

Construction and Management of Water Works.

This subject presents a variety of heads or points of interest that might be developed to a volume of no mean dimensions. Those particularly worthy of notice are: 1st, a system of good works; 2nd, a corps of efficient workmen; 3rd, a compensation to workmen that will stimulate interest in the work; 4th, the care and protection of main pipes and gates; 5th, the care and location of hydrants to make them efficient for fire service; 6th, the examination of services to see that there is no waste of water; 7th, protection of the supply. Careful consideration should be given to the proper location of the mains. The size of mains should be considered, and should not be only adequate for the present demand, but should anticipate the wants of the future for at least a generation to come. A great mistake is made by many cities and towns, in putting in mains insufficient to supply even the present demand, from a mistaken economy of expense. No city or town can afford to stint the supply or efficiency of its waterworks. It should be liberal in the size of pipes, location of hydrants, gates, and especially so in the number of hydrants, for here comes the most important part of waterworks.

Convince the citizens of any city or town that you have a good fire protection and the waterworks become popular at once. To secure such protection the mains must be of sufficient capacity to supply any demand and the elevation of the water must be such as to produce a pressure of seventy or more pounds to the square inch. The location of the pumping station, if such is required, has much to do with the efficiency of the waterworks, but it will be allowed that more depends on the pumping engine. Many cities and towns curtail the efficiency of their works by furnishing an engine of capacity barely equal to the present demand, to save expense. True economy will put in a much larger engine than might possibly suffice for the time, for it is the universal experience of all waterworks that the capacity of the engine is the first to be exhausted. The importance of a good engine, and of sufficient capacity at the beginning of the work should not be forgotten. There are many works that are in need of larger pumping engines to-day, where it was thought they had sufficient pumping capacity for a much longer time than had passed since their works were built. Practical experience shows that waterworks grow in demand much faster than the most sanguine projectors anticipate, and it is impossible to err when you build largely in excess of the present demand.

The corps of men at the pumping station should be first-class workmen, and the engineer in charge, the responsible party, holding, as he does, the key to the situation, should have full control of all, and realize that his integrity is at stake.

The best feeling should exist between the engineer and his subordinates, and each should feel that he has a duty to perform and each take a pride in doing it. A system that requires a place for everything, and everything in its place, with neatness, should be established and maintained in, or about the station, and no employee should so far forget his duty as to leave undone that which has its time and place to be done. Courtesy should be extended to all visitors.

A waterworks, to a business mind, is looked upon in the line of a machine shop or other mechanical works, but the practical workings are far different. While the laborer in the shop or factory finishes his labor with the expiration of his hours, the superintendent, the engineer and his men at the pumping station know no time for a day's work. Certain work is to be done and it is performed without regard for time. The service pipe department is liable to be called at any time—by night as well as by day, thus placing those employed on a waterworks under different situations than men employed in mechanical pursuits, and they should receive a compensation which will make them feel satisfied with their positions, and so encourage them to perform those duties to the satisfaction, not only of their employers but to themselves and the public.

The care and the protection of the main pipes depends largely upon the manner they were first laid in the ground. If cast iron pipe of the proper weight is used and laid at a proper depth, and properly caulked at the time, then, but little care is required. On the other hand, if any of these requirements are neglected the amount of labor and trouble is only measured by the circumstances of pressure, weather, and chance.

Gates and valves should be examined twice or more a year, and shut and opened if possible. Hydrants should be examined at least twice a year to see if they are in working order. The difference in make and pattern of hydrants leads to a different mode of inspection at different seasons of the year, as they are especially affected by extreme depths of frost. It is then that the superintendent is held responsible for that which no human eye can see. To open hydrants in extremely cold weather simply to see if they are frozen is, to say the least, dangerous, and should be done with the utmost caution. When the ground is frozen three or four feet in depth, the frost produces results which no human eye can foresee, and there may be a chance of finding a small per cent. of hydrants frosted.

There should be a thorough house to house inspection at least twice a year, even with a liberal supply of meters, and where the supply of meters is very limited, the inspector should be kept on the road all the time. This costs money but prevents waste.

The great question of waste of water and how to prevent it is being discussed

wherever waterworks have been established. The magnitude of the question has puzzled great minds and must be left to men of science, though some suggestions may not be out of place, and make a basis for thought and inquiry that will prove a benefit to those interested.

One very gratifying fact in regard to this question is seen in the increased use of meters in cities where waste was assuming dimensions that demanded immediate action, and that in proportion to the introduction of meters the enormous waste has, in a measure, been checked, and many believe that here lies, at least a partial remedy. A comparison made some few years ago between a few large cities as regards consumption and revenue, showed about sixty per cent. of consumption in favor of meters and from two to three hundred per cent. of revenue in favor of meters. With these statistics, based on facts and figures taken from their own reports, it is safe to urge the adoption of meters in all cases to stop the waste of water where the circumstances will allow, even if, at first view, it might not seem practical.

The supply demands careful inspection and continual watchfulness that no contamination be permitted, for this is not only the stock in trade, but the reserve fund, and must be guarded with jealous care, and every innovation be promptly met, even to calling on the law for protection.

Better Country Roads Needed.

A paper recently prepared by the Engineers' society of Western Pennsylvania estimates the average distance which farm products must be hauled in that state at five miles, and assuming that half the agricultural products are consumed on the farm, shows that the clay roads entail an annual cost of \$1,977,500 for transportation above that of turnpikes. This would keep 30,000 miles of turnpike road in repair, or would build between 600 and 1,000 miles of pike annually. This extra time, which is required to market the agricultural products of that state each year over clay roads, amounts in all to 831,000 day's work for a man and two-horse team more than turnpikes would require, which means that the work of 2,400 men for a whole year is lost.

Champion Road Machines.

The care of roads is one of the most costly and serious considerations with which municipal councils have to contend, and anything that relates to the lessening of its labor and expense is worthy of the careful attention of all.

The American Road Machine Company, whose advertisement appears in another part of this paper, manufactures first-class road machines which are recommended by all the municipalities in which they have been used.