

those of Italy, which possesses iron equal to that of Sweden, and gold which excels that of Australia and California in purity, which has unequalled fisheries, safe harbours, extensive coal fields near the water's edge, and above all a position almost midway on the very highway of nations between the Old and the New World, may hope, at some future day, to inherit a full share of that greatness, which Britain must, in her old age, resign to her children or to strangers.

ART. XI. EXPLORATIONS IN THE PICTOU COAL FIELD.
BY R. G. HALIBURTON, F. S. A., F. R. S. N. A.

FROM the discovery by Mr. French, in 1865, of the Albion Mines main seam several miles further west than it was supposed to exist, I was led to take up extensive mining rights in the vicinity of the Pictou Coal Mines. Mr. French, to whom this province is under great obligations, had proved that comparatively little was known of the extent of the productive measures, and that similar discoveries must soon be made in other directions. The explorations, which are the subject of this paper, were personally superintended by myself, and were conducted by the aid of a mining engineer on the following properties:—No. 1., situated on the south western side of the coal basin, on an area known as “the Culton property,” and adjoining the colliery of the Intercolonial Company; No. 2, on the south eastern extremity of the basin, on the west flank of McLennan's Mountain. No. 3, at the eastern end of the basin near the waters of Merigomish, on a property called the St. Lawrence area. No. 4, on a property on the northern side of the basin purchased from Messrs. McDonald, McKay and

tural Society cannot have forgotten the surpassing beauty and equal excellence of the apples communicated by the great Colony of Nova Scotia. *Certainly nothing like them had been previously seen at any Public Exhibition in this country.* “What gives this collection especial interest is the example it affords of the excellence of the climate of a Colony which half the world believes to be dismally dreary.” The *London Times* also says, “The beauty of the apple beats anything we have ever seen;” and the Royal Horticultural Society, in its proceedings, states, “The only other country except Turin, which exhibited grapes grown in the open air, was Nova Scotia, and several of these were of the same kinds as those from Lombardy, but *they seemed to have agreed better with this new habitat on the other side of the Atlantic, and to have beaten their old country-cousins both in size and flavour.*” The explanation for this may be found in the fact that Nova Scotia is situated in the same latitude as Nice, and that its autumns are prolonged by its proximity to the Gulf stream.

Known, on the East River colliery. No. 5, on an adjoining property, purchased from Messrs. Beal and How, and now belonging to the Montreal and Pictou Coal Company. These explorations, therefore, are the most extensive that have hitherto been conducted in that county, and though undertaken for the practical purpose of discovering and developing coal mines, have incidentally thrown some light on the Pictou coal field, which may be interesting to geologists and to the public. I shall first select those explorations on the northern side of the basin, on the East River and Montreal and Pictou properties, as they are in the immediate vicinity of New Glasgow, and in a district which had been previously fully described and somewhat misunderstood.

Dr. Dawson, whose investigations have thrown so much light on the structure and formation of coal, and whose geological labours have reflected so much credit on his native province, has been for many years almost the only authority on the Pictou coal field, and his inferences were based on the limited information that was derived from the works of the General Mining Association, which were confined to the southern crop of the basin. Mr. Richard Smith, a former superintendent of that colliery, suspected, as I am informed, that there was a coal basin between New Glasgow and the Albion Mines pits, but this impression seemed to have been lost sight of, and the conclusion was, many years ago, somewhat hastily arrived at, that New Glasgow was situated on the southern rise of the basin, and that the coal which was supposed to be at an immense depth, was thrown down by a great down throw fault; the large seams not re-appearing to the northward. It was evidently assumed that the town of Pictou was situated on the northern rise of the basin, which would make it from ten to fifteen miles in breadth. Dr. Dawson, in his examination before the Mines' Committee of the House of Assembly, states as follows:—

“ The outcrop of this bed is four miles in length. It is broken by a fault at New Glasgow where *it falls down several thousand feet*. It has not been found again in the county of Pictou. The other outcrop is about a mile to the S. E. of the mines.

“At New Glasgow the coal is half a mile deep at least below the surface.”—*Journ. H. A., 1845, App. 49.*

This view, as to the immense depth of the seams at New Glasgow, was adopted by the General Mining Association and by the public generally, and all the explorations at New Glasgow were considered as useless. In his *Acadian Geology* Dr. Dawson still partially adhered to his previous views, though he was evidently somewhat doubtful on the subject, which is evident from the vagueness of his language. The southerly dip near New Glasgow, which he had supposed was caused by a downthrow fault, he still attributes to a line of disturbance, and he speaks of the coal being “cut off” by a fault. Explorers and miners have been a good deal puzzled to ascertain whether he meant an “upthrow” or a “downthrow fault,” as he does not state which it is, but the extract from his previous statement before the Mines’ Committee shows what his views on this point were. Assuming them to be correct, the thickness of the Pictou coal measures would be immense, as we should have a succession of coal measures overlying the Albion Mines seams, dipping at a heavy angle northerly for several miles until we reach the northern rise as we approach the town of Pictou.

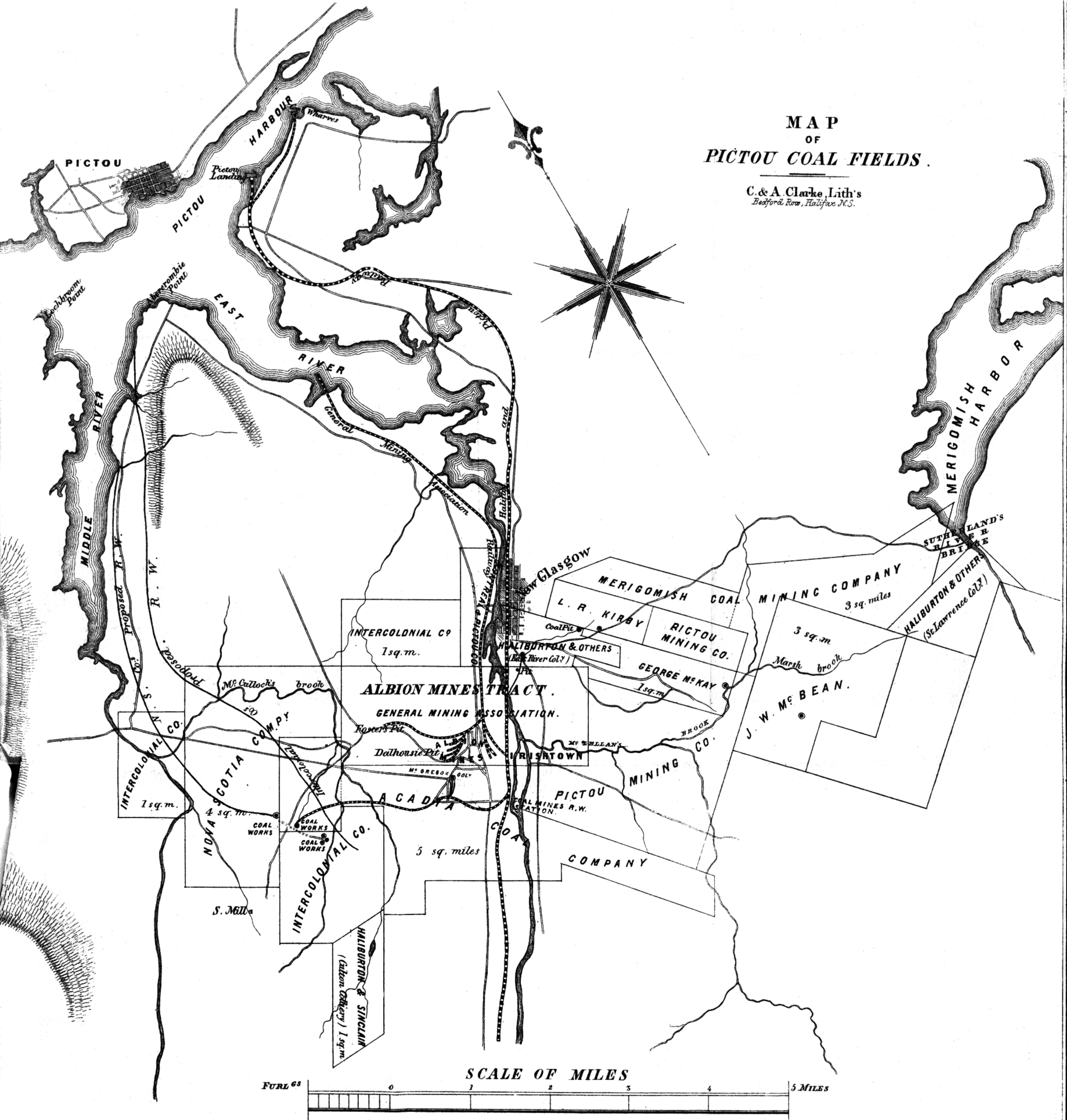
In the section given by Dr. Dawson (p. 244) he commences with the limestones and gypsums of Springville and the lower carboniferous strata overlying, proceeding, in ascending order, until he comes to the Albion Mines seams dipping nearly due north. He here reaches the southern crop or basset edge of the Pictou coal basin. He adds in his description of these measures, “the main seam has been very extensively worked, and its outcrop has been traced for several miles; but it is remarkable that it preserves its character as a good seam only for a limited distance. Both in the north-west and south-east extension it becomes very impure and intermixed with slate, indicating that though great in thickness it is very limited in horizontal extent. The measures also *are cut off to the northward by a line of disturbance* running along the south side of an enormous bed of conglomerate which *succeeds these rocks in ascending order,* or” he prudently adds with probably some misgiving, “apparently so.”

His section is consistent with his previous statement before the Mines Committee, that the coal seams are half a mile deep at New Glasgow; and there can be no doubt that if they become still deeper beyond New Glasgow through a downthrow fault, the conglomerate must not only overlie them half a mile, but even more, according to the extent of the supposed downthrow fault, which he assumes runs along its southern edge. Practical explorations have entirely disproved this assumption, and have established that the Pictou coal measures are not more than one third as thick as Dr. Dawson infers, and that a pit twelve hundred feet deep would reach the lower seams in the very centre of the basin. They have also proved that the so called Pictou coal basin really constitutes two distinct basins, the one, which I may call the southern or Albion basin, lying to the southward, and the other to the northward of the conglomerate which underlies the productive measures. It is manifest that if the conglomerate were an upheaval since the coal was formed, we should have the Albion Mines recurring to the northward unless they had been affected by subsequent denudation. But so far we have no equivalents of the southern coal measures in the northern basin, and must assume that they were always distinct basins, and now differ, from their measures having been formed under different circumstances.

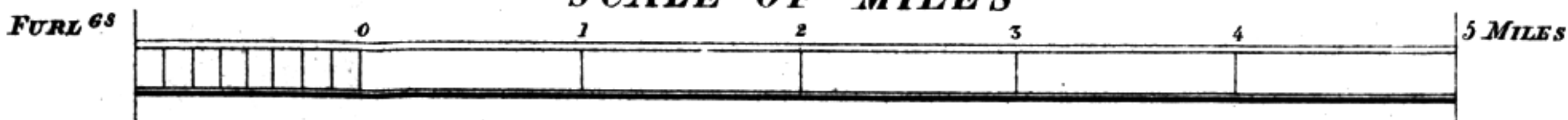
In October 1865 operations were commenced on the East River colliery, which was purchased for the purpose of working some upper seams of excellent quality which had already been tested. Finding while I was proving a small seam known as "the Richardson seam," near New Glasgow, that it dipped almost the reverse way to those of the Albion Mines, and that its underlying strata rested on the conglomerate, and that the conglomerate itself near New Glasgow dipped to the southward, and various dips on the west side of East River having indicated that the coal measures must come to the surface or crop near New Glasgow, I prepared the plan now exhibited, showing the supposed course of the northern crop of the main seam at the town of New Glasgow, and also on the west side of the river. We felt so assured of the fact that the Albion seams, instead of being half a mile deep at New Glasgow, must come to the

MAP OF PICTOU COAL FIELDS.

C. & A. Clarke Lith's
Bedford Row, Halifax N.S.



SCALE OF MILES



surface, that we purchased the bed of the river and the property to the westward, and commenced explorations on the supposed line of crop. The first trial pit on the edge of the river was successful, as it struck the crop of the main seam, which was found lying at a heavy angle. Following the course indicated by the plan, we sunk a trial pit nearly half a mile to the south-westward, where we again struck the same outcrop. A working shaft was then sunk, and the results are thus described in the official report of the government Inspector of Mines:—

“A company has been formed with the title of the Montreal and Pictou Company, to work the seam which has recently been opened by R. G. Haliburton, Esq., on the west side of East river, and adjoining the Albion mines on the north. A shaft has been sunk through several beds of coal, varying in thickness from 2'.6" to 15'.6", and separated by beds of fire clay from 7 to 10 feet thick. They dip to the south-east at an angle 65°. Although these beds are so far apart as to be practically distinct seams, there are points of resemblance and other circumstances, which lead to the belief that they represent the main seam of the Albion mines, and that this colliery is on the northern crop of that seam. The shaft has been sunk 180 feet, and drifting commenced at a depth of 165 feet.*

“The discovery of coal on this area has added to the importance of the Pictou coal field in a remarkable degree. It has given to it a conformation which appears to have been entirely unsuspected, and by which a large quantity of coal is placed within easy reach. The same seam has been discovered by Mr. Kirby on the east side of East river, and to the north-east of New Glasgow. This extension of the knowledge of this portion of the coal field will doubtless lead to further explorations, the progress of which will be watched with interest.”

CULTON AREA.—Explorations were commenced on this property in 1865, with a view to discovering the Campbell seam, which had been identified by Mr. Poole with the Culton seam found on this property, and worked by Mr. Culton. The adit driven by him is situated on Bear brook, about a mile and a quarter from the Provincial railway. Explorations were com-

*Since the publication of this report a level has been driven 100 yards to the westward on the upper bench, which has increased to 25 ft. from roof to floor. The partings have apparently been only local, and caused by a bend in the strata, and have given out, leaving the seam without any partings. On the northern side of the basin therefore, the main seam more nearly resembles the same seam at Middle river, than at the Albion Mines. The coal was found to improve rapidly in quality to the west, and the measures to be undisturbed in our west level.

menced from a point near the centre of the Intercolonial company's property, known as the Campbell area—and not less than sixty bore holes and trial pits were sunk. A small overlying seam was discovered with a strike S. 12° W. It lay at a heavy angle, indicating either that the measures turn there rapidly to the west, or that there are traces there of the series of downthrows to the south-west, which the Acadia company found on the Fraser area, as they approached the eastern boundaries of the Carmichael and Campbell areas, our pit on the small seam being in the line of disturbance which the direction of those downthrows would take. From this point a series of bore holes and trial pits were sunk to the Culton pit, over nearly three quarters of a mile of country, and wherever the strata were reached, we found the same metals, which consisted of shales. The surface drift, which was very deep, contained particles of coal. The search was unsuccessful, as the explorations were evidently in the centre of the basin.

The Albion mines shales are a distinguishing feature of the Basin. Their enormous thickness is without a parallel, and as they overlie the large seams, they are a sure indication that the crops of the seams must be sought 'to the rise.' These shales serve to identify the Campbell or Culton seams with 'the main seam' of the Albion mines. To the south-west of the Culton pit the measures were found to assume a north-westerly dip, while near Oliver's mill, a mile farther west, the measures were found to dip in the reverse way, showing that the coal basin must sweep off in that direction and between the two points in question. More than a mile to the south of the Campbell area coal and fire-clays have been found by us, while the existence of the light sandstones of the Pictou coal fields still farther south, established the fact that the coal basin must turn in that direction. For two seasons this property has been explored by us, and as we are the only persons by whom it has been examined, the results of our explorations will have more weight than theories, however ingenious, by others who have never examined the locality. The extension of the coal field in this direction is most important, not only from the very superior quality of the coal, but also because it is found at so short a distance from the

provincial railway. A level was driven by us a short distance on this seam, which was found to lie at an easy angle, the measures on this area being flatter than in any other part of the Pictou basin, excepting where the upper seams occur, which generally lie at a slight angle, and are consequently as to their angle of dip and their out-crop, unconformable with the larger and lower seams. The seam, when followed in from the out-crop, increased, in a few yards distance, from two feet to between three and four feet, and a bore hole a few feet farther to the dip went through six feet of coal. Showing that at a moderate depth we may expect to find it assume its full size. It was overlaid by oil shales similar to those over the main seam near Middle and East rivers, and in the overlying shales were found fossils similar to those above the main seam near Middle river.

ST. LAWRENCE AREA.—On this area which is near Merigomish harbour, and is the eastern extremity of the basin, explorations were carried on from February 1866 until February 1867, under the charge of a mining engineer and of a very competent oreman. The outcrop of the seam had been first struck by others; a pit was sunk one hundred feet deep, and levels driven from it. There appeared to be what miners call a 'saddle-back' where we sank. The dip was over 60° , but flattened greatly at a few hundred feet distance to the dip, and varied from S. W. to S. E. To the eastward the measures dip in a south-easterly direction, and lie at a very easy angle. The seam first found proved at a depth of one hundred feet to be fourteen feet from roof to floor, though near the outcrop it had not been as many inches thick. It was intended to have opened a colliery at this pit, as it is some miles nearer deep water than any other, but the disturbance at the spot selected will render it necessary to sink a new working shaft. The one now sunk will answer for a ventilating shaft. Numerous pits and bore holes have been sunk on the property in order to prepare for opening a colliery. A few feet from the last named seam another was found eight feet thick of very good coal. It has not been tested to the dip, and probably will prove to be an underlying bench of the other seam.

The explorations on the McBean area adjacent, show that the seams found on it must be found also on the St. Lawrence

area, which is probably on the northern side of the basin. A large amount of shales was found to overlie the seam proved by us. A few yards from the pit we found a reddish sandstone which occurs in great abundance along Sutherland's river, and dips generally at a very slight angle. It is probable that reddish sandstones on the Culton area are identical with those found on this area. The occurrence of sandstones in different localities cannot be counted upon, as the Albion mines, in sinking their Dalhousie pit passed through nothing but an immense mass of shales, while further west to their surprise they came down upon a light sandstone in sinking a shaft, and for a time at least abandoned it, supposing that the coal must have run out, and that the sandstone belonged to measures underlying the main seam. The same sandstone has been found in the overlying shales at New Glasgow and at Middle river.

I am disposed to think that the lower measures at Sutherland's river bridge are the equivalent of the New Glasgow conglomerate, and like it, are the boundary between the southern and northern basins, or as I have termed them, the Albion and the Pictou basins. The southern basin narrows and terminates a short distance to the eastward of Sutherland's river. I have found coal at its eastern extremity, and also have seen cannel coal discovered there. The explorations east of the river were merely superficial, being confined to examining exposures of strata and indications of coal. I speak therefore with some hesitation as to the country east of Sutherland's river. That there is coal there, may be safely assumed; but the extent of it must be settled by the miner's pick, and bore rod. No intuition can dispense with the drudgery and expense of practical explorations, which require a very small amount of science, and a very liberal expenditure of money.

The accompanying map of the Pictou coal district gives the boundaries of leases, &c., according to maps of the Mines Office.