumbaginous slates are not uncommon. Samples have been secured from the River Dennys district, and from the vicinity of the Grand Narrows. The rock from the latter locality yielded to the analyst of the Geological Survey :

Graphite Carbon	50.23
Rock matter.....	43.27
Water.....	6.50
	100.00

Copper.

An interesting set of specimens and photos show the development work of the Cape Breton Copper Company at Coxheath, Cape Breton County. Here a number of deposits have been traced for several thousand feet, and proved to depths upwards of 300 feet. The deposits vary in thickness up to 12 feet, and may, so far as exploration work has been carried, be described as very long lenses, bedded in precambrian felsites and slates.

While some of the lenses carry copper contents up to 10 per cent., the ore will presumably belong to the class requiring concentration. Working tests have shown that concentration readily presents a suitable furnace material, unusually free from injurious ingredients. The following tables of analyses and of working tests of concentration are of interest :

		CAPE BRETON COPPER COMPANY, (LIMITED), NOVA SCOTIA, CANADA.				Gold and Silver Assays.		
		Analyses of Cocheath Copper Ores.		Gold and Silver Assays.				
	LUCIUS PINKIN, New York.	FRED CLAUDET, London.	PROF. HOFMAN, Boston.	DR. EDW. D. PETERS, JR., Boston.		Copper.	Gold.	Silver.
							ozs. Selected Ores.	ozs.
Copper	6.04	8.99	6.79	13.4	5.3	29.6	0.17	0.45
Iron	14.11	12.83	15.79	13.62	9.84	17.	0.15	2.07
Sulphur	10.69	13.40	8.10	18.1	11.13	18.4	0.26	4.5
Silica	46.23	61.63	47.47	52.7	69.8	25.2	0.15	3.5
Arsenic.	0.01	0.05	0.012	.....	.....	15.7	0.06	4.5
Antimony.	0.17	traces.	none.	.....	.....	8.52	0.05	0.22
Lime	2.34	1.05	trace.	.....	.....	6.89	0.05	0.40
Magnesia	2.27	0.32	3.88	.....	.....	5.62	Concen- trates.	
Alumina	11.83	0.94	8.02	.....	.....	
Cobalt	.....	0.06	.....	.....	.....
Lead	none.	.....	.....	.....	.....
Bismuth	.....	.....	.....	.....	.....
Zinc	none.	.....	.....	.....	.....
Nickel	0.36	.....	.....	.....	.....
Phosphates.	0.08	.....	.....	.....	.....
Oxygen & loss.	.....	.73	.....	.....	.....
						7.23	0.7	
						9.50	0.3	
						12.61	0.5	
							Tailings.	
							0.025	
							0.01	
							Slimes.	
							0.02	
						1.90		
						2.05		
						3.		

CAPE BRETON COPPER COMPANY, (LIMITED), NOVA SCOTIA, CANADA.

TABLE I.

DESIGNATION.	PRYTES.				MIXED PRODUCTS.				WASTE.			
	Wet Weight.	H ₂ O.	Dry Weight.	Cu.	Wet Weight.	H ₂ O.	Dry Weight.	Cu.	Wet Weight.	H ₂ O.	Dry Weight.	Cu.
	No. of Sample.	%	Ko.	%	No. of sample.	%	Ko.	%	No. of sample.	%	Ko.	%
Raw Ore, stated weight.	1	0.3	3180	3.46								
Grains from 8-5-6 mm.	2		16.1	11.35	230	2.2	225					
“ 5-6-4 mm.	3		42.7	11.30	609	3.4	588					
“ 4-2-8 mm.	4		61.8	10.97	775	4.0	744					
“ 2-8-2 mm.	5		23.6	12.31	282	7.2	262		123	4.2	118	1.05
“ 2-1-4 mm.	6		45.3	.....	507	7.5	469		169	6.8	157.5	
Schlich from	7	12.0	235.	12.79	612	10.2	551		249	6.0	234	
Jigger under									897	11.3	396	0.82
do. from Rittinger	8								368	26.6	270	0.98
do. turning table.	9								213	29.6	150	
Schlamm (slimes) from flours												
do. from clarification pit												
Returns			509.3				781				164.2	365
			16.016%				24.56%				1889.7	
												59.43%

In regular work there will be obtained from the 781 Kos. mixed products still about 80 Ko. Schlich, so that the total yield would amount to 18.5%.

Concentration trials on Coxheath Ore, by Humboldt Works, Kalk, Germany.

CAPE BRETON COPPER COMPANY, (LIMITED), NOVA SCOTIA, CANADA.
TABLE II.

DESIGNATION.	PYRITES.				MIXED PRODUCTS.				WASTE.				
	Wet Weight.		Dry Weight.		Wet Weight.		Dry Weight.		Wet Weight.		Dry Weight.		
	Ko.	%	Ko.	%	Ko.	%	Ko.	%	Ko.	%	Ko.	%	
Raw Ore, stated weight.,	26	0.23	3543	2.26									
Grains from :													
8-5-6 mm.	27		17.4	8.18	36	(443	4.0	425					
" 5-6-4 "	28		25.4	8.15	37	680	4.0	657					
" 4-2-8 "	29		36.5	8.10	38	821	3.8	790					
" 2-8-2 "	30		10.4		39	341	7.5	316					
" 2-1-4 "	31		34.3	8.70	40	566	14.0	487					
Schlich from :													
Jigger under ¼ mm.	32	14.4	149.8	9.78	41	283	18.0	232					
Schlich I. Iron pyrites from Rittinger	33		8	2.30									
Schlich II, Copper pyrites from Rittinger....	34	18.4	37.1	14.10	42	156	25.0	117					
Schlich from turning table	35	20.4	40.1	9.87	43	62.5	25.0	47	49	398	26.0	294.5	0.66
Schlamm from labyrinth (flour)					44	218	31.4	150	50	220	28.7	157.2	
Schlamm from Clarification pit:					52	34	3.0	33				476	2.56
Remains not treated													
Returns			362					579				2602	
			10.217%					16.34%					73.44%

In regular work there will be obtained from the 579 Klg. mixed products still about 60 Kos. Schlichs, so that the total yield would amount to 11.85%. Concentration trials on Coxheath Ore, by Humboldt Works, Kalk, Germany.

Samples of similar ores are shown from St. George's River, Eagle Head and French Road, in the same County.

In Antigonish County the traces of copper ore are wide spread. At some points prospecting work has given promising results, but as yet the various licenses to search have received little attention.

A sample of copper ore from St. Joseph's is from a bed of mixed chalcopyrite and shale in lower carboniferous strata close to their junction with precarboniferous rocks, presumably of lower silurian age. There are about eight beds, reported to be from two to six feet in width. The following analysis of a sample from the No. 2 vein is by the Geological Survey Department:

Copper.....	27.00	Moisture.....	.20
Iron.....	29.70	Carbonate of Iron.....	6.20
Sulphur.....	33.50		
Silica.....	3.40		
			100.00

At Polson's Lake somewhat extensive development work has shown, in Devonian strata, beside a dioritic dyke, a large mass of carbonate of iron and calc spar carrying copper pyrites. The ore is stated to average from 9 to 16 per cent. of copper, and to carry several dollars' worth of gold and silver. On the opposite or west side of the Lochaber lake, similar but richer ores occur in numerous veins with spar and specular iron. Exploratory work done here a number of years ago was fairly promising.

In addition to these deposits, carbonates, sulphides and silicates of copper are not uncommon in the carboniferous shales and sandstones in irregular masses, frequently rich, but limited in extent. Further work may, however, show localities where this class of deposits will reach economic values.

In Pictou County similar ores occur at a number of places in the permo-carboniferous and in the millstone grit and lower carboniferous. Traces of copper sulphide also occur in the district forming the water shed between the Bay of Fundy and

the Strait of Northumberland. The deposits near Pictou and River John have received some attention and will probably prove sources of this metal. At Dalhousie Mountain a good deal of surface exploration has been done on a vein from 2 to 3 feet wide carrying copper pyrites. Samples have shown up to 15 per cent. of copper and about \$26.00 of gold per ton.

It may be anticipated that where the Devonian strata of this district are intersected by dioritic and granitic dykes opportunity will be afforded for copper ores, in some cases, of commercial value. The rocks referred to appear again in the southern part of New Annan, and indications of copper ore are wide spread in quartzites and felsites associated with dioritic dykes, etc.

Developments have been made at New Annan, on the East Branch of the French River, about five miles from Tatamagouche Station. The property being developed presents a bed about four feet thick, carrying stringers of black sulphide and carbonate with nodules of various copper sulphides in a fine sandstone conglomerate resting on a blue clay floor. Similar deposits also occur at the Palmer mine, near Wentworth. Here the bed is about ten feet thick and much mixed with clay. The quality of these ores varies very much, according to the state of concentration reached in the process of formation. Samples can be had running up to 50 per cent of copper, with gold and silver in varying amounts. It is expected that these deposits and others of a similar character scattered from Amherst to Pictou will furnish material for the smelter at Pictou. More extended development will be required to determine this point. It is, however, extremely probably that the older rocks lying to the south of the carboniferous will yield deposits of ore larger and more uniform in quality.

Copper pyrites also occurs on the Portapique River, Colchester Co., in a stratum, presumably of Devonian age, over a tract several hundred feet wide and a mile in length. Samples show up to 20 per cent. copper, with traces of gold.

Iron.

Among the most interesting of the exhibits under this head is that of the Nova Scotia Steel Company. This company is an example of the successful progress of enterprise combined with commercial and technical skill. The forge works of New Glasgow, which acquired well-deserved notice for their work in ship frames, shafts, stems, etc., gradually grew and prospered with the iron ores and coal of Pictou County at the doors of New Glasgow, it needed one step and the company produced its own raw material. A railway was built from Hopewell to the head of the East River, to open the Bridgeville iron ores and limestones. A furnace was built at the junction of the East and West branches of the East River, and a large steel works made Trenton another New Glasgow.

This measure of progress has not limited the company's ambition. By a lucky stroke of business they acquired possession of an enormous iron ore deposit on the coast of Newfoundland. This deposit was capable of yielding at the cheapest rate an ore suitable for the basic process. Accordingly large amounts have been annually imported for mixture with the limonite ores of Bridgeville. Exports have also been made to the United States and Europe. The company has sold part of this deposit to the Dominion Iron and Steel Company, it is said, for the sum of \$1,000,000 00. Now they propose to absorb the 22 square miles of coal area of the General Mining Association and to erect at North Sydney a steel plant rivaling that of the Dominion Steel Company.

The ores of the Pictou iron field comprise limonites, red hematites, and spathic and specular ores. As yet operations have been confined to the limonites mined by the Steel Co. There are enormous deposits of red hematites and specular ores yet untouched, and affording material for the establishment of an iron industry surpassing that contemplated at the Sydneys.

The samples exhibited by the company comprise ores, fluxes, fuels, pig iron, and the steel products.

The transactions of the Nova Scotia Mining Institute contain a full description of the plant of this company. The following analyses are self-explanatory :

Nova Scotia Steel Company, Trenton and Ferrona.

Iron Ores.

Red Hematite from Wakana Mine, Newfoundland, owned by N. S. Steel Co. Average analysis for year 1898 at 150,000 tons. Dried at 212° F. Moisture, 0.66.

Loss on ignition....	2.08	p. c.	Phos-Acid	1.62	p. c.
Silica	11.57	"	Sulphuric Acid.....	0.07	"
Iron Oxide	77.67	"	Titanic Acid.....	0.25	"
Manganese Oxide....	0.08	"	Metallic Iron.....	54.37	"
Alumina.....	4.55	"	Phosphorus.....	0.71	"
Lime (CaO.).....	1.81	"	Sulphur.....	0.03	"
Magnesia.....	0.44	"			

Magnetic Iron ore from Cuba, dried at 212 F. Average analysis :

Silica	9.91	p. c.	Manganese	0.41	p. c.
Alumina.....	0.85	"	Metallic Iron.....	61.02	"
Lime	0.50	"	Phosphorus.....	0.04	"
Magnesia	0.32	"	Sulphur.....	0.087	"

Red Hematite. (High phosphorus.) Torbrook, N. S. :

Silica	13.00	p. c.	Titanium	Trace.
Ferric Oxide	77.60	"	Barium Oxide	"
Alumina.....	4.28	"	Volatile matter.....	Nil.
Manganese Dioxide..	0.38	"	Carbonic Oxide.....	"
Calcium Oxide.....	1.90	"	Phosphorus.....	1.21 p. c.
Magnesium Oxide ...	0.35	"		

Limonite Iron ore, washed sample, from East River, Pictou. Average analysis :

Comb. water.....	12.40	p. c.	Magnesia	0.16	p. c.
Silica	11.25	"	Manganese.....	0.33	"
Ferric Oxides.....	73.23	"	Phosphorus.....	0.032	"
Alumina.....	1.49	"	Sulphur.....	0.084	"
Lime.....	0.39	"	Metallic Iron.....	51.26	"

Limonite—Lump sample from East River:

Comb. water.....	10.50	p. c.	Magnesia.....	0.21	p. c.
Silica.....	8.18	"	Manganese.....	1.25	"
Ferric Oxide.....	76.30	"	Phosphorus.....	0.02	"
Alumina.....	2.10	"	Sulphur.....	0.06	"
Lime.....	0.31	"	Metallic Iron.....	53.41	"

Fluxes.

Limestone, Springville, Pictou Co. Average analysis:

Moisture.....	0.20	p. c.	Magnesium Carbonate	4.90	p. c.
Silica.....	3.10	"	Calcium Sulphate ...	0.20	"
Alumina.....	0.24	"	Organic matter.....	—	
Ferric Oxide.....	1.86	"	Lime	} Available {	49.81
Calcium Carbonate..	88.94	"	Magnesia			2.35	"

Pig Iron.

No. 1 Foundry.			Basic Iron.		
Silicon.....	2.85	p. c.	Silicon.....	0.40	p. c.
Manganese.....	0.54	"	Manganese.....	0.75	"
Phosphorus.....	0.90	"	Phosphorus.....	1.00	"
Sulphur.....	0.01	"	Sulphur.....	0.03	"
Gr. Carbon.....	3.70	"	Graphitic Carbon ...	3.27	"
Comb Carbon.....	0.16	"	Combined Carbon ...	0.63	"
Copper.....	Nil.		Copper.....	Nil.	
Arsenic.....	"		Arsenic.....	"	
Barium.....	Trace.		Barium.....	Trace.	

Hematite Iron.			No. 2 Foundry.		
Silicon.....	1.00	p. c.	Silicon.....	2.50	p. c.
Manganese.....	0.95	"	Manganese.....	0.55	"
Phosphorus.....	0.08	"	Phosphorus.....	0.90	"
Sulphur.....	0.08	"	Sulphur.....	0.012	"
Gr. Carbon.....	3.12	"	Gr. Carbon.....	3.20	"
Comb. Carbon.....	0.70	"	Comb Carbon.....	0.30	"
Copper.....	Nil.		Copper.....	Nil.	
Arsenic.....	"		Arsenic.....	"	
Barium.....	Trace.		Barium.....	Trace.	

No. 3 Foundry.			No. 4 Foundry.		
Silicon.....	2.10	p. c.	Silicon.....	1.75	p. c.
Manganese.....	0.60	"	Manganese.....	0.65	"
Phosphorus.....	0.91	"	Phosphorus.....	0.92	"
Sulphur.....	0.02	"	Sulphur.....	0.03	"
Gr. Carbon.....	2.50	"	Gr. Carbon.....	2.00	"
Comb. Carbon.....	0.60	"	Comb. Carbon.....	0.90	"
Copper.....	Nil.		Copper.....	Nil.	
Arsenic.....	"		Arsenic.....	"	
Barium.....	Trace.		Barium.....	Trace.	

Fuels.

48 hour (Retort) Coke. Made in "Bernard's" Coke oven, from washed coal at Ferrona Iron Works.

Moisture.....	0.40	p. c.	Ash.....	7.22	p. c.
Vol. Comb Matter...	1.60	"	Sulphur.....	1.15	"
Fixed Carbon (by diff.).....	90.78	"	Phosphorus.....	0.01	"

Slate, etc., from coal washer from coal used in making coke.

Moisture.....	1.00	p. c.	Ash.....	76.31	p. c.
Vol. Comb. Matter...	18.14	"	Sulphur.....	6.23	"
Fixed Carbon.....	4.55	"			

Washed coal used for making coke.

Moisture.....	1.07	p. c.	Ash.....	4.17	p. c.
Vol. Comb. Matter...	31.69	"	Sulphur.....	1.46	"
Fixed Carbon.....	63.14	"			

Culm Coal, one-third Springhill and two-thirds Reserve Coal, (C. B.)

Moisture.....	0.82	p. c.	Ash.....	11.06	p. c.
Vol Comb. Matter...	28.31	"	Sulphur.....	2.12	"
Fixed Carbon.....	59.87	"			

Another interesting exhibit is that of the Mineral Products Company, of Bridgeville, Pictou County. These people leased the Charcoal furnace at that place for the manufacture of ferromanganese. The manganese was obtained from a deposit in New Brunswick. This deposit consisted of bog ore, which was dried and made into briquettes. It was smelted with the limonite ore of the East River, and made a product of good marketable value. The expense incurred in handling the manganese ore and its freight has been assigned as the cause of the abandonment of the enterprise. I regret to say that, owing to the absence of the manager from the Province, I am unable to give analyses of the raw materials and of the product.

In this district, in addition to the limonite ores, there are large deposits of specular, red hematite, spaltic and clay ironstone ores, which will no doubt before long be mined for the smelter.

In Cape Breton as yet there has been little iron ore development. An extensive and valuable deposit at Gillis Lake, is known as the Moseley mine.

The following set of analyses will tend to show its quality :

	1.	2.	3.	4.
Iron	63.45	63.20	58.90	64.10
Silica.....	6.96	6.42	13.38	4.71
Phosphorus ....	.0212	.014	.0257	nil.
Sulphur .....	.0631	.0604	.0041	.0027

The bed, which has been traced for several miles, averages about seven feet in thickness, and is associated with a crystalline limestone, presumably of laurentian age. It is within about four miles of deep water, and about eight miles from the Intercolonial Railway.

In the devonian strata in the neighborhood of St. Peter's, Richmond County, there are a number of deposits of specular ore, similar to those found in strata of the same age in Guysboro County.

The following analysis from the Micmac mine, about six miles from St. Peter's, will serve to show the class of this ore :

Iron ..	68.18	| Sulphur .....	.15
Silica.....	2.48	| Phosphorus .....	.05

Prospecting work at Whycocomagh, Cape Breton, has shown the presence of a number of beds of magnetite and red hematite up to twelve feet in thickness. Judging from surface indications, there is an extensive iron field in this locality. Analyses show metallic iron, from 49.13 to 63.20 ; Silica, up to 21.90 ; Sulphur, trace to .55 ; Phosphorus, trace to .49.

Very extensive deposits of a similar character occur at Nictaux, Annapolis Co., and are represented by a number of samples. A deposit of red hematite, at Torbrook, in this district, about six feet thick, was worked for some years, until the Londonderry Furnaces were closed. A description of the ores and analyses will be found in a paper on the Iron Ores of Nictaux read by me before this Institute a few years ago.

Other localities which have been drawn upon for samples are briefly as follows: Mira River, Cape Breton County, where there are several beds of red hematite from three to six feet thick.

Extensive deposits of magnetite and red hematite are reported from George's River, in the same county. As yet the explorations in these deposits have not been carried to any extent. The following analysis by F. A. Mason, of Halifax, will show that rich ore exists:

Metallic Iron.....	58.56	|	Phosphorus.....	.019
Manganese.....	1.98	|	Sulphur.....	.013
Silica.....	5.79	|	Titanium.....	.95

Londonderry, Colchester County, has for many years yielded limonite ore of very high quality. A very elaborate report and analyses were made some years ago by Dr. Selwyn, and published in the report of the Canadian Geological Survey Samples of the varieties of limonite and specular ores, and of the carbonates, etc., worked here have been forwarded.

Quarries.

These notes refer to the Quarries in the northern part of Cumberland County, which furnished samples of their products.

Quarries at River John.—No. 1. This is the only quarry at present working in this district. It is situated at River John and about a quarter of a mile from I. C. Railway, and connected therewith by a good road.

It contains a reddish sandstone of fine grain, and has been opened for about 350 feet in length, exposing a face so far of about 14 feet. Stones are cut here up to about 33 cubic feet, though almost any size could be obtained with larger machinery. The seams are very regular in formation and lie nearly horizontal. Worked for nearly a year.

No. 2. Adjoins the first quarry, and resembles it in general characteristics, though the stone is of a lighter colour.

No. 3. About a quarter of a mile up the river from No. 1, was worked for six years intermittently. Many grindstones were cut in this quarry, which yields a firm grey sandstone.

Wallace Harbor.—The Wallace Grey Stone Co., Wallace Harbor, John Stevenson, Manager. This quarry is situated at Wallace, and a great part of the stone is shipped by water, though it is connected with the I. C. Railway by a good waggon road about two miles long.

Though the stone is carried to the wharf by horses, a tramway (gravity) could easily be operated, the quarry being situated on a hill. The distance is about a quarter of a mile. This quarry has been worked for a period of nearly thirty years off and on, and is still only partially developed. It produces an average of about 1,500 tons ("quarry") a year, of fine grained sandstone in two colours—"olive" and "bluish."

Blocks up to ten tons in weight and measuring fourteen feet are cut, and the greater part of the stone is shipped to the Boston and New York markets. The poorer stone is sold locally.

Wallace Harbor.—The G. P. Sherwood Co., T. C. Dobson, Manager. This quarry adjoins the quarry of the Wallace Grey Stone Co., and the same remarks apply to it also.

At Wallace Bridge the famous Battye Quarry is being operated by George Battye. Stone has been taken from this quarry since the year 1809, and there is still much in sight. It is situated on the I. C. Railway and the Wallace River. Chief market New York and Eastern States' cities. Blocks up to ten tons are cut. At present 25 feet of rock is shown in the face, with seams measuring from 2 to 6 feet in thickness. This is composed of a very uniform and beautiful sandstone, suitable for monumental as well as construction work.

On the River Philip, about five miles from Pugwash, is situated the quarry of McLeod & Embree. It produces a handsome red sandstone contained in seams from 2 to 7 feet, and shows altogether 20 feet in the face. Blocks cut to 8 tons. Has been operated for upwards of 30 years and usually ships to the

States. This year all the stone quarried is being supplied to Toronto.

The Atlantic Stone Co., Limited, R. S. Hibbard, Manager.—The quarry of this company is situated on Cumberland Basin, $3\frac{1}{2}$ miles from Joggins Station, on the Canada Coal Company's Railway, and 16 miles from I. C. Railway. The stone is shipped chiefly by water, in vessels up to about 300 tons. The market is mainly in the New England States, though the stones are sent much further west occasionally. 2,000 tons shipped per year. This quarry produces a very superior form of grindstone. Stones from half an inch to 14 inches thick, and up to 7 feet in diameter are cut, though almost any size that could be handled are procurable.

At Lime Rock, West River, Pictou Co., are sandstone quarries yielding good building stone. Samples are shown by Mr. J. H. Fraser. In the Merigomish district the strata lying above the productive measures yield grindstones and fair qualities of freestone.

The owners of quarries of granite, syenite, etc., neglected to respond to the invitation of the Department to send samples. The demand for granite is limited practically to the City of Halifax, where this stone is used to some extent for foundations, trimmings, and in the fortifications. The present available sources of supply are Shelburne, and the North-West Arm, near Halifax. At Nictaux there are blue varieties of granite of very fine quality, and in Cape Breton there are syenites, gneisses, etc., available for decorative and other purposes.

An interesting deposit of sandstones yielding building stone, grindstones, whetstone, etc., is found at Lower Cove, Joggins, Cumberland County. Samples of the raw and manufactured article are contributed by Mr. R. L. Hibbard. These quarries have been worked continuously for many years, and an extended market has been found for the grindstones. The quarry yields stones one-half to seven inches in thickness and up to seven feet in diameter. The superior quality of these

stones has secured a reputation for the district second only to that acquired by quarries more favorably situated in large industrial districts. Similar deposits are known at several places along the Joggins shore.

Marbles are represented by a sample from Escasoni, Cape Breton County, contributed by Mr E. T. Bown.

The following list shows the building stone quarries from which samples have been secured for the Exhibition:—A. Allen, W. W. Garmon, River John; T. C. Dobson, Wallace; McLeod & Embree, Pugwash; Wallace Graystone Company, Wallace; A. McPherson, Eight Mile Brook; R. L. Hibbard, Joggins; J. H. Fraser, Limebrook.

Barytes.

This mineral is known at Five Islands, Stewiacke, River John, and at Lake Ainslie, in Cape Breton. At present a few hundred tons are annually mined at the last-named locality. The ore occurs in a vein about nine feet wide, and is extracted through a tunnel. It is of excellent color and quality, and low in carbonate of lime. Samples of this mineral are exhibited by Messrs. Henderson & Potts.

Gypsum.

This mineral is found in great abundance in Nova Scotia. It is presented as hard and soft gypsum in every variety of texture and purity. The annual production is about 150,000 tons, principally from Hants County. Small amounts are quarried at other localities for local use, as an ingredient for fertilizers, etc. The exports from Hants County go to the United States, and a considerable shipment is made from Victoria County to Montreal and Philadelphia. Samples are exhibited from Windsor, Wentworth, St. Croix, Newport and other localities, in Hants County. Selenite is also shown from Enfield, in the same county, which has yielded a few hundred tons.

The Windsor Plaster Company also show the following products: (1) "Calcined plaster" used for putty coating, finishing, etc. (2) "Selenite cement" used for under coating, etc. (3) "Land plaster," ground gypsum, used for fertiliser manufacture, stables, etc.

Tripolite.

Of late years considerable attention has been paid to the infusorial earth deposits of the province, and to deposits of very fine grained quartz available for polishing, insulating, and other purposes.

Among the localities represented may be mentioned River Dennys, Inverness Co., where the Cairo Polishing Company are doing development work; Bass River, Colchester Co., where extensive works are carried on, the shipments for the last fiscal year amounting to 21 tons. The Bass River Infusorial Earth Company procure the raw material from Bass River Lake, where it is found in a bed about three feet thick, and purify it in a large plant, which has been in operation for over two years.

The Victoria Tripolite Company have commenced extensive operations near St. Ann's, in Victoria County, and are making a specialty of insulating material.

Molybdenite occurs at many points in the Province, but as yet deposits of workable size have not been reported. New Ross, Lunenburg, yields very large and fine crystals. A sample is shown from this district. A few tons have been shipped from Gabarus, Cape Breton County. From the Margaree district, Inverness County, are shown samples of ores of Tungsten, fuller reference to which will be found in these Transactions.

Antimony. The sulphide of this metal was some years ago worked intermittently at West Gore, Hants Co. The Messrs. McNeil, of Halifax, have lately given some attention to the district, and have proved three leads. The ore carries consider-

able gold values, and there appears to be some difficulty found in extracting it. Assays show the following values :

	I.	II.
Antimony	60.29 p. c.	43.73 p. c.
Gold	2.66 oz. per ton 2,000 lbs.	2.48 oz.
Silver	—————	.10 "

Fire clays occur at several places in the coal measures, and other horizons of the carboniferous, and are apparently valuable. The manufacture of fire brick was carried on for some time at Stellarton, but is, I believe, at present discontinued.

Allied economically to the fire clay is a sample of felsite from Coxheath, Cape Breton Co, which has been proven experimentally to make a good fire brick when mixed with about one per cent. of lime.

Samples of coal oil shale and their products of parafine, wax, illuminating and lubricating oil are shown from East Bay, Cape Breton Co., where a plant is being erected to treat them on a large scale. These shales occur in lower carboniferous conglomerates and sandstones near their junction with laurentian measures.