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SEWER GAS

AND

HOW TO KEEP IT OUT OF HOUSES

A HANDBOOK ON HOUSE DRAINAGE

OSBORNE REYNOLDS M. A.

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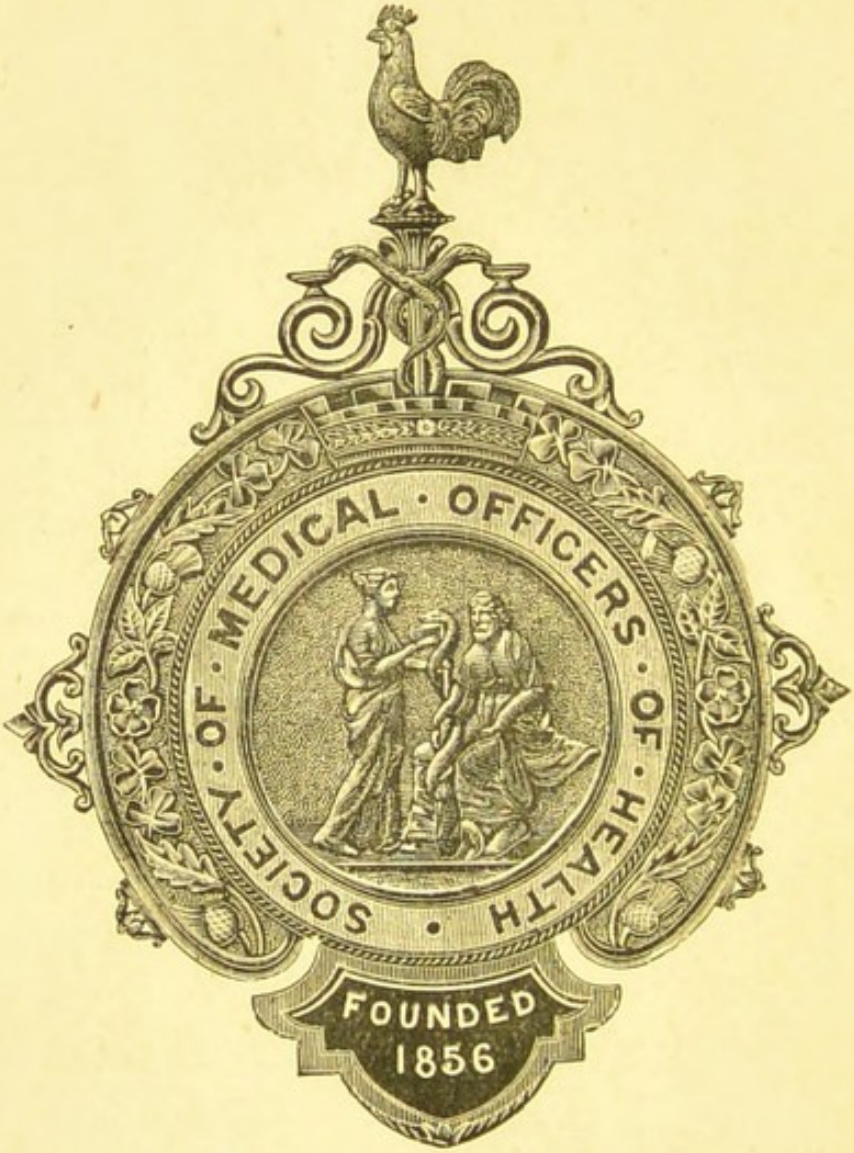

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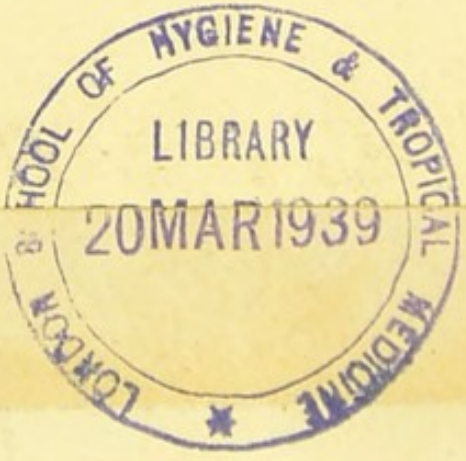

M. Moore.

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AND

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A HANDBOOK ON HOUSE DRAINAGE.

BY

OSBORNE REYNOLDS, M.A.,

Professor of Engineering at Owens College, Manchester; Fellow of Queens' College, Cambridge.

SECOND EDITION.

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PREFACE.

THE principal part of this book was written nearly four years ago. It has only been waiting in order that some suggestions it contains might have a thorough practical trial, and this being accomplished, it is now published in the hope that it may help those people who are in doubt and trouble with the drainage of their houses. It would be a public calamity if the wide-spread alarm, caused by the recent illness of the Prince of Wales, were allowed to subside without producing a beneficial effect; but there is danger that such will be the case, simply for the want of definite information as to what is amiss, and how it is to be set right. The discussion in the newspapers has been more calculated to cause alarm and bewilderment than to direct anyone how to act. Everyone is crying, "Do! do!"

while no two agree what is to be done. What appears to be wanted is a book of approved scientific merit, and of such a practical character that a householder or any unscientific person can learn from it how to ascertain if drains are safe, and, if not, how to get them put right. In the absence of such a book, I venture to hope that this little work may be useful.

My chief object in writing on this subject was to suggest a plan for preventing the evil which is now causing so much alarm—viz. the back-flow of gas into our houses. Of this plan I have now had four years' experience; and have, without exception, found it to answer perfectly. In the first place, I applied it to my own house at a cost of fifty shillings or thereabouts. This house is of the ordinary type, and is drained into a foul sewer. Before the introduction of the new plan, it was never free from smells; while, since, there has been no annoyance of the kind, nor have the drains required any attention whatever.

The plan is very simple, and can be applied to any fairly-drained house at a small cost, and without requiring the drains inside the house to be disturbed.

I am not aware that this complete scheme has

ever been suggested before; but it embodies as its principal features several plans which, I am pleased to see, are daily growing in favour; among which perhaps the most important is that of having a break or trough in the pipe which connects the house with the sewer. This has now been advocated for several years, but I do not know by whom it was first proposed.

Besides describing the proposed scheme, I have endeavoured to impress the reader with its simplicity, and also to point out other ways in which the drains in a house may be harmful, besides by the admission of sewer gas—in fact, to make this a handbook on house drainage. With this view, I have divided the book into four sections.

Section I.—A description of the plan recommended for disconnecting the house and the sewer, together with the directions necessary to enable an ordinary workman to apply it to every house.

Section II.—On the purpose and general arrangement of house drains.

Section III.—On the way in which the house-drains themselves give rise to stinks and poisonous gas, and the best means of preventing them doing so.

Section IV.—On the precise way in which the sewer gas enters houses, the inadequacy of measures in use for preventing this, and the advantage of the new plan.

Throughout the book I have endeavoured to make the language intelligible to everyone, however ill acquainted with technicalities. I have avoided, as much as possible, disputed ground; but there are two errors frequent among newspaper-writers, which I have found it necessary to point out. The first error is the common belief that there is often an excess of pressure of gas in the sewer beyond that of the atmosphere. Some writers maintain that at times this excess is ten or fifteen pounds on the square inch; others, that it is at least sufficient to force the gas past a trap. The second error is the belief in the efficacy of mere ventilation for preventing the sewer gases getting into houses. Both these notions are hypothetical, and all experience is against them.

I do not mean to say that there is never an excess of pressure in the sewer, or that sewer ventilation will not mitigate the evil, but that the evil is not solely or even generally due to such pressure, and cannot be cured by ventilation.

I have not gone into or even touched upon the drainage of towns or the disposal of refuse, but confined myself entirely to the drainage of houses. Such readers as wish to study the wider subject are referred to Professor Corfield's able work on "The Utilization of Sewage."

O. R.

SEWER GAS,

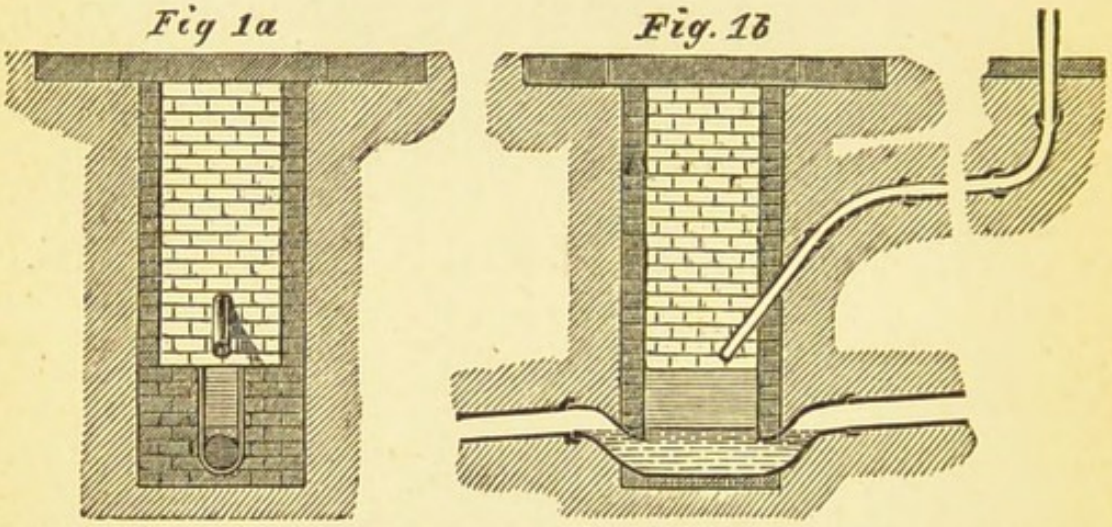
HOW TO KEEP IT OUT OF HOUSES.

SECTION I.

A description of the proposed Scheme for disconnecting the House and the Sewer.

THE art of properly draining buildings is distinct from that of sewering towns or districts. This is fortunate, for be the sewer or cesspool into which a house drains never so foul, it may be beyond the power of the unfortunate inhabitant to get it set right. He must rely on the subsoil on which his house stands, and on the floor and walls of his house to separate him from the contents of the sewer. He must rely on these and on an artful connection of the drains within his house with the poison generator without, so that they may serve to carry off the refuse without affording a passage back for the poisonous gas. In order to do this effectually it is necessary that

all the drains in the house should flow into one pipe, so that there may be only one connection between the house and the sewer, and in this pipe there must be a trap of somewhat peculiar construction. This trap is shown in Fig. 1.



A man-hole or shaft is sunk from the surface to the pipe, the floor of the man-hole being about two feet above the bottom of the drain. Across this floor there is an open trough which takes the place of the pipe; this is about two feet deep, and of the same width as the pipe. The ends of the pipe which are connected with the trough are (as shown in the diagram) so depressed that the water stands in the trough about half an inch above the orifice on the sewer side, and an inch above the mouth on the house side. In this way a trap is formed which effectually closes both the house and the sewer from the man-hole, and doubly closes the house from the sewer. And if care is taken to arrange the orifices of the pipes in the man-hole as recommended, it will not be possible for the water to be sucked out of the trap,

should the pipe run full. The man-hole affords a ready means of examining or cleansing out the trap, but in order to prevent a scum forming on the surface of the water in the trough, the pipe from a roof spout may be arranged so as to discharge itself on to the top of the trough, as shown in the diagram.

The drain from the author's house is deep, and the shaft is two feet square, built of $4\frac{1}{2}$ inches brick work, the bottom formed of bricks and cement: the trough is cemented. The pipe is five inches inside. The charge for constructing the whole was less than 3*l.*

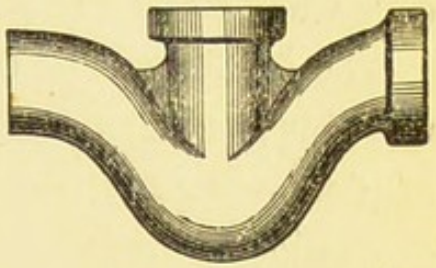


Fig. 2.

In most cases a simpler plan will be found to answer quite as well; instead of having a man-hole and trough, a special earthenware trap is used, such as is shown in Fig. 2.

The length of the upright branch should be increased with straight pipes until it comes to the surface, where its mouth may be protected but not closed. In one of these pipes there should be a side junction for connection with the down spout, as shown in Fig. 8.

Such a trap may be put in any position, and need not cost 1*l.* They are, or should be, kept by all vendors of sanitary pipes.

The best position for such a trap as this will be determined by circumstances, but it must be somewhere between the house and the sewer, branch sewer, or cesspool into which the house drains. As a general rule the nearer the house the better.

It is, however, to be insisted on that all the drains in the house shall flow into this trap,—that there shall be only one connection between the house and the sewer, or at least if there be more they shall each have a trap, and be certain of a constant supply of water sufficient to maintain the necessary level in it; for it is to be specially noticed that the essence of this improvement is to insure the action of an efficient trap, which can only be the case when the water supply is unfailing.

The reader will be better able to appreciate the reasons why this particular form of trap and the position assigned to it are specially recommended, when he has read the discussion in the following sections on the general arrangement of house drains and traps. The further consideration of these questions has therefore been deferred to the Fourth Section.

It is not necessary to have these traps for cottages and houses without cellars or water-closets, but it is equally important that in such there should be no direct connection between the drains from within and the sewer. The only essential drain from the inside of such houses is the pipe from the sink. For reasons which will be explained hereafter, it is not safe to depend on a trap in this pipe. Perfect discontinuity should be insured by bringing the pipe through the wall of the house, above ground, so that it may discharge into an open trough or gutter leading to a yard or street gully. The mouth of the pipe should not be directly over the gully, otherwise the light gas from the gully may rise up it, and thus find a way into the house.

SECTION II.

On the purpose and general arrangement of House Drains.

THE first thing for the anxious householder to do is to get a clear conception of what the drains in his house are for, and whereabouts he may expect to find them. The accompanying diagram will very much assist him in this. He will at once see that the necessity of the house drains arises from the use of water-closets, baths, sinks, and underground cellars, and that whatever may be their subsequent directions, they start from one or other of these sources. Fig. 3 represents a section of an ordinary town-house, taken so as to show all the usual inlets into the drains: A, the closet; B, the bath; C, the sink; and D, the cellar drains. It also shows the sections of the pipes from these sources, and the manner in which they are usually connected with each other and the outside drain. In this example the house drains are shown connected with a branch sewer which runs at the back of the house (a very common arrangement in towns), but it is not intended to confine these remarks to houses which drain in this way, for they

apply equally to houses which drain directly into a street sewer, or into a cesspool.

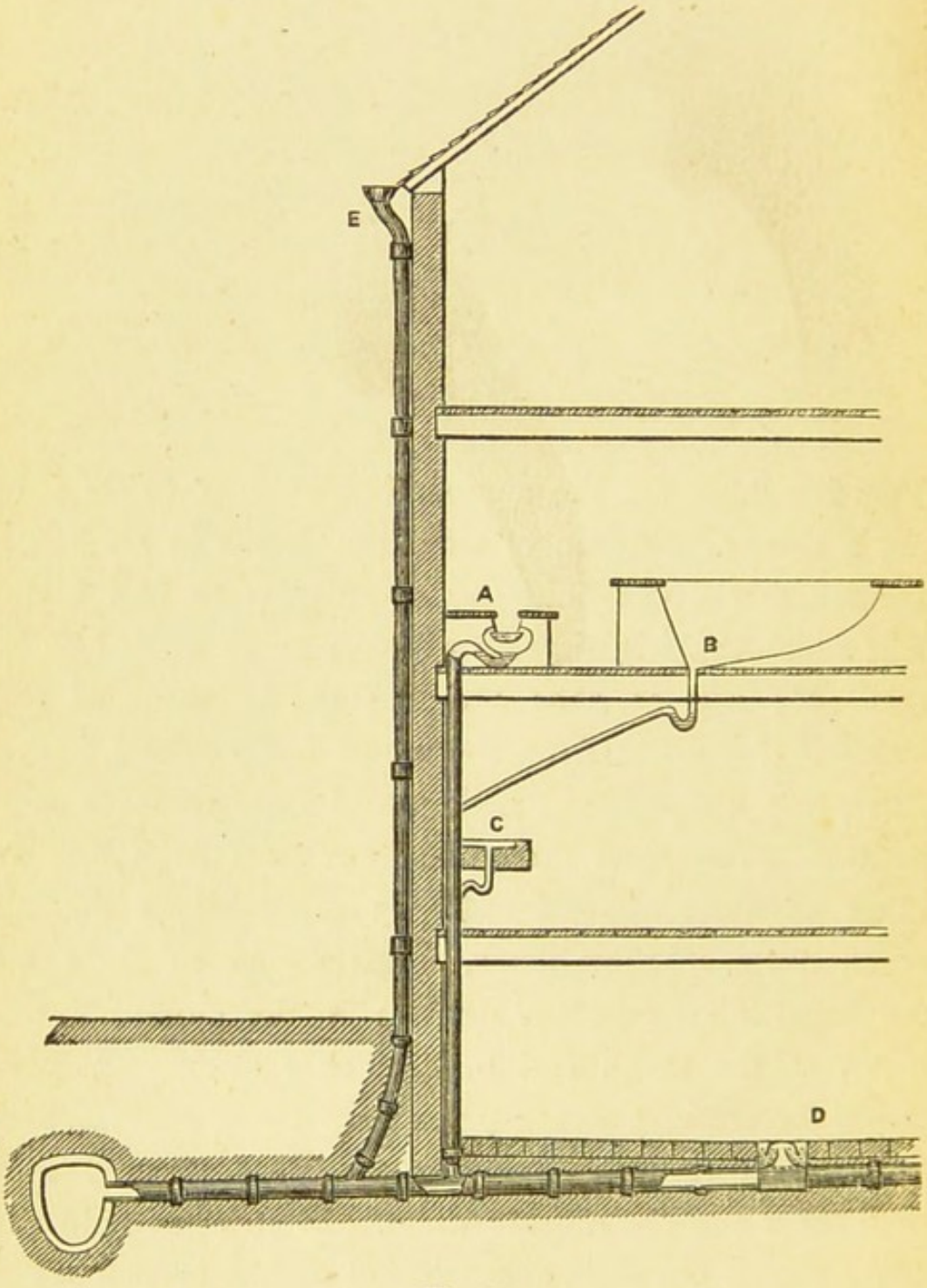


Fig. 3.

The most important drain in a house is the soil-pipe from the closet (A). It is, generally speaking, metal

between the closet and the ground. Sometimes this part is entirely of lead, but more commonly of lead and iron ; the straight part being of iron, for cheapness, and the rest of lead, for convenience of manufacture. This pipe should be, and generally is, about five inches across inside. There is usually a bend in it immediately below the pan of the closet : a depression which, standing full of water, prevents the smell from coming up the pipe into the closet.[1] In most houses the water-closet is above the ground floor, and the pipe has to descend for some distance before it reaches the ground, and it seems to have been an open question whether it is more objectionable to have the pipe with its smells, for these pipes are never smell-tight, inside the walls of the house, and protected from the frost, or to carry it at once through the walls and bring it down outside in the open air.

If the smells are kept out of this pipe, as will be the case when the house is disconnected with the sewer, in the manner described in Section I., the pipe may be safely kept inside the walls without any fear of its giving out bad smells or sewer poison.

The minor waste pipes, those from the sinks and bath, often join the down pipe from the closet. They are themselves generally leaden pipes about one inch in diameter, and they are connected with the cast-iron pipe by means of putty joints, and it is at these joints for the most part that the pipe leaks or the smells escape. There are usually depressions in these lead pipes which are supposed to keep full of water and prevent smells

[1] See Section IV. on Traps.

coming up the pipe, but these often fail from a fault in construction (see Section IV. on Traps).

The closet-pipe brings the refuse from all its tributaries down to the ground, and sometimes as low as the cellar-drain. The metal pipe is then connected with an earthenware pipe of the same size, or larger, which is laid with sufficient fall in the direction of the sewer or outlet. The junction between the vertical iron pipe and the glazed earthenware is of some importance. It is often made with a square elbow or branch. This is particularly the case where the iron pipe descends inside the house, and the earthenware pipe is the continuation of the drain from the cellar, as shown in Fig. 3. This square connection is bad wherever it exists. In the first place, the water falling straight down on to the bottom of the horizontal pipe makes a splash and loses all the impetus it had acquired in falling, which if

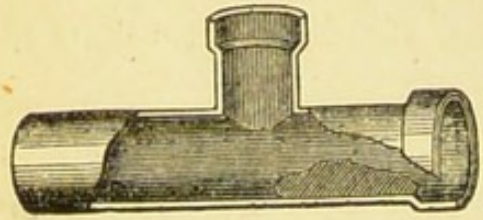


Fig. 4.

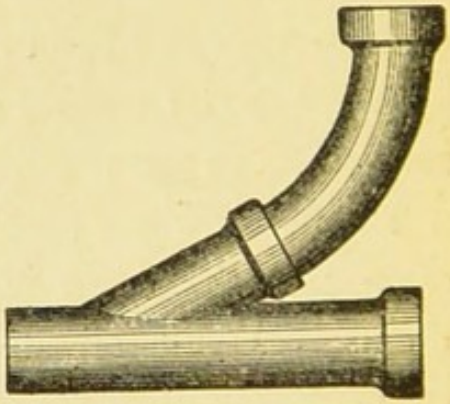


Fig. 5.

properly directed would have been of great use in carrying it past or removing any obstructions there might be to its subsequent course in the flat-pipe; and in the second place, where the closet pipe simply branches from

the cellar or some other drain, the splash at the bottom is apt to leave a deposit, as shown in Fig. 4, on the upper side of the connection, which can only be removed by a flush down the drain from some other source. When practicable, all junctions should be effected with curved bends such as those shown in Fig. 5, so that when the pipes come together their contents may be flowing as nearly as possible in the same directions.

Perhaps of all the drains in the house that from the cellar is the most liable to be the source of mischief. It is the lowest and consequently has the worst fall, and if its lawful contents are not of an offensive kind, yet, owing to its position, it often receives the contents of its more ill-favoured neighbours. Besides this, it is out of the way, it gets less attention than the others, and in many cases it is not directly used, and so has not the advantage of an occasional flushing. In many old houses in the country it is constructed of brick or of unglazed pipes. In modern houses it is of glazed earthenware pipes about five or six inches across, and sometimes as much as nine. These are all larger than is necessary, a 3 or 4 inch pipe with a fall of $\frac{3}{4}$ inch to the yard is amply sufficient.

In many houses, such as those in the neighbourhood of Manchester, there are cellars (not kitchens) under the whole house, and each cellar has its gully and drain. Now, it may be convenient to have sinks all over the house; but when we come to think how seldom these cellars are washed, or indeed have any water in them, it seems almost unnecessary to have drains all over them just to save the servants the trouble of occasionally

washing a yard or two of floor. Of course if the drains were harmless that would be all very well, but when we consider that there is difficulty and danger about every drain, and especially the cellar-drains, and that every extra foot or yard is just increasing the danger by so much, we must admit that to have a ramification of drains under the whole house is likely to cost us dear for the convenience it brings. There must be one drain from the lowest part of the cellar, but this need only just come through the wall.

Besides these drains from the inside of the house, those from the spouts (E), Fig. 3, which carry off the roof-water, often form part of the same system. They are sometimes kept distinct, and communicate with the sewer by separate pipes, but more commonly they are connected either with the drain from the cellar or the soil pipe. Some people have recently made a point of doing this with a view to ventilate the drains and form a way of escape for gas that would otherwise force its way into the house. This, however, is a mistaken idea. The plan need not be mischievous, it is often the reverse, but it is done under a similar misapprehension to that which leads people to have openings in their ceilings to take out the hot air from rooms, the fact being that, when there is a fire in the room, the draft up the chimney is so great that it draws air into the room at every crevice, and consequently the opening in the ceiling which was intended to take air out lets air in, and thus acts in a manner the reverse of what was intended. So it is with the drains. The suction of the house, especially when fires are lighted

and windows closed, draws so much air out of the sewers that they have to get it where they can, and all the openings into them from the outside, the down spouts among the rest, are actually letting air into the sewers instead of out of them.

Such, then, is the most common arrangement of drains in a house, and there are obviously two ways in which these drains may be the means of poisoning the inhabitants ; they may introduce the much-dreaded sewer gases, or they may themselves become filthy and give off effluvia. The following parts of this pamphlet are devoted to the consideration of these evils in detail, both in respect to their cause and cure.

SECTION III.

On the way in which Drains themselves give rise to Stinks and Poisonous Gas, and the best means to prevent them doing so.

If drains are made of a porous material such as brick, or unglazed pipes, they will necessarily be offensive: this will also be the case if they are badly laid so that they have hollows in which water stagnates. It must always be remembered that sewage when fresh is almost innocuous compared with the same when decomposing, and that the rate of decomposition is immensely increased by the presence of some already decomposing sewage, which acts in the same way as yeast; thus sewage stagnating in, or flowing through, dirty drains, will become offensive much more rapidly than if the drains are clean.

Those drains which are underground are particularly liable to these evils, and in addition are sometimes leaky, in which case they saturate the ground around them with stinking liquid.

It is of the first importance that these underground drains, especially if under the house, should be well

laid and composed of the right material. Fortunately there is no difference of opinion as to their proper construction, and in most modern houses they are well done. They should be composed of earthenware pipes (not cast-iron), socketed, and jointed with cement. There is an objection to making the joints with cement, which often prevents its being done. It makes the pipes very rigid, and as the ground under new houses is liable to settle, there is fear lest the pipe should be broken. This, however, will not happen if care is taken to lay the pipes on a natural or well-rammed, or, in bad places, a concrete bed.

The ordinary plan of jointing the pipes with clay-puddle, though probably the best for sewers, is not so good under a house where it will get dry, and where economy in such matters sinks into insignificance compared with efficiency and safety.

The drains above ground are generally of metal, and it is only in the depressions which are intended to form traps that stagnation can take place. This stagnation is the cause of an evil often complained of, viz. that when fresh water is let into a trap a smell comes up; as, for instance, when the pan of the closet is lifted and its charge sent down into the trap, there is often a bad smell, although apparently none at other times. The fact is, that the trap beneath the pan stands full of filthy water, and the pipe between the pan and the trap is full of the effluvia which the contents of the trap give off. So that when the pan is raised the condition of things below is disturbed and the effluvia rises. The obvious

remedy for this is to allow sufficient water to go down each time to change the contents of the trap and leave it full of pure water. More will be said on this subject further on in the book.

The size of the pipes is of some importance. It is a common mistake to make some drains too large. It must be remembered that the smaller a pipe is, the better it is flushed, and the less liable it is to get blocked so long as the inlet is properly protected by a grate. From the nature of its work the closet-pipe should not be less than five inches; but such a pipe is large enough to form a branch sewer to take the sewage from half a dozen small houses; for the cellar-drains, a pipe of three or four inches is quite large enough.

With regard to the fall in the underground pipes, it is of more importance that this should be regular than that it should be great. A common rule is to allow $\frac{3}{4}$ inch fall in the yard. This is quite sufficient, and where necessary a smaller fall may be used, provided the pipes are laid with great regularity.

In modern houses the drains are generally well laid, and consequently do not commonly generate gas within themselves. Hence, in such houses precautions should be first taken to prevent the gas from the sewers getting into the drains; after which, if there is any further smell, the drains themselves must be looked to.

SECTION IV.

On the precise way in which Sewer Gas enters Houses; the inadequacy of means in use for preventing it, and on the advantage of the New Plan.

THE entrance of sewer gas by the house-drains has been the subject of as much discussion within the last few months as if it was a new discovery; but this is not the case, for, if it had been unknown before, why have we traps, and not only traps, but laws to cause the use of traps, on the mouths of all drains? It is not the tendency of this gas to get in that has been recently discovered, but the inadequacy of the measures hitherto taken to keep it out.

But although the fact that smells and bad air do force themselves from the sewers is well known, it is not so clear why they do so. Judging from the newspapers, this is generally attributed either to an excess of pressure in the sewer arising from the fermentation of its contents, the backing up of water in the outlets of the sewers, or the pressure of wind on these outlets; or else to the lightness of sewer gas, which causes it to ascend by levitation wherever ascent is possible.

The first of these causes is much overrated, in fact it only exists at all under exceptional circumstances, as, for instance, near the outlet of a large sewer on which the wind is blowing. Whenever experiments have been made to ascertain the excess of pressure in the sewers of a town, contrary to expectation the pressure within the sewer has been found less than that without. Nor, as we shall see, is it at all difficult to find a reason for this. Sewers must not be looked upon as so air-tight that a small quantity of gas has a difficulty in escaping from them; there is generally what may be called free communication between the sewer and the outer air, so that it is impossible there should be an appreciable difference of pressure within and without.

The second cause no doubt exists; the drains are all laid with a falling gradient from the house to the sewer, and consequently they rise from the sewer to the house; and the light gas will ascend in the opposite direction to that in which the water falls.

Now, possibly some of the evil is due to this cause, but far more to the following, viz. the suction of a house produced by the chimneys, or even the warmth of the house itself.

This suction of the house, although a very small quantity in actual pressure, being always less than one-eighth of an inch of water; *i.e.* not sufficient to suck water up a tube one-eighth of an inch, and consequently never sufficient to suck the air past a good trap, is sufficient to cause a great deal of air to enter by a very small opening. This will be at once perceived by holding the

hand over the crevice of a window in a room with a fire. Hence, be there cranny or crevice into a drain, the house will suck gas, whatever be its source. This is the reason why there is a minus pressure in the sewers; the houses which drain into them are making larger demands for gas than can be supplied by the fermentation of their contents, or wind that may enter at their distant outlets.

We see, then, that there are two inducements for the gas to enter the house. Now the distinction between them has not received due attention; they have been confused together, and as the same preventives which are efficient for the one are no use for the other, the attempts to prevent the gas entering have been failures. If the effort of the gas to escape from the sewer were the only reason why it enters the house, this would be satisfied by providing it with a more ready means of exit from the sewer, such as street gullies, shafts, or down spouts. But as the suffocated houses suck away at the drains, air will be drawn out, however many other openings there may be into the sewer, which only serve to let fresh air in. Hence no amount of ventilating shafts can be efficient to cure the evil. Nor is it practicable, as has been proposed, to produce effective exhaustion in the sewers by furnaces, for the simple reason that the sewers are not sufficiently air-tight.

It is not, then, enough simply to prevent the sewer forcing or breathing gas into the houses, we must prevent the house sucking the gas out of the sewer. This is what drains on the usual system fail to do; the reason why they so fail will appear when we consider the prin-

ciple on which they are supposed to act. The drains themselves have free communication with the sewer, and are therefore always filled with sewer gas, and if the house is not to suck this gas from the drains, it is necessary in the first place that the inlets or mouths of the drains should be efficiently trapped; and in the second place, that the drains themselves should be air-tight as well as water-tight.

Now, to consider the latter of these conditions first, viz. the making the drains within a house perfectly air-tight. It may be possible to make them so for a short time; but in practice it is found impossible to keep them so. As we have seen, these drains are of different sizes and composed of different materials; this makes it very difficult to joint them tightly. The metal pipes alter in length with the temperature, and the expansion breaks the putty or cement joints. If, as is the case with gas or water-pipes, leaks manifested themselves with certainty, we might depend on occasional repair to keep these drains tight; but such is not the case. There is positively no means of ascertaining whether the pipes are sound or not. A smell often shows that they are not tight, but its absence does not prove them to be so.

It is found practically impossible to make the joints tight (especially those between the lead and iron pipes), and in the face of this fact and that just mentioned, that we have no means of ascertaining when they want repair, it is unscientific to trust to this way of keeping the gas out of houses.

Again, to go back to the traps, is it possible to close the mouth of the pipes against gases and leave them open to the refuse liquid? This can only be done under certain circumstances; then it is done by a water-valve, commonly called a stench-trap. These, though of great variety, are all on the same principle. This principle is very simple, as may be seen from the commonest and simplest form of trap—a depression in the pipe, which stands full of water, and therefore closed against the gas, after the rest of the pipe is clear.

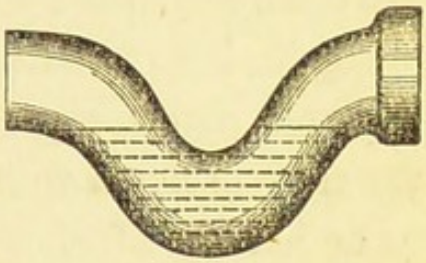


Fig. 6.

Many so-called traps are defective in construction. Sometimes the depression is too shallow, so that when this is full the passage is not completely blocked; but sometimes, where the depression is deep enough, the trap fails from the fact that of the water which runs through, none, or only a little, remains in it. This is the case with a pipe so small in proportion to its work that it runs full; for if there is sufficient fall in the pipe below the trap, the water in this portion of it will, by its syphon action, empty the depression. This is a very common fault with the traps in small lead pipes; most plumbers are alive to it, and make traps in such pipes of a larger size than the pipe itself.

But it is not only faulty traps that fail: the best trap will not act unless it has water in it; and, since water evaporates, there must be a constant, at least a frequent, supply of water through the trap to render it effective.

Now, many of the drains commonly put into a house have no water through them by the month together, and where this is the case, even if the water does not leak out of the trap, it will dry up and the trap be left open. This is particularly the case with the cellar traps, which are often out of the way and unnoticed.

Again, if dirty water stand in a trap for a few hours, it becomes putrid, especially if there be any putrid water in the trap to begin with. Hence, any trap which is likely to be left full of dirty water is liable to cause nuisance in a house. There is a great liability of this happening with the trap under the pan of a water-closet. This is often so large that there is not enough water in each discharge to make a sufficient change in the contents of the trap; and where with such a construction the closet is only used once or twice a day, the trap is sure to get very dirty. This liability is cured if the trap is left full of clean water, or if there is a frequent flow through it, clean or dirty.

There is, however, another difficulty with traps: being, as we have said, essentially depressions in pipes, they

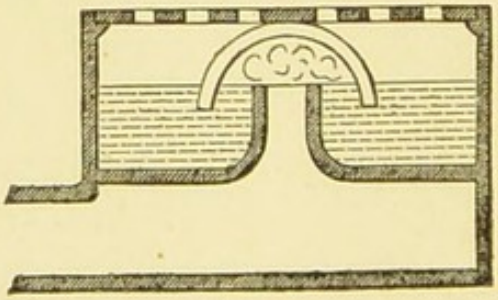


Fig. 7.

are apt to arrest sediment, and become choked up with it. This is very liable to happen in the cellar drains

where the dirt from the floor is washed into the gullies. From this reason alone the bell-trap is generally used in cellars, because it can be cleaned out with facility: but it is objectionable from its peculiar liability to dry up.

To prevent traps from becoming blocked in this way, it is necessary that water should run through them with sufficient velocity to flush them, *i.e.* carry the sediment out along with it. Where the ordinary flow is not sufficient for this, it must be done occasionally by a special effort.

Thus we see what the conditions are under which a trap will act with certainty; viz. when the pipe is sufficiently large not to run full, and when there is a frequent flow of water through it. Now, no traps inside a house exist under such conditions, unless it be that in the closet-pipe, and that not always; hence it will be an advantage to get rid of these inlet traps altogether, and supply their place by another trap placed under more favourable circumstances.

The sewer gases will be as effectually kept out of the house if they are kept from entering the drains, as if they were prevented from leaving them. In fact, these drains are passages; and, if we can stop the passages at either end, it will answer our purpose equally well. And, for reasons which are very simple, it is much easier to prevent the sewer gas from entering than from leaving the house drains. These drains, like a river, derive their waters from many sources, and bring them together to one outfall. The water from all the sources will run through this, and hence, if there is a daily flow anywhere, it will

be here; and consequently here the circumstances will be most favourable for the action of a trap. Besides this, there is no chance of the gases leaking into the house drains through open joints. Hence we see that an efficient trap in the pipe which connects all the house drains with the sewer or cesspool, will completely cut off the house from the sewer.

It is difficult to say how it is that such a simple remedy as this has been neglected so long, unless it is that the true nature of the evil has never been clearly apprehended. There is, it is true, something to be said against complicating the drains when they are buried six or eight feet under the surface, and consequently difficult to get at. And this may have been sufficient to prevent the adoption of the measure so long as it was of doubtful advantage.

A good syphon trap of glazed earthenware, such as that in Fig. 6, would probably answer all purposes in five cases out of six; but there is just the chance that the pipe might run full and suck the trap empty, or that the trap might get blocked with sediment, which would be very awkward.

Now, the plan recommended and described in Section I. cures both these failings. It secures the trap from being emptied, and furnishes the means of inspecting it, either to examine its condition or to set it right. And it will now be understood why this peculiar construction is insisted on, and why it is placed in the only connection between the house and the sewer.

Such connections as these should be adopted for all

houses having drains from within, whether they are in the town or in the country; whether they drain into a sewer

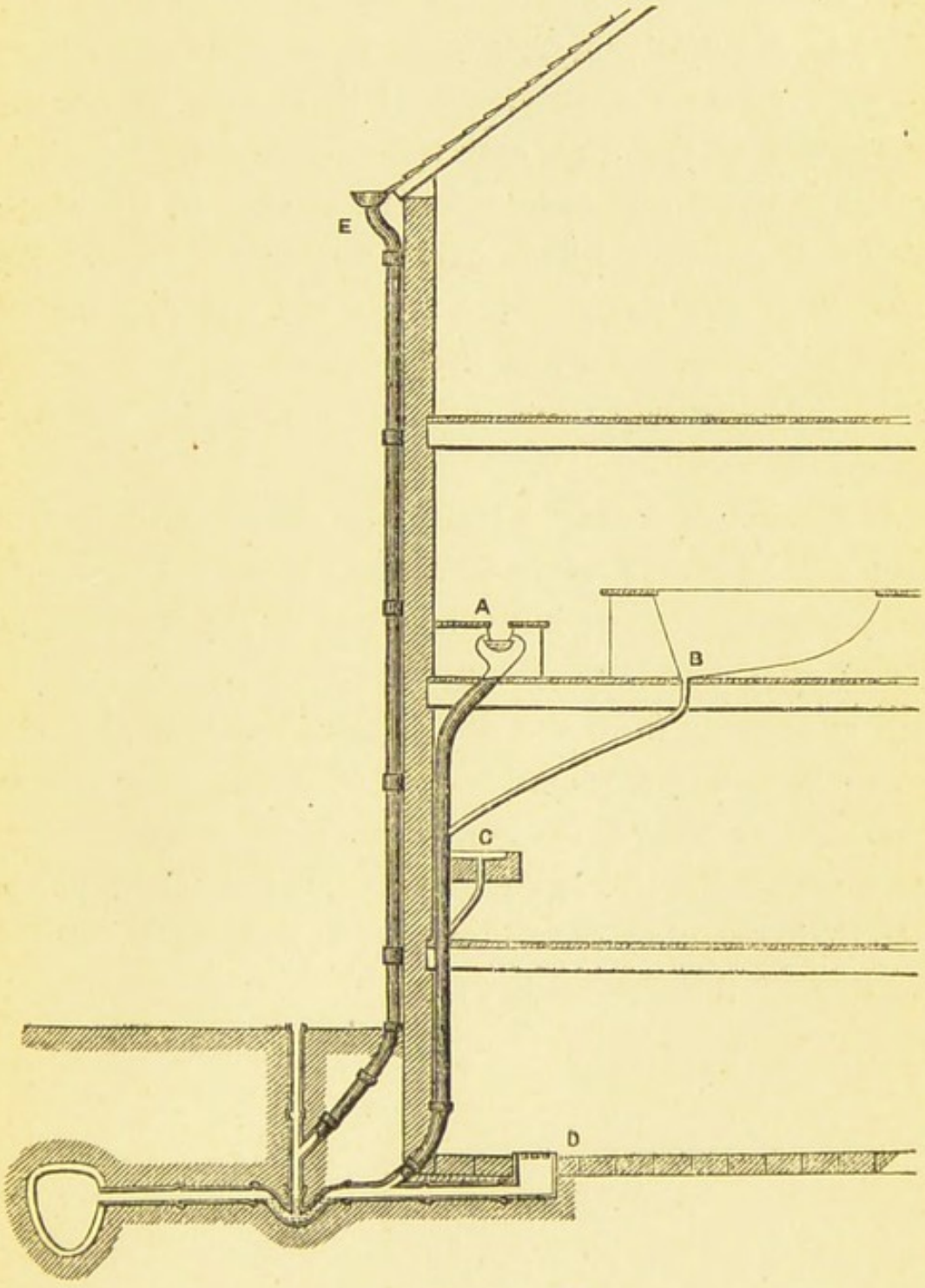


Fig. 8.

or a cesspool. There will then be no need to have traps within the house, and their riddance will be a great com-

fort, even if we thereby allow air to enter the house freely from the inlets to the drains. Owing to the friction in the pipes not much will come through, and such as there is can only come from the down spouts or such external connections as there may be on the house-side of the trap, and will therefore be harmless, unless it meets with some stagnant sewage in the house drains themselves which ought not to be there. We have seen that trapping the inlets will not stop the air entering the house, while the stagnant contents of the traps will perhaps turn otherwise harmless air into poisonous gas.

If the drains within a house are already well laid, it may not be worth while to disturb these simply to do away with the traps; but where this is not the case, or where after the external trap has been put in there is still annoyance from the drains, then the best plan will be to reduce the whole system of drains as much as possible, as shown in Fig. 8, and do away with all traps except the pan of the closet. And above all things see that the new drains are well laid, and keep a register of their position.

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A DIGEST OF FACTS

RELATING TO THE

TREATMENT & UTILIZATION

OF

SEWAGE.

BY

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