A PECULIAR REACTION OF THE NIAGARA RIVER WATER.

By Dr. Edward Gudeman.

The water supply of the City of Buffalo is taken from the Niagara River, about one mile from its source, Lake Erie. The inlet where the water is drawn, is about one-quarter of a mile from the shore, and the river at that point has a six to eight mile current.

The water is generally clear, but after every severe rain storm, or from high winds, it becomes turbid and then contains quite an amount of suspended matter, which filtration will separate.

The water contains, per United States gallon, from eleven to fifteen grains of total solids, five to eight grains being organic. The inorganic portion consists mainly of calcium carbonate and sulphate.

From December, 1891, to August, 1892, the water, as taken from the mains, gave an absolutely neutral reaction. During August a sudden change took place, the water becoming alkaline. The amount of alkalinity varies; 100 c. c. of water being sufficient to neutralize from 0.05–0.3 c. c. of half normal sulphuric acid. The water gives a strong reaction for carbonic acid, and this reaction is, without doubt, due to the calcium bicarbonate contained in the water. The water loses this alkaline reaction by filtration through animal charcoal.

The distilled water made from the Niagara River water, gives a distinct *acid* reaction.

The acid in 100 c. cm. of the distilled water will neutralize from 0.01–0.5 c. c. of half normal caustic potash solution.

The water before being distilled was made alkaline with caustic soda, sodium carbonate, caustic baryta and barium carbonate; still the distillate gave the same acid reaction as the original untreated water. The water was made acid with sulphuric acid without any effect on the distillate. Potassium permanganate also

gave no better results. The water was filtered through animal charcoal, then distilled, without any effect on the acidity of the distillate.

The amount of acidity varies constantly, but, so far, has always come within the above mentioned limits, the average being about 0.15 c. c. of half normal potash solution to 100 c. c. of distilled water.

It makes no difference whether the distillation is carried on in copper or glass retorts; whether the heat is applied by means of steam coils or bunsen burners.

The separate portions from the same distillation show no marked difference in acidity, the first 100 c. c. of distillate neutralizing as much potash solution as last. The water remaining in the retort gives the same reaction, neutral or alkaline, as the original water. This would tend to show that the acid is not contained in the water as such, but is a product of decomposition, continuously formed during ebullition.

The distilled water gave no reaction for carbonic acid and leaves absolutely no residue on evaporation. It reacts acid to solutions of litmus, lakmoid and alkaline phenolphthalein.

The water can easily be purified from this acid body by boiling off about one-fourth of its bulk, when the remainder will be neutral. A second distillation, after having made the water alkaline with sodium carbonate, also gives a neutral distillate.

To be absolutely certain that this acid reaction was not due to some local contamination, I requested Prof. H. M. Hill, of the University of Buffalo, and Dr. J. A. Miller, of the Niagara University, to test the water as delivered at their respective laboratories, the one being about one mile and the other about two miles from my laboratory, and all supplied from different water mains. Both gentlemen obtained the characteristic acid reaction from their distilled waters.

These tests were begun in December, 1891, and are still being carried on.

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