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ANTISIPHONAGE DEVICE FOR WATER CLOSETS AND LIKE WATER SERVICE SYSTEMS

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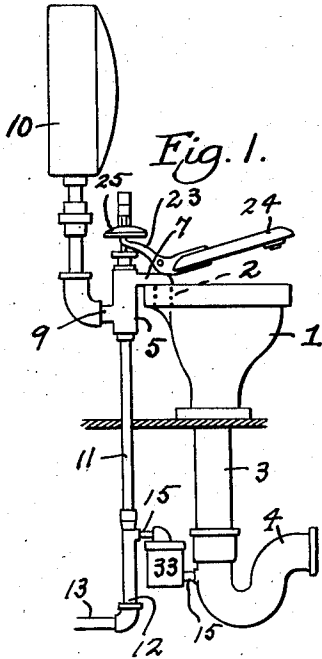


Fig. 3.

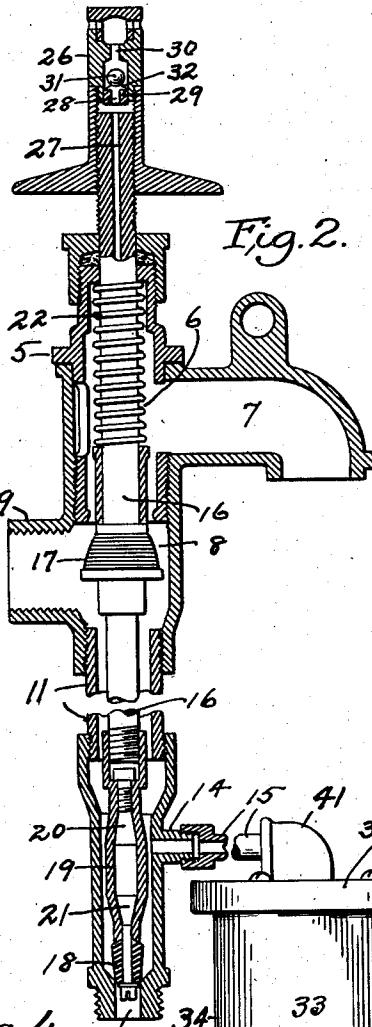
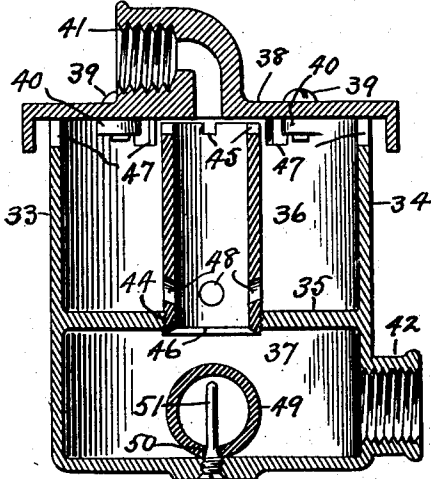


Fig. 2.

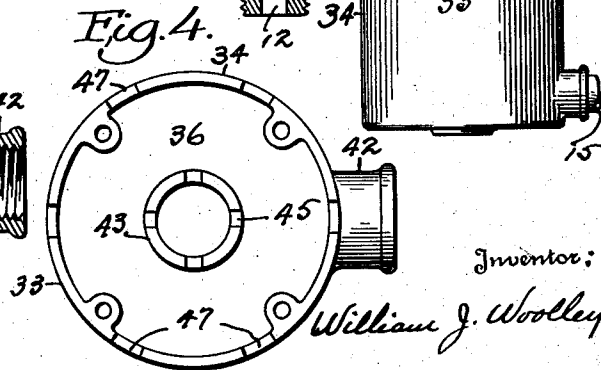


Fig. 4.

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ANTISIPHONAGE DEVICE FOR WATER
CLOSETS AND LIKE WATER SERVICE
SYSTEMS

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21 Claims. (Cl. 4—23)

This invention relates to an anti-siphonage device, or combined air-break and backwater-trap, for water closets, frost-proof drinking fountains, wash sinks, hydrants and other like water service apparatus having a drain or waste outlet connection with a waste disposal or sewer line, and particularly to water service apparatus or systems of this character in which such a drain connection is located below the frost line.

One object of the invention is to provide a simple, reliable and efficient device of this character which will afford a vacuum relief action to break a vacuum when formed in the drain outlet side of the connection to prevent backflow of waste into the service system with liability of pollution of the water therein, and which, in the event of stoppage of the sewer connection or other action causing a backflow to occur, will close communication between the sewer connection and drain outlet.

A further object of the invention is to provide an anti-siphonage device which, in the possible event of derangement of the means normally operating to prevent backflow, will nevertheless ensure safety by venting the backflow substance to the exterior, thereby preventing its entrance into the water supply system of the fixture.

A still further object of the invention is to provide a device of the character described which is adapted for use as a lower anti-siphonage device in the drainage side of a water service apparatus having an upper anti-siphonage device to prevent siphonage in the water intake side, whereby double security against flow of water to and pollution of the water in the water supply system will be secured.

With these and other objects in view, which will appear in the course of the subjoined description, the invention consists of the features of construction, combination and arrangement of parts, hereinafter fully described and claimed, reference being had to the accompanying drawing, in which:—

Fig. 1 is a side elevation of a Vogel type of frost-proof water closet embodying my invention.

Fig. 2 is a vertical section through the water supply and drain valve mechanism thereof on an enlarged scale and showing the application of the invention thereto.

Fig. 3 is a vertical section on an enlarged scale through the anti-siphonage device embodying my present invention.

Fig. 4 is a section on line 4—4 of Fig. 3.

In the illustrated embodiment of my invention, I have, for purpose of exemplification, shown

the same in application to a Vogel frostproof type of water closet combination, but it is to be understood that the invention is not limited in application in this respect, as it may be used with similar advantages in connection with frost-proof drinking fountains, wash sinks, hydrants and other water service apparatus for which it is or may be adapted.

Referring now more particularly to the drawing, 1 designates a closet bowl provided at its upper rear portion with an inlet 2 for supply of flush water thereto, and connected at its base with a waste pipe 3 communicating with a trap 4 forming part of a waste disposal or sewage system. The trap is designed to be arranged in practice sufficiently below the frost line, in the use of the closet in exposed places, in order to prevent liability of the freezing of water therein.

Disposed adjacent the top of the bowl and in rear thereof is a valve casing 5 formed with an upper flush chamber 6, a flush discharge outlet 7, and a lower flush chamber or passage 8 having a lateral inflow and outflow connection 9. The flush discharge outlet 7 communicates with the inlet 2 of the bowl, while the connection 9 is provided for communication through a suitable conductor with the water supply tank 10. Extending downwardly from the lower end of the casing is a standpipe or conductor 11 having a water inlet 12 at its lower end communicating with a water service or supply pipe 13 and having a drain inlet 14 above the level of the water inlet 12, which drain inlet is connected below the frost level by a cross pipe 15 with the trap 4 of the waste disposal or sewage system.

Arranged within the casing 5 and the standpipe 11 is a valve stem carrying within the chamber 6 an upper flushing valve 17 movable to open and close communication between the chambers 6 and 8. At its lower end the valve stem carries a valve 18 controlling the water supply inlet 12, and a valve 19 controlling the drain outlet 14, portions of the valve stem above and below the plane of the drain valve 19 being of open-work construction or provided with ports 20 and 21 to allow water to flow between the pipe 11 above the level of the drain valve and the drain outlet 15 or water inlet 12 in the different positions of the valve members 18 and 19. A spring 22 associated with the upper end of the valve acts, in conjunction with gravity, to maintain the valve device in a position in which valve 18 closes inlet 12, valve 19 is open and connects that part of the pipe 11 above the drain valve with the cross pipe or drain outlet 15, and the

valve member 17 is open so that chambers 6 and 8 and the closet and tank are in open communication. A forked arm 23 carried by the pivotally mounted closet seat 24 engages under a head 25 fixed to the upper projecting end of the valve stem and operates thereon to lift the valve when the seat is depressed. On depression of the seat the valve stem is raised to close valve 17 and cut off communication between the pipe 11 and the bowl and to move valve 19 to a position in which it closes the drain or cross pipe 15 and simultaneously moves valve 18 to open position, for the upflow of water through the connection 9 from the supply pipe 13 to the tank 10. The tank will thereupon be filled with water and the air therein compressed until the pressure equals or exceeds that in the supply line, at which the flow of water will be automatically cut off. When the seat 24 is released spring 22 moves the valve stem downward to close the valve 18 and to open the valve 17 to establish communication between the tank and bowl for the flushing action and to simultaneously open communication between the lower end of the pipe 11 and the drain outlet 15 for the subsequent drainage off of the residual water remaining in the flushing connection at the end of the flushing action.

I preferably employ in connection with this type of apparatus an anti-siphonage device in the form of a relief or control valve 26 at the upper end of the valve stem 16. As shown, the upper end of the stem is formed with a relief or air feed passage 27 communicating with the flush chamber 6 at its lower end and opening through its upper extremity and communicating with an opening 28 in a valve seat plug 29 which is arranged below a control port 30 in the valve casing. A ball valve 31 is provided to control the port 30 and normally rests upon an elevated seat 32 at the top of the plug 29, which seat is so formed as to provide, when the valve rests thereon, a restricted passage beneath and about the valve to normally permit a flow of air between the passage 27 and the port 30 for a relief action under suction in the chamber 8. If, therefore, at any time during or after a flushing action, a partial vacuum or reduction of air pressure exists in the chamber 8 or in said chamber together with the chamber 6 and the tank 10, whereby a suction action is instituted, air will enter the valve casing through the port 30 and pass around the valve and enter the chamber 8, thus relieving any reduction of pressure and breaking up any siphoning action therein. The breaking up of the reduction of pressure and any siphoning action will prevent any back-flow of sewage from the bowl upwardly into the valve chamber in the event of stoppage from any cause, and thus prevent any possibility of the pollution of the water in the supply pipe through the passage of sewage from the bowl into the standpipe through the upper flushing connection. The control or relief valve 26 is arranged in an effective position on the casing 5 for this purpose and also in such position as to further perform a relief action to replenish the tank 10 with the proper supply of live or elastic fresh air to take the place of dead or inelastic air in the tank, which may occur through depletion of air supplied or absorption of air under certain conditions, and thus prevent water-logging of the tank and its attendant objections.

My present invention provides a novel construction and arrangement of anti-siphonage or combined air break and backflow preventing de-

vice 33 which is located in the cross connection 15 for a vacuum relief action to prevent siphonage of waste matter from the trap 4 into the standpipe 11 or supply pipe 13, as well as to normally prevent such backflow of waste matter in the event that a suitable vacuum relief action is not effected, and further to provide an additional safeguard to effect a ventage to the exterior of any backflow waste matter which may be drawn over in the event of the failure of the vacuum breaking and backflow preventing means from acting from any cause.

This device 33 comprises a casing 34, of circular or other approved form, and divided by a horizontal partition 35 into an upper relief chamber 36 and a lower discharge chamber 37. The chamber 36 is normally open at its top and closed when the device is in service by means of a cap or cover plate 38 detachably secured by means of screws 39 to flanges 40 on the casing 34. This cap or cover 38 is provided with an internally threaded inlet connection 41 receiving a part of the pipe 15 connected with the standpipe 11, and the chamber 37 is provided with a threaded outlet connection 42 for connection with a part of the pipe 15 connecting the same with the trap 4.

The inlet 41 opens at its base through the cap or cover 38 into the central portion of the top part of chamber 36 in axial alinement with a restricted flow passage in the form of a tube 43. This tube 43 is made of hard rubber or other suitable material and is open at each end and threaded with a tight fit at its lower end, as at 44, into a threaded opening in the partition 35. The upper end of the tube 43 terminates adjacent to but below the cover plate 38, so as to have restricted communication with the upper portion of chamber 6, for flow of air back and forth between the same, while disposing it so that it will receive the drainage flowing through the connection 15 and inlet 41 and conduct the same with a certain degree of velocity downward into the discharge chamber 37. The upper end of the tube 43 is provided with slots or notches 45 for the reception of a suitable tool whereby its lower end may be threaded into and out of the opening in the partition 35, while the lower end of said tube is formed to provide a valve seat 46. In the casing 34 at the top of the chamber 36 are combined air inlet and vent openings 47, which are located partially or wholly below the plane of the notches 45 in the tube, and in the lower portion of the tube above the partition 35 are formed relief openings 48 connecting the chamber 37 and the lower end of said tube 43 with the chamber 37. The purpose of the openings 47 is to admit air into the chamber 36 for a vacuum break action and their purpose is also to serve as vents to permit of the flow from the casing 36 to the exterior of any waste matter which under certain conditions may possibly enter the chamber 36, thereby preventing the same from flowing over into the standpipe 11. In this relief action the openings 48 in the tube permit the waste matter to pass from chamber 37 into chamber 36. In the chamber 37 is a hollow float valve 49 preferably made of thin-walled durable rubber of ball or spherical shape, which is provided at its bottom with an opening 50 by which it is slidably mounted on a guide 51 rising from the bottom of the chamber 37 for accurate movements toward and from the seat 46.

In the operation of the device 34, it is to be understood that in the event that the main supply to the closet valve should be shut off, caus-

ing a vacuum to be formed in the discharge line 3, such vacuum will be broken by admission of air into the discharge line through the relief ports or openings 47. In the event, however, that these openings should be casually clogged or that, from any cause, a sufficient vacuum relief action is not afforded, then any waste matter flowing backward from the trap into the chamber 37 will be prevented from passing upwardly into the chamber 6 by the float action of the valve 49 in rising to engage the seat 46 and closing communication between the two chambers. This valve is prevented in a waste discharge action from floating upwardly against the seat 46 by the velocity of the water flowing downward into chamber 37 through the tube 43, but will readily float upward in the presence of backflow matter in the chamber 37. Thus it will be understood that even in the event of an air breaking action or vacuum relief not taking place, sewage matter will be prevented from passing over into the water line by the closing action of valve 49. As a further and additional safeguard, however, a relief action is obtained to prevent passage of waste matter into the water line even in the event that both the vacuum relief means and the valve should become inoperative from any cause, as should the valve fail to close under a backflow action and the suction pull be strong enough to draw the sewage into the chamber 36, such sewage will flow through the ports 48 into the chamber 36 and thence discharge to the exterior through the openings 47, preventing any sewage from passing through the inlet connection 41 into the water line. An absolute safeguard is thus provided to ensure freedom from pollution of the water in the water service system even in the event that the vacuum relief action should fail and the cut off valve be rendered inoperative. In practice, the device 33 may be arranged so as to allow discharge into the earth, or a receiving chamber, of a considerable amount of waste matter so as to ensure safety under any condition of service, as through failure of the cut off valve and vacuum relief action under conditions in which the sewer is completely stopped. This anti-siphoning device 33 may be used alone, or with the upper anti-siphoning device 28, but when both siphoning devices are employed it will be evident that maximum protection against entrance of waste matter to the water supply system will be afforded.

If desired, the cap or cover plate 38 may be of greater diameter than the casing and provided with a depending guard flange 52 lying outside the openings 47 to deflect earth or other material away from said openings and prevent the same from being clogged.

From the foregoing description, taken in connection with the drawing, the construction, mode of operation and advantages of my invention will be readily understood and appreciated by those versed in the art without a further and extended description. As stated, the invention may be used, not only in connection with water closets, but also with waterproof drinking fountains, wash sinks, hydrants, and other water service apparatus where the use of such a device is desirable or required. While the structural organization of the device herein described and claimed, is preferred, it is to be understood that changes in the form, construction and arrangement of parts falling within the scope of the appended claims may be made without departing from the spirit of the invention as set forth therein.

What I claim is:—

1. The combination with a water supply device having a drain outlet, and a waste conductor, of a connection between said drain outlet and waste conductor, and a device in said connection in open communication with the atmosphere and operating on the formation of a vacuum in said drain outlet to admit air thereto through said connection to break the vacuum therein.
2. The combination with a water supply device having a drain outlet, and a waste conductor, of a connection between said drain outlet and waste conductor, and a device in said connection in open communication with the atmosphere and operating on the formation of a vacuum in said drain outlet to admit air thereto to break the vacuum and also to close communication between the drain outlet and the waste conductor.
3. The combination with a water supply device having a drain outlet, and a waste conductor, of a connection between said drain outlet and waste conductor, and a device in said connection having openings therein constantly connecting the same with the atmosphere and operating on the formation of a vacuum in said drain outlet to admit air thereto to break the vacuum.
4. The combination with a water supply device having a drain outlet, and a waste conductor, of a connection between said drain outlet and waste conductor, a device in said connection in open communication with the atmosphere and operating on the formation of a vacuum in said drain outlet to admit air thereto to break the vacuum, and means carried by said device for closing communication between the conductor and the drain outlet on a backflow of waste material from the former to the latter.
5. The combination with a water supply device having a drain outlet, and a waste conductor, of an anti-siphonage device between said outlet and conductor comprising a casing having an upper relief chamber provided with an air inlet communicating with the atmosphere and a fluid inlet, the latter communicating with the drain outlet, and a lower discharge chamber provided with an outlet communicating with the waste conductor, and a restricted flow connection in said casing communicating with the relief chamber for receiving and conducting fluid through said chamber from the fluid inlet to the discharge chamber.
6. The combination with a water supply device having a drain outlet, and a waste conductor, of an anti-siphonage device between said outlet and conductor comprising a casing having an upper relief chamber provided with an air inlet communicating with the atmosphere and a fluid inlet, the latter communicating with the drain outlet, and a lower discharge chamber provided with an outlet communicating with the waste conductor, a restricted flow connection in said casing communicating with the relief chamber for receiving and conducting fluid through said chamber from the fluid inlet to the discharge chamber, and a valve for closing said flow connection in the presence in the discharge chamber of backflow liquid from the waste conductor.
7. The combination with a water supply device having a drain outlet, and a waste conductor, of an anti-siphonage device between said outlet and conductor comprising a casing having an upper relief chamber provided with an air inlet communicating with the atmosphere and a fluid inlet, the latter communicating with the drain outlet, and a lower discharge chamber provided with an outlet communicating with the waste conductor, a

restricted flow connection in said casing communicating with the relief chamber for receiving and conducting fluid through said chamber from the fluid inlet to the discharge chamber, and a guided hollow ball float valve member for closing said flow connection in the presence in the discharge chamber of backflow liquid from the waste conductor.

8. The combination with a water supply device having a drain outlet, and a waste conductor, of an anti-siphonage device between said outlet and conductor comprising a casing having an upper relief chamber provided with an air inlet communicating with the atmosphere and a fluid inlet, the latter communicating with the drain outlet, and a lower discharge chamber provided with an outlet communicating with the waste conductor, and a tube disposed in the relief chamber with its upper end in open communication therewith and registering with the fluid inlet to receive the incoming fluid therefrom, said tube being in open communication at its lower end with the discharge chamber and provided adjacent thereto with relief openings communicating with the relief chamber.

9. The combination with a water supply device having a drain outlet, and a waste conductor, of an anti-siphonage device between said outlet and conductor comprising a casing having an upper relief chamber provided with an air inlet communicating with the atmosphere and a fluid inlet, the latter communicating with the drain outlet, and a lower discharge chamber provided with an outlet communicating with the waste conductor, a tube disposed in the relief chamber with its upper end in open communication therewith and registering with the fluid inlet to receive the incoming fluid therefrom, said tube being in open communication at its lower end with the discharge chamber and provided adjacent thereto with relief openings communicating with the relief chamber, and a valve in the discharge chamber operating on a backflow of liquid from the waste conductor to close communication between the discharge chamber and the tube.

10. In a water service system having a drain outlet communicating through a cross connection with a waste disposal conductor below the frost line, an anti-siphonage device in said cross connection for receiving the waste from the outlet and discharging the same into the conductor, said device including means for admitting air thereinto upon the formation of a vacuum on the drain outlet side of the connection to break the vacuum, and means for closing communication between the drain outlet and conductor on a backflow of waste substance from the conductor to said anti-siphonage device.

11. A combined air break and backflow preventing device for use between drain and sewer connections of a water service system, comprising a casing having an inlet and an outlet for communication respectively with said connections, said inlet and outlet being in communication with each other, and said casing being provided with means for admitting air thereto for a vacuum breaking action on a formation of a vacuum in the drain connection.

12. A combined air break and backflow preventing device for use between drain and sewer connections of a water service system, comprising a casing having an inlet and an outlet for communication respectively with said connections, said inlet and outlet being in communication with each other, and said casing being provided

with means in constant communication with the atmosphere for admitting air thereto for a vacuum breaking action on a formation of a vacuum in the drain connection, and means operating on a backflow of waste material through the outlet connection to close communication between said inlet and outlet.

13. A combined air break and backflow preventing device for use between drain and sewer connections of a water service system, comprising a casing having an upper relief chamber provided at its top with air inlet and waste discharge openings communicating with the atmosphere and with a drain inlet for communication with said drain connection, and having a lower discharge chamber communicating at its top with the relief chamber and provided with an outlet for communication with said waste connection, and means for closing communication between said chambers on a backflow into the discharge chamber of waste material from the sewer connection.

14. A combined air break and backflow preventing device for use between drain and sewer connections of a water service system, comprising a casing having an upper relief chamber and a lower discharge chamber, said relief chamber being provided at its top with a drain inlet for communication with the drain connection and with combined vacuum breaking air inlets and waste discharge outlets and said discharge chamber being provided with an outlet for communication with the sewer connection, a conductor tube disposed in said relief chamber and having an upper open end registering with the waste inlet and communicating with the relief chamber and a lower open end communicating with the discharge chamber, and a valve in the discharge chamber acting on a backflow of material thereinto from the sewer connection to close communication between the discharge chamber and the tube.

15. A combined air break and backflow preventing device for use between drain and sewer connections of a water service system, comprising a casing having an upper relief chamber and a lower discharge chamber, said relief chamber being provided at its top with a drain inlet for communication with the drain connection and with combined vacuum breaking air inlets and waste discharge outlets and said discharge chamber being provided with an outlet for communication with the sewer connection, a conductor tube disposed in said relief chamber and having an upper open end registering with the waste inlet and communicating with the relief chamber and a lower open end communicating with the discharge chamber and provided at a point between said ends with relief ports opening into the relief chamber, and a valve in the discharge chamber acting on a backflow of material thereinto from the sewer connection to close communication between the discharge chamber and the tube.

16. A combined air break and backflow preventing device for use between drain and sewer connections of a water service system, comprising a casing having an upper relief chamber provided at its top with air inlet and waste discharge openings and with a drain inlet for communication with said drain connection, and having a lower discharge chamber communicating at its top with the relief chamber and provided with an outlet for communication with said waste connection, a conductor tube disposed in said relief chamber and communicating at its upper and lower ends

therewith and also communicating at its lower end with the discharge chamber, a cover for the relief chamber having a guard flange depending on the outer side of said chamber opposite and in spaced relation to said combined air inlet and waste discharge openings, and means for closing the lower end of said tube to cut off communication between said chambers on a backflow into the discharge chamber of waste material from the sewer connection.

17. The combination, in a water service system, with a sewer outlet connection, and a fixture having an upper water intake connection and a lower drain outlet connection, the latter communicating with said sewer outlet connection, of a valve device having an upper valve member and a lower valve member operating to alternately open and close communication between a source of water supply and said intake connection and between said drain outlet connection and sewer outlet connection, an upper anti-siphoning device operating on the formation of a vacuum in the region of the intake connection to admit air thereinto to break the vacuum therein, and a lower anti-siphoning device operating on the formation of a vacuum in the region of the drain outlet connection to admit air thereinto to break the vacuum therein.

18. The combination, in a water service system, with a sewer outlet connection, and a fixture having an upper water intake connection and a lower drain outlet connection, the latter communicating with said sewer outlet connection, of a valve device having an upper valve member and a lower valve member operating to alternately open and close communication between a source of water supply and said intake connection and between said drain outlet connection and sewer outlet connection, a valved upper anti-siphoning device operating on the formation of a vacuum in the region of the intake connection to admit atmospheric air thereinto to break the vacuum therein and operating in the presence of backflow liquid therein to close the atmospheric connection against discharge of liquid therethrough, and a lower valved anti-siphonage device operating on the formation of a vacuum in the region of the drain

outlet connection to admit atmospheric air thereinto to break the vacuum therein and operating in the presence of backflow liquid from the sewer outlet connection to close communication between the latter and the drain outlet connection.

19. An anti-siphonage device for use between a drain outlet and a waste conductor of a water supply device for the purpose set forth comprising a casing having an upper relief chamber provided with an air inlet communicating with the atmosphere and a fluid inlet, the latter communicating with the drain outlet, and a lower discharge chamber provided with an outlet communicating with the waste conductor, and a restricted flow connection in said casing communicating with the relief chamber for receiving and conducting fluid through said chamber from the fluid inlet to the discharge chamber.

20. An anti-siphonage device for use between a drain outlet and a waste conductor of a water supply device for the purpose set forth comprising a casing having a relief chamber provided with an air inlet communicating with the atmosphere and a fluid inlet, the latter communicating with the drain outlet, and a discharge chamber provided with an outlet communicating with the waste conductor, a restricted flow connection in said casing communicating with the relief chamber for receiving and conducting fluid through said chamber from the fluid inlet to the discharge chamber, and a valve for closing said flow connection in the presence in the discharge chamber of backflow liquid from the waste conductor.

21. An anti-siphonage device for use between a drain outlet and a waste conductor, of a water supply device for the purpose set forth comprising a casing having a relief chamber provided with an air inlet communicating with the atmosphere and a fluid inlet, the latter communicating with the drain outlet, and a discharge chamber provided with an outlet communicating with the waste conductor, and a connection between said chambers for conducting fluid through said relief chamber from the fluid inlet to the discharge chamber.

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