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Contributors

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HINTS ON
SANITARY FITTINGS
AND
THEIR APPLICATION.

BY

R. M. WHARAM.

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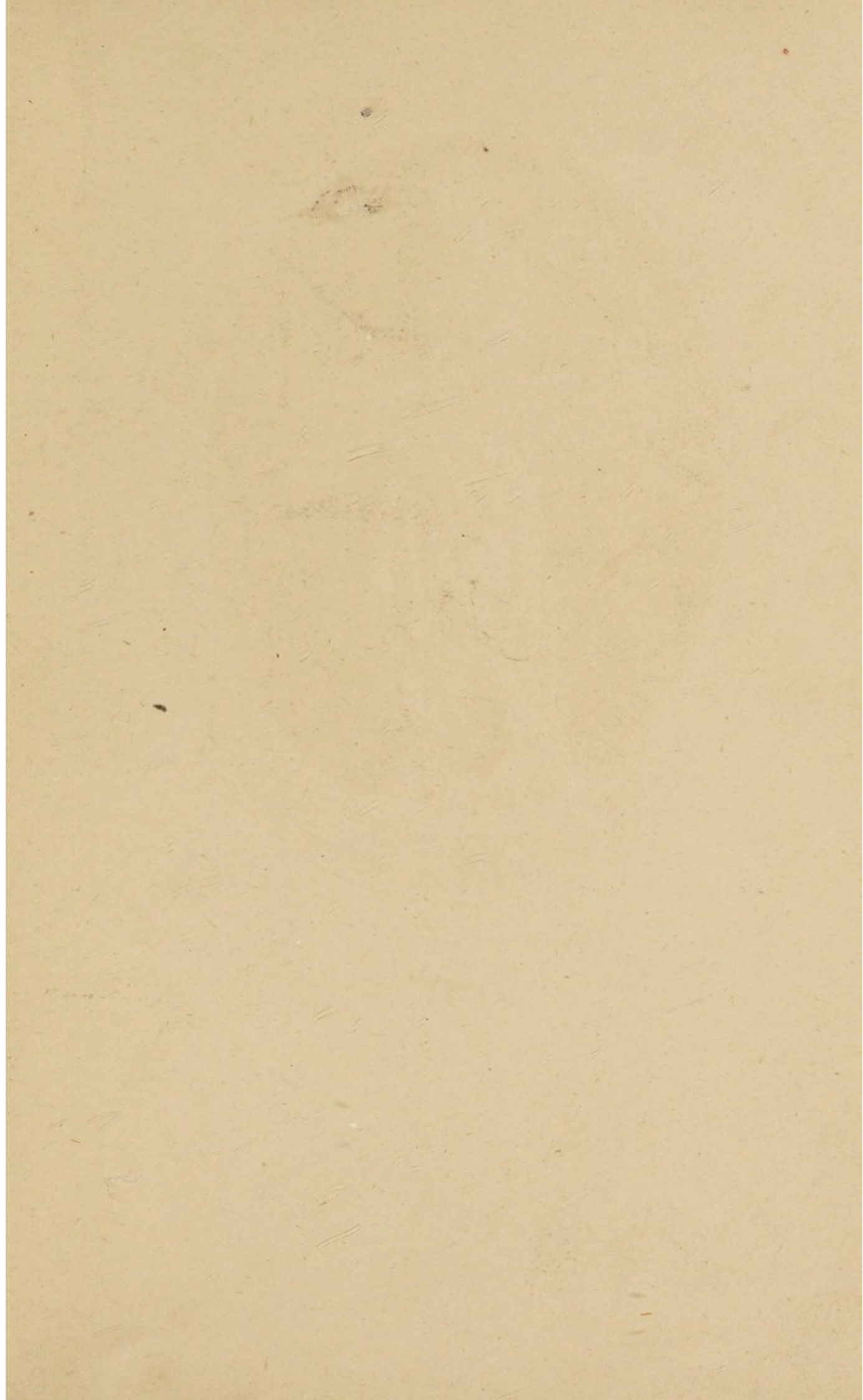
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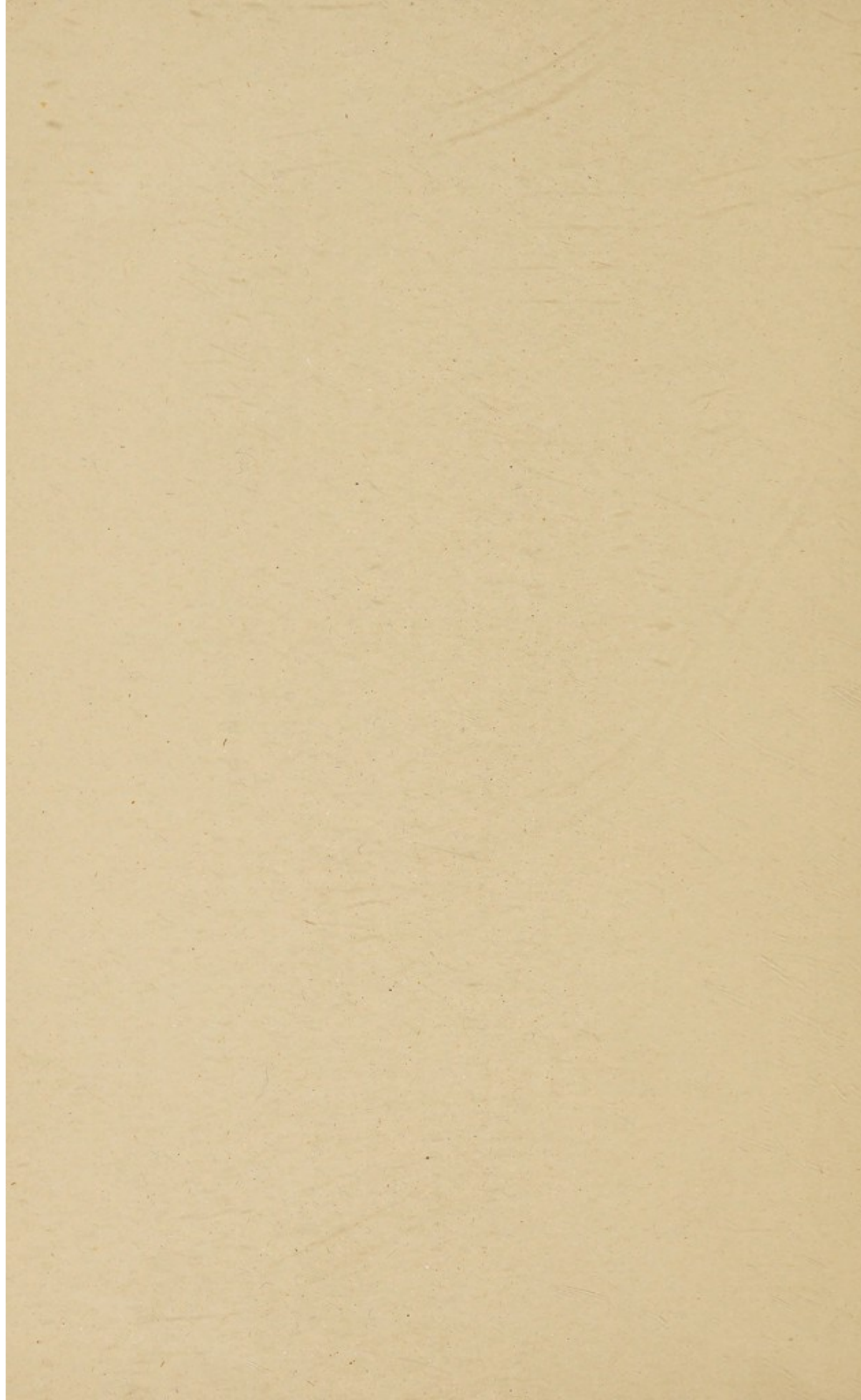
Author



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March 1892





HINTS ON
SANITARY FITTINGS
AND
THEIR APPLICATION.

BY
ROBERT MARR WHARAM.

LONDON :
H. & W. BROWN, 20 FULHAM ROAD, S.W.

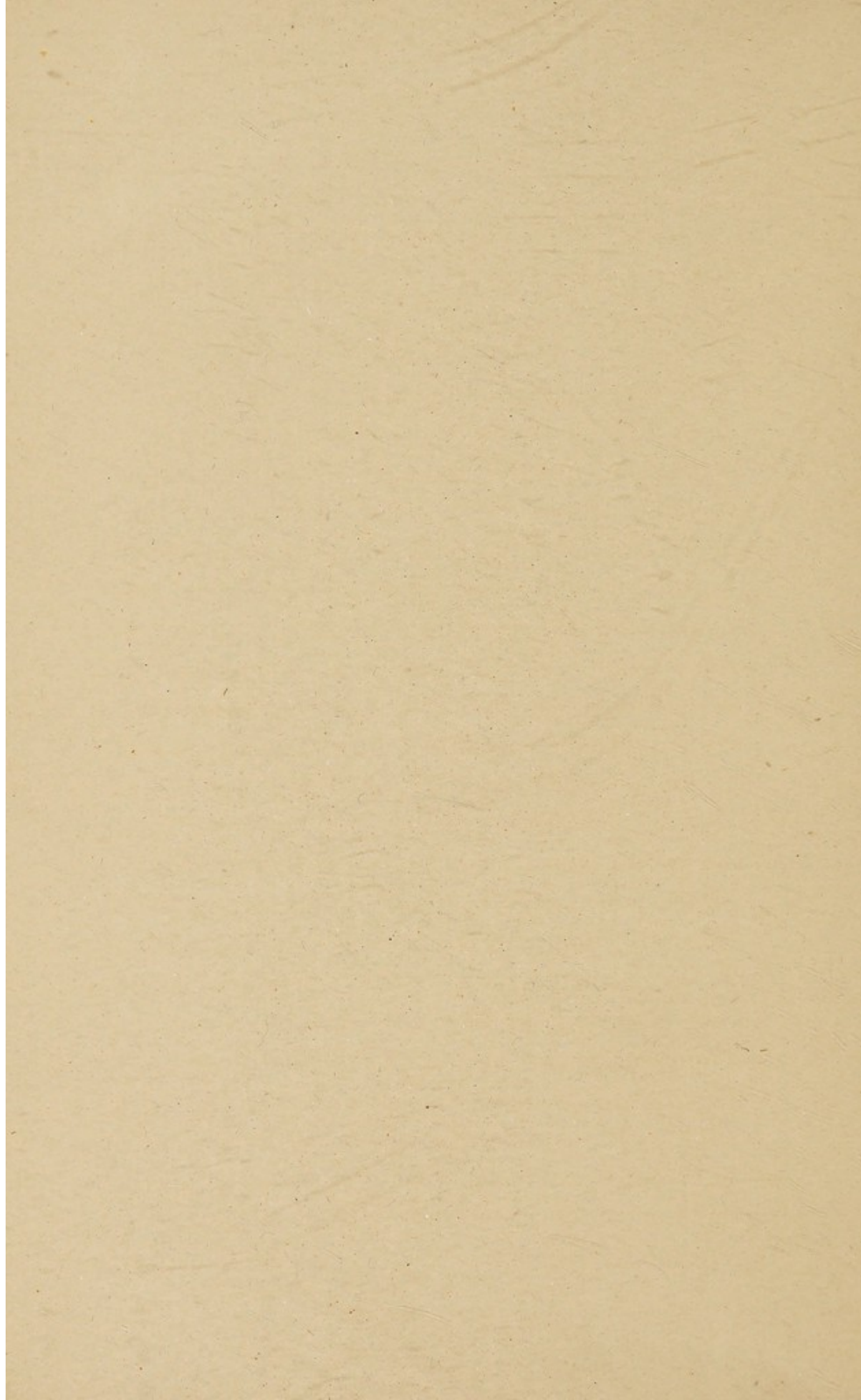
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PREFACE.

Many of my readers may, in all probability, be sufficiently conversant with the principles and methods detailed in this little work to render it superfluous so far as they are concerned; but a daily recurring experience convinces me that there are many—very many—among both owners of house property, and those more immediately interested in sanitary work to whom the information I offer is useful and valuable. Only those who are conversant with these matters can appreciate the amount of inconvenience and monetary loss, and unhappily in some cases the loss of health and even of life, entailed by carelessness in the construction of drains, and in the application of even the best of fittings. I feel strongly that a wider knowledge on these points will be to the benefit of all concerned.

R. M. W.



Sanitary Fittings and their Application.

Considering that drainage, in the sense in which it is generally understood by townspeople in this country—the removal of fluid refuse from dwelling houses—with such kindred matters as ventilation, the supply of pure water, and the wholesome preparation of food are such vital matters, it seems almost incredible that so little progress should have been made in the 2000 years that we may fairly claim to be within the reach of history; and it says much in favour of the resisting power of the human body against such deadly poisons as those we have been exposed to by our own carelessness and consequent ignorance, that in spite of all, the human race has gone on increasing.

A very important step was the recognising of the fact that animal and vegetable matters undergoing those chemical changes which are commonly known as putrefaction and decay give rise to aerial products which are inimical to health and life. It was noticed that great wars were followed by extensive outbreaks of disease; then that accumulations of refuse were frequently found in localities where infectious fevers raged; and so these clues

were traced downwards to smaller evidences of the same facts. Fifty years ago the arrangements for the removal of sewage from the precincts of houses were still of a primitive description, and it is only during the last twenty-five years that anything like rapid progress has been made in the construction and application of suitable fittings to our dwellings.

A further advance came with the knowledge that these poisonous gases were rendered comparatively harmless by free dilution with purer air; and as a natural sequence came the practice of ventilating our drains.

For practical purposes it may be as well to consider the subject in relation to London houses of the annual rental of about £50, for the main principles embodied would apply to both larger and smaller dwellings.

The great arterial system of the Metropolitan Main Drainage—the largest, and most perfect system of the kind the world has ever seen—is pretty generally understood. How the house-drain delivers into a sewer under the roadway of perhaps a small street, which again delivers into a larger sewer under a larger street, and this in turn into another, and so on till one of the great trunk arteries of the system is reached, is understood, more or less, by all of us. But for the

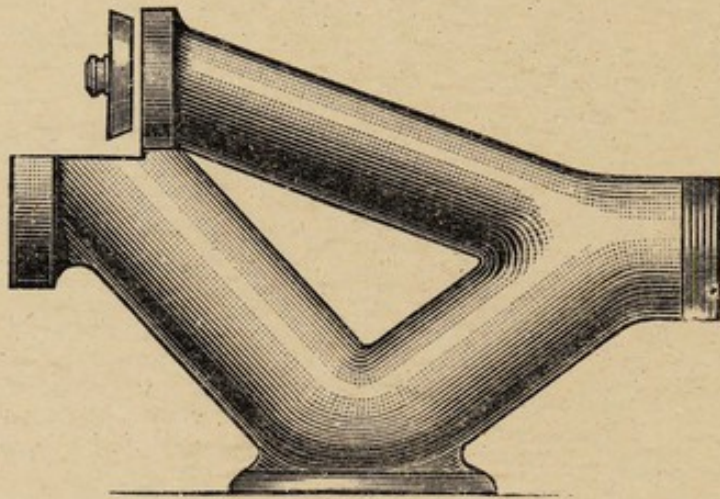
present purpose it is intended to confine attention to the unit of this vast system—the single house.

One of the chief dangers attending this system, and constituting a standing menace to the health of the household, is the accumulation in portions of the sewer of the gases—known as sewer gas—given off in the processes of decomposition which are constantly in action there; and although sanitary authorities now give much more attention than formerly to the ventilation of sewers, and the rendering these gases innocuous by dispersion and dilution with fresh air, this deleterious mixture not infrequently finds its way into dwelling houses through the drains and their defective or inefficient fittings. Many and various are the methods and appliances which have been introduced from time to time to prevent the possibility of its entry, but it is now recognised that the most effective manner of preventing sewer gas entering the house by the drain is by means of a water trap intervening between the house and the sewer. This, in connection with a good drain on the following or similar lines of construction is accepted as being as near perfection as we have as yet arrived.

Assuming, then, that the house drain delivers into a sewer in roadway in front of the house; between the sewer and the house a well-built,

water-tight chamber should be constructed which should be of sufficient capacity to allow a man to move freely when attention to the drains is necessary. A similar chamber should be constructed outside the house, at the back, and the main house drain connects these two, in a straight line where possible.

Returning now to the inspection chamber at front: at the bottom a stoneware disconnecting

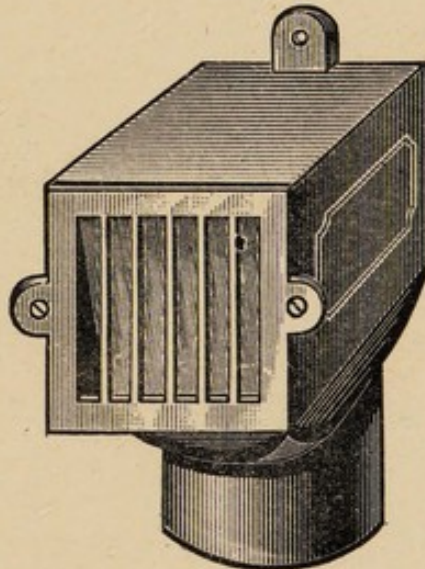


Stoneware Disconnecting Trap, for intercepting main drain between the house and the Sewer.

trap should be fixed in the drain pipe. This is relied upon to "disconnect" the inner portion of the house drain from the outer portion and the sewer, and to prevent the passage of air from the sewer inwards towards the house. The connection between the inner portion of main drain and the disconnecting trap is by an open channel pipe. In

in some cases a water drain from roof, portico, or verandah, or waste from a bath-room has to be carried down the front of house. They should be discharged over a gully trap, and junctions must then be provided in the channel pipe to take the out-go from these gulleys.

Connected with this chamber, preferably by a vertical pipe of galvanised iron, there should be an air-inlet valve.

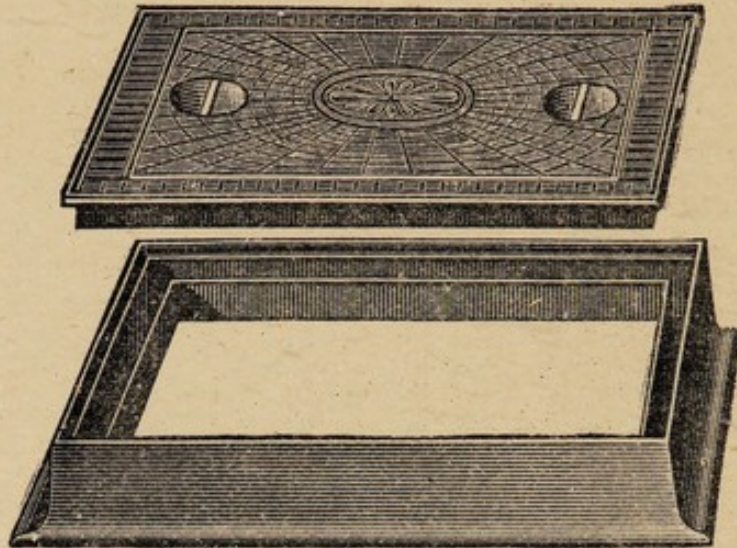


Mica Air Inlet Valve.

This inlet has a talc which yields to the least current of air from the outside, letting in fresh air, but by its own weight closes against a back current preventing the escape of sewer gas, which at this point would be objectionable, as the inlet is usually placed near the entrance to the house.

To close the opening to this inspection chamber,

a cast iron frame, carrying a movable cover, should be built in at the top of the chamber. This, when fitted, should be air-tight.



Air-tight Drain Cover, with frame.

The main drain coming from the inspection chamber at the back should receive particular attention. If it can be laid outside the house so much the better, but in many cases this is impossible, and therefore it must pass underneath.

Circular drain pipes, not more than six inches internal diameter, are preferable. If the pipe is larger the stream is wider and shallower, and this necessarily reduces the scour. If of earthenware—and these have much to recommend them, provided there is no likelihood of the earth subsiding—they should be laid on a bed of concrete, and also covered with concrete. If of iron they

should be of suitable strength, and coated inside and outside with solution to guard against oxidation. They should be laid in as direct a line to the sewer as possible, with a sufficient uniform gradient. Junctions in the drain should never be at right angles, but at an acute angle (as railway junctions are) and in the direction of the main flow, and great care should be given to the jointing of the pipes.

There is now in the market such a variety of branches for use in connection with house drains that there is no excuse for rough joints with projecting ends or edges which would be likely to retard the flow.

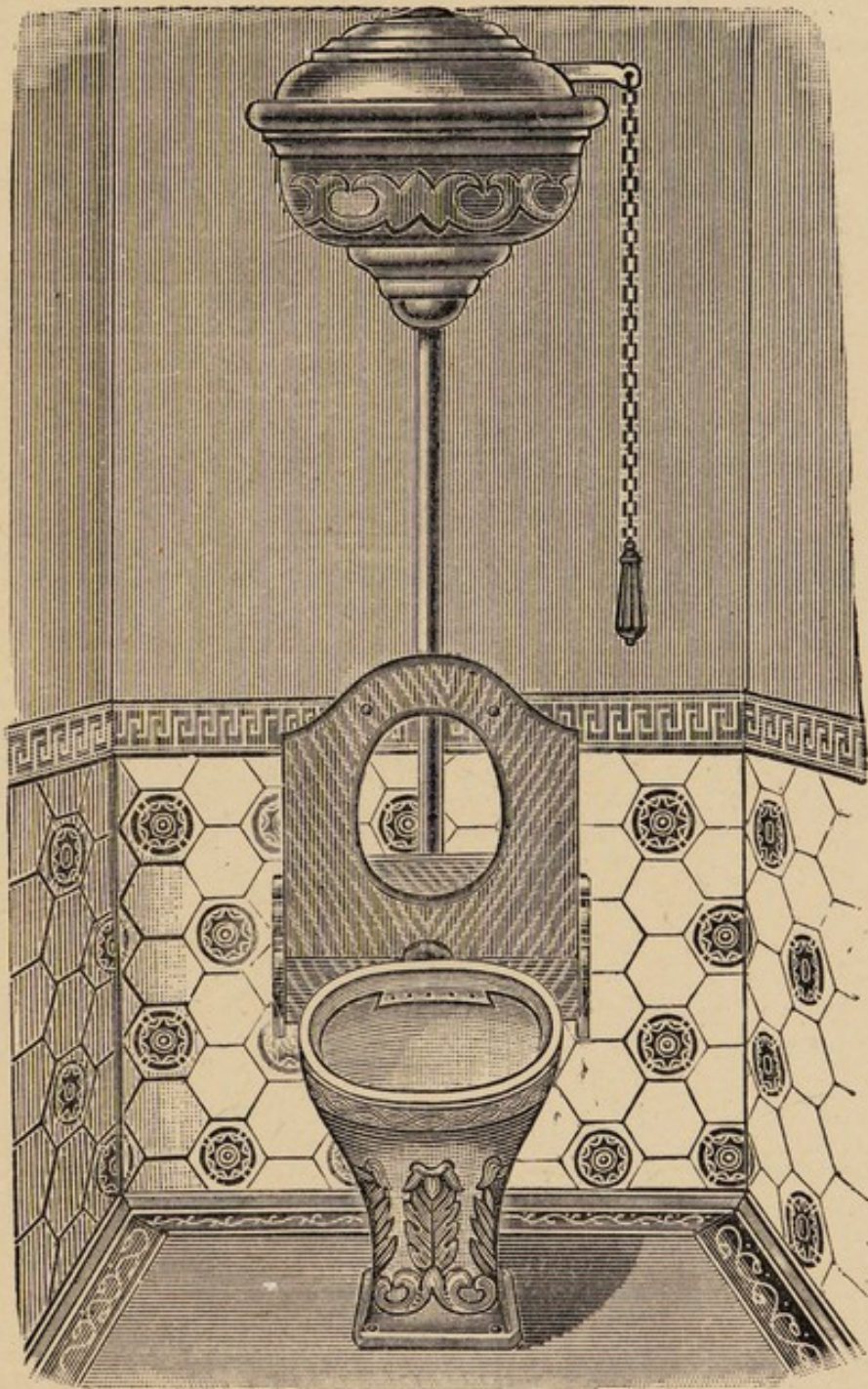
At the highest point of the main drain, which should be outside the house but near to the outer wall in the back area or garden, the second inspection chamber should be constructed, with suitable floor and channels to receive the branch drains, soil pipe, etc., and an opening at the top to allow of access, with cast-iron cover let into iron frame, similar to the one at front.

This modern style of having drains accessible, and in many cases having them periodically inspected, is in strong contrast to the older style of putting everything out of sight with a sort of blind trust that all would go on right without any sort

of attention or supervision—as many do even now with their clocks, locks, kitchen ranges, and other household accessories. And the same feeling prevails in regard to internal fittings. It is now considered the best practice to place all sanitary and plumbing fittings in view, and in easily accessible positions—needless to say they should be kept out of sleeping apartments. Wooden casings with their accumulations of damp and dust, and their accompaniment of unwholesome smells — often wrongly attributed to defective plumbing work — are now very generally avoided. In case of accident, too, there is far less damage, delay, and annoyance where pipes are easily accessible.

Great care should be taken in the selection of all sanitary appliances. All earthenware fittings should have as smooth a surface and be as impenetrable as possible. Two merits should especially be sought: simplicity of construction and action, and fitness for the purpose for which they are intended. Owing to failure in these requirements there are some appliances which are a positive evil in themselves.

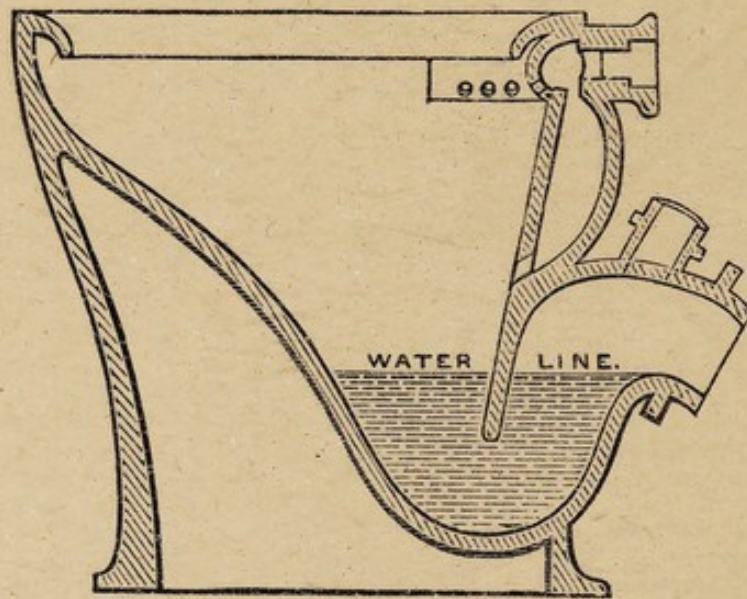
We will assume that there are two water closets, one inside the house, say on the first floor, and the other outside the house in the back area or garden.



Combined W.C. Apparatus.

The water closet apartment inside the house might well be a larger room than is commonly provided, and also should be properly ventilated. That is, there should be suitable provision for inlet of fresh air and outlet for impure air. A small window is often the only available ventilator, and this is much more frequently an inlet for an uncomfortable draught than an outlet.

For the inside of house a very simple and efficient apparatus is one which combines W.C. basin

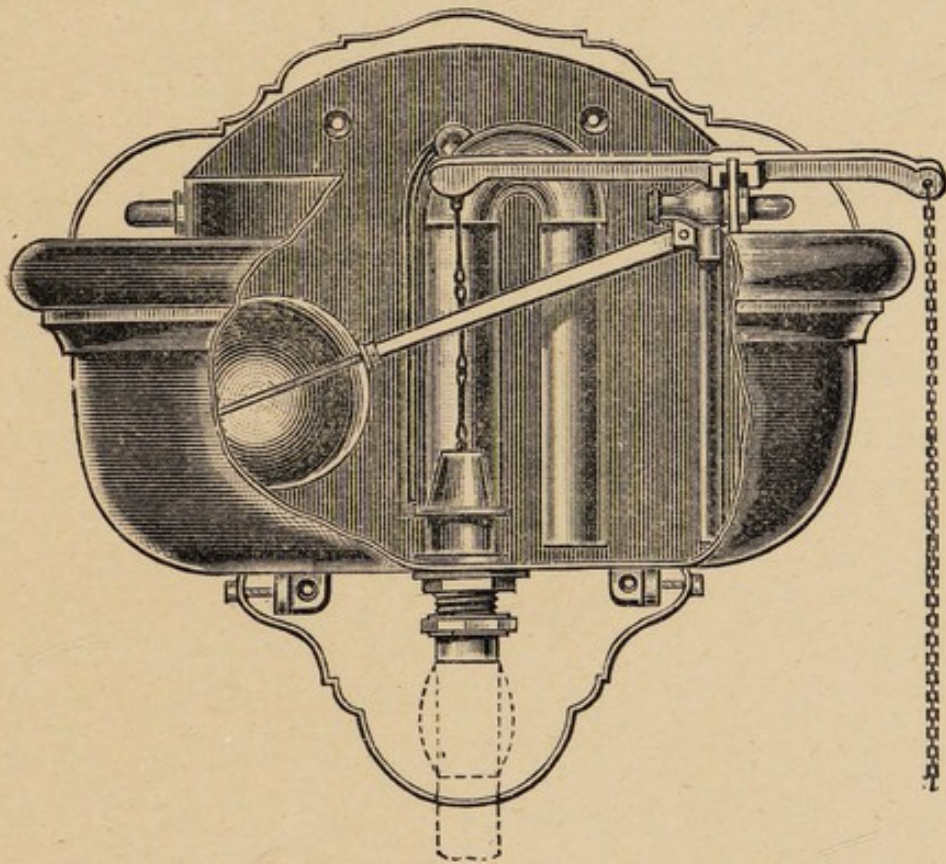


Section of the Basin and Trap (combined apparatus).

and trap, urinal and slop sink. The basin is known as a "wash-down." The trap is above the floor, so that any leakage could be readily seen, and remedied.

The W.C. seat is self-rising which obviates any nuisance when the basin is used as urinal or slop sink.

The flushing cistern shown has a syphon action, and contains about 3 gallons of water. It should be supplied from a separate cistern provided for



Section of Ornamental Syphon-Action Flushing Cistern, with tranquil inlet and silencing discharge.

the W.C. apparatus. An overflow should be attached to flushing cistern, to discharge into open air, and a pipe, $1\frac{1}{2}$ inches internal diameter, should be attached to outlet underneath, and

properly connected to the arm of the closet basin. The water in this cistern could be discharged automatically by a seat-action arrangement—a very desirable addition for hotels and public institutions.

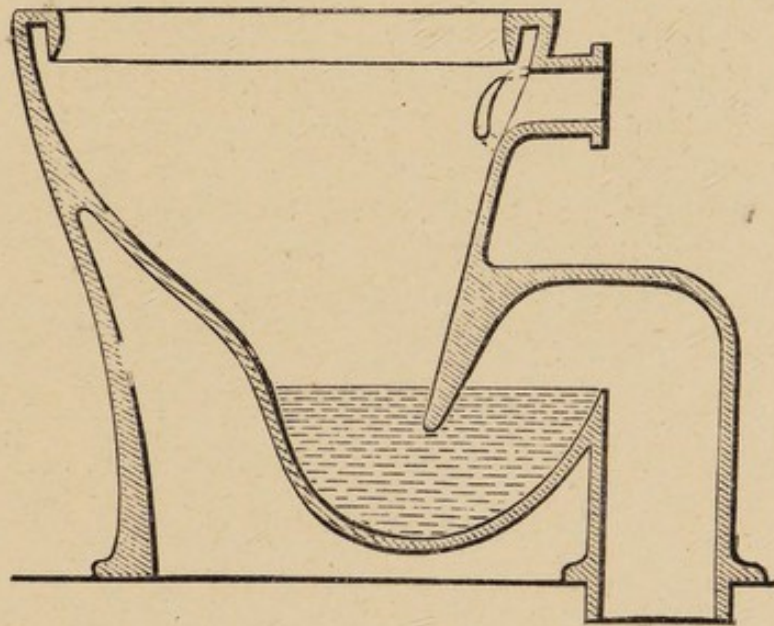
To the trap of the closet should be connected a lead out-go carried into a vertical soil-pipe outside the house. This soil-pipe should be a strong lead pipe about $3\frac{1}{2}$ inches internal diameter: the lower portion should be made good into one of the channels in chamber situate in back area or garden, and the upper portion should be continued up above the house to act as ventilating pipe, with a domical wire grating at the top. To prevent syphonage of closet trap a lead pipe should be attached to the ventilating arm and carried through external wall and connected to soil-pipe above the out-go of W.C.

By the introduction of fresh air into the inspection chamber at front of house, and the ventilated soil-pipe connected to chamber at back of house, a current of fresh air will be continuously passing through the main drain. This should prevent stagnation of the air in the house drain which is a source of danger to health.

It is advisable that the water-closet outside the house and situate in the back area or garden, should be as far as possible from the larder or other

apartments. For W.C. the basin and trap shewn below will be found to be simple and efficient.

The trap should be carefully connected into a pipe laid in the direction of, and connected to one of the channels in the chamber in the back area or garden. The principle of this W.C. apparatus



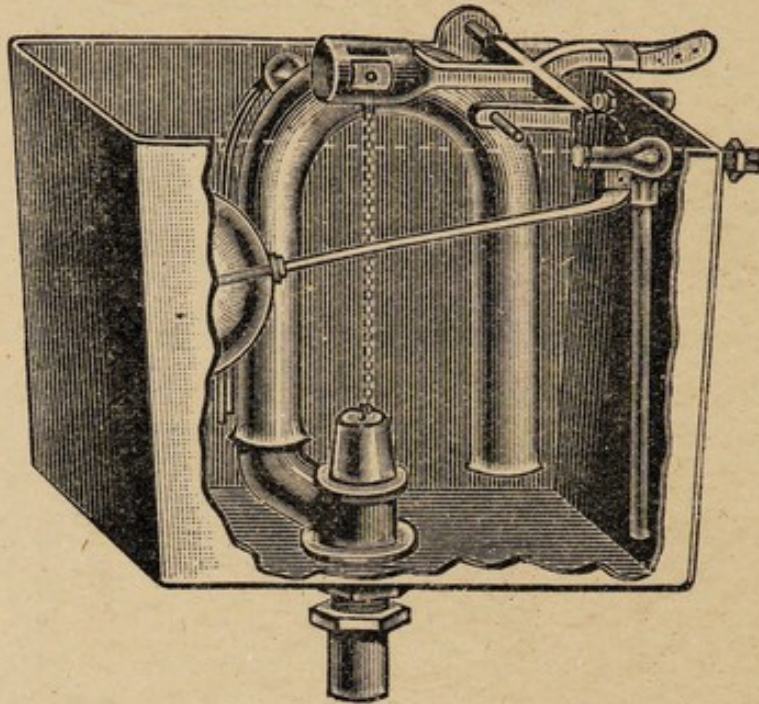
Section of Basin and Trap for Servants' W.C.

is identical with that for inside of house, shewn in illustration on page 16, and although less costly in design and material, it is quite as effective.

The flushing cistern should be syphon action, should contain about 3 gallons, and have a discharge pipe $1\frac{1}{2}$ inches in diameter properly connected to arm of basin.

It is always advisable that a separate cistern be provided for storage of water for the water-closets.

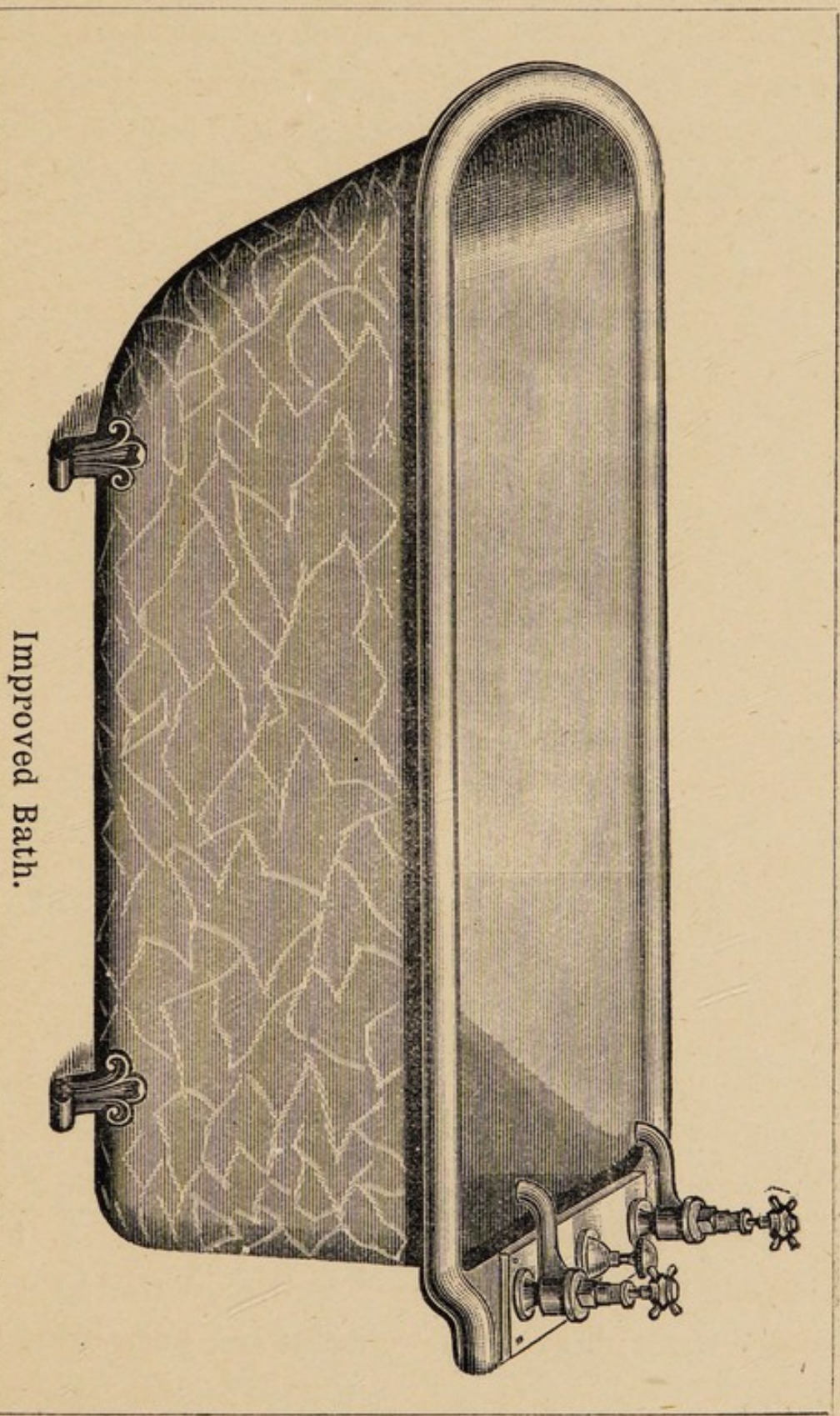
By this means the possibility of contamination of the water used for culinary or drinking purposes is greatly reduced.



Syphon-Action Flushing Cistern for Servant's W.C.

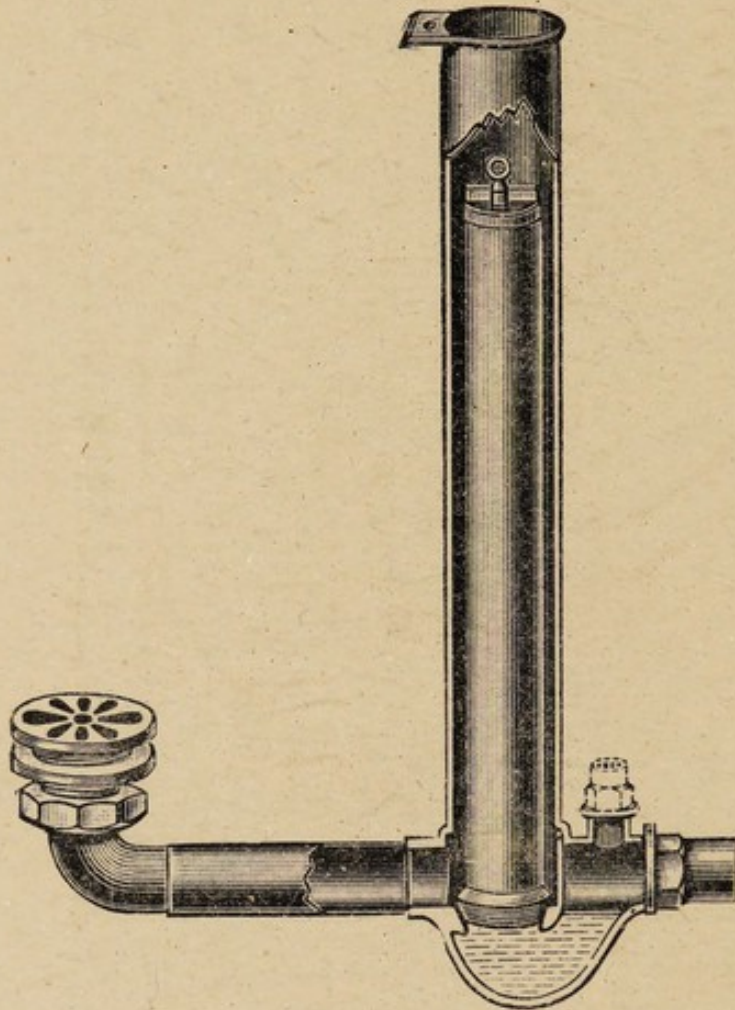
Most modern houses have a bath-room: here again the modern teaching is to keep all fixtures well in view, and to avoid unnecessary enclosures. The type illustrated on opposite page is now largely superseding the cased-in baths hitherto used.

The supply valves are fitted so as to discharge over the top of bath, as shewn in illustration, and any defects can be readily observed. In view of any casualty which might result in an overflow of water, a lead tray fixed underneath the bath is a desirable addition. This should be



Improved Bath.

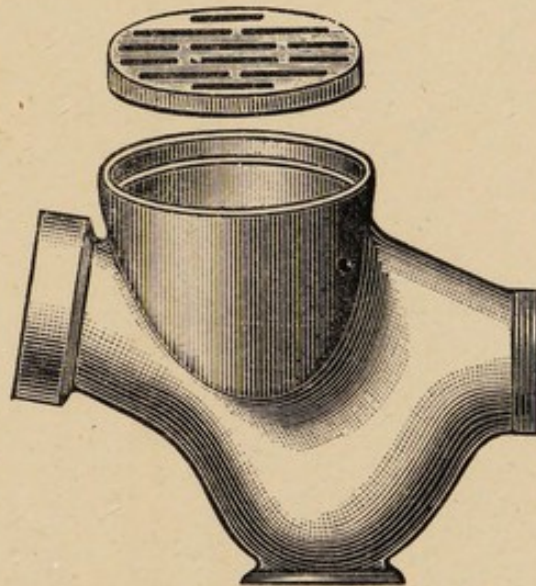
drained by a lead pipe discharging into the open air by a flap valve. The waste apparatus shewn combines an overflow and trap, and should be at the foot of the bath, but above floor. At



Section of combined Overflow, Waste, and Trap for Bath.

the upper part of trap there is a vent-union to connect anti-syphonage pipe, which should be carried through external wall to a point above head of bath.

To this waste apparatus should be attached a lead pipe of sufficient diameter to allow of the bath being speedily emptied. This pipe should carry outside external wall, and discharge into a suitable hopper. To outlet of hopper a lead or galvanized iron pipe about $2\frac{1}{2}$ inches internal diameter should be attached by a water-tight joint, and continued down, and delivered over



**Gully Trap, to receive Waste from Bath, Lavatory,
and Rain-water Drain from Roof.**

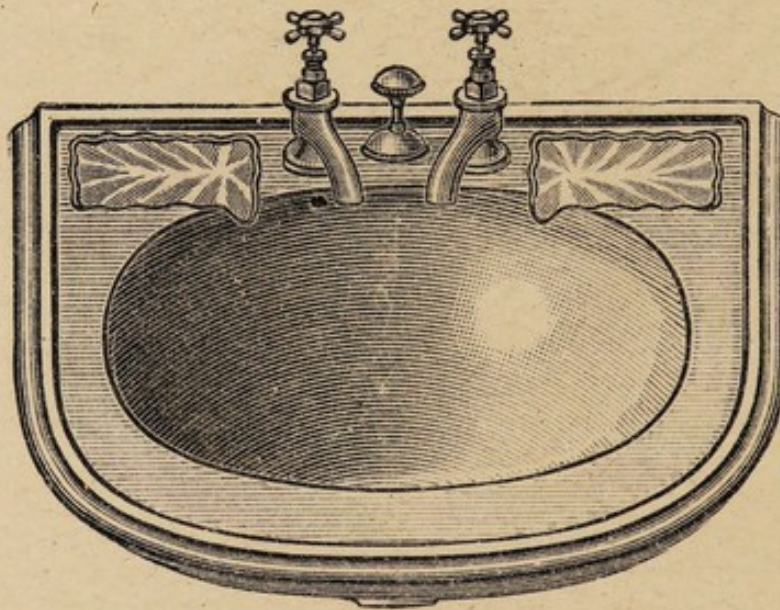
a gully trap. To the outlet of gully trap a suitable pipe should be connected and made good into one of the channels in the chamber in back area or garden.

Care should be taken with respect to open heads fitted to receive wastes that they be not fixed too near windows, for by constant use the

pipes are liable to become fouled, and consequently in hot weather may give rise to obnoxious odours.

It can hardly be too strongly insisted that all wastes should be trapped, and that such traps should be fitted immediately under the bath, lavatory, sink, etc., as the case may be.

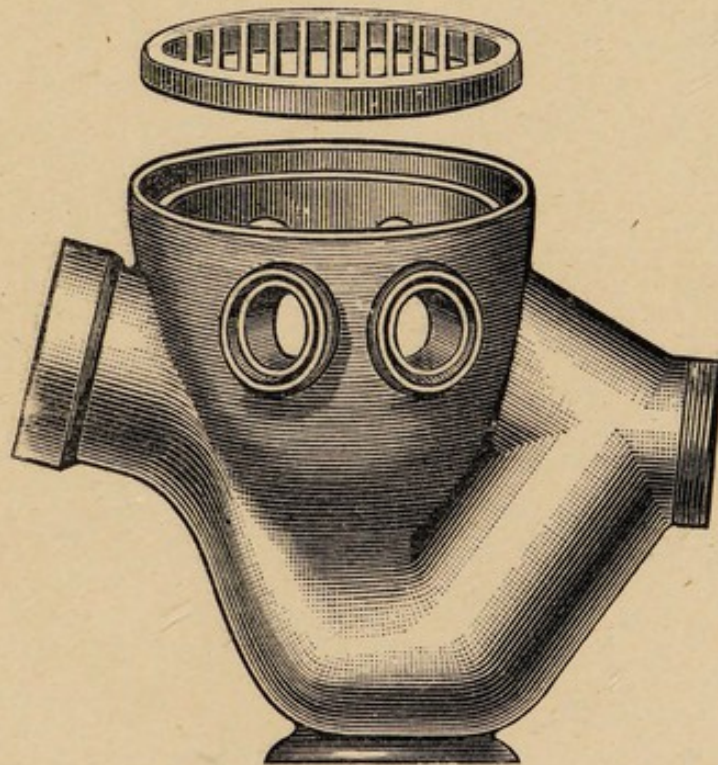
There is now ample scope for selection in lavatory basins. The one illustrated is a convenient shape, and the soap and brush trays drain into the basin, and thus are not liable to become clogged.



Lavatory. Basin.

To the waste apparatus should be attached a suitable lead trap with pipe, which should carry outside external wall, and discharge into hopper provided for waste of bath.

The scullery sink, for which strong enamelled fire-clay is perhaps as good as any, should have a brass grating, with lead trap underneath attached to a lead pipe of suitable size, which should continue through external wall, and discharge into a grease gully. Only those who have experience of drains in large houses, and the amount of fat finding its way to the drain only to solidify, can comprehend the necessity for these grease traps and the

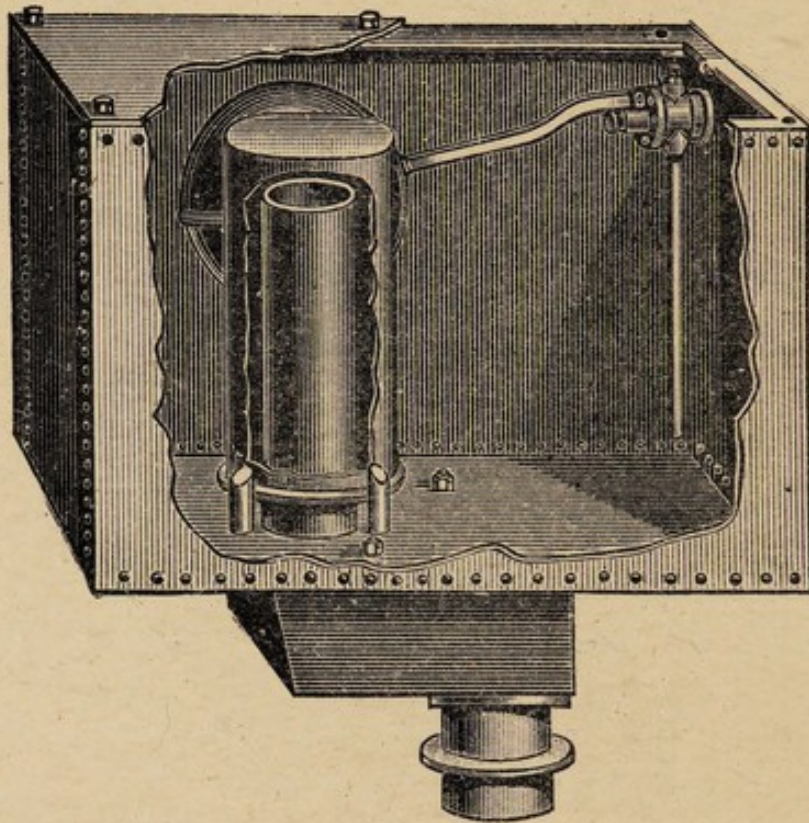


Grease Trap for use with Automatic Flushing Tank.

accompanying automatic flushing tank. The trap should be fixed in the back area or garden, as near as possible to the inspection chamber, and it is as well the flushing tank be

fixed over it; the outlet of the tank about four feet above the trap to accelerate the velocity of the discharge. To the outlet of the tank should be fixed, in a vertical position, a pipe of similar diameter, and connected to inlet arm of grease gully trap.

The construction of this grease gully trap is such that the grease is carried off into the sewer



Automatic Flushing Tank, for use with grease trap, or with drains of low gradient.

by means of a heavy flush of water from an automatic tank. Few houses may require the use of all the inlets. Those not in use should be capped up.

The flushing tank should discharge about 35 gallons of water at each flush, and have a regulating tap to the supply valve, so that the discharge may take place at fixed periods, say once or twice each day.

These flushing tanks are also especially useful in the case of drains having only a small gradient where deposit of solid matter is likely to take place: for it is an important feature in sanitary work to make all water pipes and appliances as absolutely self-cleansing as possible.

In the foregoing remarks it is assumed that the construction of the drains are fairly under control, as would be the case in erecting new houses; but unhappily it too frequently occurs that in houses which are already erected radical alterations are required before the premises can be pronounced safe for habitation. In such cases the drains and soil pipes can be easily tested as to their soundness by means of water, smoke, or oil of peppermint. This should be done throughout the entire course as far as the sewer in roadway, and if the sanitary condition of the house is proved to be bad, all worn and defective work, and inefficient appliances, should be removed; also all sewage-contaminated earth from about the defective drains, and in its place clean, dry earth substituted.

The most approved provision to carry away rain-water from roof is galvanized iron pipe, about $3\frac{1}{2}$ inches diameter, made perfectly water-tight, fixed at back of house, from gutter downwards, and connected to inlet arm of gully trap, provided for waste of bath. If it is necessary to have a rain-water pipe at front of house it should be dealt with in a similar manner. Smaller pipes from portico or bay window may be carried into the rain-water pipe if one be fixed, or carried down, and discharged directly over a separate gully.

No waste or overflow pipe should be connected to soil pipe, nor to any pipe connected with drain. It may seem unnecessary to have the rain-water pipe disconnected and delivering into a gully trap, seeing that the pipe does not appear to be connected with the inside of house, but it must be borne in mind that an accident might happen to any of the joints, and the pipes being in a vertical position a slight defect might not readily reveal itself; yet through such defects foul gases may escape, and this very probably in proximity to some of the windows.

Surface water may be dealt with by gully traps fixed in suitable positions in area or garden. Care should be taken to obtain a proper fall toward these gullies. The outlets should be con-

nected to chamber in a similar manner to gullies taking rain-water from roof.

The position for the cistern containing water for culinary or drinking purposes should be carefully chosen. Outside the house is perhaps the better, provided it is sheltered from the sunlight. If inside they should be fixed in a well-ventilated room at the upper portion of house ; in either case they should be easily accessible for cleaning. They may be of galvanized iron, and should have proper coverings to keep out dust, etc. The usual overflow for each should be provided to discharge into the open air.

Briefly stated, the chief points to be looked to in a house drain are :—

(1.) The main drain, of about 6 inches diameter, having a sufficient, even, down grade to the sewer, and as straight as possible.

(2.) Two inspection chambers near external walls outside the house, *i.e.*, one at the highest portion of the main drain, and one at the lower side with an intercepting trap.

(3.) An inlet for fresh air to the lower inspection chamber, and an outlet from the higher portion of drain carried up above roof. This is

practically a syphon inverted, and will be found to be almost continuous in its action : and it may be noted that when the long arm of the syphon, that is, the ventilation pipe to the roof, is warmed by a contiguous flue, the up current is increased.

(4.) To use W.C basins and traps of well glazed earthenware, and of simple construction. Efficient flush is, of course, a *sine quâ non*.

(5.) To have all wastes from baths, lavatories, sinks, etc., trapped, and with provision against syphonage.

And generally to have all plumbers' fittings easily accessible, and to avoid unnecessary casings, such as are likely to accumulate dust, and impede free circulation of air.

It is not improbable that a very few years will see important changes in the regulation of many matters connected with house drains. Within the last few weeks several actions have been tried, and the results have been verdicts for damages against the lessors of properties in which the drains were proved to be defective, and to have caused illness in the families of the lessees. It is to be hoped that the outcome may be the requirement of some definite information as to the construction of the drains and appliances in each and every house, so

that an intending tenant or purchaser may be able to obtain a form of warranty as to what he is undertaking; whilst on the other hand the lessor or vendor, as the case may be, may be protected from costly litigation. Perhaps the difficulty would be met by some form of registration of houses at the time of erection. Whether this certificate should be given by local authority, or whether the duty of self-protection should not rather be left to the individual, is a matter for consideration by all interested. It is certainly anomalous that a government which imposes fines for comparatively harmless adulterations of food, and restricts the sale of poisons, the storage of substances dangerous to life, and the carrying on of trades prejudicial to health, should tolerate the practice of letting and selling houses with inefficient sanitary provisions which are practically death-traps to those who inhabit them. But it has to be said that when the principles and details of modern sanitation are more fully understood the public will be in a position to protect themselves.

June 24, 1891.

