water reaching the tile from the water mains into the sewers at each manhole.

Yet a third town, of the writer's knowledge, pumps its water against 150 feet of head and pumps nearly 300 gallons per day for each inhabitant; the quantity escaping from its wood mains being estimated at two-thirds the total supply.

These examples are by no means isolated. The most of the pipe used in the works referred to was of wood wound with wire. The writer does not wish to offer in this paper a wholesale condemnation of wooden pipe, but his experience with the commercial wood pipe laid in cities and towns which have come under his knowledge, shows that if wooden pipe are to be used for any such purpose as the supplying of water under pressure, they must be handled with the greatest care from the time that they leave the factory until the water has been turned into them. They should be used as soon as they are brought from the factory, and should never be stored for any length of time, neither should they lie in the ground without being filled at once with water. It is also practically impossible to make a suitable joint where a wooden pipe is connected with a valve or other cast iron special. The necessary conditions thus set forth to make a proper job are seldom complied with by the average town, and the result is a piece of work which cannot prove satisfactory. In prairie towns the best quality of wooden pipe costs perhaps but little more than half as much as cast iron pipe, and probably three-quarters as much as steel pipe, and its cheapness is its prime recommendation. Other things being equal, and especially where the water works system is a pumping, is there any engineer who would prefer to recommend wood pipe in preference to metal?

It is almost a truism that a water supply without sewers is useless. Sewers then must next be installed. The tendency in this branch of public work is not so much to skimp on the price of the pipe as to skimp on the digging. If there is plenty of "fall" the sewers are laid too close to the top. If the lay of the ground is flat, the tendency is to flatten the grades to a finish. One particularly level town has its small sewers eight inches in diameter laid with the fall of one foot in half a mile or more; just enough to tempt the sewage to find its own level. Its efficiency in carrying solids to the outfall is questionable. Such grades are naturally adopted to avoid excesive cuts or, possibly, pumping. The expenses connected with cleansing of sewers after this fashion are often more than sufficient to defray considerable extra first cost.

One frequently meets with sewers constructed with too small a capacity. This may be the result either of a faulty forecast or immediate economy. Without investigation they should not be condemned, since the ultimate plan may provide for intercepting sewers which will give the proper relief when the time comes that they are needed, and with less expense than if the individual outlets had been constructed to meet the final requirements in the first place.

When water mains and sewers are installed concurrently they are occasionally placed in the same trench. Even under the best of conditions as far as the supporting soil is concerned the writer believes this practice to be bad, although showing a possible economy of installation. In the first place the percolation of water which might leak from the main breaks down the supporting bench, and the pipe, loosened from its original position sags as its support gets soft or gives away.

In the second place the ponderous iron specials intended to carry the flow around the sewer manhole shafts are difficult to place properly and a stock of every kind has to be maintained for repairs. This portion of the design has equal merit with the rest of the scheme.

With the growth of the movement towards the purification of all sewage effluents, it is a matter of much importance that the Municipal Engineer bear in mind the location of a prospective disposal plant and that he arrange his outfalls so that they may all converge on a suitable location for a plant. This may be done at no extra expense if due thought is given in the designing of the earlier installation.

The growth of sewer systems is unlike most growths, being chiefly from one end, and that the smaller end, so that unless built to a complete and final plan it becomes unequally taxed, in some cases beyond its capacity.