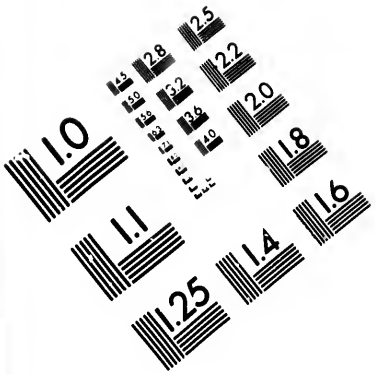

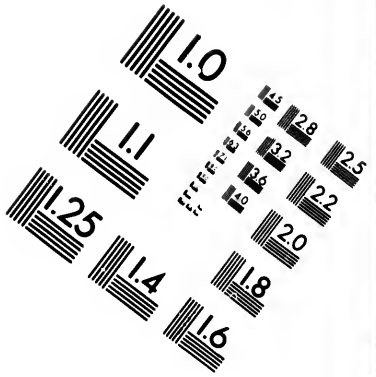

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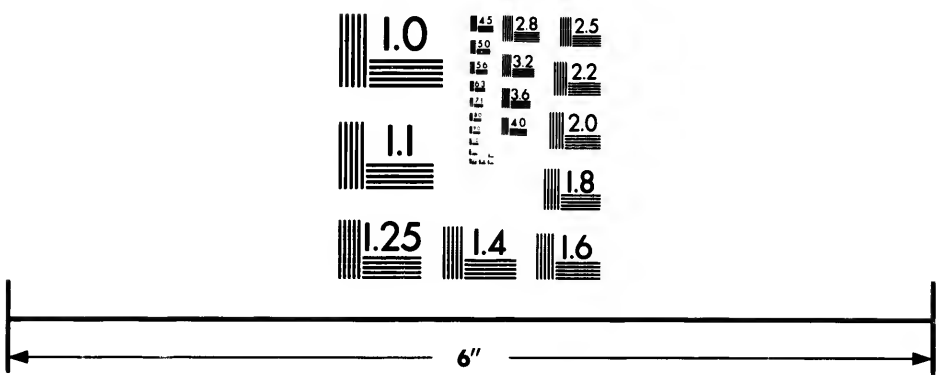

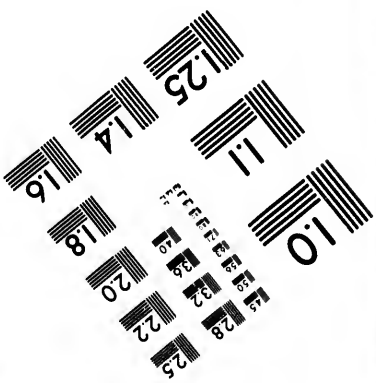

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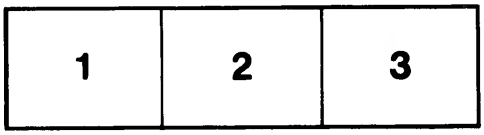

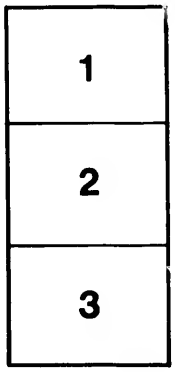

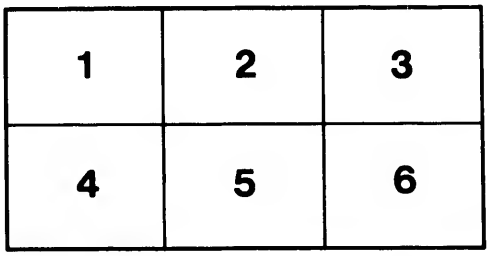

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REPORT

OF

E. S. DE ROTTERMUND, ESQUIRE,

CHEMICAL ASSISTANT

TO THE GEOLOGICAL SURVEY OF THE PROVINCE.

[TRANSMITTED TO THE PROVINCIAL SECRETARY, UNDER DATE OF THE 17TH APRIL, 1846.]

Printed by Order of the Legislative Assembly.

Montreal:

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1846.

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Chemical Assistant to the Geological Survey of the Province.

TRANSMITTED TO THE PROVINCIAL SECRETARY,

UNDER DATE OF THE 17TH APRIL, 1846.

After having analysed the waters of the St. Lawrence and of the Ottawa opposite the city of Montreal, I again proceeded up the River Ottawa as far as the "Graisse" River, and from thence continued to the Township of Hawkesbury to Caledonia and George's Lake; I came down to Lancaster and then went up the St. Lawrence again as far as Kingston. After visiting the mineral springs on Prince Edward's Island, I went in the direction of Toronto by Belleville and the River Trent. I visited Lake Simcoe as far as the Township of Georgiana. I went afterwards to Hamilton and examined its environs. I continued as far as Brantford and Woodstock, and then returned to Hamilton by St. Catherines and took the direction of Niagara, and finally returned to Montreal by the St. Lawrence. The mineral springs which exist in the different localities I have just mentioned are divided into magnesian, iodurated, saline, antimoni-ferruginous, sulphureous, and gaseous. The magnesian and iodurated springs are principally at Caledonia, on George's Lake, and the "Graisse" River. Those which I visited in the neighborhood of Lake Simcoe and at Woodstock, are magnesian. The saline Springs are at Kingston and Prince Edward's Island. Near Hamilton and at St. Catherines the sulphureous springs are very weak, and so are the gas springs, and are always accompanied by magnesian. In fine, the antimoni-ferruginous springs are at Brantford. The name of "iodurated springs" does not mean that the iodine predominates over all the other substances held in solution, but that this substance being very scarce and of great medicinal value, I have given the waters

which contain it, that denomination which is used by several men of science. For the same reason I have called the acid springs of Brantford antimoni-ferruginous, on account of the presence of that substance, only recently found in mineral waters, and heretofore unknown in their composition; and because it is one of the most remarkable substances as a remedy for several diseases. There are mineral springs called "acid springs." from the presence of carbonic acid, such as that of Vichy in France, where white-lead is manufactured. In order that the above mentioned spring be not taken to be similar to these, I have given it the name proper to its composition.

Having described the nature of the various springs and their respective positions, I will now give a description of each one in particular. On the River "Graisse," in the Township of Hawkesbury, Ottawa District, there are several mineral springs very close to each other. The first is on the left bank, at a distance of three miles from Mr. Jamieson's residence, and two miles from Mr. McNab's mill, on Mr. McKinnon's land, lot No. 3, of the Sixth Concession, and is situate at the foot of a tree a few paces distant from the river. This spring disengages in a very small quantity hydro-sulphuric and carbonic acid gases. The water is magnesian, and contains chloride of magnesium and sodium, sulphate of magnesia, and carbonate of lime. It deposits a very small quantity of sulphur on the surface of wooden vessels, which is owing to the decomposition of the hyro-sulphuric acid. This spring is very close to the river, and is covered by the high waters. Its temperature was 46°, that of the atmosphere being 74° (Réamur). The soil is blue clay.

At a distance of a quarter of a mile from the first spring there are four others, which are almost in the river; one of them disengages carbonated hydrogen gas, and carbonic acid. These springs contain neither lime nor sulphuric acid combined, but chlorides and carbonates. Their temperature was 44°, that of the atmosphere 33° (Réamur).

At a distance of fifty or sixty paces from the preceding ones, but further from the river, and in the depth of the wood, there is another spring which, with a slight exception, is similar to those already mentioned. It contains some traces of iodine and more salts in solution, which is probably owing to its being at a greater distance from the river, and consequently less affected by the high waters. Its temperature is the same, and the gases it evolves, of the same nature. The soil is also similar, clay, but not quite so

blue. But these springs cannot be brought into use, on account of their being covered by the waters of the river in the spring and autumn.

THE CALEDONIA SPRINGS.

The mineral springs known under the name of Caledonia are three in number. The first, near the Hotel, is a gas spring: its specific gravity is 1.0038. The second is saline: its specific gravity is 1.0087. The third is sulphureous: its specific gravity is 1.0062. The temperature of all three is 44°, and they are situate in a ravine at a few paces distance from each other. The first disengages a great quantity of carbonated-hydrogen gas mixed with carbonic acid and oxide of carbon. The second disengages the same gases, but in a very small quantity. The third hydro-sulphuric acid also in a small quantity. These gases are disengaged in much greater quantity before a storm; they diminish with the heat, and are in still less quantity in very hot weather. I think this is owing to the atmospheric pressure which may condense the gas by its action on the surface of the water, while another cause may exist with relation to the springs which disengage hydro-sulphuric acid. It may be supposed that it arises from the sulphuret of iron or pyrites with which the country abounds, and which is found in the different beds of earth, being dissolved in much greater quantity by the water in the seasons in which they are most abundant, and in which the decomposition of the sulphuret is more facilitated than at a period when the spring is fed from one part of the bed only.

An analysis of the Caledonia waters had already been made by Mr. Chilton of New York. I am sorry to remark that they do not agree with his analysis, not as regards the quantity of matter, but principally as regards their composition and the existence of substances in them. According to him, these waters contain sulphate of lime, iron, and potassium. I have not even been able to detect any traces of these substances; consequently I think that Mr. Chilton has taken carbonate for sulphate, and has found the iron and potassium in the ashes which may have been blown by the wind into the springs, or in the bottles which contained the water, if they had not been well cleansed.

As magnesian, iodurated, and sulphureous springs, they are very useful, and on account of the temperature which is always regular, are excellent for rheumatism and gastric diseases; they are besides useful for diseases in the nature of *goitres*, for which

iodine is so efficacious a remedy. The soil is reddish clay; underneath, at a depth of one foot, the soil is blue clay of the same nature as that of Hawkesbury. The Caledonia Springs are in a plain, surrounded by marshes. The atmosphere, however, is always healthy, as it contains nothing of that heavinesss generally produced by marshes. The soil is good for the purposes of agriculture, for, though argillaceous, it contains a very thick layer of vegetable earth; but the country people lose all its advantages by burning it, as by doing so they leave nothing but the clay. The vegetation is very rich before the fire has passed over it, which proves that agriculture would succeed very well in this country if the manner of clearing were different. The soil might easily be improved by lime which abounds at a distance of a few miles. Near Caledonia, in the direction of Vankleek Hill, there is a marsh twelve miles in circumference, which contains turf of the thickness of a foot. It might be made use of with great advantage as regards economy, especially when wood becomes scarce.

Besides the three springs above mentioned, there is another in the wood at a distance of two miles from the settlement. Professor Williamson, of Kingston, analysed a spring at this place, which he styles intermittent. It must have been of great value; for, according to the analysis, it contained 1.7 gr. of bromium, and 0.3 of iodine. Unfortunately the spring answering to this description has disappeared. Two paces from its site another has formed itself, of a totally different nature. It is entirely of a gaseous nature. Its gas is carburetted hydrogen, and no traces can be discovered of the hydro-sulphuric gas which the former spring contained. This new spring disengages the gas in great abundance, and not at intervals. It is situate at a distance of about thirty paces from the marsh, near a ravine which is filled with water. The soil is blue clay, a little reddish at the surface. This spring is separated from the Caledonia springs by a marsh two miles in width, and which has no solid bottom, unless at a very great depth. This marsh is full of moss and plants in a state of decomposition, on which various trees grow, of the fir species, and the Labrador tea-plant. I think that formerly a Lake must have existed, the waters of which have partly run off, and the surface has been covered with vegetation of different sorts. This sponge-like substance formed of moss and marsh plants imbibes the water, which (with the plants in a state of decomposition,) serves as a nourishment for the trees, which form a complete forest. If report be credited, several mineral

springs are to be found there. But on account of the great difficulty of making a passage through the wood and marsh, I resolved not to make expensive researches which might perhaps turn out of no use.

GEORGE'S SPRING.

From Caledonia I proceeded to George's Spring by land, so as to judge better of the changes in the soil. Three miles from Caledonia there is a marsh which extends north and south, and through which the road is cut. Before reaching the springs you descend three rocky ledges towards the north, and you then come to George's Lake, to the south of which there is a mountain. At the foot of this mountain is a mineral spring which flows into the lake. Its components are the same as those of the Caledonia springs, besides a certain quantity of sulphate, and more iodine. This spring flows from under a rock of calcareous shale which contains a very great quantity of iron pyrites; the water contains no traces of iron nor of hydro-sulphuric gas, which would lead one to suppose that it proceeds from another bed. As the proprietor of this spring does not reside on the spot, and the house which contains it being shut, I could not examine nor ascertain the nature and quantity of the gas which disengages itself, nor could I find out the correct temperature. The rust which deposits itself at the mouth of the spring is in consequence of the water discharging itself through an iron tube which is covered with rust. The water which I analysed, though it had passed through this pipe, contained no traces of iron. This spring is situated at a distance of from twelve to fourteen miles from the Caledonia Springs. It is at least two hundred feet lower, and flows to the north; those of Caledonia flow to the south.

Proceeding from Caledonia to Alexandria, I passed by Vankleek Hill, where the streams are very clear and contain carbonate of lime in solution. Lime which contains fossils is found as far as Alexandria, and the soil is covered with hard wood of different species.

KINGSTON.

The Kingston mineral springs are of a saline nature, and contain salts of lime and magnesia. The spring belonging to Mr. Morton has been analysed by Mr. Williamson; he found hydro-sulphuric acid, but I could detect no traces of it, either by the salts of silver or by the salts of lead. Not that I doubt the cor-

rectness of Mr. Williamson's analysis; but, on seeing this difference, I could not understand how the nature of this spring could have changed; and after a more attentive examination I found out the cause. Mr. Morton caused the spring to be dug to the depth of one hundred and forty feet. By this means the orifice became much wider, and allowed the water flowing from the different beds to fill the well. This water being of a different nature from that of the spring, by mixing with the latter has caused the change. He had also inserted a leaden pipe and an iron pump; it is natural that if the spring contained hydro-sulphuric and carbonic acid, the lead and iron would be attacked and form sulphuret and insoluble carbonate of lead. It is difficult to form exact conclusions as to the gas, for, by the motion of the pump, it is separated from the water, the temperature of which is increased by the same cause. But in order to be certain that this supposition is correct, it would be necessary to know the temperature of the water in the spring; when it comes out of the pump its temperature is 49°.

PRINCE EDWARD'S ISLAND.

At Bloomfield the spring is situated in a garden at a distance of a hundred feet from Mr. Stewart Christie's house, on the eleventh lot of the second concession. The soil is blue marl, under which lies fossil lime. The water of this spring is very saline, and may be used with advantage for the manufacture of salt. It contains lime in solution, which diminishes its value in a commercial point of view. Its depth is forty-five feet, and its specific gravity 1.00721. The level of the water in the ..rest season is five feet below the soil. This spring is in very bad order, filled with pieces of rotten wood and leaves of trees. It was difficult for me to ascertain the nature of the gases which it contains. It is certain, however, that it is not hydro-sulphuric acid. This spring might easily without expense be so improved as to serve for the manufacture of salt, inasmuch as there is another of the same nature at a distance of twenty feet further. At Picton there is a spring on the southern declivity of the mountain; the soil is the same as at Bloomfield, but it only contains water in the spring and autumn. There are several mineral springs on Prince Edward's Island, but they dry up in the very hot weather. If care were taken to prevent evaporation by the rays of the sun, they might possibly be made use of with advantage throughout the whole year.

Near Belleville, at a few acres distance from the landing place, there are several gas springs in the river. In two places the ebullition is more than two feet in diameter. This gas can be no other than marsh-gas or carburetted-hydrogen, caused by the decomposition of organic substances. At a short distance there is a marsh covered with water; the presence of fish in this marsh is a proof of the nature of the gas, for if it contained any signs of hydro-sulphuric acid gas, no fish could exist in it.

Four miles from Belleville on the road to Trent, there is a saline spring at the foot of a tree on Mr. Leman's property, on the border of Prince Edward's Island, Victoria District. The soil is calcareous. Not far from this spring, on G. Caly's property there is lead ore. I visited several mineral springs at Trent, among others one on Mr. Ford's property, on the broken front of Lots 7 and 8, in the Township of Murray, two miles from Belleville. The inhabitants of the locality consider it as the most important one in the vicinity: I found it to contain magnesia; the gases are disengaged in very small quantity. Mr. G. C. Bull, a merchant of the place, assured me that in spring and in autumn they are disengaged in much greater quantities. In my opinion these springs are of no importance, as their strength is not always the same.

TORONTO.

There is also a mineral spring here, on Lake Ontario, almost opposite the Wellington Hotel. It is magnesia, but too weak to be of much use as a medicine. It is more worthy of notice by its low temperature of 42° (that of the atmosphere being 76°) than by the quantity of salts in solution. This spring is of no use from the manner in which it is kept.

LAKE SIMCOE.

In the Township of Georgiana, near Lake Simcoe, there is a mineral spring known as Jefferson's Spring. It is near Thorah, on lot No. 10, in the third concession, in a small ravine which intersects the Thorah road. There are two springs there very close to each other; one of them gives very good drinkable water, the other, notwithstanding the quantity of water it affords in a season so dry at this period, contains enough magnesia to give it a taste; there are hardly any traces of the presence of hydro-sulphuric gas. The proprietor states that at other seasons this spring disengages a very remarkable quantity of that gas. The soil is

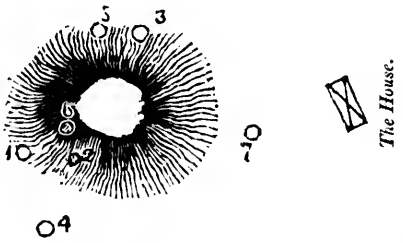
the same as that of Trent. It is therefore possible that the iron pyrites or other sulphurets contained in a certain portion of the layers of earth, are decomposed by the organic matter, and the hydro-sulphuric gas disengages itself. Ten miles from this place the inhabitants of the locality have discovered three other springs in the woods, also in the direction of the ravine; but these springs disappear with the clearing of the forests.

LAKE ONTARIO.

Between Wellington Square and Toronto, in the fourth concession of Dundas street, Township of Nelson, on Henry Sovering's farm, two arpents from the road and three from Lake Ontario, there are two saline springs close to each other, and a few arpents further there are two others. These springs are in a soil of red shale and contain a very considerable quantity of chloride of sodium or muriate of soda, without lime, in which they differ from those of Kingston and Bloomfield. The depth of these saline springs is fifty two feet; it is a great pity they are not made use of. The specific gravity of the water at the surface, is 1.0159.

Four miles from Brantford, on the Grand River, in the third concession, lot 26, of the Township of Tuscarora, there are springs known as "Sour Springs." I think it would be necessary to change that name for one more characteristic, according to their composition and nature. I will therefore call them antimoni-ferruginous. These springs are in the centre of a splendid forest of oak, beech, fir and maple trees, at a few miles distance from the River. They are rather on a table land of the mountain than in a plain. There are four springs constantly filled with water, even in the driest season, and seven in the three other seasons. They are all acid and disengage hydro-sulphuric and carbonic gas, bubbling up with great violence. These springs contain sulphate of protoxide of iron, sulphate of alumina and of potash, chloride of antimony, chloride of zinc, sulphate of magnesia and of lime, resinous substances, and vegetable albumen. The temperature of the water is 47°. These three springs are at the base of a small hillock seven feet in height, which was once covered with trees, which have since been cut down, leaving only the stumps. The earth is filled with sulphur crystallized in very fine grains. It appears to be in the state of decomposition of organic substances. The soil is clay, covered with several inches of vegetable earth. It is so acid that it changes blue paper into dark red, and finishes by destroying it as strong acids do. What is more remarkable is

that the earth which has this property is taken from the summit of the hillock. Notwithstanding the composition of all these springs is the same, they must be of different strengths as regards the the quantity of salts in each—for the effect of each is different, and so is the taste. Their relative situation is shewn by the following figure :



The numbers are in the order of the quantity of water which each spring furnishes. No. 1 furnishes more than twenty gallons per minute. The inhabitants make use of these waters in different diseases: Nos. 1 and 2, internally; No. 3, for inflamation of the eyes ; No. 4, to wash scorbutic and venereal sores. No. 2, is considered very efficacious for gonorrhœas. As Nos. 5, 6 and 7 do not exist at all seasons, they are not made use of. I have taken these waters in tolerably large quantities. I have found that they act chiefly on the nervous system and the circulation of the blood, and cause at the same time diarrhœa. I did not at all feel that heaviness and fatigue generally felt after drinking other mineral waters. I know that several diseases have been cured by means of these springs. A woman of Brantford had a disease of the skin, and the epidermis was so attacked and the blood so corrupt, that the flesh under her nails was affected. By drinking No. 1, and washing with No. 4, she was cured, as several persons of the locality affirm. A mechanic who had wounded his hand with a piece of glass, more than a year before, was completely cured by washing with No. 4. Another cured a gonorrhœa by drinking No. 1. A third a venereal sore by washing with No. 4; and there are a great many other examples of various cures. It is to be remarked that the strength and quantity of these waters increase with the moon. It is my duty to call attention to the importance of these springs, so that Government, in the interests of humanity, may encourage any person who would provide convenient means for using them, so as to obtain the benefits and

advantages which might result therefrom in a medical point of view. It may be useful to remark that if water containing zinc and potash, as well as alum combined with potash, is very scarce, water containing antimony is still more important on account of its still greater scarcity and medicinal power. The salts of antimony are of the greatest value, on account of the great difficulty of preparing them properly; for the chloride of antimony becomes decomposed in water, while here it is produced by the presence of the acid and of organic matter. The discovery of antimony in a mineral spring is undoubtedly an immense advantage for the science of medicine; for the same substance prepared artificially is never so efficacious as when found in water, and no one has succeeded in imitating mineral waters, such as those of Carlsbad, Baden, Aix-la-Chapelle, &c., &c., &c. No imitation could have the same medicinal virtue. I will take the liberty of explaining the theory of the formation of this antimoni-ferruginous spring, and of explaining the cause why the antimony is in solution without being decomposed or precipitated by the water. According to geological researches it is known that this place contains a great many marshes, iron pyrites, lead ore, zinc and antimony, as well as beds of gypsum. Water running through iron pyrites or gypsum, by some chemical or other phenomenon, becomes decomposed and charged with a quantity of sulphuric acid; (the waters of this spring prove its presence in a very decided manner;) the water so acidulated, passing through turf or a marsh covered with vegetation, must contain vegetable albumen, (which I have found,) organic acids, resinous substances, &c. If the water thus charged passes afterwards through beds of ore of antimony, it is natural that it will dissolve the substance without precipitating it.

I will not enter into further details respecting this spring, for as I consider it of the greatest importance in medicine, as well as to the scientific world, I will communicate to you a memorandum when I shall have been able to procure the several instruments which are most necessary for making the complete analysis of these waters, and which I have not in my laboratory at present. I think it would not be useless for me to communicate here my observations on this place, with respect to its commercial and industrial importance. The geographical position of Tuscarora, with its fine navigable river uniting Brantford with Lake Erie, is most advantageous. Great benefits would arise if it were occupied by inhabitants having a legal right of possession, and not by persons who seek only to avail themselves of possession they have obtained without right.

For this reason, the Indians ought to be allowed to make legal sales. Several settlers have already established themselves there under the simple protection of the forests, without having any right to acquire lands. Without improving the cultivation of the land, they destroy the forests which are of the greatest value, especially for this country, where wood is required for building and for navigation. If they continue, these forests will disappear without being of any advantage to any one. The soil as well as the climate of this township are of the highest value for agriculture. I think that if Government allowed the Indians to sell the land, it would be of great use if it were in the hands of able and educated persons who would know how to turn it to as much advantage as possible, and thereby contribute to the commercial and industrial interests of the neighbouring towns, such as Hamilton, Brantford and London.

WOODSTOCK.

The mineral waters near Woodstock are magnesian, and disengage hydro-sulphuric acid. These springs are of little value, being flooded by streams. If the course of these streams were turned the springs might possibly be of some use in medicine, especially for the inhabitants of the locality. There is a spring in the Brock District near Mr. Riddell's lands. As it was dried up, I was not able to ascertain its nature.

ANCASTER.

On the way from Brantford to Hamilton, in the village of Ancaster, there is a road on the left at the corner of the hotel, which leads to a magnesian sulphureous mineral spring. It is in a deep ravine on the left of the road going up the stream, on Mr. Griffin's property. The nature of this spring is the same as those in the Townships on Lake Simcoe.

The spring known as the "Burning Spring," is in the Township of Salt Fleet, 4th Concession, six miles from Hamilton and three from the road leading from Hamilton to St. Catharines. This spring is on the same stream as that of Ancaster, a hundred feet above that spot. Its gas is carbonated hydrogen and not hydro-sulphuric. This spring contains a great quantity of lime; as there is also carbonic acid in this spring, it would be useful in the manufacture of white-lead (*ceruse*).

On the left of the road leading from Hamilton to St. Catherines there are saline springs which are used in the manufacture of salt. One of these springs is already abandoned, but that of Messrs.

Dougall and Kent is in full work; its depth is three hundred and seventy-five feet. It proceeds from red shale, such as that of Wellington Square. This spring is near a ravine at a small distance from Lake Ontario, in Salt Fleet, 1st Concession.

ICE SPRING.

The famous spring known as the "Ice Spring," is nothing, or rather does not exist, unless it be as a chemical phenomenon. It is on the right of the road from Hamilton to St. Catherines, near the Red House. When I went to visit it I found neither ice nor water, but a great heap of large rocks which had fallen from the mountain and been stopped by a small ledge. These rocks are sandy, and would be very good for filters, such as are used in Paris by every person who wishes to have the Seine water pure for his table. At this place the rocks form a pretty deep cavern. From the month of July to the month of October it contains nothing but moisture. About the middle of October the water coming from the mountain gathers and fills a cavity which contains a half-*litre*, (a little more than a pint.) This water remains there the whole winter. It is a known fact that in this season the temperature of caverns does not become lower. As the water remains then perfectly quiet, not even disturbed by the wind, and having no foreign substances suspended in it, it may remain without freezing even in a temperature of five degrees below the freezing point. In the months of March, April and May, the snow in melting absorbs a quantity of caloric, and thereby cools the neighbouring bodies; then the May and June sun causes a certain quantity of water to evaporate, which oozing out slowly through the rocks, diminishes or lowers the temperature, so that the second drop congeals, and this is the reason why, in the warm season, a small icicle may be seen and a little congealed water in the cavity below, and that there is only water in winter. It is on the same principle that the Egyptians cool water for their use by exposing their jars when filled to the rays of the sun. But about the months of August and September, the heat being very strong and the moisture of the rock being dried up, no water is left to ooze out; then nothing remains to be turned into ice, and there is only the moisture which exists in all caverns. If my explanation be erroneous, what then is the cause of the formation of the ice? Since ice is formed, there must first have been water, and it is well known that the falling of the temperature causes ice to be formed. If my explanation were contested, recourse must be had to some chemical process—what would this process be? It is known that the tem-

perature may be made to fall 40° below freezing point by the great dissolving power of a salt, which abruptly diminishes the temperature and thereby produces ice. The spring must therefore first be in a liquid state, and the salt be at its surface; for if it is at the bottom, the ice being formed cannot ooze out through the rock or run without being turned into water, and be converted into ice afterwards. Then I do not see by what process the ice is to be formed. I think that this name, given by persons who know nothing of science, ought not to be adopted, as it may be incompatible with scientific observations, and create a belief in the existence of something marvellous, where there is only a physical phenomenon. Travellers have found what they pretend to be an ice-spring in Siberia, but as they have not given sufficient explanations I could not ascertain whether there exists any identity between them in a physical or chemical point of view.

ST. CATHERINES.

Six miles from St. Catherines to the south, on the left of the great Canal which unites Lake Erie with Lake Ontario, there is a mineral spring on the mountain from which the stones are taken for the construction of the locks. It is magnesian, but contains carbonate of lime, and disengages a very slight quantity of hydro-sulphuric gas; its specific gravity is 1.0304. The soil is calcareous and filled with fossil substances.

In the village of St. Catherines, on the border of the Canal, there is a saline spring which contains lime in abundance; this takes away a great deal of its value for the manufacture of salt, especially as it contains also magnesia. This spring descends through forty feet depth of earth, and (according to information derived by the proprietor) 407 in the rock. The proprietor uses it for salting fish and for baths. I think this salting cannot be very advantageous to the consumer. It might be turned to greater advantage still, by separating the salt of lime and of magnesia from the muriate of soda, by taking advantage of the salts being soluble at different degrees of temperature, and where fuel is expensive, by using the strength of the solar rays. But in the present state in which this spring exists, it would, in a commercial point of view, be very difficult for the proprietor to keep up with the price current with advantage. There is a ferruginous mineral spring in the lock at the entrance of Lake Ontario. This spring might have been very useful in medicine, as it is ferruginous and magnesian, but as it is in the centre of the lock it is almost certain that it can be made no use of.

There is now nothing left for me but to describe the Niagara Spring above the great Falls. It is called the "Burning Spring," on account of the carburetted hydrogen which it contains. This spring is of no greater value than any other cold spring. The water is calcareous; it proceeds from calcareous rocks impregnated with hydrate of iron, which is not however in solution in the water. These gases can only proceed from the decomposition of the organic substances existing at different depths in the soil.

I will now give the description of a mineral spring containing bitumen and petroleum, and which Mr. Logan found in his first trip to Gaspé. According to the specimen he gave me, this spring is composed of creosote, naphtha, petroleum, bitumen and *paraffine* or *suif de montagne*. By means of a chemical process a substance can be formed having a strong smell of musk, and imitating that which comes from China. I think a description of this kind of spring which is found in foreign countries, will be interesting, as I am not acquainted with that of Gaspé; it is of the greatest importance to have more details on this spring, as it may conduce to other researches very useful for the country and for science. These springs of naphtha and petroleum exist in Persia, on the northern side of the Caspian Sea, at Baku near Derbent. The soil is argillaceous marl impregnated with naphtha. They may also be found in the Birmese Territory. The Town of Bainanghong is the centre of a small District which contains more than five hundred of these springs. The soil is sandy clay, which lies over alternate beds of sandstone and hardened clay. Underneath is a thick bed of argillaceous shale of a pale blue, which forms part of the pit-coal strata, and this argillaceous shale rests immediately on the pit-coal, which is impregnated with petroleum. At Coalbrookdale in England, there is a similar spring of petroleum which originates in a bed of pit-coal. Near the Cape Verd Islands large masses of petroleum have been seen floating on the surface of the sea. Petroleum has been found in the River Thames, near Lake Erie. It has also been found on Mount Osmund in Dalecarlia, in Sweden, but has since disappeared. The most remarkable feature in this appearance of petroleum, is that the country consists of transition limestone, surrounded by granite. It is then probable that the petroleum owes its origin to a bed of aluminous shale on which the limestone of the Osmund Mountain probably rests. These springs exist also in France, not far from coal-pits. As to the soil of that part of Gaspé where the above mentioned spring is found, having nothing to guide me but the specimen furnished by Mr. Logan, I can make no comparison

with what is known in the other parts of the world, and thereby facilitate the theory of the formation of creosote. There are several circumstances to be considered, which are of the greatest importance. If the Gaspé spring comes from pit-coal, where is this bed of coal from which it originates? Can it be accidental like that of Sweden? This might be ascertained from the Indians of the place, and whether it is of old date or of very recent existence; this would enable me better to explain the theory of the formation of creosote in this kind of spring. And if this spring resembles those of Asia and of Europe, would it not be a sign of the presence of coal. In many points of view this spring is remarkable and may be of great value to the country; for it may furnish naphtha in abundance (more than 60 per cent.) which is very useful for light, varnish, mineral tar for ships, and creosote, which, if it can be obtained in any great quantity, will be of real advantage. Until now creosote had been obtained by treating substances derived from the distilling of wood with phosphoric acid. This is a very expensive process. Creosote is considered as an artificial substance; I will therefore refrain from giving the theory of its formation in this spring, as it requires more delicate experiments than my laboratory will permit me to make for the present. I had forgotten to say that the above mentioned spring, from the specimen furnished to me, contains creosote which might be procured with advantage, especially if the spring be abundant. As it is very reasonable to suppose that these springs must exist in various places, their value for industrial purposes, commerce, and the arts, may be very great. The scarcity of creosote, and its high price, prevent its being used in manufactures, especially for the preservation of wood. In England, where wood is so precious, it is found advantageous to use corrosive sublimate, notwithstanding its exorbitant price, on account of the value of the mercury. If therefore one knew how to turn to advantage these natural resources, and knew the real value of this spring, that is, in how many places it may be found, how much it can furnish per hour, what is its geological position, whether it proceeds from shale or from a bed of pit-coal, or since there is such a spring, whether it is not a sign of the existence of pit-coal as in other countries; in fine, its relation to the carboniferous substances found in the shale clefts between Gaspé and Cape Chat. From my observations on the spot itself, I found it to contain all the characteristics of pit-coal.

It is possible, and very probable, that the science of Chemistry will gain something by these data; for there may be means for extracting or facilitating the preparation of creosote so useful for medical and industrial purposes. I have no doubt that the country contains more than one person who will not hesitate to dedicate his money and time to the general advantage.

I can say nothing of the oil spring in the River Thames near Lake Erie, as my instructions did not permit me to pass the limits assigned to me; but I consider it as indispensable to mention it here, for springs of that nature are really valuable to the country.

E. S. DeROTTERMUND,
Chemist.

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