PUBLIC WATER SUPPLY

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The question of Water Supply is, from every standpoint, one of the greatest public concerns of the day, and from an engineering standpoint particularly, the problem is always exceptionally interesting, as the solutions are in but very few cases exactly alike.

In these days of rapid travel and change, the general public cannot afford, in the interests of health, comfort and safety, to be indifferent to the lack of a thing so necessary to life and health, in all centres of population, whether great or small, as a good water supply for both domestic and fire service.

Although public water supplies were established in the larger and more important cities of Europe and North America over one hundred years ago, it is only within the last fifty years that rapid development has taken place. This development has been such that it is fast becoming the exception for any good sized village or town of 1,000 inhabitants to be without a public supply.

It will be interesting to note the following table, giving approximately the total number of waterworks in existence in Canada and the United States at the end of various periods :

Waterworks Systems in Canada and the United States.

Year.	Number of Works.
1850	100
1860	150
1870	300
1880	700
1890	2,000
1900	6,000

The phenomenal growth and development of the last few years is due in a large measure to the existence of a higher standard of civilization. The manner of living of the present is so very different from that of former generations that it is no wonder an intelligent and progressive people so fully appreciates the vast importance of public water supply.

The two most important uses of a public water supply, whether in a city, town or village, are, firstly, the furnishing of suitable water for domestic use, and, secondly, the furnishing of the necessary carriage for disposing of sewage by means of a sanitary system of drainage. Another very important use is for the extinguishing of fires.

The economic value of good fire protection is directly shown in the reduced rates of insurance which follow its introduction, and its commercial importance is recognized when one considers that the existence of a water supply often determines the location of industries ; indeed, all the benefits accruing from it tend to increase the desirability of a town for many purposes, and to enhance the value of the property therein.

SOURCE OF SUPPLY.

The first thing to be considered when contemplating the installation of a waterworks system is the source from which the water is to be obtained. If the water is to be used for domestic purposes, it must be satisfactory from a chemical and sanitary standpoint and, above all, free from any suspicion of possible contamination, including that most dangerous one from animal and human wastes, generally known as sewage. The supply should be sufficient in quantity, not only for present, but also for future probably greatly increased requirements.

As regards these requisites, namely, quality and quantity, statistics prove conclusively that the introduction of a wholesome and abundant public supply of water has not only lowered the death rate but has improved the general health of the community, the one being of course an index of the other. When it is known that a water is contaminated by sewage, no further test is required to prove that it is in that condition totally unfit for human consumption.

The question of securing an abundant and uncontaminated source of supply is frequently very difficult of solution, especially in thickly settled districts, and sometimes vast sums of money have to be expended in bringing the water for long distances or treating it specially by filtration and other methods.

Rainfall is the primary source of all water supply which is obtained from the earth's surface or from under ground. Surface waters are usually obtained from streams, rivers and lakes, ground waters from flowing springs or wells. These two classes of water often differ very considerably in their chemical characteristics. Surface water is usually softer than ground water, but ground water is likely to be of better quality, from a sanitary standpoint. Surface water is naturally much more liable to contamination, because it absorbs and becomes mixed with the surface waste and general drainage of the area over which it flows.

Rivers being the natural outlets for the drainage of towns located upon their banks, are in consequence very frequently, especially in settled districts, unfit for use. Great efforts are at present being made to lessen or do away with the pollution of lakes and rivers by compelling the partial or complete purification of sewage and other wastes before discharging them into these rivers or lakes.

There is an opinion prevalent that all flowing streams possess the power of self-purification by the oxidation of all organic substances, due in some way to the free exposure to the atmosphere, combined with mechanical admixture, and that contamination practically disappears a very few miles below the point of pollution. This is a dangerous fallacy, because, while there is a certain amount of natural purification apparent, it is almost entirely due to the dilution by the admixture of a large volume of good water and sedimentation, which takes place under favorable conditions on the bottom of rivers. A similar fallacy, although not so prevalent, exists with regard to the pollution in practically slack bodies of water such as lakes.

The chief diseases met with as a result of contaminated water supply are fevers of the typhoid and typho-malarial kind. Nothing has been more clearly established in sanitary science in late years than the fact that typhoid fever is caused by the direct inoculation and contact of a certain germ, which attacks the intestines and poisons the system. These germs can only find entrance through the liquid we drink, or the food we eat.

It is in the water we drink that the greatest danger of taking in these germs lies, and this is proved clearly by the fact that general epidemics of typhoid fever have in 99 cases out of 100 been directly traceable to a contaminated water supply, and that while this disease is not, strictly speaking, contagious, like many other diseases, it can be transmitted and spread in a community by lack of care and cleanliness in handling all substances and materials of any description, which may come into contact with the germs. The public mind is very often confused and led to attribute typhoid to other causes, such as foul air, including sewer and other noxious gases, which of themselves can only produce diseases of the respiratory order, such as tonsilitis, scarlet fever and diphtheria.

The experience of many large towns and cities has been that with the growth of population the danger of typhoid epidemics has increased. This has been strikingly so in places situated near rivers or lakes, where the surface waters serve the dual purpose of public water supply and sewage disposal.

With the natural growth of population the area of pollution is constantly increasing, and hence supplies, which at one period may have been quite safe and satisfactory, are becoming more and more endangered.

There is an immense evaporation, which is everywhere taking place from the earth's surface. The amount of evaporation differs in different localities on account of