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For THE CANADIAN ENGINEER.

WATER, ARTICLE IV.

BY W. M. WATSON.

The readers of the Canadian Engineer would understand the subject discussed in the present paper better if they will refer to the articles published in the issues of June, 1897, and of May and June, 1899. In the articles named, I tried to explain how necessary it is to be careful to lay down water mains straight, parallel, and carefully graded, having cutoff and washout valves properly placed, so that every section can be well controlled and thoroughly emptied and washed out, when required. Also, that the arrangement of street mains should be such, that when all are in full working order, the water the street mains contain is always on the move, and that in no part of the system can the water be motionless for days together.

During the fifteen years I have been in Canada, I have observed that waterworks are usually laid on what European engineers call the temporary system, that is in a zig-zag or snake fashion, laying them over hills and dipping the pipes down under valleys and gullies or culverts, paying no regard whatever to the depressions made in the pipes, that will form receptacles for dirt and poisonous matter, or to the air pockets that will hinder the flow of water and cause water hammer and damaging commotions to exist in the pipes, which start

leakages and cause over 100 gallons of water to be pumped per head of population per day in Canadian waterworks, when the quantity actually used does not amount to over 40 gallons per head per day. In fact, as far as I can make out, the health of the public, who have to drink, wash, and cook, with the water carried to them by the street mains, receives very scant consideration, and the fearful cost of repairs and management, after the construction is completed, appears not to weigh one feather weight, I am told on all hands that the country is rich, and can stand it, though I know by experience that my taxes alone are nearly as much as both my taxes and rent were together when living in Great Britain. I also know that the state and local bodies have mortgaged the property so well that our very clothing fits as if they are in the grip of the money-lender, yet money is wasted on public works just as if it were as plentiful as sand. The purest water can be fouled and badly contaminated during its passage through the water mains to the consumer, by allowing it to have a sluggish flow, and stand motionless for long periods in the pipes; also by allowing the minute particles of vegetable or other foreign and objectionable matter to remain in the pipes, and cause to incubate and multiply, at the rate of, often, millions an hour, poisonous microbes, which afterwards find their way to the taps and get mixed with the people's food. Experience has proved that all such objectionable matter lies in deep depressions, or is forced to the dead ends, and such street mains as are extended the furthest from the intake end of the supply. On that account it is absolutely necessary that washout valves be provided at such points of the water mains, so that the pipes can be thoroughly cleaned about once a month, without wasting much water. Some two years since, I saw in the newspaper that the Toronto analyst had been analyzing the city water, drawn from taps near the centre, and he reported the result to be good. On the same day, I was engaged unstopping a blocked water service in one of the side streets, about two miles west of where the analyst got the water he analyzed. On cutting and dividing the pipe, I found a frog's leg, a few small bones of a fish and some vegetable debris. Afterwards I allowed the water to run to clear it, and the quality that the pipe delivered was far from being fit for use for domestic purposes, and the analyst would certainly have said the same had it come under his notice. All the houses in that street are subject to periodical stoppages, on account of the water main in the street being dirty, and no proper means to clean it out being provided. The water at the intake pipe of the city of Toronto is excellent, but the distributing mains appear to have been laid without any thought of cleaning them out.

There has been said sufficient to show how the health of the people largely depends on the laying of the public water mains and service pipes, and may pass on to the costly damages and inconvenience of frozen