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

By David B. Dick, Architect.

[CONCLUDED.]

THE danger of gases from the sewer entering the house drain was recognized after a fashion, and was sought to be avoided by building a large cesspool between the house drain and the street sewer. Experience, however, showed that the filthy reservoir, which is what it really was, did not serve its purpose, but gave off its own dangerous emanations into the house drain. It was then sought to bottle these up in the soil pipes by putting a trap under each fixture. It was then supposed that all that human ingenuity could do to render plumbing safe had been done, and that if people still died of zymotic diseases, it was a dispensation of Providence which had to be submitted to, but for which there was no remedy. The clergyman was called in, when the man who was really wanted was the sanitarian, whether doctor, or engineer, or plumber—no, not plumber, he had already done all he knew; for the sanitary plumber has been an evolution of recent times. There were two reasons why these traps failed to do what was expected of them: First, the pipes were made of poor and light materials, and if air-tight when first put up, soon became corroded and full of holes, especially if of iron, but lead was little better. I have seen a piece of lead soil pipe with a large piece eaten out of it by rats. When pipes were put in, no test was applied to discover whether they were air-tight. That was taken for granted. The second reason was that the traps became unsealed. Every one knows that a trap is useless unless the bend is kept full of water. Now, although traps had been in use for generations before anybody discovered the fact, it is not only very easy to unseal an ordinary invented trap, but it is very difficult to prevent its becoming unsealed. When a quantity of water is poured quickly down a soil pipe, it drives the air in the pipe before it, and causes a vacuum behind it in the same way as the plunger of a pump does. According to the popular saying, "nature abhors a vacuum," therefore the air rushes in to fill it and take the place of that which has been driven down the pipe. But the only way by which it could get in was through the fixtures and the trap below them. Now that our eyes are open to the fact, we know what happened. The air in its passage carried the water with it out of the trap, leaving the trap, if not empty, at least unsealed, which amounted to the same thing. This is called syphoning the trap. There are several other ways in which a trap may become unsealed, but it is not necessary to enter into a discussion of these now. Enough has been said to show how untrustworthy the old traps were.

All this has been changed in modern practice. Pipes are now made of the materials and heavy enough not only to resist corrosion, which in calking joints in iron pipes is very considerable, and quite sufficient to split a thin pipe. But the most radical change has been in the entire abandonment of the old plan of trying to bottle up the sewer gas in the pipes. The objects aimed at now are: first, to make drains and soil pipes both self-cleansing, so that when properly flushed with water, no foul matter will lodge in them; second, to prevent the passage into the house drain of any sewer gas that may form in the street sewer, by interposing an efficient intercepting trap; and third, to have a current of fresh air passing at all times through the whole of the pipes in the house. This is attained by putting on the house drain, just above the main trap, a pipe which admits fresh air to the house drain and soil pipes, and by carrying the main soil up through the roof, having the end of it open.

The air in the soil pipe inside the house being generally warmer than that outside, naturally ascends the passes out at the top, as cold air enters by the fresh air inlet at the bottom. If, when water is passing down the pipe, the air is driven before it, no harm is done, as the current of air is simply reversed for the moment and a puff of air will come out at the inlet, after which the normal upward circulation of the air is immediately re-established.

To guard against the danger of the traps being syphoned, a duplicate set of pipes is provided for supplying air to them. Each pipe has a trap taken from the top of it. These pipes are all connected together and either branched into the soil pipe above the highest fixture, so as to draw air down through its open upper end above the roof, or they are connected into a similar pipe, which is led up through the roof independently. These pipes prevents the syphonage of the traps, because, when a vacuum is caused in the soil pipe by the sudden passage of a bolt of water, the air to fill the vacuum is drawn down through these pipes instead of being sucked through the traps under the fixtures. This apparent complication of pipes looks rather intricate to the uninitiated, but the main principle is really very simple and easily understood.

To make assurance doubly sure, the whole system should be twice tested; first, by plugging the ends of the pipes before the fixtures are connected and filling them with water right up to the top, when any leaks will at once be detected by the water dribbing out. Secondly, after the fixtures are placed and connected and the traps filled with water, oil of peppermint is poured into the top of the soil pipe and volatilized by sending a pailful of hot water after it. If there are any defective spots through which sewer gas could escape into the house, the pungent odor of the peppermint will find its way out at these places, and any ordinary nose will very readily detect and locate them.

Some of the old fixtures, notably the pan closets, were very objectionable, because their construction was such that it was impossible to keep them clean. There is now such a variety of good fixtures for every conceivable purpose, and competition has made them so moderate in price, that there is no excuse for using an old fashioned or bad one of any kind. Many are still made and sold which cannot be recommended as coming up to the standard of modern requirements. But those who are familiar with the subject have no difficulty in selecting good ones. Indeed, there is quite an embarrassment of riches. As a glance at the catalogue of a good manufacturer will show, there are so many good fixtures of all kinds, differing only in slight particulars which only an expert can appreciate, that one is sometimes tempted to wish there was not quite so many.

A soil pipe or drain should never, if it can be avoided, be buried under the floor of a house or closed in behind plaster. They should, if possible, be run along the cellar walls or suspended from the ceiling and run up in a corner of a pantry or bathroom where their appearance need not be objected to. Every one knows they are there even when concealed, and a tastefully arranged and neatly executed piece of plumbing work is by no means an unsightly object. If it is absolutely necessary to bury a pipe under the floor, it should first be carefully tested and then covered with a good concrete floor, building small brick pits where necessary to give access to brass cleaning plugs, in suitable places to admit of any foreign bodies being removed from the pipes without tearing up the concrete. These foreign bodies will sometimes get into the pipes in spite of the utmost care on the part of the housekeeper. Children and domestic servants seem to have an unconquerable *penchant* for trying whether the plumbing system is able to assimilate sponges, wash rags and similar objects. I remember in one case of stoppage, being assured by the master of the house that his children and servants would never think of getting rid of any such thing in this way, but when the stoppage was reached, there were taken out, besides other thing, several of his neckties and a piece of one of his wife's corsets. When shown the collection, he could only exclaim, "well, well; I never could have believed it." But there they were. Sometimes the much abused plumber is blamed when anything goes wrong, when some such gross ignorance and carelessness as this is the sole cause of the mischief.

The advice which any sanitarian would give to any one intending to put plumbing in his house, may be summed up very briefly: First, have the work arranged and carried out by some one who knows his business. Never entrust it to a tinsmith who takes up plumbing, which he does not understand, in addition to the tinkering which he does understand; second, have no more plumbing put in than you are prepared to pay for having done in thoroughly good fashion; third, see that your plumbing appliances are properly used after they are in.

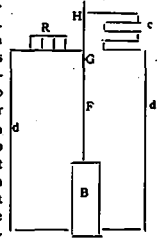
A concrete floor has just been incidentally mentioned. This is a most desirable thing to have under every house in order to keep down the damp ground air. For that reason it is desirable to have a cellar or basement under the whole of the house with a good concrete floor and the ground should first be underdrained if there is any appearance of dampness or any risk of surface water flowing towards the house. It is not an unusual thing to place a hot air furnace in a basement which has an earth floor that has been saturated with filth from leaky drains, and to draw the supply of air (to be warmed) from the cellar instead of from the open air by a proper closed duct. This is sometimes the arrangement which forms the last straw that breaks the camel's back and renders a house entirely uninhabitable until it is altered. It effectually destroys any chance of escaping from the effects of the defective drains, because the air which has been befouled by them is thus carefully collected and warmed and sent up through the registers to be breathed by the occupants of the house. No surer way could be devised of intensifying the danger arising from defective soil pipes and drains. Even if there is no plumbing or drains in the house at all, the air of the house should never be thus taken to be warmed and breathed over and over again. Every hot air furnace should be provided with a duct bringing in fresh air directly from out of doors and it ought to be brought from some point where it will be as free as possible from dust or anything objectionable.

A few of the most important points to be attended to in order to have a healthy house "with modern conveniences" as the agents say, have been very briefly touched upon. There are many others besides which any one whose interest in the subject is once fairly aroused will soon discover for himself. And no one need remain in ignorance of anything that affects his well-being in this connection. The literature of sanitary science is now ample and easily accessible, and there are few who would not feel themselves well repaid for devoting a portion of their spare time to its perusal.

HOT WATER HEATING.

Editor Canadian Architect and Builder.

SIR,—I have had considerable experience both in the theory and practice of hot water heating, and have heard and read many opinions both good and indifferent in reference to this subject, but never anything that seemed to my mind so utterly ridiculous as the statements in the opening part of the article which you extracted from the *Northwestern Architect*, and which appeared in your August number. The writer claimed that it was the contraction of hot water, and not the expansion of cold water by heating that caused circulation. If the writer has found this to be the case, he might have informed us from what hot spring he obtained his water supply, so that we who are toiling up the rugged road to perfection might follow in his footsteps, and so gain such a grand result that our fuel bill for heating would be nil. But we ordinary mortals find that when we fill our system, the water is as cold as the season of the year will allow, and nefore we can obtain circulation, it is necessary to heat the water, which then immediately rises to the highest point in the system and is replaced by the colder, (and therefore heavier) water. The theory may be all very well from the writer's standpoint, but if he tries to see his assertion as others see it, he will understand how ridiculous it appears. We must start by expanding the cold water, which will, of course, when it has accomplished its work, contract, and therefore decend to take the place of the warmer water. There is another item in the letter which seems to me to bear witness to the fact that the writer is deficient in the very first principles of hot water heating, and that is the drawing he has given to illustrate his theory. He says B represents the boiler; R, the radiator; c, a coil; t, a tank; f, a flow or supply pipe, and d d return pipes. Now every person that knows the first thing about hot water heating knows that this represents a wrong construction. The tendency of water when heated is to rise, and the nearer the pipes through which it has to rise are to the perpendicular, the quicker will be its motion; and according to this construction the tank will rob to a considerable extent both the radiator and the coil, because there is nothing to alter the natural tendency of the water to rise, either at G or H, and the consequence is, that the water will flow direct into the tank. Another wrong assertion is, that the loss of bulk in the pipes did, will be made good by the tank. Now this is altogether impossible, because the hot water in F is rising as rapidly as it can, and how is the water in tank T going to fall (in opposition to the water rising in F) to H or G, which it will have to do if it is to supply the loss of bulk in d d.



The tank T should only be used for the purposes of expansion and feed, and in no way should it be expected to assist in the circulation of the system except when the boiler and radiators are on the same level; and where there is only one connection between the expansion tank