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SEWERAGE, SEWAGE DISPOSAL, WATER SUPPLY AND WATER PURIFICATION

WATER SUPPLY AND INFILTRATION METHODS.

In order to obtain a supply of lake water, many Canadian towns have adopted a method which has become known as that of "Infiltration."

This is done in order to save the expense of running an intake pipe into a lake beyond the zone of turbidity.

Our lakes generally consist of large bodies of water, eminently suitable in every respect for domestic supply purposes. The water, however, at the margins of the lakes is not suitable. Under conditions of storm the shore water becomes turbid; even with gentle winds blowing landward, such water is contaminated less or more by surface drift.

On the foreshore of our lakes we find frequently stretches of sand and gravel. "Infiltration" consists of digging a hole, or well, in this sand or gravel, with the view of the lake water filtering through the material, and thus obtaining a pure supply of lake water, which can be pumped to storage at a height suitable to provide supply.

There is no reason for suspecting that this system of attempting to obtain pure water is sound or effective. There is every reason for suspecting that the system is absolutely unsound and entirely inefficient.

The conditions are: (a) A well dug at a distance of, say, fifty feet from the edge of the lake to a depth of, say, ten feet below the normal lake level. (b) A body of sand and gravel existing between the well and the lake through which the water must pass before entering the well.

With reference to (a), it is obvious that, the well being pumped empty, there is a hydraulic head of ten feet, less the amount of loss of head due to friction presented by the intervening bed of sand and gravel. Further, when the well is at five feet deep there is five feet head, less the loss due to friction, and so on.

With reference to (b), it is also obvious that the gravel and sand used as the filtering media is always under a condition of partial saturation, and that only when the well is pumped dry is half the area of sand exposed to air. This half is represented by a line drawn from the bottom of the well to the surface of the water at the lake edge. This body of sand is made to last as a continuous filter (by lateral filtration) without renewal or washing, and only subject to partial aeration. No bacteria removal could at any time be expected by such a filter. As a strainer, granted that the filtering media is clean to start with, the filter may be effective, but on continued use and collection of matter in the filter, a more impure water may be anticipated in the well than the lake provides.

The point which has not been made clear with reference to this system of filtration is one of great importance, viz.: Does the water appearing in the well really proceed from the lake or from a land source?

The fact that, when the well is not being pumped, the water maintains the same level as the lake is no proof that the lake is the source. The land water at a point so near the lake will be practically at the same level as the lake.

The fact is not always appreciated that where the land surrounding a lake is of a porous character a greater amount of water reaches the lake by invisible than by visible sources of supply. In the neighborhood of Toronto, for instance, no one pretends that the rainfall, less the amount of surface evaporation, in the watersheds of the Don and Humber is represented by the volume discharged by the rivers Don and Humber. The greater amount of the water finds its way by underground streams to the lake.

North Toronto derives its water supply from wells located alongside a stream. An bundant supply of good water is obtained, not by infiltration from the stream, but from an underground source independent of the stream, summer or winter.

What proof exists that in many of the systems of so-called infiltration the water is not supplied from some land source which is feeding the lake.

Dr. Amyot, the analyist for the Provincial Board of Health has on several occasions made analyses of the water in many of these infiltration wells, and in nearly every case found the water to be of a distinctively different character from that in the lake—in some cases as many as 20 parts of chlorine as against 2 in the lake; and generally pointing to sources of land supply.

A case in point is a town on the Georgian Bay, which has for years boasted of an infiltration plant providing pure lake water to the citizens. The question arose of enlarging the well so as to provide a greater infiltration area and obtain more lake water than at present. A by-law for $4,000 was sanctioned for this purpose. Experts were first called in, who were able to demonstrate that the water supply was not from the lake, but from an underground source, which passed under the inhabited part of the town, and into which a number of cesspools drained. On analysis the well water showed 14 parts of chlorine as against 2 in the lake. The depth of the gravel and sand at the lake edge was only about one foot, resting on hard pan, and the distance from the lake such that a simple calculation of the head and loss by friction showed conclusively that no lake water reached the well. Although dye water from certain works had at times discolored the foreshore water, and showed no appearance in the well, and the water in the well presented both summer and winter an invariable temperature, what appeared the obvious source of supply from the lake had not been doubted.

At the best, any scheme of infiltration such as the above must be inefficient as far as filtering water is concerned. The chances are (if no surface contamination is possible) that the land supply will be purer than the lake. Sand or gravel at the edge of a lake in its interior capacity contains large quantities of organic and other objectionable matter, the result of the constant wash of debris and floating matter to the shore. A simple calculation of the head and loss by friction resulting from the material intervening between the well and the lake will generally convince anyone that the lake supply must be relatively small as compared with the land underground flow supply. In all such cases it behoves a community to turn their attention from the large body of water stretching away from their feet to the horizon and pay some attenion to that unseen underground flow feeding the lake, and which may contain impurities gathered in its course.