

HOUSE DRAINAGE.—I.

THE Sanitary Committee of the Society of Arts (London) were able to obtain evidence from Messrs. W. Eassie, Rogers Field, and E. F. Griffith (three engineers having wide experience) on various matters connected with house drainage. The following is the part relating to the examinations of houses and to works :—

MR. WILLIAM EASSIE:

Will you be so good as to describe, as practically as you can, what is the course of your examination in diagnosing, so to speak, the condition of the house?—In the “Practical Hygiene” of Drs. Parkes and De Chaumont, I have furnished a description of how this is usually carried out in ordinary cases. I first begin with the drains, which I lay bare, when I can do so, at various places, in order to see of what they are composed. When I find that they run inside the house, and are not concreted around, I pour in at the end of the drain a measured quantity of water, and collect it at the opening made somewhere in the area, not far from the outfall into the sewer. In some cases I find it necessary to fill the drain with water, and notice if this water disappears, because if it does so, it betokens unsound pipes or bad jointing, in which case I take it up and relay the drain. In testing the suitability of a drain for properly conveying away solid matters, I work the closet by pouring into it some suitable substance, and watch at the opening in the area whether it speedily appears. If it does not quickly make its appearance, and especially if the scouring dislodges any excess of paper or solids not introduced by me during the testing, I conclude that the drain is calculated to retain improperly the voidances, and I then recommend the drain to be taken up and relaid. By these means I am able to ascertain the general soundness of the pipes, their freedom from forming deposits, and their velocity of flow. If the house has been rebuilt upon an old site, I also examine for any old cesspools or brick drains. I next ascertain the absence, presence or condition of the main trap between the house and the sewer, which is generally found in one of the area vaults. If it is a dip-trap, I invariably find it acting as a cesspool, and remove it, and I do the same with some patterns of syphon traps. Where I am permitted, I then construct a disconnection chamber, with a fresh-air inlet of some kind suitable for the place; and as the next thing to consider is the ventilating outlet of the drain, I pay particular attention to the absence or presence of the ventilating pipes. If the soil-pipes be adequately ventilated, and if these are at the extremity of the drain, carried up to the roof, and terminating sufficiently far from windows and chimneys, I consider them calculated for the work which they have to perform in the matter of ventilation. But I sometimes introduce special ventilating pipes. When the soil-pipes descend inside the house, I fill them with water in order to ascertain their soundness; and if, as I frequently find, they leak, I recommend them to be taken down and others fixed, if it be at all possible, outside the house. I always assume the soil-pipes to be faulty, owing to improper jointing or decayed solder seams, and subject them to the water or some other test. An examination of the closets follows, and if they are of

the horrible pan pattern I condemn them, and if of the valve pattern, with D-traps, I remove the latter. Of course the woodwork around the closets must be taken down, and if the trays or safes have their wastes conducted into the D-traps I make a note of the removal. I pay particular attention to the servants' closets, and see whether they flush properly and are of a good pattern. The next inquiry is regarding the cisterns which supply the closets, and it frequently takes a considerable time to ascertain whether these cisterns also supply drinking water, and to where the overflows are led. If I find them supplying taps from whence drinking water is likely to be drawn, I proceed to notice where a separate cistern can be fixed for this service, and make a memorandum of recommendation to this effect. An examination of all other cisterns follows, and I carefully notice whether the overflows are properly disconnected, and also the physical appearances of the water and the state of the cistern interiors. I notice whether any of the basement closets are supplied direct from the mains. Very likely next in rotation would come the waste deliveries of the sinks, baths, and lavatories. If, as I too frequently find, they enter the soil-pipe, the closet-trap, or the drain direct, I specify their immediate removal. It is sometimes difficult to disconnect some of the sinks in the interior of the house, but it is always possible to contrive some method of doing so. I always make a note insisting upon the disconnection of the rain-water pipes, and their delivery over a gully. When I find an improper disconnection, as is frequently the case with sink wastes, I indicate the best method. Sometimes a too free method of disconnection has been followed, as, for instance, where an untrapped sink waste is made to deliver close to the trapping water of a gully, and where the effluvia from the latter is led into the room. I find it very often necessary to draw attention to the position occupied by the closets, and to the want of ventilation of the spaces in which they are placed, as also to the general ventilating arrangements of the house, and whether there is a proper air flushing, if possible, to the rooms and staircase.

What forms, sizes, and inclinations do you usually adopt for house-drains?—My chief desire is to make use of the smallest possible pipes, and I use stoneware pipes of four inches diameter when these can perform the work, and if they will not, then pipes of six inches diameter. Sometimes I am obliged to use pipes of nine inches diameter, but this is more rarely, and only as a main when several six-inch pipes junction into it. I rarely find use for twelve-inch pipes. The fall greatly depends upon the depth of the sewer, and I take as much fall as the latter will afford me, providing a little extra fall before the main disconnection chamber. Where there is a good means of flushing, the amount of fall is of less consequence. I find houses where it is impossible to get a fall of more than an inch in ten feet. Mr. Field's self-acting syphon is of immense advantage in such cases, and I have fixed them in connection with the sinks whence the cleaner kinds of wastes are delivered.

What are the modes you find applicable for testing the sufficiency or competence of this description of work?—If the pipes are laid down on proper lines, and surrounded by concrete, with occasional man-holes it is very easy to ascertain whether they act properly. As for the disconnected traps, their efficiency can be seen at a glance. The chief delinquencies are found at the water-closets, and the proper working of these is tested by the rapidity with which introduced paper, etc., can be carried to the disconnection chamber, which I mostly cover for this very purpose with an iron man-hole cover easily lifted up. If any smell arises in a properly laid drain, and from a closet, the soil-pipe of which is ventilated by a pipe of the same diameter, to the outer air, I generally attribute it to some temporary stoppage of the drain, owing to the introduction of some foreign substance, such as a duster down the closet. In any case the fault ought to be easily remedied when the work has been properly executed. In every case where pipes are led down inside the house, they should be cased in with hinged casings, and the seats and risers of water-closets should also be so constructed as readily to afford inspection. It is not in my opinion necessary to employ a workman to test the efficiency of any drain, and as I provide a plan of the house, showing the position of the man-holes and air-chambers, it is only necessary for a servant to raise the covers to see if the drains run clear. Screw caps on the various traps render it easy to remove any temporary stoppage at these places. With a proper plan of the drains in his hand, and with an air-chamber, i.e., a disconnection chamber, easy of access, a man should be able to test the efficiency of all the waste removals, in the course of an hour, even in the largest houses.

MR. ROGERS FIELD:

Will you be so good as to describe, as practically as you can, what is the course of your examination in diagnosing, so to speak, the condition of a house?—The first point is to ascertain whether the drains pass underneath the house or outside it. If they pass underneath the house I test them carefully for soundness (to ascertain whether they are water-tight), as well as testing them for freedom from deposit and velocity of flow. If they pass outside I merely apply the two latter tests. The test for soundness is managed as follows: The drain is opened down to at its lower end generally in the area between the house and the street, and carefully stopped with a plug of clay. Another opening is made in the drain, and the drain is then gradually filled with water. As soon as the drain is full, the water is turned off, and carefully watched at the upper opening. If the water remains in the drain, the drain is sound, but if not, the drain is leaky, and the rapidity with which the water sinks indicates the amount of the leakage of the drain. It is not at all unusual for the water to run

away so rapidly that it is impossible even to fill the drain so as to make the water show at the upper opening at all. The test for deposit is by flushing from the closets, sinks, etc., and pouring down a large quantity of water and watching the drain at the opening at the lower end (of course without any plug in it). If the water comes down thick or with a bad smell, it shows that there is a deposit; if it runs clear and sweet, it shows that the drain is clear. The test for velocity of flow is by noticing the time that water takes to run a given distance. Whether there are any old drains or cesspools, etc., can only be ascertained by opening up and searching for them, and this must be done whenever there is any reason to suspect their existence. The next point is to ascertain whether there is any trap between the house-drains and the sewer. A strong draught up the drain from the sewer is generally unmistakable evidence of the absence of the trap. Should there be a trap, it must be opened down to, as the chances are that it is so constructed—as to be more or less full of deposit. It must, of course, also be ascertained whether the drains are ventilated. There is not much difficulty about this, as it is generally evident they are not. The next proceeding is to examine and test all the details of the sanitary arrangements, water-closets, sinks, baths etc.; and as it would take much too long to describe all these various necessary operations, I must simply refer to a few of the most important points. The soil-pipes must be carefully examined, and if they are inside the house they must be specially tested. If of iron, with putty joints, as is often the case, they may, without much risk of error, be assumed to be unsound; but if it is wished to test them, this could be done by the smoke test. If they are of lead, they should be tested by being plugged and filled with water. A glance at the water-closet apparatus is enough for an experienced man; but it is necessary to take down the seats to see whether the overflow of the "safes" or lead trays underneath are connected with the soil-pipes, as is often improperly the case. The condition of the traps can be tested by lifting the handle of the closet and noticing whether any smell comes up (in a good closet no smell is perceptible). If, however, the apparatus is of a faulty description, the closet is sure to smell sooner or later. It must be carefully ascertained what cisterns supply the closets, and, if there is the least uncertainty, the cisterns must all be tested by drawing off water from them, and in some cases by coloring the water. The waste-pipes of sinks, baths, etc., often give a good deal of trouble. A good way to trace them is by pouring down hot water, and feeling which pipes become heated. If hot water poured down the waste of a bath, for instance, heats a soil-pipe, it shows that the waste of the bath goes into the soil-pipe. It is never safe to trust to appearances, as the following curious instance will show: In a house I recently examined, I saw an open end of a pipe projecting through a wall, and was informed that it was the overflow of the cistern. I tested this overflow by pouring water down it, but no water came out of the projecting pipe. I was then told that it was the waste from the "safe" or tray under the water-closet. I tested this in the same way, but no water came out of the projecting pipe. I was then told it was the waste from the safe of a bath, and on closer examination I found that the pipe evidently did come from the bath. I thought it better, however, to test it by pouring water into the safe of the bath, when to my surprise no water came out of the pipe. I then had the casing of the bath taken down, when it was found that the pipe had surely enough been connected with the safe of the bath, but at its highest point, so that no water would run out of it, and that the real outlet from the safe of the bath was into the soil-pipe. The explanation was, no doubt, as follows:—The outlet of the safe had always gone into the soil-pipe, but some former tenant had insisted on its being altered. To do this properly, the fall of the safe must have been altered, which would have involved some expense, and the projecting pipe had therefore been run through the wall as a sham to deceive him. The bath in question was in a dressing-room opening into a bedroom, so that the connection of the outlet with the soil-pipe was a very serious matter.

How long does the process of examination usually take?—The time varies so much with the size of the house, the complication of the sanitary arrangements, whether there is any plan or not, and the facility of examination, that it is almost impossible to answer this question. In order, however, to give some rough idea, I may say that in an ordinary London house of moderate size the examination would probably take from three to four hours of my personal time. This is on the assumption that the house has been previously prepared for my inspection by having the concealed parts exposed, and that no great amount of testing is required. If the sanitary arrangements are complicated, or if there is delay on account of workmen opening down to the drains, making preparations for testing, etc., the time is largely increased. In very many cases, however, after opening down to the drains, I consider it unnecessary to test them, as I am morally certain that they are leaky, from my experience in testing other similar drains.

What forms, sizes, and inclinations do you usually adopt for house-drains?—I generally use stoneware pipes of 4 or 6 inches diameter. Occasionally 9-inch pipes may be required in very large houses, but this is only under exceptional circumstances. Under ordinary circumstances 9-inch pipes are too large even for considerable sized houses, and it is a mistake to use them. The fall varies immensely according to circumstances, but I always endeavor to obtain a fall of 1 in 30, or 1 in 40, for ordinary house-drains. When, however, self-acting flushing arrangements are employed, the fall may be greatly reduced, and I have 6-inch main drains carrying the sewage from

large mansions, working very satisfactorily with falls of 1 in 100 to 1 in 200, where flushed by my self-acting syphon.

What are the modes you find applicable for testing the sufficiency or competence of this description of work?—In order to render my answer intelligible, I must, in the first place, explain that the different portions of all sanitary work carried out by me are made as accessible as possible. The drains are laid in straight line, with man-holes, or inspection openings, at every change of direction. The traps on the drains are all made easily accessible. The soil and waste-pipes are never built into the wall, and, if cased, the casings are easily removable. The open ends of all waste and overflow pipes are made visible. The water-closet seats are all hinged, so as to lift. The traps of sinks, lavatories, etc., have screw-caps for inspection and cleaning. It is then a comparatively easy matter to examine and test the drainage. The drains are tested to see that they are watertight when they are laid, but this test (by blocking and filling them with water) can be applied at any time. The accuracy of the laying of the drains, and their self-cleansing capacity, can be immediately tested by trying the velocity of flow, as already explained. The traps on the drains can be tested by examining whether any solid matter rests in them, and also by trying whether paper, etc., flushed down the drains, passes through them. The sufficiency of the flush of the water-closets can be tested by seeing whether it drives paper through the traps. The test of smell is also valuable, as in well-laid drains any other smell than that of fresh sewage is an indication that something is wrong. I may add that in the work I carry out, I not only supply my clients with an accurate plan of the drains showing every detail, but also a detailed schedule referring to the plan, giving particulars of every pipe, trap, closet, man-hole, inspection cap, etc., with a written description of the works, and detailed instructions for maintaining them in order. This is extremely useful for future references, and in some cases my clients have duplicate copies made, and deposit one of them with title-deeds.
