Turbidity is due to solids in suspension; it has nothing to do with color.

Hardness.—The permissible amounts of hardness in a water should be (in parts of 100,000) 21 parts of total hardness and 7 parts of permanent hardness.

The hardness scale for water is approximately:—

Not exceeding (parts in 100,000)		6 = very soft.
"	"	13 = soft.
"	"	20 = hard.
"	"	34 = very hard.

Chlorine.—All waters contain chlorides. The knowledge of the amount is of no value unless we know the normal content of the particular water under observation. An excess over the normal content points to sewage pollution.

A high chlorine content combined with an excess of nitrates points to suspicion of pollution.

Lead.—No trace of lead is permissible in potable water.

Nitrites.—The presence of nitrites in water points to suspicion of organic pollution.

Nitrates.—These are the products of the oxidation of organic matter, chiefly derived from manure and sewage. As much as 1.5 parts per 100,000 should cause grave suspicion.

Free Ammonia.—Most waters contain a trace. Permissible amount is only .005 parts per 100,000. If over the permissible amount in conjunction with excess of chlorine, fœcal pollution is probable.

Albuminoid Ammonia.—The permissible amount is .01 parts in 100,000; however, if the water be of a peaty or vegetable nature, the amount may be higher; if accompanied by an excess of chlorine, then the excess is suspicious.

Oxygen Absorbed.—0.1 part in 100,000 is the highest permissible amount.

Bacteriological Examination.—All surface waters and shallow well waters should be subjected to a bacteriological examination as well as a chemical.

The presence of B. coli in water points to sewage pollution, as such bacteria are peculiar to the intestines of animals.

OUTLINE OF SANITARY WATERWORKS IN THE PROVINCE OF QUEBEC.

By James O. Meadows, Sanitary Engineer of the Board of Health of the Province of Quebec.

(For editorial comment on this article see page 687 of last week's issue.)

There are two broad classes from which our domestic water supplies are derived, namely, surface and underground supplies. The origin of all fresh water is in the rain and snow. Of the total precipitation 50 per cent. is returned to the atmosphere, 33 per cent. is run-off or surface water, and the remaining 17 per cent. is cut-off or ground water.

Dr. Jos. A. Beaudry, in the two previous meetings of this Convention, has told you of the different classes of water and how they are purified. From his papers you have noted that ground water supplies are to be preferred because they are purer and are less liable to pollution. It very often happens that a ground water supply can not be secured or that the supply of this nature is not large enough to supply the needs of the municipality. When a good and abundant ground water supply can not be secured it is necessary to secure a surface water supply to meet the needs of the municipality.

This surface water, whether it be in river, pond or lake, drains all the land adjacent to it. The surface water in passing over the soil takes into solution the soluble organic and inorganic constituents of the soil, and it also carries in suspension insoluble matter and bacteria. The chemical constituents normally present in water vary a great deal, according to the geology of the country in which the watershed is situated. A water low in mineral matter is called a soft water and such a water is very desirable, both for domestic and manufacturing purposes, because in the household less soap is necessary, and in the manufacturing plant the soft water forms very little scale in the boilers. A water containing a large amount of mineral constituents in solution is a hard water. The water supply of some municipalities is so unsatisfactory because of this fact that means have been resorted to to remove a large portion of these chemical constituents.

The top layers of the soil are rich in bacterial life, and many of these microbes are carried in suspension in the water. The waste from man and animals is swarming with bacteria, some of which find their way to our domestic water supplies. The dejecta from patients suffering with typhoid fever finds its way into our water supplies and, in numerous cases, cause severe epidemics in municipalities located on the same supply further down stream.

Thus, it is seen that we can not guard the municipal supplies, which are derived from surface waters, too carefully. Several large typhoid epidemics have occurred in this Province, due to polluted water supplies, the recent large epidemic at Montreal being very severe and one known to all of us present.

During the past eight or nine months the Quebec Provincial Board of Health has been studying some of the surface waters in this Province. Particular attention has been given to the water purification plants already installed as it was desirable to know what purification they were accomplishing.

A sanitary survey of the Ottawa river from Pembroke to Montreal has also been started and will be carried out so that reliable data can be secured in regard to this river. It is the intention of the Board to carry on this work on the other rivers of the Province which serve as municipal water supplies. Valuable data will be secured in this way which will be of value to all the municipalities located on the streams.

It is the purpose of this paper to outline briefly some of the work which has been done on the surface waters in the Province.

Ottawa River.

The Ottawa river has its source in lakes near the height of land. The river has a length of 700 miles and has a total watershed area of 56,000 square miles. The upper part of the Ottawa flows through a granite plateau and the country is low and marshy; below the granite plateau the river falls rapidly. The upper Ottawa basin contains many lakes having a total area of several hundred square miles.

The sanitary work in the Ottawa river was started above Pembroke and continued until the river joined the St. Lawrence in Lake St. Louis. Samples, both chemical and bacteriological, were taken, usually above and below a municipality.

The Ottawa river from Pembroke to Ottawa is a series of lakes separated by rapids. Pembroke Lake has an area of 60 square miles, Coulonge Lake 25 square miles, Lac des Chats 40 square miles, and Lake Deschênes 45 square miles. The current through these lakes is slow, and matter in suspension including bacteria has a chance to settle out. The