

MUNICIPAL DEPARTMENT

THE INVESTIGATION OF PUBLIC WATER SUPPLIES.*

By FLOYD DAVIS.

Whenever I am called upon to investigate the water supply of a city, which may include wells and other sources, I generally classify waters under five divisions, as follows:

1. Excellent waters, or those which are so pure and free from suspended matter that aeration and filtration would scarcely improve them. Aerated distilled water and the water from some springs in granite regions belong to this class, but it is rare that a chemist has to investigate them.

2. Permissible waters, or those which can be used constantly for all domestic purposes, without injurious effects. They are waters which, however, can be improved by better methods of storage, or by a thorough filtration. Nearly all drinking waters belong to this class.

3. Suspicious waters, or those which are liable at any time to produce ill-effects, or to become so polluted by an influx of filth that they may become bad, or even dangerous. I always recommend that suspicious waters be first thoroughly boiled, and then filtered, before being used for drinking.

4. Bad waters, or those which are sufficiently polluted to render them unfit for domestic use. These may not be immediately productive of disease, but I believe that they lower the vitality of the system and render it very susceptible to zymotic infection. On account of the nature of their pollution, common intelligence should prevent us from using them.

5. Very dangerous waters, or those which are polluted by direct communication with cess-pools or privies, and in which the pollution is of so high a degree that they should be immediately condemned. Such waters are often productive of typhoid fever and other filth diseases.

In passing upon the quality of a public water supply it is, therefore, essential that all water flowing into it which is seriously polluted with sewage should be rejected. There are other waters, not thus polluted, that have a disagreeable taste and odor, and are manifestly unfit for drinking; still, they are sometimes used in public supplies, largely from necessity.

Cisterns and common surface wells are too infrequently used for public purposes to be considered here, and there are few or no apologies for such a supply in any wide-awake town, although from a sanitary standpoint they deserve our most careful consideration. Springs are used as a source of public water supply in many mountainous regions where the topographical conditions are favorable for their utilization, but in other localities ground

waters, stored surface waters, rivers, and lakes are generally used. In many parts of Europe several of these waters are introduced into one city, sometimes at great expense. In this country the usual source is the one that is most convenient to adopt, which is somewhat determined by the topographical conditions of the locality. Thus Denver has a delightful water supply furnished by mountain springs and melting snow, supplemented by hundreds of artesian wells; some cities, like Columbus and Des Moines, located near never-failing streams, utilize the ground waters in the adjacent gravel beds; Boston and New York, having no adequate supply of fresh water near by, store in artificial lakes or reservoirs the rainfall on the nearest elevated water shed; some cities, like Cincinnati, St. Louis, and Omaha, situated on rivers, secure their water supply from these natural channels; while other cities, like Cleveland and Chicago, having great lakes at their doors, reach out into these for their waters.

Spring water which flows from subterranean sources is generally pure and wholesome, because from necessity it is free from organic contamination, and, when the springs are remote from the agencies of pollution, their water is certainly our most healthful beverage. It is so much superior to surface water for domestic use that some cities have incurred great expense to introduce it for public supply, and in some instances have thus freed themselves of much sickness and a high rate of mortality.

Ground water in regions remote from habitations is generally very pure, and, although it may be, and often is, derived from polluted rivers, yet, owing to its thorough natural filtration, it cannot often be considered unwholesome. Indeed, with the exception of springs and some mountain streams, I consider ground water by far the best general supply for a city, and in the Mississippi valley this can generally be easily obtained. When such water is secured from wells and filtering galleries in beds of gravel above a city, or along a river course some distance from its channel, it is generally clear, sparkling, and nearly free from organic matter. This is especially true when the gravel beds are separated from the surface by an impervious stratum of clay, and the supply of water comes for long distances by filtration from rivers or other inexhaustible sources. Such water owes its purity to sedimentation and thorough filtration, combined with oxidation; for, during the passage of the water from its source to the well or gallery, the suspended decaying organic matter and the bacteria are retained in the soil, while the soluble organic substances are oxidized into harmless inorganic compounds. It is generally superior to artificially purified water, inasmuch as it is rendered pure long before being utilized, while surface water is purified as used.

Stored surface waters, rivers, and lakes may be very similar in their impurities. The former, when gathered on uninhabited water sheds will contain little else that is harmful than decaying vegetable matter. But rivers are the receptacles of

the waste products of the inhabitants of the districts through which they flow, and are sometimes very dangerous to use. When it becomes known that a surface water is in any considerable degree contaminated with the wastings of feed-lots and slaughter-houses, the refuse of manufacturing, dead and decaying animals, and the drainage filth of many thousand square miles, it should be avoided; and, when it is further contaminated with sewage, or privy and cesspool drainage, or in any way mixed with the waste products of the human body, its use for drinking and cooking should be prohibited, for some of our most dreaded diseases are now traced to such water supplies.

My reason for rejecting all such water as unfit for human use depends also upon other principles well-established in all civilized communities. The first is that common decency causes every intelligent person to rebel against the use of sewage-polluted water, for no one but a savage, or a lowly-organized scavenger, will willingly devour the urine, excrement, washings, and filth of man and beast. That such filth is actually finding its way into many rivers is beyond dispute, for the many thousand head of cattle and hogs now kept along our western rivers during the feeding season contribute annually an immense amount of filth to these waters. Trampling the clay soil soon renders it impervious to the rains, and consequently nearly all the filth finds its way in rainy seasons through the small streams into these rivers. In time of high water, there is only little sedimentation of these impurities, and they are carried in suspension and solution down to and past the intake of water works of cities and towns located below. In time of low water much of the heavier suspended matter settles to the bottom of these rivers, there to decay and pollute the water, or to be washed down the stream at the next fall of rain.

The second principle is that, when a water has once become infected with disease germs, it can never be entirely purified, except by distillation or sanitary filtration. Such germs are liable to be contributed to these rivers at any time, should a sporadic case or an epidemic of typhoid fever occur in the drainage area above and the dejections of the patients go into the river. The impurities in these river waters are such as will favor the multiplication and development of germ life, and the living organisms, instead of disappearing, sometimes become more numerous as the rivers are descended. During high water, when there can be no permanent sedimentation, these waters become constantly more impure in their flow down the river; so, in using them as a source of supply, we must expect to be confronted with all the evil effects that can arise from the sewage and filth that go into them.

(To be Continued.)

Mr. A. M. Brown, who held the position of city clerk of Winnipeg, Man., from 1874 until 1882, and father of the present city clerk, is dead, at the age of 75 years. He at one time was a resident of Kingston.