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## The Canadian Engineer.

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### ERROR IN DRAINAGE PRACTICE.

BY W. M. WATSON.

A person living in a house that was subject to a foul odor reported the nuisance to the town's medical officer, who sent at various times each member of his staff to investigate, and they each laid the blame on the plumbing and sanitary appliances used in the house, but when an experienced sanitary plumber was engaged he looked for another cause to account for the smell, and after using pick and shovel for a few hours, he put on exhibition the reason for the foul odors, which, as usual, was the blocking of the house trap and settlement of the new drains, causing the dumping of the sewage from all the fixtures in the house into the soil under the kitchen.

Another similar, but more serious example of the many hidden dangers, I propose to relate here, showing the evils of using too many drain traps and using drains of too large a size. I was engaged to find out the cause of foul odors pervading the basement of a large factory. There were water closets, urinals and slop sinks on three of the four flats, each and all delivering into one 4-inch soil pipe extending from the drain underneath the floor to above the roof of the factory. Then every fixture was back-vented into a 3-inch cast iron pipe commencing at the basement floor and passing through each story and terminated above the roof. The plumbing and fixtures were of a high class, and well put together, but when some digging was done below the basement floor and the drains and discharge end of the 4-inch soil pipe were

exposed to view, it proved that very little, if any, of the stuff coming down the soil pipe had found its way to the street sewer because the careless way the soil pipe was connected to the tile pipe drain made it almost impossible for it to do so, except at a time when there was a heavy rainstorm or when a large amount of liquid was discharged down the interior drains. Fig. 2 is a sketch showing how the drain and soil pipe were connected when found, leaving out the branch that served the basement water closets and which should be shown to join the horizontal piece of soil pipe between the two bends, immediately before it joins the tile pipe. There was a 9-inch tile-pipe drain from the street sewer to about 7 feet inside the building, laid almost at a dead level, including the trap and T pipe, then a 6-inch drain commencing with a hand-hole running trap intended to keep back the sewer gas from all the other parts of the building. This pipe passed under the factory floor for the full length of the factory, with branches to each rain water leader and slop water gully in the yard, having a grade of only about 1 in 100, and clayed joints. The total length of the 6-inch pipe laid under the floor would be over 100 feet, which would be equal to a storage tank holding about 140 gallons. The 9-inch trap would hold about 40 pounds of water, and the water in the T pipe would have to be 1 inch deep before it could in any way move such a bulk of water as rested in the 9-inch trap, and then the liquid only would be able to get round the dip, while the solids would stay in the dip of the trap and choke it. The largest flush a soil pipe would discharge at one time would be 3 gallons, under 30 pounds in weight, and in this case it discharged vertically through a square T, striking the opposite side or bottom of the 9-inch pipe. The sewage then had liberty on account of the drain being level to choose its own road, and of course preferred the easiest, which was to pass backward through the 6-inch trap that only holds about 20 pounds of fluid or half the amount of a 9-inch trap, which would be soon choked and blocked up with solids. The drains being nearly level throughout their whole length they would hold about 50 gallons of sewage in store before a reaction would take place, even if the 9-inch trap was free, and the fluid begin to dribble outwards towards the street sewer. The 50 gallons would therefore generally belodging in the pipes or wasting away through the defective joints in the sewer pipes and contaminating the sub-soil under the planked floor. The excrements and paper of sewage will, if well distributed among the fluid, dissolve into a liquid in a few days, so that when there is a space, as there was at this factory equal to 50 gallons, acting as a storage and liquefying chamber, they may continue to dispose of the excrements for a number of years through leaking joints and never have a real choke to enable the owners to find out what hidden damage is done to the building and inhabitants. A 4-inch soil pipe can never flush the sewage it delivers through 9-inch pipe traps, because it is about five times larger than the 4-inch soil pipe. The fluid coming down the soil pipe will pass through the largest trap only by soaking through slowly, devoid of any carrying force, which makes it nearly impossible to carry down any substance heavier than water. Therefore to put in a 9-inch