

require it, but when we are well we like what we drink to be pleasant to the taste. While this water must therefore be sweet to the taste and pure, in order to make it valuable, it must contain those rare minerals in such delicate proportions as to make the water a valuable tonic, and a corrective of the acidity of the blood, which is so often the result of the modern style of living.

A foreign water which has attained a world-wide celebrity on account of the possession of these qualities, is Apollinaris, which is drunk over the entire world, and in enormous quantities.

A more recent spring of a similar quality is the Johannis water, which is now being pushed very vigorously, and which appears to contain all the elements of a first class mineral table water.

The most recent discovery of a Canadian water of this description, is that known as "Radnor" water, and it is to this spring that I wish more particularly to draw your attention in this paper.

The spring, which is located at Radnor Forges, Champlain County, Quebec, was discovered on 8th September, 1893.

The circumstances which led to the discovery are worthy of mention. During the early part of the year 1893 the General Superintendent of the C. I. F. Co., reported there was an outbreak of what seemed to be a "skin disease" among the children of the village and neighborhood. The trouble seemed to be so general, that, in his opinion, there was some good cause for it. The company at once instituted a thorough investigation, sending Dr. W. H. Drummond to Radnor Forges to look into the matter. After a very full investigation he reported (his report being concurred in by the late Dr. Archibald Campbell) that, in his opinion, the trouble was to be attributed to the water supply, which at that time was obtained from the ordinary village wells. Samples of water were taken from almost every well in the village, and a thorough analysis made, with the result that the water was found to be heavily impregnated with iron, and affected by other impurities, the result of analysis bearing out the Doctor's opinion. A matter of note in connection with the investigation was that the Rev. Cure Prince of the adjacent village of St. Maurice, stated that during 28 years he had noted at least four outbreaks of skin disease, and these at intervals of four or five years.

After completing the above investigation, and finding that the waters of the subsoil could not be improved upon, even by piping water from a reasonable distance, the company finally decided to bore an artesian well. Operations were commenced in the centre of the village park. Borings were made at that point to a depth of about 354 feet, the strata through which the drill passed being first subsoil, then limestone, and then into gneiss rock, a granite similar to that of the Highlands of Scotland. At a depth of 100 feet a strong flow of water was secured, which on analysis proved to have so much lime and chloride of sodium that it was looked upon as unfit for domestic purposes. This spring was finally closed at a depth of 354 feet, and although the officers of the company were much disheartened by this, and by the fact that all former attempts at sinking artesian wells in that vicinity had proved failures, it was decided that one more attempt should be made. A location was selected on the company's property some distance away, at which the drill was set to work, with the result that at a somewhat greater depth in a valley, an extraordinary strong flow of water was found, apparently of great purity, its mineral qualities being from the first very marked but at the same time agreeable to the taste.

The strata through which the water passed were first subsoil, then somewhat porous shale rock, and lastly gneiss rock, similar in physical structure to that of the first location, but much darker in color. The shale is reported to have been very light, whilst the gneiss rock from which the water actually springs, is very close and hard.

A four inch wrought iron pipe was driven down into the gneiss rock, and through this the water flows to a height of about five feet above the surface of the ground. Strong pressure is indicated by the fact that from this four inch pipe the water can be lifted to a total height of twelve feet three inches through a one inch pipe.

The quality of the water seemed so good that the officers of the company decided to at once have a complete analysis made by the most competent authority in Canada, and Prof. J. T. Donald, Professor of Chemistry, Bishop's College, Montreal, was selected to make the analysis. From the very first Prof. Donald was favorably struck with the quality of the water. His report was as follows:

"MONTREAL, June 14th, 1894.

"I hereby certify that I have analysed the sample of Radnor Water received from the Canada Iron Furnace Company Ltd. and find the following results in 10,000 parts of water.

Chloride of Sodium.....	14.354
Chloride of Potassium.....	.211
Sulphate of Sodium.....	.210
Sulphate of Magnesia.....	1.262
Bromide of Sodium.....	.080
Bicarbonate of Sodium.....	1.697
Carbonate of Lime.....	2.940
Carbonate of Iron.....	Traces
Silica.....	.145

In 10,000 parts of water..... 22.899

"This analysis shows that Radnor Water is of the same class as Apollinaris and German Seltzer. Like those, it contains no excess of Sodium Chloride and Carbonate of Lime, and again, like these, it contains the valuable ingredients in such proportions that its use as a table water overcomes constipation and acidity of the stomach in a gentle and pleasant manner. And it is most important that the valuable Sodium Bromide, which is entirely wanting in the German waters named, exists in appreciable quantity in the Radnor Water, making it a most desirable tonic."

(Sgd.) J. T. DONALD.

This report was at once submitted by the Managing Director to the best authorities in Germany for their report. The following letters will show what a good opinion was formed of the water by the best experts in Germany:

Dr. E. Scott, of Frankfort-on-Main, Germany, a physician of high standing, writing under date June 23rd, 1894, says:

"The analysis of this water is very like Apollinaris, which it surpasses in its percentage of Chloride of Sodium, which is artificially added to the Apollinaris water to make it keep.

"We have in Radnor Water an agreeable drink, which can be used every day as a sort of beverage, but which also in cases of dyspepsia, typhus and kidney disease can be used with a beneficial influence, thus one is certain in drinking this water to have the advantage of not being affected with the harm-giving substances which are frequently to be found in ordinary drinking water."

Dr. Julius Lowe, Chemist of Frankfort-on-Main, the great German expert on Mineral Waters, says, under date June 21st, 1894:

"In comparing the analysis of Radnor Water with the analytical results of the springs of Seltzer and Apollinaris, I find that the Radnor contains in quantity many of the ingredients which are to be found in the Seltzer and Apollinaris water. The Radnor exceeds the Apollinaris water in its percentage of Chloride of Sodium, which is added to the Apollinaris water artificially.

"Supposing there is a sufficient yield of your springs it deserves, according to its composition, your whole attention, as far as value is concerned, and it justifies the expectation that the water of this spring can compete successfully with Seltzer and Apollinaris."

With regard to the actual flow, experiments with standard measures show the natural flow to be slightly over 30,000 gallons per day. Certainly the pressure is very great, and there is no reason to suppose that by putting on a steam pump the flow could not be increased, i.e. if it was found necessary to exceed the natural output.

The best test as to the permanency of the spring is that from the date of the discovery, 8th September, 1893, the water has not even for an instant showed a diminution of flow. Prof. Donald and others when interviewed in regard to this matter stated that this is about as good a guarantee of permanency as can be given.

As to the "keeping" qualities of the water, it may be mentioned that some of the water taken from the spring in its natural state has been kept in a glass for over a year, and it is as sweet to-day as when taken from the spring. The water being entirely mineral in character will "keep" without the slightest difficulty.

Since the discovery of the spring, and the use of the water by the people of the village, no sign of the sickness and trouble referred to has been seen. The water is in daily use in all their houses, and is known to be of the highest value in all cases of indigestion, rheumatism, etc.

The water placed on trial thus far has given the greatest possible satisfaction, and no better proof of its admirable qualities can be found than by testing it by the side of any of the most popular table waters. The delicacy, purity and flavor of "Radnor" water when thus compared leaves no question as to its quality.

Now in conclusion let me say that it is one thing to discover a spring of fine mineral water, and quite another thing to make people buy it and drink it. It is like a patent medicine, give it a good name, make it well known, and people will very soon ask for it. The splendid success that has been attained by such well known waters as Apollinaris, Johannis, and others, shows what can be obtained by persistently presenting to the public the merits of your spring. Make yourself sure by careful analysis and experiments that you have got the right thing, and plenty of it, and then spare no pains to let the public know this fact, and you will reap an abundant reward. There is at present room for a mineral water of the same nature as Apollinaris, for it would appear that there is actually more demand for it than can be supplied direct from the original spring.

I venture to prophesy for "Radnor" water a world-wide fame, founded not on advertising and puffing, but on the merits of the water itself.

The Geological Survey of Canada and Its Operations.

By R. W. ELLS, LL.D., F.R.S.C., Ottawa.

It has been suggested to me that, to those of our members who live in this city where the Geological Survey had its first location, as well as to many throughout the several provinces of our Dominion, some facts relating to the work of such a department, as annually carried out might be of interest. The question has been often asked, what is the work of the Geological Survey? what does its staff find to do year after year, and what great purpose does it serve in the country's progress and welfare? To discuss this subject fully would require a very long chapter, but I hope to be able to lay before you a few ideas regarding the general character of this work that may, to some extent at least, be an answer to the question propounded.

And first of all as to its history. The Geological Survey of Canada, whose operations have now extended to every part of the Dominion, has had an existence of fifty-two years, and while it may seem almost superfluous to devote any time to the story of its inception, it is possible there may be some present who are not perfectly familiar with the early struggle and disappointments, which attended the efforts of those who were desirous of seeing such an institution in successful operation, and who firmly believed in its great utility as a factor in the advancement of the interests of the country. As far back then as 1832 a petition, asking for pecuniary assistance in carrying on a geological and statistical survey, was presented by Dr. Rae to the Lieut.-Governor of the Province of Upper Canada; but, though strongly recommended by that gentleman, it was not even entertained by the committee of supply. In December of the same year the York Literary and Philosophical Society also forwarded a petition for the same purpose which met with a like fate. In 1836 a committee of several gentlemen was appointed by the government to report on a plan for a general survey of the province, which report was presented, but no further action taken in the matter. On motion of the committee of supply it was then resolved that an address be presented to Sir F. B. Head, the Lieut.-Governor for the time, with reference to the practicability of the desired Survey. This, however, failed to go any further, and in December of the same year, a Mr. Dunlop gave notice of an address to the King, praying for a grant of wild lands to defray the expenses of a geological survey, which application also met with the same fate as its predecessors, and the matter was thenceforth dropped till the union of the Provinces of Quebec and Ontario in 1841.

In that year the Natural History Society of Montreal through Mr. Benjamin Holmes and the Literary and Historical Society of Quebec through Mr. Henry Black, again petitioned for aid to carry out a Geological Survey. The consideration of these petitions was taken up by the government, and on the motion of the Hon. S. B. Harrison, the sum of £500 sterling, for the purpose of such a Survey was included in the estimates. As a result of this action, early in 1842, the advisability of appointing a geologist for the work was considered, and the matter was referred to Sir Chas. Bagot, who was then Colonial Governor for the time, to Lord Stanley, then Secretary of State for the Colonies, by whom on the recommendation of Sedgewick, Murchison, DeLaBeche and Buckland, the position was offered to Sir Wm. Logan in September of that year.

Logan, who was in England at that time returned to Canada in the fall and proceeded to Kingston, then the seat of Government. Here the question of an assistant was discussed and, on the recommendation of DeLaBeche, the services of Mr. A. Murray, a gentleman who had been educated for the navy but who had served for some time on the Ordnance Survey of Britain, were secured. Murray was already to some extent acquainted with Canada, having resided here for several years, and