

# REPORT

BY

## MR. DE ROTTERMUND,

ON THE

## QUEBEC COAL,

To His Worship the Mayor of Quebec.

At the same time that I give a detailed account as to the nature of the combustible mineral which is found in the city of Quebec, I believe I am bound to give the causes and reasons which have guided me in forming my opinions:—

1.—That the mineral in question is not *indurated bitumen*, as it is intended to be maintained according to Mr. Logan's report, p. 35, 1854, nor any kind of bitumen or bituminous shale, but purely and simply coal; and from the existence of so many different qualities and kinds, I shall give it the name of Quebec coal.

2.—That the environs of Quebec, are not upon the formation of the primitive or silurian rocks.

The combustible mineral found in Mountain Hill, at Quebec, is real fossil coal, or what is commonly known by the name of coal. In color, it is velvety black, or deep blue black, it is lustrous, powdery, and in breaking is sometimes conchoidal, and sometimes lamellated or crystalline. It contains a very small quantity of iron pyrites, and its specific weight is between 11. 6, 11.9, and 12. 1, producing gas when distilled, and a residue of coke or coal. The coke is slightly turgid, powdery, of a metallic color, and when burnt with oxygen, leaves a very small quantity of yellowish white earthy ashes. This coal contains several indications of fossils called *stygmaria* and *sigillaria*; its position is in a vein or bed of a few inches in thickness, which widens as it descends, and at a depth of six feet, this vein is more than four inches in width.

The coal is in a shaly sandstone, (*grès schisteux*) running north and south, and has the same inclination as the incasing sandstone, that is to say, southwest, and does not run across the stratification, nor in the splits of the rocks. When submitted to the action of fire, it burns with a long and very brilliant flame, the volatile substances which form its composition are 19, 20 10 and 80, 80 10 of pure coke. The quality of the coal differs as it descends, from what it is nearer the surface, this is owing to the different states of atmospheric action. There are several very thin strata one above the other; and up to the present time I have observed that all those strata, are in the same quality of sandstone.

In order to prove that the ground about Quebec is far from belonging to the primary or silurian formation, as many persons imagine, I shall cite the authority of Sir Charles Lyell, in his work entitled "Travels in North America"; speaking

of Canada, he finds the following fossils at Beauport:—*Saxicavarugosa*, *Mya truncata*, *M. arenaria*, *Tellina*, *Naticaclausa*, &c., &c., near Mr. Ryland's house, 200 feet above the St. Lawrence, also *Saxicavarugosa*, &c., &c. At Beauport and in its environs, he enumerates twenty-three kinds of fossils which he found, among others already enumerated, *Nucula*, *Mytilus Edulis*, *terebratula*, *Echinus*, &c., &c. By looking at the Geological Manuel of M. de la Beche, you will find that he places all these fossils in the supercretaceous formation, and one or two of them in the carboniferous groups. I have found the *stygmaria* and *sigillaria* in the Quebec coal, and according to the notes of my journey of 1844 between Quebec and Gaspé, a number of the fossils found, belong to the carboniferous formation, and Mr. Logan, in his report of the same year, says he found *eanularia*, *quadriscutata*, *Patripa*, *Porthoseres*, *lingula*, and *leptina*, all of which M. de la Beche places in the carboniferous group. As to the *stygmaria*, which I have already mentioned, Sir C. Lyell states that it is found in the carboniferous formation of Nova Scotia, "in the old coal of South Joggin." M. de la Beche not only places it in the carboniferous group but when speaking of the fossil plants found in the coal regions, he remarks the *stygmaria* as presenting the similarity between those of America and Europe.

M. Dufresnoy mentions them in his work upon the age and composition of the transition soil of the west of France, and of the silurian soil; it will be seen, in a description of the coal basin that the *clayey shale and shaly grauwacke, schiste argileux gsauwacke schisteux* contains the impressions of *stygmaria* and of iron carbonates, of iron where the strata of coal are situated.

Brogniard says that the *sigillaria* would appear to predominate in the middle and upper strata of the coal region. M. Burat places the fossils of *stygmaria* in the shaley clays *argiles schisteuses* which form the walls of the strata of coal.

M. d'Omalus d'Halluy, remarks that these fossils are found in the carboniferous shales of Liege, Charleroi and Mons.

Although I have established the existence of several small strata which denote the real characteristic of coal, it is not a place fitted for working, nor even one where a gallery might be advantageously opened in order to continue the work of exploration, but it is useful for the purpose of indicating the direction, and directing the obser-

vations, always taking into consideration the dislocations which the soil may contain; moreover it proves that Lower Canada possesses coal, notwithstanding that the self-love of some, and the ignorance of others, induce them to make use of every means to circulate the idea that it is only bitumen, and that coal cannot be found in any part of the country. I cannot give my opinion as to the productive richness of this coal, because, in order to do so, a special investigation and attentive examination, both as to the nature of the geological formations and as to the topographical position of the vicinity would become necessary, &c.

As I see that certain individuals conceal their names, but excite public opinion, by means of newspaper articles which denote a systematic spirit of opposition instead of solid reasoning, I am placed under the necessity of proving why I cannot make use of Mr. Logan's opinion, *neither upon the nature nor upon the bearing of the mineral in question.* I defy a Chemist or Mineralogist who respects science, to give the name of "bitumen" or "indurated bitumen" to a substance which is nothing but fossil coal. As to the spot where the work should be commenced or as to the profitability of working it, I have stated above why I did not give my opinion. I have attentively examined the reports of the Provincial Geologist, which are the sole authority cited in Canada; I have carefully examined his opinions, in order to counterbalance, as it were, my own; & I think it may be useful to give some extracts from them. If I take up the report of 1854, p. 35, "he states that the combustible substance which is found at Quebec, is *indurated bitumen which has no analogy whatever to coal*, and that it is in the splits, running across the stratification." Such is not the case at Mountain Hill; the mineral runs in the stratification, with the inclination of the strata of the wall rocks.

Now let us examine the report of the 1st May 1845, p. 21. He states that between Cap Chat and the Ste. Anne river: "The shale are highly tilted, and several dislocations occur, but it can be made out, that based upon a strong bed of gray oolitic limestone, ten to fifteen feet thick, with a thinner one a short distance above it, consisting of flat calcareous pebbles lying on one another, as if carefully packed on their sides, there reposes a mass of thin bedded, dark gray, yellow weathering limestone, separated by thin bands of black bituminous shale holding large calcareo-arenaceous nodules or isolated masses, becoming very conspicuous in a considerable bed of bitumino-argillaceous shale at the top, where the nodules or patches sometimes resemble septaria, and are occasionally composed of a dull olive gray chert, weathering to a dingy red, in which the cracks or veins hold a mineral indistinguishable in its general appearance and combustible nature from good sea-coal." At page 22, he finds a "similar mineral in an analogous position at Point Levy and Quebec. Mr. Logan acknowledges having seen oolitic limestone. The oolitic limestone belongs to the jurassic formation, which latter is below the supercretaceous formation and immediately over the coal formation. At page 35, he gives the names of fossils, such as *Canularia quadriscutata*, and other species which M. de la Beche places in the groups of the carboniferous formation. Therefore according to those three descriptions we are led to suppose the existence of the three formations, supercretaceous, oolitic and carboniferous.

Mr. Logan acknowledges that I was with him in his journey of 1844, one year before I was ap-

pointed chemist to the Geological Exploration. He relies upon my opinions in several instances, in his report of the same year, but he merely forgets to state that I analysed that combustible substance on the spot and that I found in it all the characteristics of coal of none of those of bitumen.

I shall remark and I am ready to prove it, that the description is without foundation, for this substance which it is so difficult to distinguish from good coal, is really nothing but the coal situated between the lamina of black shale, in the stratification and not across it. The same thing occurs in relation to the coal of Quebec, so far as the deposit goes, but the nature of the wall rocks is different from the other. I do not know what he calls, at page 22 "in an analogous position." Whatever person, having any knowledge of science, so as to be capable of judging, will read the reports of the geological exploration, one after the other, will perceive that in many places they are contradictory and that, very frequently, one assertion destroys the other; I will give his own description of the coal mines of Nova Scotia, given on the 28th April 1845, p. 50. "Both on the south and on the north, the coal formation seems to rest unconformably on the rocks below, & in these the flexures produced prior to the deposit of that formation, are so violent, that in many places the strata come against its base nearly at right angles from which it results that the coal measures rest sometimes upon the baset edges of the highest subjacent sedimentary deposits, and sometimes upon the granite, and the carboniferous perimeter is no guide whatever to the geographical range of anything coming from beneath. The boundary of these lower formations in Canada, is the north bank of the St. Lawrence, from Labrador to Cape Tourmente, near Quebec."

Now let us read p. 22, 1st May 1845, where it is stated: "A similar mineral, in an analogous position, is found at Point Levy and Quebec. Now none of the material where it has come before me in situ, bears any analogy in the mode of its occurrence to workable coal. This is always found in extensively continuous beds conformable with the stratification; whereas the mineral in question occurs in cracks cutting the strata across for greater or less distances."

What conclusion can we come to from what we have read? Has Mr. Logan deceived himself by this description of the position of the coal mines of Nova Scotia, or like a man prepossessed by one idea, has he forgotten that he was placing himself in opposition to his own opinions and not in accordance with them? Moreover if you will look at p. 49 of 1844, you will see at the description of the east. "It is these conditions which distinguish the eastern from the western part of the Province, and they consist in the violent contorsions of the strata, the altered nature of some of the rocks, and the want of conformability in probably more than one member of the series of formations." And in the successions of deposits, gray, greenish gray and red sandstones, of a free grit, with many layers of red and occasionally gray shales. When the sandstone beds are their and flaggy, their surfaces are often covered with carbonized comminuted plants. The total thickness of the formation, which has some fossils, is about 4,000 feet. The thickness of the formation is uncertain and it lies unconformably on those below. It is probably an inferior member of the carboniferous series, but it seems to be too low down to contain any of the profitable beds of coal." From this we may be led to believe that he found coal and not bitumen, & upon this Mr. Logan bases himself in order to prove

that it is not fit to be worked. When he gave the opinion of Dr. Buckland, p. 18: "That the accumulated experience of many years has proved that it is only in those strata of the transition series, which have been designated as the carboniferous order, that productive coal mines on a large scale have been discovered." He adds himself: "But it is brought home with peculiar force to Canada, seeing that in its immediate vicinity the geological position of the productive coal bearing formation has been clearly ascertained, and the relations it bears to the rocks that strike through the Province have been accurately determined."

Subsequently he promises that "We may find another great transition trough, p. 19, which widening as it proceeds to the westward, may ultimately hold within it the great coalfield of New Brunswick and Nova Scotia. The western extremity of this, like the northern extremity of the Pennsylvanian Basin, will probably be split into a number of subordinate troughs formed by parallel anticlinal axes, but the great dividing geological ridge between the two grand carboniferous areas, would, if this view be correct, be a continuation of the green mountains of Vermont. And though these do not appear to have any decided geological feature to represent them across the line between the St. Lawrence and the Famine, they are evidently prolonged into the Eastern Townships as far as Orford Mountain, and a hill called the Carbuncle, on the west side of Brompton pond, which is sufficiently to the north to carry an anticlinal axis between the two transition troughs supposed, &c., &c., and from the description given by Capt. Bayfield of the south shore of the river from Point Levy to Cape Rosier, it appears probable that the coast strata, all the way down, are of the same epoch." Then at p. 20: "The northern outcrop of the New Brunswick coalfield, is, I believe, stated to reach Canada on the shore of the Bay of Chaleur. What the distance of its base may be from Cape Gaspé is uncertain, but even if it do not exceed twenty miles, there will be space enough at a much less dip than Captain Bayfield has given to the limestone there (25 degrees) to hold the total thickness of the various formations that may occupy the interval, even should they measure as much as their equivalent in Pennsylvania."

And he will not admit of the possibility of finding coal basins fit to be worked, throughout an extent of several hundred square miles, with a country confused and overthrown, as he has described it to be, even when we prove the existence of the carboniferous fossils, the real accompaniment of coal mines which is carbonate of iron, even the strata of coal and a thousand other indications. In his report of 1854 he reverts again to the combustible mineral, stating that it is indurated bitumen, having no analogy whatever with coal attributing its formation in the rocks to the same causes as that of other metals. Does Mr. Logan seriously think that the formation of bitumen is due to the same phenomena as that of other metals? Let us look at his theory of the formation of metals; I see

in his report of the 20th April 1851, p. 11: "It appears very probable that the metal is come from the veins of quartz situate in the range of mountains, through the agency of some cause which may have driven it to the south, and, even should we find traces of it to the north of that range, &c., &c."

This explanation reminds me of the one given by an ancient philosopher, who in order not to lose his influence among the impatient illiterate, used to say, because nature holds vacuum (or vacuity) in abhorrence.

In order to prove that I am not the only person who may hold opinions opposite to those of Mr. Logan, I will remark that whoever will take the trouble to read the report upon the copper mines of Canada, made for the London Company, by Mr. Phillips, one of the most distinguished mineralogists of England, will see that he differs entirely from the Provincial Geologist.

Therefore not having found in all these reports, taken one after the other, any satisfactory or complete data, I was obliged after an examination more or less attentive of each one, to reject the opinions they contained, and to take for my basis, as well in geology, mineralogy, as in chemistry, the principles of those learned men who are looked upon as scientific and practical authorities and some of whom have been my professors.

In closing I believe it will be useless to mention a fact which is somewhat analogous with what occurs here; it is to be found in the "Annual of Scientific Discovery" for 1855; in an article upon coal. It is stated that at a meeting of the "British Association," Dr. Redfern presented a memorial upon the structure of coal, particularly upon that of "Forlane Hill," Scotland, which resembles the Albert coal of New Brunswick, and which, like this, was the subject of a legal contestation, in order to ascertain if it was real coal or only bitumen; it will be also seen that the presence of the fossil stygmara was proved, as in all other coals.

The following are the proportions of the different substances which enter into the composition of the Quebec coal:—

| First Analysis.                      |         |
|--------------------------------------|---------|
| Coke.....                            | 80,80   |
| Ammoniacal Water.....                | 6,00    |
| Gas and loss.....                    | 13,20   |
|                                      | —100,00 |
| Second Analysis by Slow Disillation. |         |
| Bitumen.....                         | 4,50    |
| Gas.....                             | 9,22    |
| Ammoniacal Water.....                | 0,78    |
| Coke.....                            | 82,30   |
| Loss.....                            | 3,20    |
|                                      | —100,00 |
| Third Analysis.                      |         |
| Coke.....                            | 81,50   |
| Ammoniacal Water.....                | 00,20   |
| Bitumen.....                         | 5,00    |
| Gas and Loss.....                    | 12,90   |
|                                      | —100,00 |

This coal appears to be of an excellent quality for the fabrication of iron and for the preparation of steel.

I have the honor to be, with the greatest respect,

Your obedient servant,

E. S. DEROTTERMUND.

Quebec, 1st March, 1855.

It is a fact that the Government has been very successful in its efforts to bring about a more efficient and economical administration of the public service. The results of its efforts have been very satisfactory and the public has been very much benefited by the reforms which have been introduced.

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