

No. 697,369.

Patented Apr. 8, 1902.

I. SHONE & E. AULT.

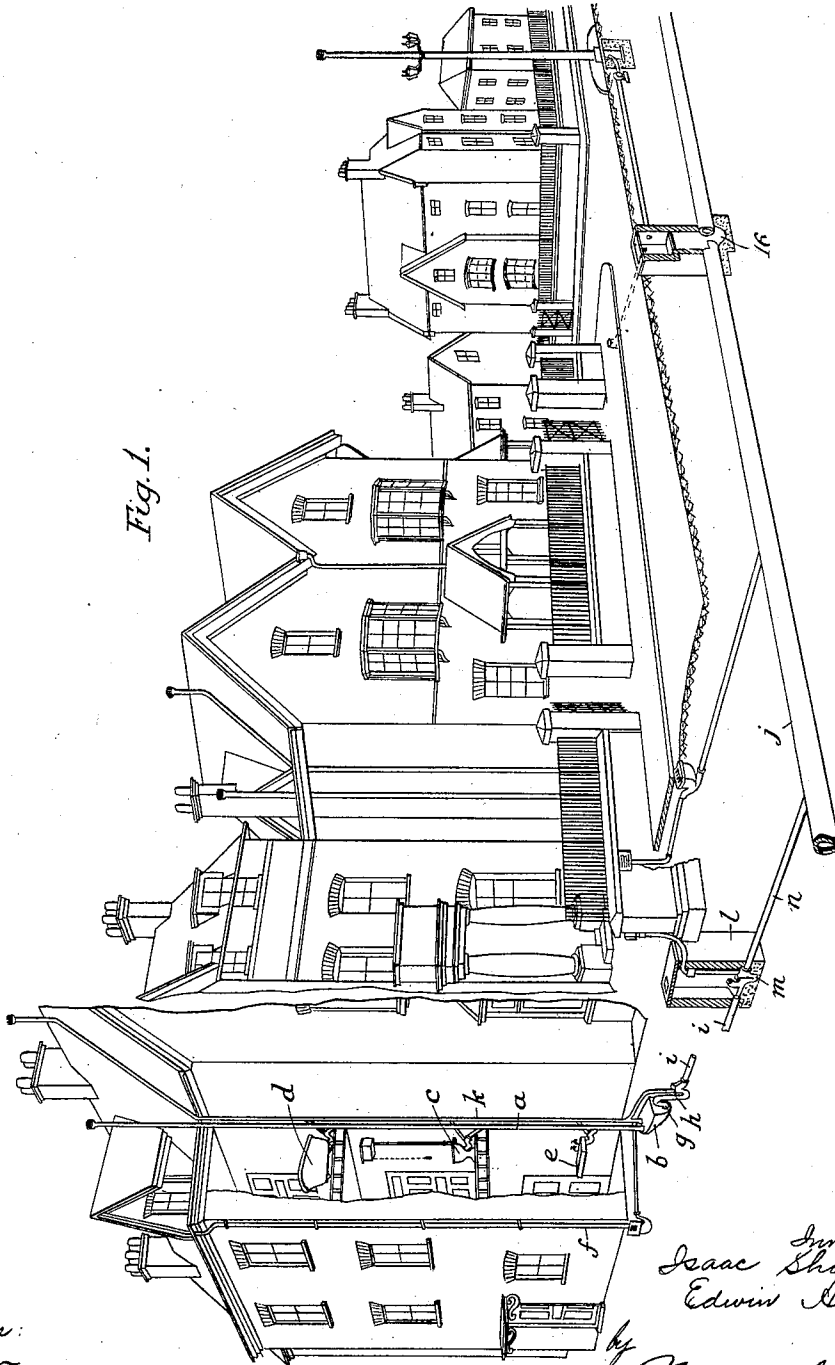
MODE OF AND MEANS FOR VENTILATING AND FLUSHING HOUSE DRAINS OR OTHER
DRAINS AND SEWERS.

(Application filed Aug. 8, 1901.)

(No Model.)

5 Sheets—Sheet 1.

Fig. 1.



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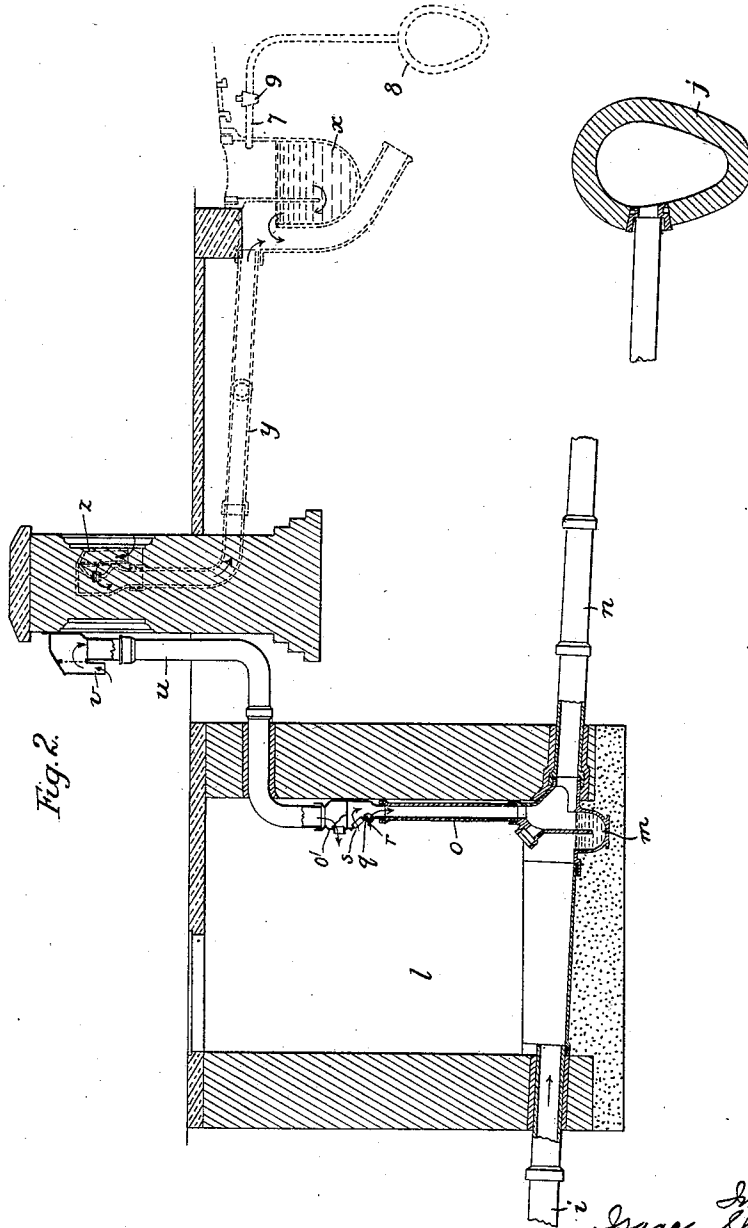
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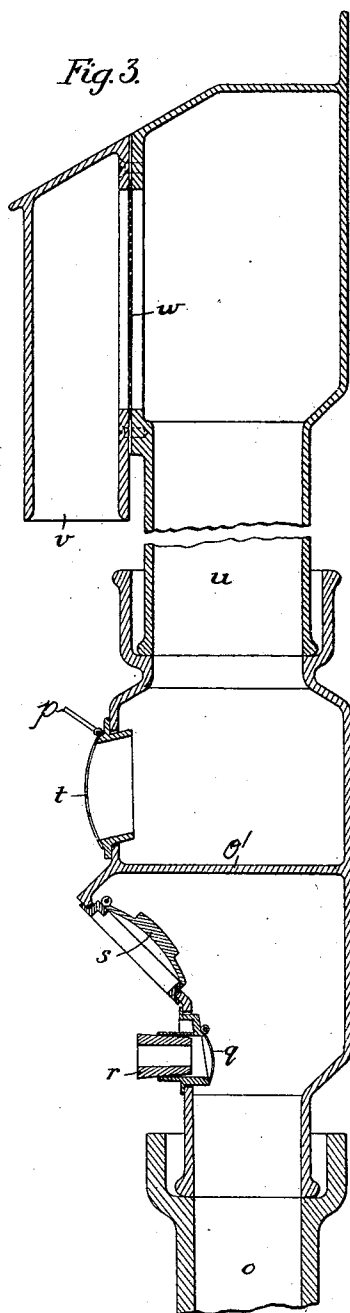
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5 Sheets—Sheet 3.



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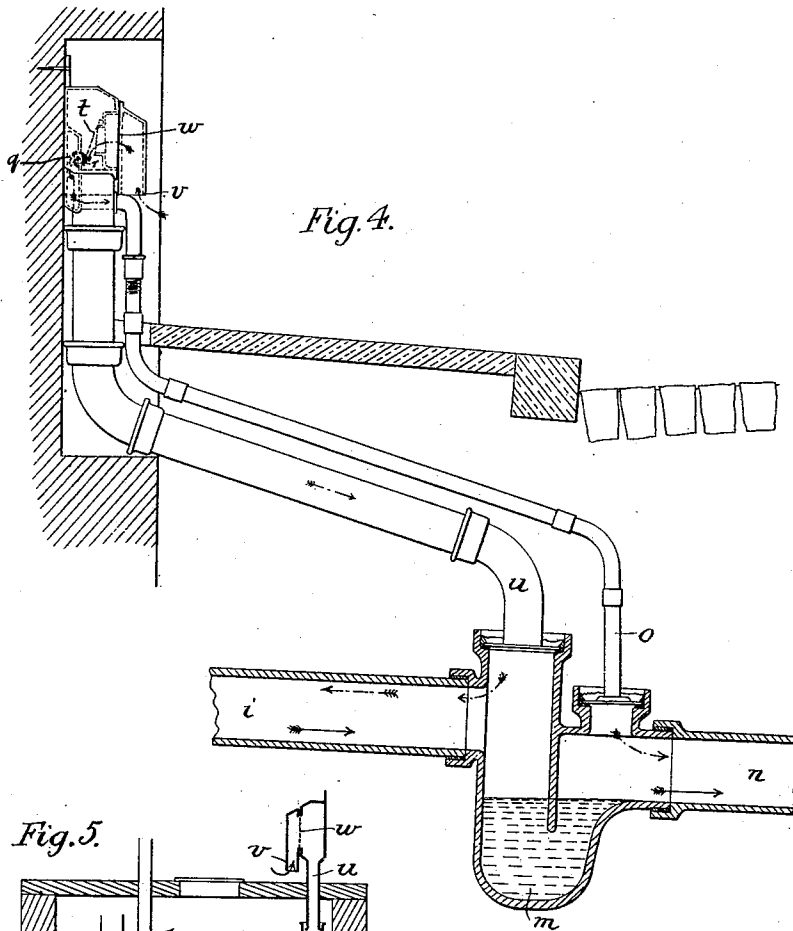


Fig. 4.

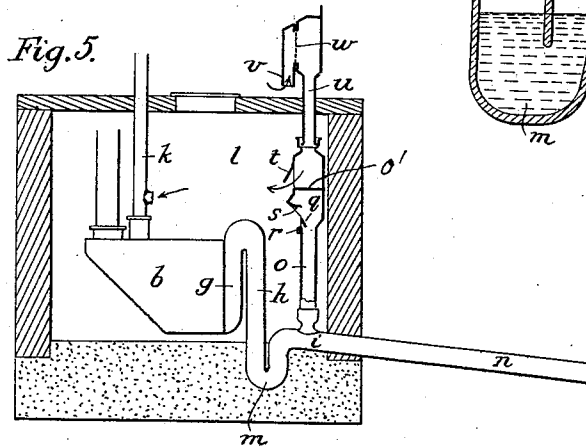


Fig. 5.

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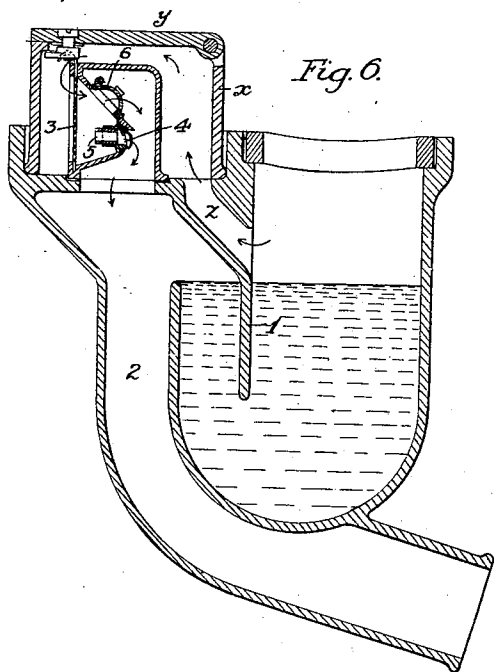


Fig. 6.

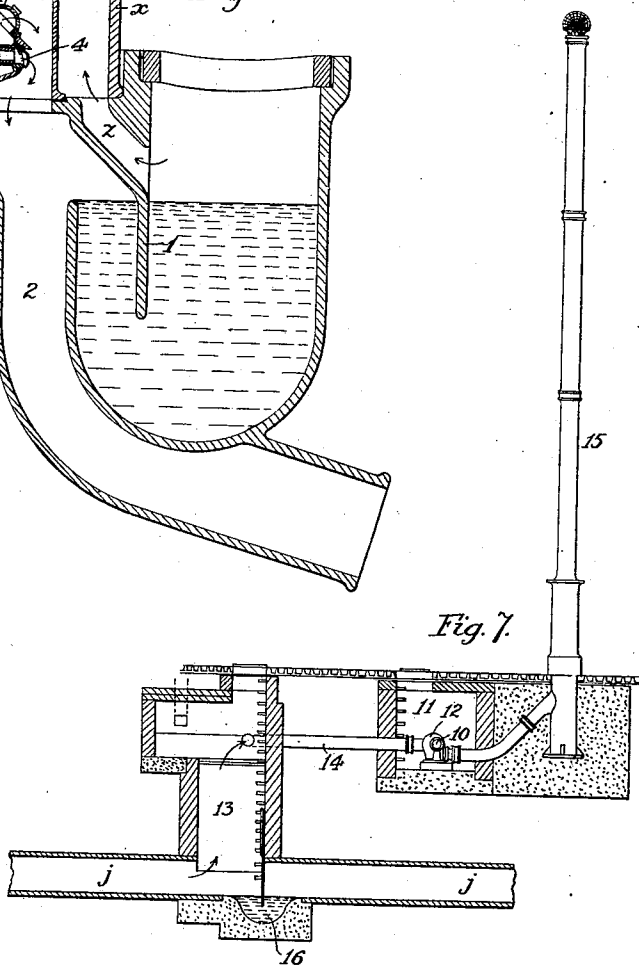


Fig. 7.

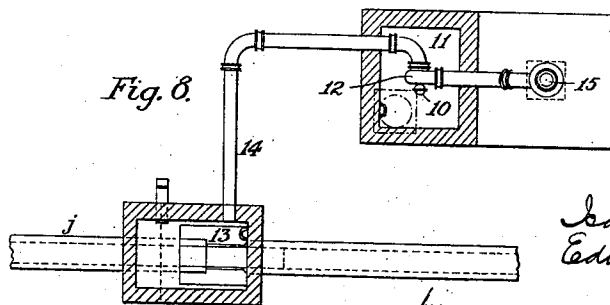


Fig. 8.

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UNITED STATES PATENT OFFICE.

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MODE OF AND MEANS FOR VENTILATING AND FLUSHING HOUSE-DRAINS OR OTHER DRAINS AND SEWERS.

SPECIFICATION forming part of Letters Patent No. 697,369, dated April 8, 1902.

Application filed August 8, 1901. Serial No. 71,409. (No model.)

To all whom it may concern:

Be it known that we, ISAAC SHONE and EDWIN AULT, civil engineers, subjects of the King of Great Britain and Ireland, residing at 47 Victoria street, Westminster, London, England, have invented a new and useful Improved Mode of and Means for Ventilating and Flushing House-Drains or other Drains and Sewers, of which the following is a specification.

In the arrangement now generally in use the liquid waste and rainfall waters which are discharged into the drains proceed to the sewers through what is called an "interceptor-trap" in driblets or in small quantities, and generally no self-cleansing action takes place, owing to the large size of the drain and the flat gradient at which it is laid and also owing to the shape and size of the interceptor-trap. To produce a cleansing action, but of an expensive character, automatic flush-tanks are sometimes employed, using from twenty to two hundred gallons of valuable potable water at each operation. The intervals between the discharges are, however, long, and the traps are frequently unsealed by such flushing operations. Moreover, no proper systematic circulation of fresh air in the drains and sewers is effected. The volume of air forced down the soil-pipe into the drain by the discharge from a water-closet is polluted, first, by contact with the interior of the soil-pipe, and, secondly, with that of the drain. It is true that under the present most approved practice provision is made in the inspection-chamber for an interceptor-trap, the water seal of which on the house side of the trap is in contact with fresh air admitted through a mica valve placed at the mouth of the air-inlet pipe, which communicates with the inspection-chamber and the house-drain; but there is rarely any provision made for ventilating that part of the house-drain which lies between the interceptor-trap and the sewer.

The system now used for trapping street-gully waters from the street-sewers is practically the same as it was fifty years ago—that is to say, all the street-gullies are trapped; but there is always in the pipe which carries the rainfall from the gully to the sewer foul stagnant air, which is rarely, if ever, prop-

erly removed till a heavy rainfall comes, and then it is forced into the sewer, to add to the quantity and pressure of the foul air in the sewer, and such accumulated foul air is then driven into the atmosphere somewhere in a haphazard, unscientific, and unsanitary manner.

Now according to our invention we utilize the refuse liquids from a house—such as those from the water-closet, the sink, the bath, and other sanitary appurtenances of a house or other building, with or without the rain-water from the roof or other surface—for effecting a powerful ventilating action, while at the same time considerably reducing the amount of potable water heretofore necessary for flushing purposes. For this purpose we cause all the sewage discharges of the building to debouch and collect into a tank, which may be called the "flushing-ejector." This tank is provided or connected with an upcast air-shaft reaching to or over the top of the building.

Figure 1 of the drawings is a perspective part-sectional elevation as an example of our flushing and ventilation arrangement. Fig. 2 is a part-sectional elevation of part of same drawn to a larger scale. Fig. 3 is a sectional elevation of a device for admitting air to the drains and sewer. Fig. 4 is a sectional elevation of an interceptor-trap with air-admission device, and Fig. 5 a similar view in connection with an inspection-chamber. Fig. 6 is a sectional elevation of a gully-trap with air-admission device. Figs. 7 and 8 are part-sectional elevation and plan of a fan, air-shaft, and sewer.

In the arrangement Figs. 1 and 2 and in detail view Fig. 3, which is specially applicable where the house discharges pass down a vertical soil-pipe *a*, we use a tank or flushing-ejector *b*, with suitable siphon arrangement. The soil-pipe *a* discharges therein from the water-closets *c*, bath *d*, and sink *e*, while the trapped outlet from the pipe *f* enters the ventilating-shaft *h* laterally. The form of the outlet from the bottom of the tank *b* to the short leg *g* of the siphon and the length, depth, and shape of the long leg *h* of the siphon should be such as to cause grease and paper alike to be completely broken up and

discharged into the drain *i* on its way to the sewer *j*. The long leg *h* of the siphon is connected with the said drain *i* by a trap, as shown. The upcast air-shaft *k* is connected
 5 to the side of the soil-pipe *a* and may be used exclusively as an independent upcast pipe or as an antisiphon-pipe in connection with the soil-pipe *a* in the usual way, but by preference so that its upper outlet end shall be carried
 10 up above the roof, as shown.

In order to maintain or restore atmospheric equilibrium in the drain *i* from the tank *b* to the sewer, we carry a pipe from the drain *i* back to the upcast shaft *k*, as shown, or we
 15 may carry a pipe up to or above the surface of the ground and provide a mica or other light flap-valve in order in the well-known manner to permit ingress of fresh air to the said pipe while preventing egress of foul air.
 20 In connection with the pipe *n* to the sewer and the inspection-chamber *l*, in which the trap *m* is placed, we provide a light flap-valve, by preference an aluminium flap-valve *q* of the dished form shown, which we find is
 25 suitable for making tight joint, while at the same time very sensitive to the least rise of pressure in the inspection-chamber *l*. The inlet to these valves *q* is by wooden ferrules *r* of various inner diameter adapted to
 30 the requirement of each house—that is to say, the greater the distance of the house from the ventilating-fan, presently to be named, the larger the hole in the wooden ferrule *r* must be. *s* is another dished aluminium or other
 35 metal valve, which, however, is loaded, as shown, so that it only opens when the pressure in the chamber *l* may have accumulated through rapid discharges of the flushing-ejector *b* or from other causes. By this arrange-
 40 ment air is prevented from passing through the branch ventilating-pipe *o* and valve to the inspection-chamber *l* or the atmosphere.

In connection with the chamber *l* we provide an air-inlet pipe *u* with a light flap-valve
 45 *t*, by preference of aluminium of dished form and provided with counterweight *p*, as shown in Fig. 3, to render it both air-tight and very sensitive. This valve may suitably be fitted in an upper continuation of the box contain-
 50 ing the valves *q* and *s*, but separated therefrom by a cross-partition. The air enters the pipe *u* by the opening *v* and wire-gauze *w*.

Fig. 4 shows a modified form of inspection-trap *m*, which on the side toward the house-
 55 drain *i* has a pipe *u*, (corresponding to the pipe *u* in Fig. 2, where an inspection-chamber *l* is used.) This pipe *u* receives fresh air through the air-inlet *v*, wire-gauze *w*, and light flap-valve *t*—say of dished aluminium and bal-
 60 anced. There is also a ventilation branch *o* on the side toward the sewer, with a light flap-valve *q*—say of dished aluminium, (answering to the valve *q* in Fig. 3.) By this valve air is admitted to the drain *n*, leading to the
 65 sewer, while air is prevented from passing through the branch ventilating-pipe *o* and valve *q* to the atmosphere. By the size of

the opening through the ferrule *r* a regulation is effected in the manner already described.

The drain-pipe *i* from the soil-pipe may, as
 70 shown in Fig. 5, be fitted with a light balanced flap-valve device for admitting fresh air, but so as to prevent egress of vitiated air therefrom. The flushing-ejector *b* is then
 75 placed in an inspection-chamber *l*, which also contains the trap at the long leg *h* of the flush-tank siphon, said trap corresponding to the trap *m*, and is placed near the house instead of some distance therefrom. From the
 80 sewer side of the trap *m* we provide a pipe *o*, to the upper end of which is connected a box containing the valve *q* and the valves *s*. Above the cross-partition *o'* the valve *t* is provided, which supplies air to the chamber *l*, all in the
 85 manner already described with reference to Figs. 1 to 3. The ventilating-pipe *k* has an opening to the chamber *l* for allowing the vitiated air therein to escape up the pipe *k*.

We also construct street-gullies in such
 90 manner as to admit air to the drains leading to the sewer and for this purpose provide a box *x* adjoining the gully, Fig. 6, with its usual trapped outlet to the drain. This box has a hinged or other closable cover *y*, which
 95 is flush with the pavement and has a small lateral air-inlet *z* on the curb side. The air by this inlet enters the box, within which we provide a chamber communicating with the drain 2 to the sewer. The air enters this
 100 chamber through a wire-gauze 3 and a light flap-valve 4, by preference of dished aluminium and with inlet-ferrule 5 of varying inner diameter, according to their distance from the ventilating-fan, presently to be described.
 105 Another, by preference larger and loaded, valve 6, also, by preference, of dished aluminium, serves to prevent siphoning of the gully-trap at a time of flooding, or the air-supply to the box may in some cases be from a pipe
 110 communicating with air-openings from the atmosphere provided in walls or in gas or other lamp posts. In order to insure the water-sealing of the gully, even in very dry
 115 weather, we provide, as shown in Fig. 2, a small pipe 7, leading from the water-main 8 and provided with a cock 9, which in a dry season is left slightly open for admitting continuously a little water to the gully.

The action of the apparatus described with
 120 reference to Figs. 1 to 4 is as follows: When the tank or flushing-ejector *b* has become filled to the level of the top of the ridge where the two legs *g* and *h* of the siphon meet, the discharge, for instance, from a water-closet
 125 into the soil-pipe *a* will start the siphon action, so that the whole contents of the tank *b* will be discharged with a powerful rush through the full bore of the siphon into the drain *i* first and into the sewer *j* secondly
 130 by way of the inspection-chamber *l*, the trap *m*, and the pipe *n*; but the discharge from the water-closet draws after it in its downflow through the soil-pipe *a* a certain

quantity of fresh air through that pipe, while the air standing in the upper part of the house-drain and in the siphon *g h* will be forced into the inspection-chamber *l*, and thence through the pipe *n* to the sewer or partly thereto through the valves *q* and *s*. Directly the discharging action of the flushing-ejector *b* has ceased the air within the drain *i* between it and the inspection-chamber *l* will assume its normal condition—that is to say, the current of the ventilation is reversed or flows up the upcast shaft *k* and thence into the atmosphere. The drain *n* to the sewer itself will also be ventilated by this action, as will be explained farther on.

The action of the apparatus described with reference to Fig. 5 is similar to that just described, with the exception that there is no connection between the drain *i* and *n* and the inspection-chamber *l*, the air displaced by the flush being forced directly into the sewer.

If, as an example, the flushing-ejector *b* in the above cases contains six gallons of sewage and the water-closet cistern charge is one gallon of water, then a seven-gallon flush is obtained without the direct expenditure of potable water.

A more general ventilation of the public sewer should, however, in addition to the periodical ventilation indirectly effected by the aforesaid arrangements, be produced by suitable mechanical means, such as gas-burners or fans, in such manner that the air is caused to flow in the direction of the sewage and enters at one or several points on the lines of the sewers, and in combination therewith may be used apparatus for oxidizing or deodorizing the sewer-gas by suitable chemicals, such as permanganate of potash or of soda or peroxid of chlorin, in the form of mist or otherwise at the heads of the sewers or at points where the sewer-air is discharged by mechanical means.

In Figs. 7 and 8 is shown a motor 10, driven by compressed air or by electricity or by other power, set in a chamber 11 under the street or pavement and which may, for instance, drive a fan 12, which draws the air out of the sewer *j* by way of the chamber 13 and pipe 14 and discharges it out of a high shaft 15 above the fan. By regulating the air-openings through the ferrules *r*, Figs. 2, 3, and 5, at the various house-drain interceptor-traps and the openings through the ferrules *s* at the street-gullies according to the distance from such a fan and air-shaft a continuous circulation of fresh air into the sewage system can be secured without permitting the foul air of the street drains and sewers to get into the house-drains or out into the street. It will be understood that, as in a town, a number of air-shafts, such as 15, may have to be provided. The sewers *j* will in such case have to be divided off into sections by traps 16. A loaded air-inlet valve, like the valve *s*, Fig. 3, may be fitted to the chamber 13 for admitting air in case the sewer *j* is apt to be flooded.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. In a drain and sewer system, a power-driven device for drawing air into and through the system, an air-exhaust shaft, a plurality of air-inlet valves provided with means for regulating the inlet-opening for the purpose stated, and a safety-valve loaded so as to open when a predetermined maximum pressure has been produced in the system, for the purpose of preventing the forcing of inspection or other traps.

2. The drain from the house, in combination with the inspection trap and chamber, the drain therefrom to the sewer, a rising branch from said drain, an air-inlet valve with means for regulating the inlet for the purpose stated, the loaded safety-valve for the purpose stated, the fan, an inspection-chamber, and a valved air-inlet thereto, substantially as set forth.

3. The drain from the house in combination with the inspection trap and chamber, the drain therefrom to the sewer, a rising branch in the inspection-chamber, from said drain, a box thereon with dished aluminium valve and inlet with ferrule of adjustable diameter and with a loaded safety-valve, an air-inlet hood with gauze screen, a dished aluminium valve opening into the inspection-chamber and a fan substantially as set forth.

4. The soil-pipe from the house in combination with a flushing-ejector tank with siphon device and trapped outlet therefrom, the acting cubic contents of said tank several times larger than that of a water-closet flushing charge, a ventilating-pipe carried up a suitable height from the tank, and inspection-chamber with trapped drain to the sewer, a rising branch from the said drain, the air-inlet valve with means for regulating the inlet for the purpose stated, the loaded safety-valve, the valved air-inlet to the inspection-chamber, and the fan substantially as set forth.

5. The soil-pipe from the house in combination with a flushing-ejector tank of the size specified, with siphon device and trapped outlet therefrom, and inspection-chamber wherein said tank is placed, a ventilating-pipe carried up from the tank, the drain, from the tank to the sewer, a branch pipe in the inspection-chamber and rising from the said drain, the air-inlet valve with means for regulating the inlet for the purpose stated, the loaded safety-valve, the valved air-inlet to the inspection-chamber and the fan substantially as set forth.

6. The drain from the house in combination with the inspection-trap, the drain therefrom to the sewer a rising branch from said drain, and air-inlet valve provided with means for regulating the inlet for the purpose stated, the fan, an air-inlet hood with gauze screen and a light valve for admitting air from the hood to the house side of the inspection-trap, substantially as set forth.

7. In a drain and sewer system, a power-driven device for drawing air into and through the system, an air-exhaust shaft, a plurality of air-inlet devices each consisting of a box
5 fitted with a light air-inlet valve of a dished form, a ferrule for regulating the inlet-opening thereto, and a safety-valve, substantially as set forth.

8. An air-inlet device, consisting of a box
10 having two compartments and applied in connection with an inspection-trap, one of said compartments fitted with a light air-inlet valve of a dished form for admitting air to the sewer side of the trap, a ferrule for regu-

lating the inlet-opening to said valve, and a 15 safety-valve; and the other compartment fitted with a light balanced air-inlet valve of dished form for admitting air to the inflow or house side of the trap, substantially as set forth. 20

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

ISAAC SHONE.
EDWIN AULT.

Witnesses:

VICTOR JENSEN,
GEORGE ISAAC BRIDGES.