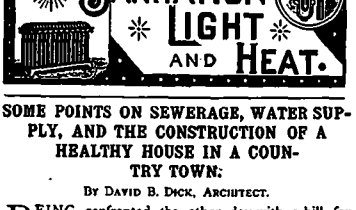

SOME POINTS ON SEWERAGE, WATER SUPPLY, AND THE CONSTRUCTION OF A HEALTHY HOUSE IN A COUNTRY TOWN.*

By David B. Dick, Architect.

BEING confronted the other day with a bill for what seemed to be a large amount for emptying an ancient pit on the site of a new building, I remarked to the excavator that it must have been a very large pit to have held so much. He replied that the quantity of stuff usually taken out of a pit did not depend so much upon its size as upon the way in which it was constructed. The remark was suggestive. If, of two pits that under similar circumstances might be expected to contain the same quantity, one is found to have in it a much smaller quantity than the other, the question would naturally suggest itself, "what has become of the surplus?" An examination of the nature of the materials and method of construction of the two pits would probably result in the discovery that one was water tight while the other was not; or more probably that one was less leaky than the other.

It is an old saying, "Out of nothing, nothing is expected to be got," ("*Ex nihilo, nihil fit.*") But in the construction of the leaky cesspool, a good deal has been put in and still very little taken out. What then has become of it? Ask the physicians in the neighborhood where they have been called upon to attend cases of typhoid, intermittent fever and diphtheria, then follow up the clue thus obtained and there will probably be very little difficulty in discovering where some of it at least has gone. Chemical analysis of the drinking water in the wells or springs from which the supply was obtained for the houses in which the patients lived, will probably change a strong suspicion into a positive certainty, and further investigation will ascertain the channels through which the missing portion of the contents of the cesspool has found its way into the sources of water supply. The idea is too abominable to be willingly accepted as a proved matter of fact. Very likely the sceptic will assert that the natural and proper method of disposing of excreta is to return it to the soil, and probably he will quote Scripture in support of his position, addacing the command given to the Jew, to have a paddle on the end of his weapon to aid him in accomplishing that desirable end. And, in fact, the contention is true, and therefore the premises are perfectly correct, but the conclusion drawn from them is utterly wrong.

It is true that the excreta should be returned to the soil but there is a right way of doing this, which is safe, and a wrong way, which is highly dangerous. The safe way and the rational way is to spread the stuff on the surface of the ground or convey it into the soil at such a distance below the surface that the roots of the growing plants will seize hold of the poisonous matter and by the skillful chemistry of nature convert it into plant nutriment, and so into healthful food for man and beast. The wrong and dangerous way is to dilute the excreta until it liquidizes and then allow it to soak away down far below the plant roots until the ground is saturated down to the level of the ground water, when the liquid flows away with the natural underground streams which feed the wells and springs. It is out of sight and out of mind until the investigations of the physician compel the most sceptical to see that as effect invariably follows cause, so sickness invariably results from the use of water which has been thus poisoned. It is true every one who uses the water does not fall ill of malignant fever, just as it is true that a certain quantity of poison may be taken with impunity and the constitution may even be habituated to its use. But it is also true that the dose of poison which a strong healthy person might take with impunity, would be sufficient to kill a weakly person. And so with the contaminated water, the robust person whose constitution is able to resist the effects may use it for a time without apparent evil results, while those of enfeebled condition may succumb to it at once.

This question of the best methods of safely, if not profitably, disposing of waste water, is one which every community has to face, and the more rapid the growth of the community, the more urgent becomes the need to find a satisfactory answer to it. On the sea coast, it is seldom thought necessary to consider any further than the best means of conveying it to the sea. If carried out to deep water at some point where the currents will carry it out to sea and not throw it back on the shore, this is probably as safe a method of disposing of it as any. It is certainly unprofitable, but that must apparently always be a matter of secondary importance in the consideration of this question. The first and most important thing is to prevent it from becoming a source of danger to health. Inland towns, however, have not this ready means of getting out of the difficulty. It may be said without hesitation, that it is unsafe to throw sewage into any running stream. If the town which throws it in does not suffer, those that are lower down must be sacrificed. Many a once clear and beautiful trout stream has been turned into a current of abomination in which even the coarsest fish could not live. Neither is it safe to throw it into a fresh water lake, however large. Having no tide, there is seldom current enough to carry the stuff away without polluting the water for a considerable distance from the mouths of the sewers. This plan is rendered still more objectionable by the fact that the supply of what is supposed to be pure water is usually drawn from the very lake into which the sewage is poured. This is indeed to do deliberately what is so often done unintentionally in the case of the leaky cesspool, in the hope that, if sufficiently diluted, even sewage may become a harmless beverage. The fallacious nature of the hope has been so often proved, that probably no municipal body would now deliberately inaugurate such a system in a new place. The people of many towns are almost at their wits' end to know how to undo the evil which has thus been brought upon them by the ignorance or carelessness of their predecessors.

Many growing inland towns have now reached a stage at which the question must be faced. They have gone on as long as they dare go on with the old plan of cesspools and wells, and while the authorities are sometimes sadly puzzled to know what they ought to do, they are in this happy position that they can begin at the beginning and inaugurate a proper system without being handicapped by the presence of an old and insufficient system which is incapable of improvement, but in which so much money has been sunk that any proposal to abandon it is sure to arouse a storm of opposition. It may be safely asserted that there is no town or village in the country thus situated for which competent engineering skill cannot devise a safe and suitable system of water supply and sewerage. The two things necessarily go together. Either one without the other is almost useless. If one only is provided, the need for the other is soon so strongly felt that it also must be supplied. When water works only are introduced, the people will not long be content to draw water from a street hydrant, and so soon as the water is introduced into the houses, the necessity for a drain becomes apparent.

Whether the system of dry earth or water carriage for the removal of excreta be adopted, the necessity for a system of drains remains the same, because the quantity of water used for washing and other necessary purposes is so great that no dry earth system can deal with it. It has also to be borne in mind that even when solid matter is got rid of by the dry earth system, the liquid waste remains, and, if not carried away before decomposition begins, is just as much a source of danger as the other. As regards garbage, such as refuse vegetable matter, there is only one safe way of dealing with it, and that is to burn it. By the exercise of a little care and good management, this may be done in every kitchen in the ordinary stove without burning an additional ounce of fuel, and at such times as not to interfere with the use of the fire for any domestic purposes. It is only necessary to keep the garbage in a vessel on the back of the stove for a few hours when it will become dry enough to burn readily.

The dry earth system may be advantageously used whenever there is a bit of land to be cultivated, and when thus used, it may even become profitable, because the used earth can be kept in any dry place until it is wanted. Every one is familiar nowadays with the dry earth system in some form or other. It consists simply in deodorizing the excreta by covering it with a little dry loam or other suitable material. In most cases, however, where a complete system of sewerage is laid, it is preferable that the solid matter of sewerage proper should be disposed of in the same way. The subject of the best method of the disposal of sewage is too large a one to be entered upon here. It may, however, be said in passing, that the small pipe system with the storm water excluded, used in connection with a sewage farm, or at least a piece of ground properly prepared for filteration, will probably be found to be the most suitable for most small inland towns.

Many people have an idea that they may have as many baths, wash basins, and sinks in a house as they like, and that these cannot be a source of danger so long as there is no water closet. There cannot be a greater mistake. One fixture is just as safe as another if properly connected with the drains; and, on the other hand, the most innocent looking fixture, even if it is only intended to take away the drip from the drinking fountain in a public reading room, is just as much a source of danger as a w. c., if it is not properly constructed and connected.

The end of good plumbing is to provide a means of conveying soil into the sewers without allowing any air from the drains or soil pipes to pass into the building either through the fixtures or through leaks in the pipes. Any plumbing that does this and is strong enough to continue to do it permanently under fair usage, is good plumbing. Any plumbing which fails in any of these points, is bad plumbing. Good plumbing cannot be done cheaply. The multiplication of fixtures beyond the limit of actual necessity becomes a luxury, therefore, when it is proposed to introduce plumbing into a house, not a single fixture should be put in more than can be good of its kind and fitted up with the best of workmanship. The ruin of good workmanship in plumbing as in every other kind of handicraft, is the dictum so many people lay down that they are determined to have a certain number of fixtures or what not, but that they will only pay so much for them. There can be no greater folly. The sensible way of going about the matter is to consider how many fixtures it is desirable to have, and then put them in, if there is money enough to make a first-class piece of work. If not, then reduce the number to that which the available funds will warrant.

Within the last few years there has been a radical change in the principle of plumbing. Formerly the idea prevailed that sewer gas could be bottled up in the soil pipes and yet not find its way into the house. Plumbing fixtures were scattered all over a house wherever convenience or fancy dictated. Tile pipe drains were run underneath the floors to every fixture or soil pipe. These drains were seldom water-tight at the joints. The soil leaked out and saturated the ground underneath the house, where it decomposed and gave off poisonous gases, which were sucked up through every crevice in the floor boards and behind the skirting and wainscotting whenever a fire was burning in the house. A fire cannot burn unless it is supplied with air, and it will suck air from every chink so long as it continues to burn, for if the room were air-tight, the fire would go out. This source of danger was seldom thought of, and sometimes it was intensified by building a drain of brickwork many times larger than was necessary. If the tile pipes were seldom tight, it is safe to say that the brick drains never were. They were also too large to be self cleansing, that is to say, the small quantity of water flowing along the bottom had not force enough to sweep away the soil, which collected in the bottom as in an elongated cesspool, breeding pestilential vapours as dangerous as those of the street sewer.

(TO BE CONTINUED.)

* Paper read by David B. Dick, Architect, Toronto, at the Convention of Executive Health Officers of Ontario, at Lindsay, Ont., August 14th, 1888.

FIGURES OF THE TOWER BRIDGE.

THE following technical description of the new bridge, which is rising east of the city under the direction of the corporation, and comparison with London Bridge, will interest, we believe a considerable portion of our readers: Total length of bridge, 940 feet; total length of bridge and approaches, 2,640 feet; opening span width, 200 feet; opening span headway, when opened, 135 feet; opening span, headway, when shut, 29 feet 6 inches; side spans, width, 270 feet; side spans, headway, from 20 feet to 27 feet; width between parapets, opening span, 50 feet; width between parapets, side spans and approaches, 60 feet; steepest gradient of approaches, 1 in 40, (steepest gradient of approaches of London Bridge, 1 in 7;) depth of foundations, 60 feet below Trinity high water mark, 27 feet below bed of river; sectional area of waterway, 20,040 square feet, (London bridge, 19,300 square feet;) depth of water in opening span at high water, 33 feet 6 inches; depth of water in opening span at low water, 13 feet 6 inches. Estimated quantities of materials in the bridge and approaches—Bricks, 31,000,000; concrete, 70,500 cubic yards; cement, 19,500 tons; granite and other stone, 235,000 cubic feet; iron and steel, 10,500 tons. Machinery, etc.—Two steam pumping engines for hydraulic machinery, each 360 horse power, eight large hydraulic engines and six accumulators, for hydraulic lifts in towers for passengers; size of each leaf of opening span, 50 feet wide by one 200 feet long; weight of each leaf of opening span, including roadway and counterbalance weighs, 700 tons; estimated cost, £750,000.—*The London City Press.*

Messrs. Patterson & Hall have just completed and put in operation at Midland, Ont., what is claimed to be the most complete planing mill in the Dominion. The machinery consists of a double cylinder lightning matcher, capacity from twenty to thirty thousand per day; No. 0 sticker, capacity 10,000 lineal feet per day; 26 inch double surfaces, capacity 40,000 feet; re-sawer, and gang rip, capacity 20,000. Power is supplied by a 45 h. p. engine, and 45 h. p. steel boiler. The mill is supplied with the best modern labor-saving and fire protection devices. It is the intention to supply the Ontario market with every description of dressed lumber, mouldings, etc.