

ART. VI.—THE CARBONIFEROUS OF CAPE BRETON—By EDWIN GILPIN, JR., A. M., F. G. S., F. R. S. C., DEPUTY COMMISSIONER PUBLIC WORKS AND MINES, AND INSPECTOR OF MINES.

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PART II.

IN my last contribution on this subject I sketched briefly the outlines of this formation as exposed in the Counties of Cape Breton and Richmond. I now purpose following the various subdivisions as they are met in the remaining counties, and to finish with analyses of the coal beds, iron ores, limestones, saline springs, etc., met in the Carboniferous of the Island. These analyses are found scattered in various reports and papers, and are not accessible to the general public, and I may therefore be pardoned for inflicting on you the dry calculations of the analyst.

In finishing the first part of this paper I alluded briefly to the coal field of the River Inhabitants Basin. This district was first reported on by Sir J. W. Dawson, and the results of his survey are to be found in the journals of our Legislative Assembly. Owing to the paucity of exposures and the wooded character of the country, little could be gathered by him of interest to the field geologist.

Some interest was shown in the district at that time, and seams were opened on at Little River, and at Carabacou Cove, and some outcrops exposed on the west side of the river Basin. The mines, which were imperfectly opened, did not long compete with the collieries of the Sydney district and were abandoned. Mr. Fletcher, of the Geological Survey, used every exertion to map out the district with precision, but it proved a difficult task, its complicated structure was rendered less intelligible by the presence of several faults of great magnitude, and scarce a record could be found of the large sums spent in prospecting. It, however, would appear, that, roughly speaking, there is a coal basin

extending from Carabacou Cove to Little River, then running in an easterly direction across the River Inhabitants, and sweeping south to the shore of Lennox Passage. Outside this basin are thick beds of millstone grit, but the whole series is interrupted by masses of the Marine Limestone Series, brought, possibly by faults, into curious relations to the coal beds. In fact at Little River it has been suggested by several geologists that the coal is associated with the limestones, and gypsums, a mode of occurrence paralleled I believe in the North of England.

At Coal Brook a seam four feet thick is said to have been found, with several smaller ones in the vicinity. At the Little River Mine the measures are steeply inclined, and apparently form the axis of a narrow basin. They dip at a nearly vertical angle, and present the following section :

	Ft.	In.
Coal	3	0
Strata.....	154	0
Coal	4	0
Strata.....	60	0
Coal	3	0
Strata.....	45	0
Coal	5	0

The upper beds were opened some years ago by the Eastern Development Company, and a few tons extracted. The coal is compact and apparently of good quality, but I have seen no recent analysis of it.

These outcrops have been traced but a short distance as the surface earth is very deep. Their exact relation to the Seacoal Cove seams is obscure, but they may possibly be repetitions on the northern side of an anticlinal. At the latter place quite extensive operations were carried on between 1863 and 1865, but only a few hundred tons of coal were shipped. Mr. Campbell reported that there were several workable seams from three to eleven feet in thickness, all standing nearly vertical. The coal is said to be similar in quality to that of Little River, and to resemble the Pictou coal rather than the more bituminous variety mined in the Sydney district.

It is to be regretted that the records of the thousands of dollars spent in exploratory work in this district have been almost entirely lost. The field geologist, confined to natural exposures and outcrops, finds that the notes of a borehole or of a shaft frequently supply the very information desired to show the nature or dip of an important piece of ground. However, Mr. Fletcher has compiled all that is available above and below ground, and has furnished information of great value to future explorers. From a review of what is known about this district it may be said that there is a strong probability of workable coal seams being found in those portions lying less disturbed than the sections opened at Seacoal Cove and Little River. The fact that an almost continuous winter shipment can be carried on will help to forward the development of any discoveries.

At Glendale, on the upper waters of the River Inhabitants, there is a small isolated coal field, the exact horizon of which is doubtful. If the idea of there being two unconformable series of measures as suggested in Mr. Fletcher's report be adopted, the coal of Glendale and of the mouth of the River Inhabitants may be assumed to correspond, and the limestones of Glendale and Plaster Cove are identical. However, further search into the relationship of the Little River coal and plaster is needed before the structure can be clearly made out. The Glendale coal field as yet boasts of only one seam about 20 inches thick, as reported by Mr. Fletcher, there is said to be another seam about three feet thick underlying it. However, the total extent of ground apparently underlaid by coal is limited, and at present scarcely tempts exploration.

The extent of the Carboniferous of Victoria and Inverness Counties can be readily understood by any one at all familiar with the geography of the island. If a line be drawn from the mouth of the Cheticamp River to the mouth of Middle River the country to the east of it will be found to be almost exclusively occupied by the pre-Cambrian measures, and on the west side are met the Carboniferous with a few outlines of the older measures. The western shore of the Bras d'Or Lake from Baddeck through the Grand Narrows and West Bay to Hawkesbury complete the

circuit of the district now under consideration. Its length is about eighty miles, and its maximum width from Mabou to the Grand Narrows about thirty-five miles. It is composed almost exclusively of Carboniferous measures with a few protruding ridges of Devonian and Pre-Cambrian strata. The largest of these ridges forming the Craignish and Whyhogomah hills begins near Plaster Cove, in the Strait of Canso, and runs north-easterly to Whyhogomah; its width at the Strait of Canso being about ten miles, but narrowing to an average of about five miles. Near the Strait of Canso it is largely Devonian, then Pre-Cambrian felsites, etc., are met, followed by the associated crystalline limestones, most generally known in connection with the Whyhogomah iron ores. Scattered areas, small in extent, of felsites and limestones, are met at the head of, and near the eastern shore of Lake Ainslie, and connect with the main body first referred to along the divide between the Margaree and the St. Patrick's Channel watersheds. The highlands of Cape Mabou, and of the Malagowatch Hills, and some small outliers along the north side of St. Patrick's Channel may complete our reference to these pre-Carboniferous measures.

It may be remarked here that throughout Cape Breton the older and harder rocks in ridges of varied size and outline have a general north-east and south-west course, and are higher than the newer carboniferous strata which dip, roughly speaking, away from them, forming wide valleys. The traveller will readily recognize these features in the stern hills of Boiesdale, St. Ann's, Coxheath, Mira, Marble Mountain, etc., as compared with the valleys of the Sydney, Middle and Margaree, as well as of the Dennys and Inhabitants Rivers.

Taking the productive and millstone grit measures together, they are to be looked for on the Gulf shore, and apparently at one time formed a belt continuous, at least from Judique to the Cheticamp River, a distance of about sixty miles. Now they form four narrow strips, separated by the Pre-cambrian of Mabou and by the Lower Carboniferous horizons of Mabou River, Broad Cove and Grand Etang, their width nowhere

exceeds three miles, and the largest continuous patch is that lying south of the Margaree River and Chimney Corner.

The Judique district, forming the fifth of the synclinals into which Mr. Fletcher divides the Carboniferous of southern Cape Breton, contains measures of uncertain age. They are largely composed of soft sandstone and marls, frequently gypseous, and carrying small impure seams of coal. They are possibly millstone grit, and are succeeded to the north by the economic coal strata of Port Hood. There has been apparently in the Judique district conditions of deposition permitting the growth of coal plants, and at a small vertical horizon of conditions favoring the accumulation of gypseous and calcareous matter. The section given in the Geological Survey Report, 1879-82, is on this account very interesting. It may possibly be applied at some time to the elucidation of the problems offered in the River Inhabitants Basin.

At Port Hood the exact extent of the coal bearing measures is still unsettled. Two large seams are known—one is exposed at low water, and said to be six feet thick; the other seam crops near the shore, with a dip also toward the Gulf. The following section of it is given by Mr. Fletcher:—

	ft.	in.
Coal with bands	1	5
Slaty band	0	9
Coal	4	2
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Total.....	6	4

The seam dips at an angle of 27°, and was opened by a slope in 1865, by the Cape Breton Company. Another slope was driven some distance to the north to win the same seam in a submarine area held by Judge Tremain and others, but was closed in 1878. Formerly a sand bar connected the mainland with Smith Island, but its destruction by the sea ruined the harbour, and any attempts at coal shipping would be attended with difficulty, unless, as has been suggested, a fresh bar could be formed by sinking a row of cribs along the line of the old one. The extent inland of this district is still unknown. The crops of

small coal seams have been observed about three-quarters of a mile from the shore; beyond this the measures consist of grey sandstone and shale, having a millstone grit facies.

Mabou.—Mr. Fletcher remarks of this district that there is no difficulty in defining its limits, the two patches at Coal Mines and Finlay Point being sharply interrupted by the gypsum at a distance from the shore, not exceeding one quarter of a mile. These were presumably united at one time, but are now isolated by folding and denudation. The geological survey sections give one seam six feet thick, and a number of thinner ones. Mr. Brown, in his book on the Coal Fields of Cape Breton, now unfortunately out of print, states that on the south side of the first basin the outcrops of four workable seams have been examined. They lie with heavy northerly dips, and are included in about 550 feet of measures. He gives their thickness as follows:—

	ft.	in.
Highest Seam.....	5	0
Second "	7	0
Third "	14	0
Fourth "	4	0

As there is no good means of shipment at present available, there has been no coal mined here except for local use. No doubt the time will come when these seams will yield valuable returns in their land and seaward areas, Mr. Brown estimating the amount of coal in one square mile at 27,000,000 tons.

Still continuing to the north there is a small patch of Lower Carboniferous at Cape Mabou, but the shore for about three miles further is occupied by Pre-Cambrian rocks. At Port Ban the commencement of the Broad Cove coal field is met. Here it follows the valley of Rankin's Brook for about two miles in a narrow tongue resting on the felsites. Beyond this it widens until a little to the north of McIsaac's Pond it is nearly two miles wide, it then contracts to a narrow point about a mile north of the mines; the total length of the district being about five miles. It is probable that a large part of this district is underlaid by workable coal seams. Their dimensions are best

known at the mines of the Inverness Coal and Railway Company, where work has been carried on intermittently for a number of years.

The following general section of the strata has been given by Mr. Brown:—

UPPER GROUP.

	ft.	in.
Coal	3	0
Strata.....	340	0
Coal	5	0
Strata.....	100	0
Coal	7	0
Strata.....	240	0
Coal	3	6

LOWER GROUP.

Coal	2	6
Strata.....	60	0
Coal (said to be)	3	6

In common with all the other coal districts of Western Cape Breton there is no proper shipping place. The coal shipped from the Broad Cove mines had to be lightered to vessels lying in an open roadstead, an arrangement that could not be followed at the present prices of coal. It has been proposed to cut a ship channel across the bar forming McIsaac's Pond, which would give ample dock room. It is questionable how far such a channel would prove permanent, in view of the small volume of fresh water discharged into the pond, and the continued drift of sand along the coast, as the forces laying down the sand bar would resume their work the moment its profile was altered. At Chimney Corner, a few miles to the north, at some considerable expense a breakwater could be built so as to afford shipping facilities, but the frequent employment of a dredge would be required.

Continuing to the north we meet the commencement of the Chimney Corner coal field at Broad Cove Marsh. Here, as elsewhere in the district under consideration, the dividing line

between productive and millstone grit measures is obscure. Taking them as grouped together by Mr. Fletcher they form the westward slope of the watershed between the Margaree River and the Gulf, until about half way between the Forks and the mouth of the river, when they come nearly to the river bank and form the south-western shore of the harbour. Out of this district, which is eleven miles long, and about two and a half miles wide on an average, it may be assumed that a strip on the west side about a mile or a mile and a half wide may be assumed to be valuable to the coal miner. Attempts have been made to open a colliery at Chimney Corner, but a breakwater would have to be built before regular operations could be carried on. The following section shows the relative positions of the seams opened here; they dip under the sea, and are of excellent quality:—

	ft.	in.
Thin Seam.....	1	6
Strata.....	300	0
Coal	3	0
Strata.....	88	0
Coal	5	0
Strata.....	200	0
Coal	3	0

To the north of Margaree Harbour Mr. Fletcher reports that for several miles a narrow fringe of rocks, representing probably the lower beds of the district just referred to, skirts the shore. Thence to the mouth of the Cheticamp River the Lower Carboniferous come to the shore. The Island of Cheticamp is occupied by rocks of the Middle Carboniferous, presumably millstone grit, as I do not know of any reported outcrops of coal seams.

These notes may serve to show roughly our reserves of coal in the County of Inverness, and although they are of considerable value from their quality and extent, the present conditions of the coal trade do not warrant any ground for predicting their early development. Should the older measures in their vicinity yield workable deposits of copper ore and other minerals they

may be found useful at an early date. It is of interest to glance at their former seaward extensions. Part of Port Hood Islands and Margaree Island are composed of Middle Carboniferous, and they are the relics of a vast coal field extending for miles under the Gulf of St. Lawrence, and gradually worn away by its tides and currents. Even in historic times we have seen marks of the progress of destruction in the sweeping away of Port Hood Bar, and undermined cliffs at numerous localities.

In the district we are considering, Mr. Fletcher has divided the remaining Carboniferous strata into two groups, on which he remarks:

“Conglomerate—At or below the base of the lower Carboniferous, in several places occur strata, greatly altered by the intrusion of igneous rocks. They frequently resemble the supposed Devonian of the Isle of Madame, but are more probably for the most part Carboniferous, and underlie the Marine Limestone.”

The more important and most highly altered rocks of this series, occur at Mabou, Strathlorne, South West and North East Margaree and Cheticamp. They comprise, argillaceous and arenaceous shales, and sandstones and conglomerates with diorites and tuffs. Similar but less highly altered grits, sandstones and conglomerates occur in the ridge between the Baddeck River and St. Patrick's Channel at Middle River, Mabou, Lake Ainslie, Syke Glen, etc.

One band of these measures, begins at Low Point, on the Strait of Canso, and runs to Lake Ainslie in a band about five miles wide. A branch of it running down the West River of Whyhogomah forms the Salt Mountain, and gradually widening occupies great part of the district between Lake Ainslie and the mouth of Middle River, and following the west bank of the Middle River terminates near Loch Ban.

Other isolated patches are met on both sides of Loch Ban, and between the branches of the Margaree. Another irregular band, beginning at the forks of the Margaree, on the east side of the river, follows it down to within a mile of the shore, to which it pursues a roughly parallel course until it ends on the Cheticamp River, about five miles from its mouth, and has for its

eastern limits the Pre-Cambrian of the interior and the valley of the lower part of the North-East Margaree. These strata are non calcareous and in great measure must be considered as representing the basal conglomerates which I have referred to as characteristic of the Carboniferous of the Sydney district, while the more altered sections are possibly to be regarded as lower than the commonly accepted dividing line between the Carboniferous and Devonian.

The Marine Limestone formation in this part of Cape Breton presents the same typical features which lead to its easy recognition in all parts of the Maritime Provinces. In the extreme part of Cape Breton it extends from Cape St. Lawrence to Cape North, and nearly joins the exposure of the same horizon at Aspy Bay, which, following the valleys of the Brooks, runs far into the island. At Ingonish, and along the shore from Cape Enfume to St. Anne's Harbour, there is a narrow strip of the marine limestone, which follows the valleys of the St. Anne rivers for several miles until it is succeeded by the Pre-Cambrian felsites. Through St. Anne's this horizon is continuous to Baddeck and connects with the larger exposures of Carboniferous in Inverness County. From Baddeck it follows the valley of the Middle River in a narrow tongue, and connects with the same measures filling the valley of the Margaree and its principal branches. In the opposite direction it extends from Baddeck through the River Denny's Basin into the watershed of the River Inhabitants, and passing between the Malagawatch and Craignish Hills ends on the Strait of Canso at Plaster Cove, and on the Bras d'Or at the head of West Bay.

Another band lying west of the Craignish Hills, and the belt of altered Lower Carboniferous already referred to, runs from Judique to Mabou and passing to the east of the felsitic highlands of Cape Mabou extends to Lake Ainslie. Here it surrounds some outliers of the "altered" rocks referred to above, and continues in the rear of the Broad Cove and Chimney Corner coal district, until it meets the valley of the North West Margaree. Another narrow strip skirts the eastern shore of Lake Ainslie. There are many small isolated patches of these measures along

the shores of West Bay, at Port Hood, etc., but they need not be noticed in this brief sketch.

This formation presents everywhere beds of limestone and gypsum, with marl shales, sandstones and grits, of various colours, frequently gray or red.

The gypsum deposits are of every conceivable variety of colour, texture and quality, and frequently extend for miles. They often give rise to saline springs and mark the ground with funnel-shaped holes. The limestones are in equal variety, and at some points carry the fossils characterizing the formation. Little use is made of these minerals, nature having scattered the former everywhere; while a few bushels of the latter meet every requirement of the local architect and mason. The student will frequently notice these measures running in long tongues and spurs beside some brook in large deep valleys of the Pre-Cambrian felsites and syenites, thus bringing into close connection the valleys of three epochs of countless years. There is first the Pre-Carboniferous valley eroded in the felsites. In this was deposited the marl, limestone and gypsum, and finally we have geologic history repeating itself, and a glen worn out in them in their turn by some brook bearing a highland name.

At many points the sub-divisions of the Carboniferous present signs of unconformability, but this cannot be settled in many cases, as there are frequent faults and small undulations, which when accompanied by great erosion, made unequal by the varying resistance of limestone and gypsum, and marl, yields dips of uncertain value. Generally speaking, however, the sequence in passing from north-west to south-east is fairly regular.

No estimate is given by Mr. Fletcher of the thickness of these measures, except in connection with the Port Hood mines, where he has measured one section lying above the gypseous strata, which is 3370 feet thick. Owing to the inter-section of the district by the outliers and ridges of Pre-Carboniferous rocks and to the deposition of the Carboniferous in their hollows, etc., it is doubtful if any exact measure of their volume will be arrived at.

In my next paper I purpose giving analyses of the seams of the various coal districts, and of their ashes, their gas values, etc. ; and such information as I can gather about the extent, nature and value of the various beds of iron, copper and lead ores, and of the other minerals of the various sub-divisions of the Carboniferous of Cape Breton.