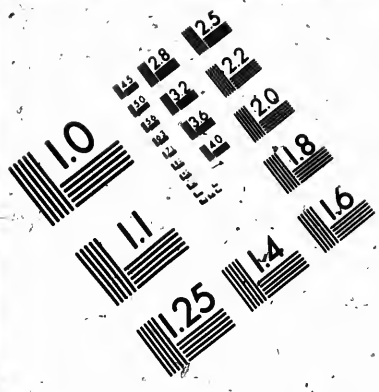

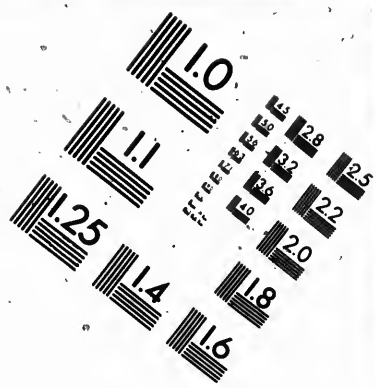

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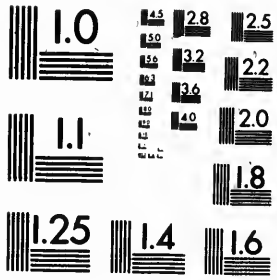

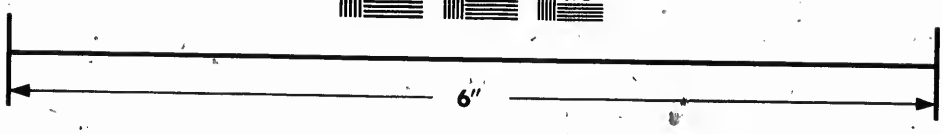

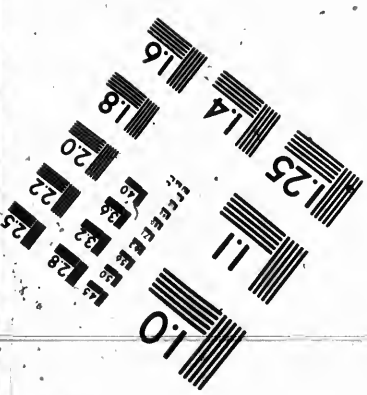

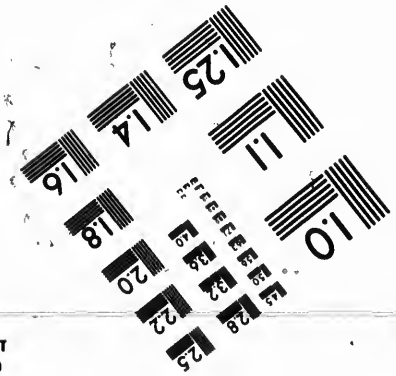

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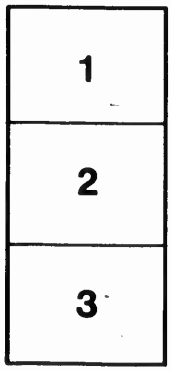

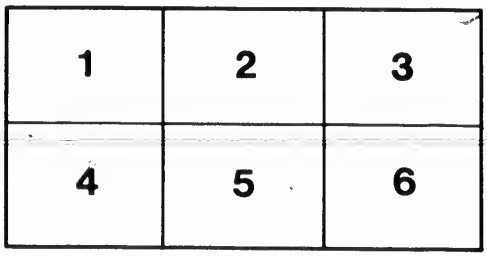

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REPORT

ON THE

ANTIGONISH OIL-COAL MINES.

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REPORT

ON THE

ANTIGONISH OIL-COAL MINES,

THE PROPERTY OF

HON. JOHN McKINNON, M.E.C.,

AND

WM. CHISHOLM, Esq.,

NOVA SCOTIA.

For Private Circulation.

Honorable John McKinnon, M. E. C.
and William Chisholm, Esq,

GENTLEMEN,—Having examined the greater part of the Antigonish Oil Coal Basin, I beg to make the following Report of such facts as came under my observation while there, and also submit my own views regarding the value of such deposits as have already been discovered, and also as regards the prospects of still more valuable discoveries being made when that district is subjected to a more thorough exploration.

I have not been able, while there, to discover any reliable indications of workable beds of Bituminous Coal; still, it is possible that they may be there, for I have failed to discover anything that should be regarded as conclusive evidence of their non-existence in that district.

The group of strata in which the beds of Oil Coal, or Curley Cannel, are seen, resembles very much the group in which beds of a similar character are found in the Albion Coal Basin; but it does not necessarily follow that they should on that account be regarded as of the same age.

The fact that the centre of the Antigonish Basin is occupied by highly bituminous Limestone, overlying the Oil Coal, and Oil Shale Beds, may possibly indicate that the whole group is Upper Devonian, or Lower Carboniferous rocks, which are not known in this country to contain Coal beds of any value.

Should this prove to be the case, workable beds of bituminous Coal may not be found, although the small seam of good Coal discovered among beds lying near the bottom

of the group, undoubtedly favours the view, that larger beds of the same material may exist higher up towards the Limestone.

In vertical thickness, the group of strata lying between this small seam of bituminous Coal, and the Limestone, cannot be much short of five hundred feet, a space large enough to hold several beds of good size, for at least two thirds of it, remain to be explored.

The bituminous beds appear to be divided into two distinct groups, separated by coarse gray Sandstone, and Sandy Shales.

The lower group appears to be about 70 or 80 feet in thickness, 20 feet of which may be regarded as good oil Shale, including five feet of Curley Cannel rich in oil.

The upper band, which lies in immediate contact with the Limestone cannot be much short of one hundred and fifty feet in vertical thickness of Strata, containing a large percentage of oil. Of this great bed of oil Batt, about thirty feet will in all probability yield from twenty to twenty-five gallons to the ton.

Though I had no Analysis made, there is good reason to believe that the above estimate will be found rather below than over the mark. Similar materials obtained in several other localities are known to have yielded results equally favourable, and in some instances a much larger percentage of oil has been obtained from such Shales.

Shales found near the Asphalt mines at Hillsborough, New Brunswick, yield from thirty to forty gallons of rectified oil to the ton, while the Asphalt itself yields over one hundred gallons per ton.

In the Albion Coal field, the oil Batt, or Shale yields also from thirty to forty gallons per ton, while the Curley Cannel or Fraser oil coal gives from fifty to seventy gallons per ton.

The material from the Curley Cannel beds of the Antigonish basin, will probably yield near their outcrops from

forty to fifty Gallons per ton, and farther in towards the centre of the basin, where the Coal will be likely to improve in quality the yield, per ton, will in all probability reach to as much as seventy or eighty Gallons.

Torbane Hill Cannel, of Scotland, gives from a hundred to a hundred and twenty five Gallons per ton, which is about the highest yield obtained from any of the oil yielding Rocks.

The Curley Cannel beds of the Albion and Antigonish basins, resemble in all respects the Torbane Hill Cannel, and had, evidently, a similar origin.

Torbane Hill Cannel contains a larger percentage of bitumen, or oily matter,—and less fixed carbon, than the Albion and Antigonish Cannels do, but it contains a much larger percentage of earthy matter than either of them, in this respect it resembles more closely the oil Batt obtained in the latter localities. Analyses made by a very competent Chemist, Professor Howe, of King's College, Windsor, Show this in a very clear light as may be seen by the following statements of results obtained by him.

Oil Batt from the Albion measures gave, of volatile matter.....30. 65.
Fixed Carbon.....10. 98.
Ash or Earthy Matter.....58. 74.

Torbane Hill Cannel gave, the following result.
Volatile Matter.....71. 17.
Fixed Carbon.....7. 65.
Ash or Earthy Matter.....21. 18.

Curley Cannel from the Fraser Mine, in the Albion basin gave, of
Volatile Matter.....66. 53.
Fixed Carbon.....25. 23.
Ash.....8. 21.

From these results it appears that an oil Coal, may

contain a very large percentage of earthy matter, and yet be a very excellent article of oil Coal, or in other words, an oil Coal may be very stony looking, and heavy, yet capable of yielding a very large percentage of good oil.

It appears also that, though the presence of fixed Carbon, may render an oil Coal light, and impart to it a coaly aspect and fine luster; yet it does not seem to be an essential element, to a good material for yielding oil.

In the Antigonish basin, I observed bands of oil batt, which in external appearance, very closely resembled the finest variety of cannel; they are light, have a smooth conchoidal fracture, but on close examination, they are found to contain too much earthy matter in their composition, to be regarded as a true cannel coal.

One in particular of these bands, I observed in the upper section of the bituminous shales, it is about fifteen feet in thickness, shows the curly structure on a large scale, and will no doubt yield well in the retorts.

When followed to the dip, or towards the centre of the trough, as a general rule such materials as these are found to improve greatly, and even Shade, very often, into true Cannel Coal. In order to remove all doubts that may be entertained on this point, it would be very desirable to have a boring put down, as far in on the basin as the depth of the over-lying Limestone would admit of. To accomplish this object, where there is a great depth of Strata to be passed through, a small steam engine would do good service, for by one boring all the beds in the group might be pierced, and every doubt be thus removed at once, as to the value of the deposits in this basin; whether of bituminous Coal, Cannel Coal, or oil Batt. Nor would it be surprising if a deep boring in the centre of that trough should lead to the discovery of Petroleum in quantities sufficient to make it of commercial importance.

While examining that district, several indications of the existence of such a deposit were obtained, and I have

now before me, specimens of oil Shale observed there, in which I find thin veins of Asphaltum that have evidently been forced between the planes of bedding and into cross fractures of the Shale. Indications of this nature have great significance, and should be regarded as sufficient to prove the existence of Petroleum there beyond the shadow of a doubt. And the only thing that remains therefore to be proved by boring, is, whether it can be obtained in paying quantities, either in the liquid state, or as dikes of Asphaltum. I see no reason for entertaining any doubt of its existence there, in both conditions, and would strongly recommend, a very careful exploration of the district, with that fact in view.

Where the rocks are found to be most disturbed, and contorted, or arched, trial shafts should be put down through the crown of the arches, or as near as possible to the axis of the upheaved areas. For if Asphaltum has been the disturbing agent, it will in all probability be found beneath those areas that have been most disturbed, and where thin veins of it are to be seen penetrating fissures in the Shales.

The Asphaltum in Cuba, and at Hillsborough, New Brunswick, is found beneath the areas most disturbed, and contorted or flexured, of Strata containing Petroleum.

There is therefore some reason for suspecting that some of the contortions and flexures observed in the Shales of the Antigonish basin, were produced by the formation at some depths below, of veins, and masses of Asphaltum. At Hillsborough, the rocks in which the Asphaltum and Petroleum occur are of lower carboniferous age. In Canada it occurs in Devonian rocks; but in the United States it is found to exist in rocks both of carboniferous and Devonian age.

The rocks of the Antigonish basin are therefore the very group of Strata in which Petroleum should be expected to exist, if all the conditions essential to its origin,

had existence there, during the period of deposition of these rocks.

The lowest geological horizon in which the oil is found in Western Canada is in a group of Strata, named by the Canadian Geologists the Corniferous limestone, the cavities of which are often found filled by liquid bitumin. Immediately overlying the Limestone, there is there a group of Shales, known as the Marcellus Shales, highly charged with bitumen. The average thickness of both groups is supposed to be in Western Canada, about 200 feet, and they are as far as yet known the reservoirs which hold the Rock Oil of that country.

Ascending in the geological scale, we find in the State of New York that the oil is contained in what is known as the Hamitton group, about 1000 feet in thickness there; above this group succeed black shales, known as the Genesee slate, averaging about 300 feet in thickness, and rich in oil.

Again above the Genesee slates there is a group of Strata, composed chiefly of shales and sandstone, about 1700 feet in thickness, known as the Portage group, into the upper sandstone beds of which the deeper wells of oil creek, Pennsylvania, are sunk. But much of the oil in that State is found in the Chemung group; which is still higher up in the scale, and is composed of shales and limestone over a 1000 feet in thickness.

Measured in their maximum of development, as shown by the Geological Surveys we find, lying between the lowest oil bearing rocks of Canada, and the highest of those, at Oil Creek, from 5000 to 6000 feet, vertical, of Strata, the entire group, of which, are supposed to represent the old red sandstone, or devonian rocks of other countries.

The lowest beds of the true coal series, are found caping the highest hills near the mouth of Oil Creek, and not less than 1200 feet above the sandstone beds that yield the most abundant supply of Petroleum; but in other parts of

the State, the lower, and even the middle coal measures are yielding large quantities of oil, as on the Monongahela river, and other streams.

These facts show that oil may be looked for with a fair chance of success in any group of Strata, lying between the lower Devonian Rocks, and the upper Coal Series.

There is therefore very good reason for suspecting the existence of oil in some localities in this Province, in rocks of the same age, and in selecting ground for making the first trials, great skill should be exercised and much pains taken, because a few failures in the first instance might be very discouraging, and perhaps lead to the abandonment of the search, whilst there may exist many chances of its proving successful.

As regards the Antigonish basin, even on the supposition that no Petroleum can be procured there from wells, it will afford a very good field for the profitable investment of a large amount of Capital, for it must soon become a district of vast importance on account of the oils contained in some of its Strata.

In the first place there is there a five foot seam of Curley Cannel, which will yield at least 40 Gallons of Crude Oil to the ton; and 14,821,333 tons, can be got from 2000 acres of this bed; which at 40 Gallons per ton will yield 592,853,320 Gallons of oil worth at least 25 cents per Gallon, which would amount to $148,213,330. Add to this what could be obtained from say,—fifteen feet of the best section of the oil Batt, which will yield at least twenty Gallons of oil per ton. As before 2000 acres contains 44,463,999 tons which can be mined, and this quantity at 20 Gallons per ton, will give 889,279,980 Gallons of oil, which should be worth 25 cents per Gallon, at the Shipping Port, which would equal $222,319,995, and we have in all $370,533,325 worth of oil which can be obtained from twenty feet in thickness of Strata, under lying two thousand acres of land,—out of eighteen thousand,—

composing a basin under laid by at least fifty feet in thickness of beds rich in oil.

It was generally supposed, a few years ago, that the large yield of oil from the wells, would render its manufacture from the Shales and Cannel unprofitable, but the rapidly extending use of the article, and consequent increase of the demand, has raised the price of it since that time, on an average more than a hundred per cent. So, *that* objection has been removed, and we should now be able fully to understand how enormously great the value of these oil bearing Strata must be, and how vast the advantages that must result to those that may undertake to utilize, and bring their products into the market.

In other Countries such deposits as those in the Antigonish basin, are being eagerly sought after, by those who are beginning to understand their true value. When we consider how greatly the demand must increase, when such oils are brought into general use as Steam fuel, we need not feel any surprise at seeing a rush made now to grasp at a thing, regarded a short time ago as almost valueless.

The London Mining Journal of Dec. 9th, 1865, gives the following account of trials made at Woolwich Dock-Yard, with a view to testing the practicability of using Petroleum for steam fuel, instead of Coal.

"The improved Petroleum Boiler at Woolwich Dock-yard, which was started early in November, having proved very successful, the following particulars will be interesting to our readers.

It has been made rather smaller in size contains about one and a half tons of water, has of fire grate surface 9-45 superficial feet, heating surface 176 superficial feet. The porous material forming the grate bars is of simple founders loam; the admission of air is in the front of each bar, through a small opening in the door.

All the former air tubes and the return chimney tubes are omitted, and the whole machine made as simple as

possible. On November 6th, with the water in the boiler at 46° it created full steam in 47 minutes, with a consumption of 4 Gallons of Petroleum; a leakage of the oil taking place it was stopped, and on the 7th, it was started with a mixture of English Coal Oil, and American Petroleum, it evaporated 2941 lb. water, with 27 Gallons of oil in three hours.

They have since been using shale oil, and have had two extremely satisfactory trials."

Again, on page 803, of the same number of the Mining Journal we find it stated that, "The experimental Boiler made in the Factory at Woolwich Dock-yard, and which has been at work at intervals during the last fifteen months, in testing Petroleum, Shale, and other oils for steam purposes, to supersede the use of coals, has been given over to the Admiralty authorities, by Mr. Richardson on the completion of his experiments, which it is stated have thoroughly matured the principal, and proved his theory correct beyond any doubt."

"Mr. Richardson has likewise, at the request of their Lordships, submitted plans for the conversion of the ordinary ships' Boilers into Boilers for which Petroleum can be used. This it is stated can be done at small cost, (we shall be enabled to give some interesting particulars respecting the Boiler and experiments in our next.)"

In connection with the above, see the following remarks on the subject of Shale oils copied from vol. 35, page 787, of the same Journal,—"About a twelve-month ago the Patent under which the oil was extracted from the Torbane Hill mineral expired, and it was not sought to be renewed, as much from the fact that the material itself was well nigh exhausted, as from any higher motive."

"In granting the lease originally a reservation of about ten acres was made on which the Mansion-House of the proprietor was situated. Recently £80.000 has been offered for this ten acres, but it is still held for a higher offer."

"Previous to the expiring of Mr. Young's patent it was discovered that certain shales yielded a profitable per centage of oil when treated in a specific way; and the Torbane Hill Company have erected and are now adding to their original work of Midcalder buildings, and appli. ances which when completed will cost them upwards of one hundred thousand pounds (£100,000). Other smaller works have been constructed in the Ardrie and Bathgate districts, and Queen's Ferry, and Boness on the Forth, and we understand a jointstock company is being formed for raising a similar establishment at a point between Ardrie and Coatbridge."

"At the latter place there is a seam of Shale and Coal combined; the Shale is reported as of good quality, but the coal is a small seam of gas coal of a peculiar nature, (in all respects like the small coal of Antigonish Basin,) an t unknown in the Bathgate district. Shale has also been found at the Poissil pits, about two miles to the west of Glasgow. Beyond the Forth is the Overton cannel, rather rich in oil, and ranking next to the Torbanehill, or Boghead cannel in importance."

"Accompaning some of the iron stone bands layers of this oil Shale are also found, and around the mouths of old and deserted pits, large quantities lie exhumed and ready for the yaning retorts. Coal-masters are now re-tracing their steps to these deserted workings, to gather up the formerly discarded debris, whilst others are re-erecting shafting to work over the Shales they formerly regarded as useless. The make of oil from these works varies from one hundred to several thousands of gallons of oil per day; and with the increase of the works, and the consequent increase of the make, the article is rising in value; the demand is in fact, expanding in a much greater ratio than the produce. This very cheering state of matters has driven speculators into the trade, and land is in great request in all the districts named above. Over

almost every acre, the borer has been prospecting, and if his divining rod indicates the existence of the much coveted Shale, the land is forthwith let for 200 and 300 per cent of increase.

Although we do not expect that all will draw prizes in an enterprise of this nature, it is not too much to say, that on both sides of the Tweed, as well as on the sister Island massive fortunes may be made out of the manufacture of these bituminous Shales, into valuable oil, and paraffin."

In view of these facts, the course that capitalists ought to pursue in this Province is quite clear; they should lose as little time as possible in making arrangements for commencing the manufacture of Oil in all the most favourable localities that can be found in the province, before the ground is occupied by foreign speculators.

Next to the Albion Basin, perhaps no other locality in this country offers greater facilities or better prospects of success for such a business than the Antigonish Basin. There the supply of raw material may very safely be considered as inexhaustible for many ages to come. It can be mined very cheaply owing to the good drainage afforded by the deep valley of South Lake Brook, which enters the basin by cutting across its Southern edge. This valley will give fine drainage, and also wonderful facilities for the working of the mineral on both sides of it. Nor could nature be expected to do more, in opening a passage for a Rail Road into this basin, where her riches are so prodigally heaped up, than she has done by cutting this valley. A Rail Road from the South Lake about two miles and a half along this valley, can be built cheaply, as the timber is growing on the land and the excavation on the inclined bank will be easy, and cheap, and no bridging will be required. The average breadth of this valley will not much exceed two hundred yards, and its bottom level appears to be, from a hundred and fifty, to two hundred feet, below the general level of the surrounding Country.

Along the greater part of its course, it is bounded by very steep banks, sloping at angles, ranging, from sixty to eighty degrees.

South Lake forms the eastern termination of the valley, along the course of which it extends upwards of forty chains. Its greatest depth of water at low tide is about twenty feet, but it may be deepened very easily to a depth of twenty five or thirty feet, and when the channel is deepened on the bar, it will form a very safe, and Commodious Harbour; which will to a great extent supply a want, much felt by those who have to enter the Bay St. George when north-easterly winds are blowing.

Now from my firm belief in your property being of immense value, I have no hesitation in advising that you should on no account be in a hurry to throw it into the market, or to dispose of it for a small consideration. For keeping in view, the great extent of the deposits, both in superficial area, and thickness of beds,—the rich quality of the material, the facilities for cheap mining and transportation, and also the rapidly expanding demand for the products from oil Shales, and oil Coal,—you can easily perceive the difficulty of forming a correct idea at present of the magnitude of its value. Nor should you lose sight of the fact, that it is a rare opportunity to meet with a property of so great value so favourably situated. On no account should you dispose of this property without retaining a large interest in it yourselves.

The manufacture of oil from Coal or Shales being an enterprise of comparatively recent origin; those who may comtemplate embarking in it must, to a great extent, depend on their own judgements and skill, in devising the most effective, and economical mode of fitting up, and conducting their works; and also in estimating the costs, and probable profits.

Supposing, for instance, that the material on which you intend to operate, is capable of yielding on an average,

twenty gallons of rectified oil to the ton, and that at a cost of one hundred thousand dollars, you can put works into full operation, road and Harbour included, capable of distilling twenty five thousand tons a year, you will be able to send to the market, at least, five hundred thousand Gallons of oil per annum; and I think it is not unreasonable to suppose that for every gallon of that oil, you would get twenty five cents per Gallon, equal to.....$125.000,

From which deduct cost of mining 25.000 tons at $1 per ton,.....	$25.000.	
For labour and other expenses in distilling,.....	25.000.	
Cost of Casks to contain the oil,.....	25.000.	
To pay interest on $100.000, at 10 per cent.....	10.000.	85.000.
	Balance,	$40.000.

And we find a balance as above of forty thousand dollars per annum, being more than thirty per cent interest on the amount of capital permanently invested in the enterprise.

Improvements recently made in the mode of distilling the oil Coals, and oil Shales, have simplified the process and reduced the expense, so as greatly to increase the profits resulting from the manufacture of oil beyond what they were a few years ago; so those now investing capital in that business may with proper management rely on complete success.

Respectfully submitted, by
Your obedient Servant,
J. CAMPBELL.
Provincial Geologist.

Halifax, N. S., December 27th, 1865.