

the closet and drain each time, the 6-inch trap was cleared by a 6-gallon flush in only two out of four cases; 4 gallons cleared it in only one out of six cases, and anything less than 4 gallons altogether repeatedly failed to clear the trap.

The third series numbered twenty-two experiments with a 6-inch drain and a 4-inch intercepting trap. With a 3-gallon flush the closet, drain and trap were efficiently cleansed every time, but a flush of less than 3 gallons failed each time to clear the drain and to reach the trap.

The fourth series (eighteen trials) with a "Unitas" washout closet, 4-inch drain and 4-inch interceptor, flushes of 3, 2½ and 2 gallons being used; 3 gallons sufficed to clear the trap in two out of six cases. With smaller flushes the trap retained a portion of the charge in every case; in five cases the drain was not cleared, whilst in eight the closet trap was not cleared, due evidently to the inherent faults of the washout closet. I shall be pleased to supply fuller details of these results to anyone interested in the matter, and I venture to submit the following

CONCLUSIONS.

(1) That 3 gallons is the minimum amount that can be relied upon for efficient flushing—i.e., prompt carriage of dejecta through closet, drain and interceptor to sewer even with a good form of washdown closet well laid, 4 inch or 6 inch drain, and good 4-inch interceptor. (2) That if an inferior type closet be used, or if the intercepting trap exceed 4 inches in diameter, 3 gallons is clearly not sufficient for effecting flushing. The proper remedy then, however, is to correct such structural deficiencies rather than to increase the flush. (3) That if no intercepting trap be employed a flush of 2½ gallons is the minimum amount that can be relied upon to efficiently cleanse the closet trap and drain. (4) That the invariable employment of a disconnecting trap, as recommended by the model by-laws, is far from being an unmixed benefit, and, owing to the obstacle the disconnecting trap presents to the cleansing of house drains, its use should be strictly limited to those dwellings inside which a drain opening exists—e.g., in the cellar—and that if such drain openings inside houses were prohibited in new dwellings, disconnecting traps might, with great advantage, be entirely dispensed with. There is much reason to believe that we have hitherto exaggerated the potency of sewer air; assuming, however, that it is noxious in its effects, the object of a disconnecting trap is wholly gone if we keep all drain openings outside our dwellings; and having done this, it is absurd to continue to insist on disconnecting traps, which only diminish the efficiency of the flush of water.

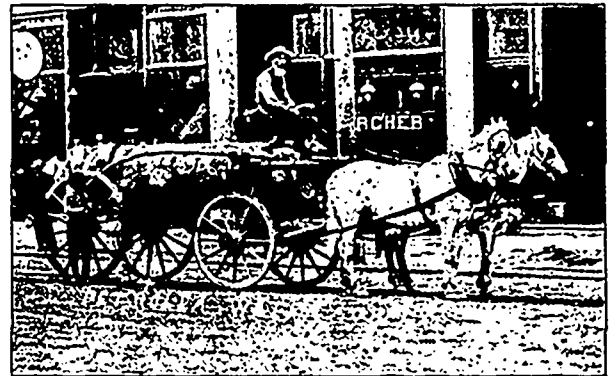
This is the opinion of Dr. Porter, an eminent authority on sanitary matters. If our readers turn up the back number of April, 1897, they will find an article on sanitary appliances, showing how cellars and basements can be properly drained without the drain entering the premises. This is the way Dr. Porter suggests they should be.

PETROLEA WATERWORKS.

The Board of Water Commissioners, Petrolea, Ont., has presented a statement of receipts and expenditures for the year ending November 30th, 1898, that is most encouraging, and considering the prospects for the future the chances are that next year the works will be self-sustaining. These works were constructed in 1896 and 1897, and have been in continuous operation since January, 1897, although not fully completed until a few months later; they were fully described in THE CANADIAN ENGINEER for November, 1897. Few people, even in Petrolea, believed that a town of less than 6,000 population could afford to

spend \$172,000 on a waterworks system, and many prophesied that the works would not only be a failure financially, but that they would not be a success mechanically. The town engaged as engineer Willis Chipman, of Toronto, to design the system and to superintend construction. The cost was kept well within the estimates and within the amount raised by the sale of the debentures. Not only has the cost of all the service pipes, but the cost of all the extensions of mains laid in 1897 and 1898 has been paid out of the amount raised by the sale of original debentures.

The town of Petrolea in 1893 entered into an agreement with a private company to put in works on the franchise plan, but the company not succeeding in finding an available source of supply near the town failed to complete the works after laying two miles of pipes. By this



PETROLEA WATER WORKS, 1890.

agreement the town was to pay \$4,900 per year for 70 fire hydrants. Upon the recommendation of their engineer in 1895 the town decided to construct its own works and go to Lake Huron for its water supply, a distance of twelve miles in a straight line from the town hall, pumping the water over a rise of 150 feet above the lake to a water tower in the town, its base being 87 feet above the lake level. The size of the main to be laid from the lake to the town, the protection of the intake on the fully exposed lake shore, the class of machinery required and the probable necessity of filtration, were all important problems with the town council, and other engineers were called in to report upon the plans, but their recommendations were not followed and the works were constructed as originally designed. The intake has now stood two winters without injury, the water supplied has given the best of satisfaction to the citizens, the cost of pumping, owing to the high class of machinery adopted, has been no greater than in many other places where the pumping station is not distant more than a mile from the town, and there have been no breakdowns since the works were started.

The commissioners report the receipts from consumers as \$8,800 and they allow for fire hydrants only \$4,000; making a total revenue of \$12,800 for the year ending November 1st, 1898. The operating expenses for the year have been \$3,560, leaving a balance of \$9,240. The interest and sinking fund charges amount to \$9,947 per year, and the net revenue is now \$9,240. If the amount the town agreed to pay the private company for fire protection were substituted for the \$4,000 the works would now be self-sustaining, and it is evident that in a year or more they will be so even with the present allowance for fire protection.

With the present low rate of interest for municipal debentures every town can afford to construct a system of waterworks, but it will be found to pay to put in a general sewerage system at the same time.