(No Model.)

P. HARVEY.

SIPHON CLOSET AND TANK.

No. 501,506. Patented July 18, 1893.

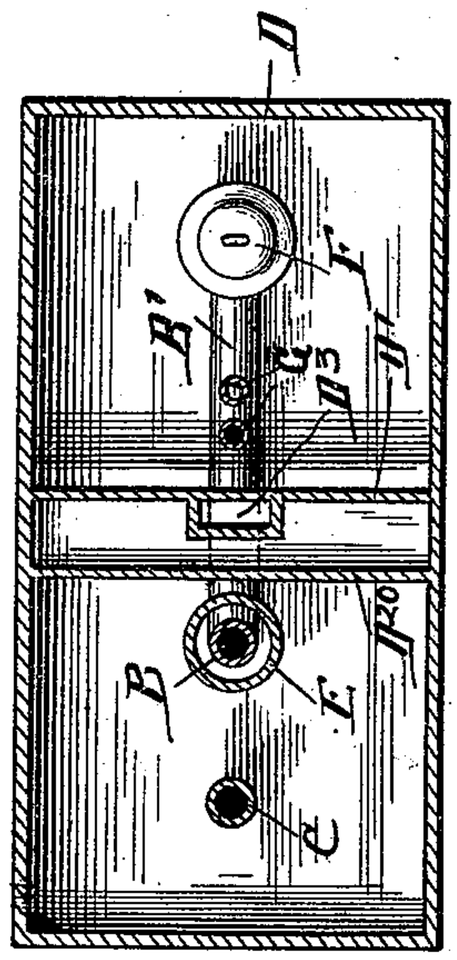

Fig. 2.

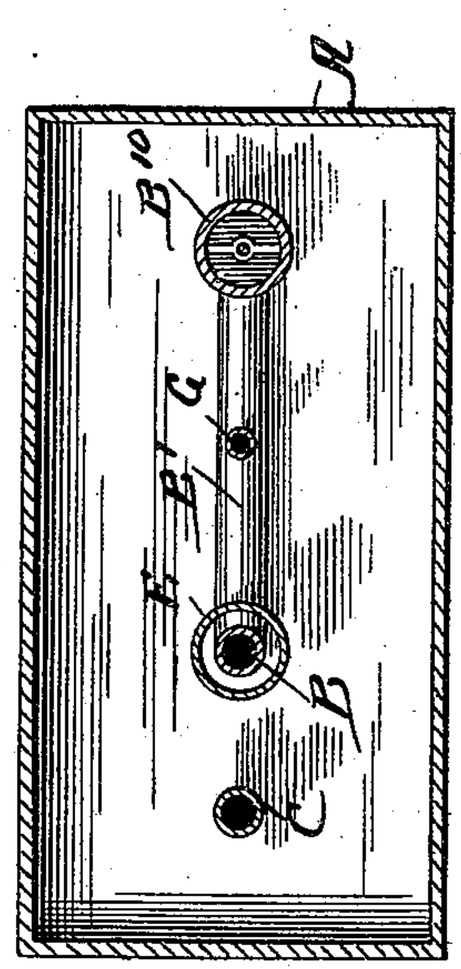

Fig. 3.

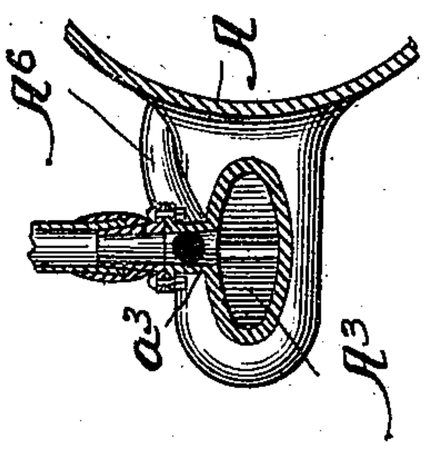

Fig. 4.

Fig. 1.

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PATRICK HARVEY, OF CHICAGO, ILLINOIS.

SIPHON CLOSET AND TANK.

SPECIFICATION forming part of Letters Patent No. 501,506, dated July 18, 1893.

Application filed April 14, 1890. Serial No. 347,781. (No model.)

To all whom it may concern:

Be it known that I, PATRICK HARVEY, a citizen of the United States, residing at Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Siphon Closets and Tanks, which are fully set forth in the following specification, reference being had to the accompanying drawings, forming a part thereof.

The purposes of this invention are: first, to provide means whereby a siphon closet, in which the siphonic action is set up by withdrawing the air from the inter-trap space into a closed tank by means of the discharge of the water from the tank to flush the closet, may be operated without danger of forcing back to the closet and into the room the foul air thus drawn from the inter-trap space while the tank is refilled; and, second, to provide novel means for effecting the after-wash—that is the discharge of the water—after the siphonic action therein has finally ceased.

In the drawings, Figure 1 is a vertical section of a tank and connected closet embodying my invention. Fig. 2 is a horizontal section at the line 2—2 on Fig. 1. Fig. 3 is a horizontal section at the line 3—3 on Fig. 1. Fig. 4 is a section at the line 4—4 on Fig. 1.

I will first describe the closet and the particular feature therein which prevents the forcing of the foul air back through the closet into the room without regard to the specific form of tank which is illustrated, but referring only to a tank of any construction which is adapted to draw the air out of the inter-trap space by the discharge or escape of the water from the tank.

A is the closet bowl.

A′ is the upper trap, and A^2 the lower trap, A^3 being the inter-trap space, and A^4 the discharge limb leading to the sewer, A^5 being the usual ventilating pipe leading from a point beyond the lower trap.

The construction, as thus far described, involves the usual and familiar arrangement of the traps in a siphon closet.

B is the flushing pipe, and C, the air exhaust pipe, the former leading to the rim *a*, and the latter communicating with the inter-trap space A^3 at the crown.

The peculiarity in the construction of the closet to adapt it to the purpose above described consists of a duct A^6, which communicates preferably with the air pipe C before the junction of the latter with the air space A^3, although for the purpose of convenience in construction, I form this duct in the earthenware of which the closet is composed and integral therewith, and make it open into the air pipe through the boss a^3, whereat the pipe C is connected, treating that boss as a part of the pipe in this description. This duct A^6 might be partially effective for its purpose, as hereinafter explained, if it opened directly into the air space A^3, but it is much more effective opening as described into the pipe before the latter merges in the air space. At the other end, this duct opens into the up-limb of the lower trap A^2 a short distance below the water level of that trap. Preferably, if the trap has four inches seal, the mouth of the duct thereinto should not be more than an inch below the water level. The operation of this constructure, when the pipes B and C are connected to a closed tank from which water is supplied through the pipe B to flush and prime the closet, and into which the pipe C opens in such manner that the withdrawal of the water from the tank draws the air from the space thus vacated through said pipe C, out of the air space A^3, is that when the suction caused by the lowering of the water in the tank is first experienced at the closet, water will be drawn from the trap A^2 up into the duct A^6 before any sensible change of level will be caused of the water in the lower trap, because the smaller quantity of water necessary to fill the duct will be moved thereinto more quickly than the larger quantity necessary to fill the air space A^3,—that is, the down-limb of the second trap. And as long as the suction which fills the pipe C continues to increase, the water will be held in the duct A^6 several inches higher than it will stand in the down-limb of the trap A^2,—that is to say, in the air space A^3. But the constant flow of water into the closet and out through its traps will prevent the unsealing of the lower mouth of the duct A^6, so that the partial vacuum in the tank and air space will not be broken or interfered with by that duct in the process of the continued action of

the tank and closet,—that is to say, the partial vacuum produced in the air space A^3 will cause the water to overflow from the bowl and fill said air space, inducing the siphonic action and causing the evacuation of the bowl, and thereupon the breaking of the siphon by the entrance of air when the water falls low enough in the bowl, or by some other means dependent upon the construction of the tank.

The process of emptying the closet and refilling it to the original condition will be performed in the familiar manner. The water entering to refill the tank will, in the absence of any provision to the contrary force back into the inter-trap space the air which has been drawn into the tank above the water from said inter-trap space. Ordinarily, and in the absence of any preventing device, the air thus forced back into said space A^3 will be forced down through the trap A′, raising the water temporarily in the bowl, and will escape through the bowl into the room. But with the construction I have above described, by reason of the fact that the water seal above the lower mouth of the duct A^6 is much less than the water seal of the trap A′, the back pressure of air which would force it through the trap A′ will instead and more easily force it out through the duct A^6 and through the very shallow seal over the mouth of that duct into the down limb of the siphon toward the sewer, from which it can escape through the ventilating pipe A^5, and by this means, the danger of forcing such foul air back into the room is prevented.

I will describe the construction of tank which I prefer to employ with this closet to cause it to operate in the manner described, and to provide therein the necessary after-wash to fill the traps after the siphonic action has ceased. D is the tank, to which water is supplied in the familiar manner through a cock E′, controlled by a float E^{10}. A portion *d* of this tank is entirely open above to atmospheric pressure. This portion is partitioned from the remainder *d′* by the vertical transverse partition D′, which, however, does not extend to the bottom of the tank, but does extend from side to side, water communication between the two parts thus separated being possible only underneath the lower edge of this partition. The partition D′ joins the top or upper inclosing wall D^4 of the tank, so that the portion *d′* of the tank is inclosed from atmospheric pressure except for the communication above mentioned at the bottom of the partition D′, and the air and water pipes leading into and from said inclosed portion, as hereinafter described. A little below the middle of the height of the tank, I form a pocket on the partition wall D′ in the inclosed portion of the tank by means of the horizontal ledge D^2 and vertical lip D^{20} at the edge of it. This pocket may extend across the whole width of the tank, so that the side walls of the tank complete it. I form a duct D^3, which opens through the partition D′ above the water level, and has access, therefore, to atmospheric pressure, and extends down into the pocket formed by the ledge D^2 and its lip D^{20}. A convenient mode of making this duct is to utilize the partition D′ for one side of it, as illustrated. The purpose of this construction will be hereinafter explained. The lower pipe B extends up through the bottom of the tank into the inclosed portion *d′*, its upper mouth being at the water level, this pipe operating as an over flow. A hood E is inverted over the mouth of this pipe, being supported or suspended so that it leaves a little space above the end of the pipe, and being of such size as to leave ample space around the pipe for the passage of water, whereby is formed a siphon of which the discharge pipe constitutes the down-limb or longer branch and the annular space about it the up-limb or shorter branch. The horizontal pipe B′ leads into the pipe B below the mouth of the hood, said pipe being conveniently located at the very bottom of the tank, and at the other end from its connection with the pipe B, it has the short upward branch B^{10} open at the upper end some distance above the level of the downwardly open mouth of the hood E, and constituting the discharge aperture from the tank which is closed by the valve F, provided with familiar means for opening it and adapted to be seated by its weight. Between the pipe B and the valve F, a relatively small siphon pipe G leads upward from the horizontal pipe B′ to a point above the water level, and descends into the water, having its open mouth a short distance above the level of the lower mouth of the hood E.

The operation of this tank, in connection with the closet above described, is as follows:— The tank being full, as illustrated in Fig. 1, the valve F being momentarily opened, the water enters past it into the pipe B′, and thence into the pipe B and filling the latter, and falling therethrough toward the closet, draws the air out of the siphon G, and institutes siphonic action therethrough, and the flow of water through that siphon into the pipe B, assists in starting the siphonic action of the siphon formed by the hood E over the pipe B (and which may hereinafter be referred to as the siphon B E), so that after the valve F is again seated, the water will continue to pass out of the tank through the siphons into the closet. The capacity of the siphon B E is considerably greater than that of the siphon G, so that the water will be drawn through the former siphon notwithstanding the resulting rarefaction of the air in the inclosed part *d′* of the tank. As the water level falls in the inclosed portion *d′* of the tank, it withdraws the air through the pipe C from the inter-trap space A^3, and eventually institutes the siphonic action of the closet, causing its evacuation. If this should occur before the water level in the inclosed portion *d′* of the tank has fallen far enough to permit air to be drawn through the duct D^3 (which will eventually occur as hereinafter explained), the further lowering of

the level and rarefaction of the air in the space above the water in the tank and in the inter-trap space of the closet may cause a repetition of the siphonic actionof the closet. But eventually the water level in the inclosed portion *d'* of the tank will have fallen so far that the small column of water contained in the duct D^3 will present resistance to the entrance of the air therethrough, which may be overcome by less force than is necessary to induce the siphonic action in the closet, and thereupon and thereafter the air will enter through the duct D^3, and prevent the further rarefacation of the air in the air space above the water in the tank and in the inter-trap space A^3, and therefore prevent the further repetition of the siphonic action of the closet. After this has occurred, the water, continuing to flow out of the tank into the closet, will constitute an after-wash which will continue until the water has fallen in the tank low enough to uncover the mouth of the shorter limb of the siphon G. Air being thus admitted to the siphon G, and an instant later to the siphon B E, both siphons will "break" and the flow of water from the tank through them will cease, and the tank will commence to refill through the supply valve, which will have been opened by the fall of the float attached to its valve in the customary manner. And the water supply thus refilling the tank will tend to compress the air confined in the inclosed portion *d'*, and to force it out of said inclosed portion. Now, the trap which comprises the pocket D^{20} presents in the portion *d'* of the tank a large surface of water which must be depressed below the level of the lower end of the up-limb D^3 of the trap, before air will escape from the tank at that point; but such depression of the water surface in the pocket will raise a column in the limb D^3 whose height would be to the depression of the surface of water in the pocket inversely as the cross-areas of the pocket D^{20} and the limb D^3; and the height of this column will measure the resistance offered by the trap to the escape of air through or past it. But the pressure in the chamber *d'* will be experienced also through the pipe C, and in the inter-trap-space A^3, and in the duct A^6. There are thus three avenues by which under sufficient pressure the air may escape from the tank, and that path of egress wherein the least resistance is experienced will be the one through which the escape will be effected. Obviously the duct A^6 which is closed by a very shallow seal offers less resistance than the trap A^2 and by reason of the large ratio between the surface of the pocket D^{20} and the cross-area of the limb D^3 the resistance at that path of egress is greater even than that offered by the trap D^2 and very much greater than that offered by the seal over the duct A^6, which will therefore be the avenue of escape for the foul air from the tank to the ventilating pipe A^5 through which it will be discharged above the building.

An incidental advantage of the construction of the closet bowl with the air passage A^6, as described, is that in case of the accidental stoppage of the air pipe C, preventing the action of the devices intended to exhaust the air through said pipe from the inter-trap space to start the siphonic action of the closet, the outflow from the bowl of the water delivered thereinto through the flushing rim and its discharge over the bridge between the up-limb and down-limb into the inter-trap space will force the air little by little out through the passage A^6, and cause it to bubble up from the lower end of that passage through the water which seals that end, and so pass out beyond the lower trap through the ventilating pipe, the water through which it thus bubbles acting somewhat like a check valve, permitting the air to bubble up through it but being nevertheless maintained at the discharge level by the constant supply of water from the bowl, so that air cannot pass back into the passage A^6. This action continuing, if the flow from the flushing rim is copious, will quite rapidly cause the siphon to be primed by the filling of the air space with water and the exhaustion of the air therefrom, so that although the siphonic action of the bowl is not started quite so promptly as if the air pipe C were open and the air exhaust devices in the tank operative, it will nevertheless be started soon enough to serve the purpose, and the evacuation of the closet bowl will result in consequence with only a little delay by the stoppage of the pipe C.

I claim—

1. In a siphon closet, in combination with the flushing tank the closet bowl and two traps having the air space intervening between them, the air pipe through which the air is exhausted from said inter-trap space and mechanism for exhausting the air, and a duct leading from said air pipe into the second trap near the water level thereof on the discharge side, whereby the mouth of said duct is slightly sealed at the end which enters the trap: substantially as and for the purpose set forth.

2. In a siphon closet, the closet bowl and the discharge passage therefrom comprising two traps having an air space intervening between them; a flushing tank comprising a portion closed above and communicating with the remaining open portion only at the lower part; the air pipe leading from the inter-trap space of the closet and terminating in the upper part of the closed portion of the tank; the closet having a duct communicating at one end with the air pipe and at the other end with the lower trap of the closet on the discharge side near and below the water level thereof, the closed portion of the tank being provided with a passage communicating with the outer air above the overflow level of the tank, and with the inclosed portion at a level enough lower to afford a flushing supply between the two levels, said passage being con-

trolled to permit easy ingress and difficult egress of air from the closed portion: substantially as set forth.

3. In a siphon closet, in combination with the bowl and the two traps having an air space between them, an air pipe leading from said air space; the water tank into which said pipe opens at the other end, said tank being closed at the top and having egress for the water therein only toward the bottom, whereby the lowering of the water operates to draw air through the air pipe into the tank and the rising of the water operates to force the air back from the tank through the pipe; and a duct communicating with the air pipe and discharging in the lower trap of the closet on the discharge side and near the water level thereof; the water seal over the mouth of said duct being less than the water seal of the first trap of the closet: substantially as set forth.

4. In a siphon closet, in combination with the closet bowl and traps, the tank having a portion *d'* closed above and separated from the remaining open portion by the partition D' at whose lower edge communication is afforded between the open and inclosed portions of the tank; a trap or pocket located in the inclosed portion above the level of the communication between said closed and open portions; and a duct open downwardly in said pocket and extending above the water level and opening through the wall of said inclosed portion of the tank to the outer air, the capacity of said duct being small relatively to the capacity of the water seal of the bowl; substantially as and for the purpose set forth.

5. In combination with a siphon closet having a by-passage from the inter-trap space to the up-limb of the second trap slightly below the water level of said trap, the flushing tank having the inclosed portion *d'* the air exhaust pipe from the inter-trap space of the closet communicating with the said inclosed part of the tank at the upper part of the latter, said inclosed part of the tank having a communication with the outer air at the upper part through a duct leading down into the tank and terminating in a water pocket making a trap, the horizontal area of such pocket within the inclosed part of the tank being large relatively to the cross-area of the said duct, whereby the water seal in the trap formed by the duct and pocket, may be made so shallow that it will offer less resistance to an in-draft of air than the seal over the mouth of the by-passage in the closet, while still offering greater resistance than said by-passage seal to discharge of air from the tank: substantially as set forth.

In testimony whereof I have hereunto set my hand, at Chicago, Illinois, this 11th day of April, 1890.

PATRICK HARVEY.

Witnesses:
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