March 17, 1936. R. A. BROOKS 2,034,173

SIPHON BREAKER FOR WATER CLOSETS

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Fig. 1.

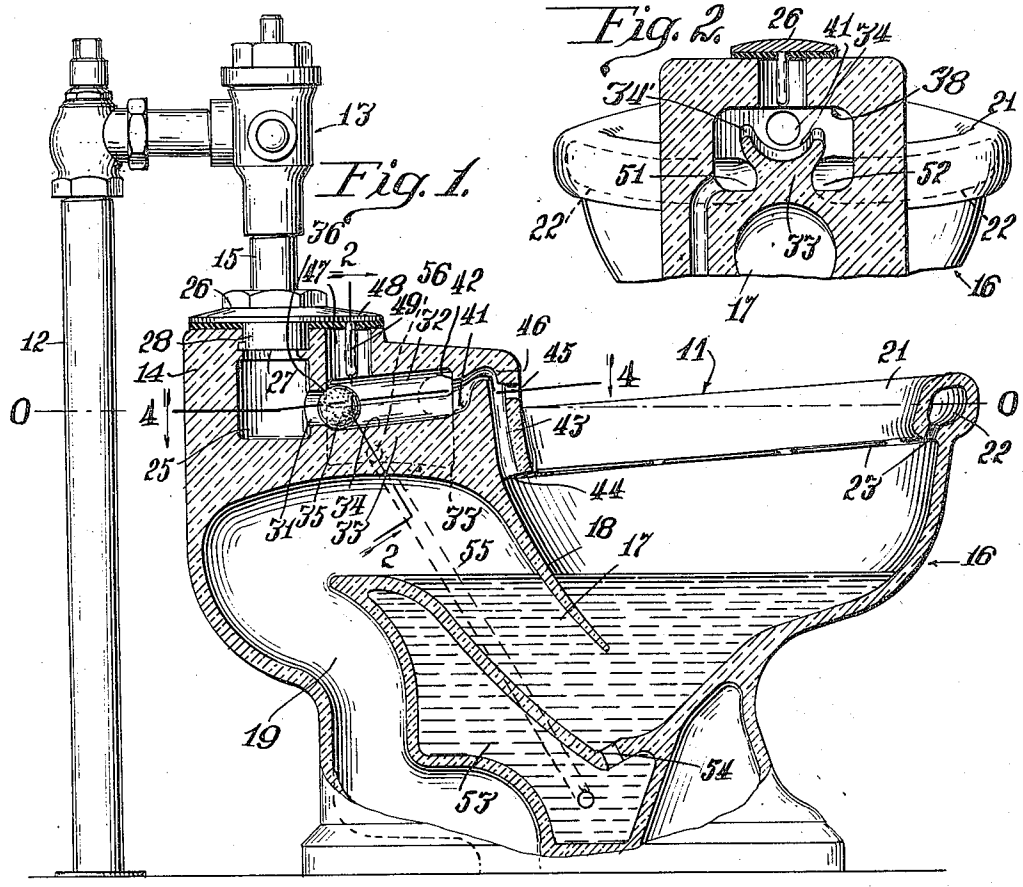


Fig. 2.

Fig. 3.

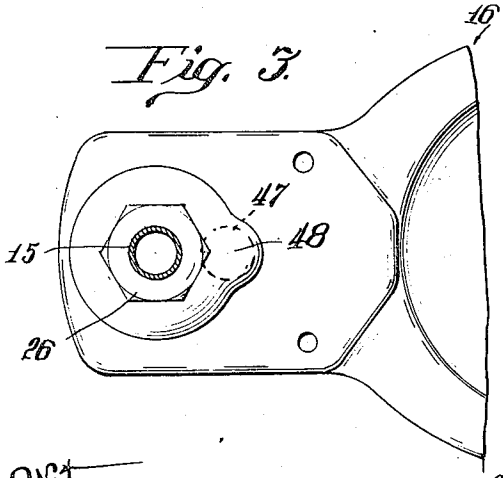
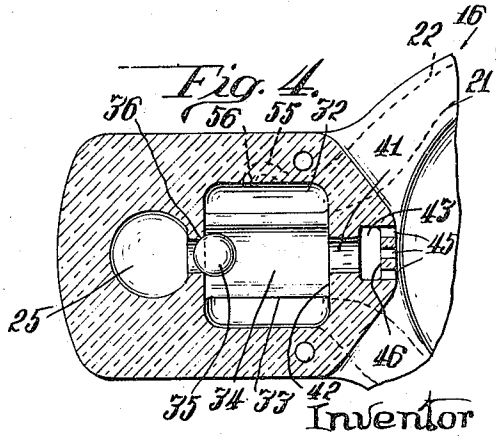


Fig. 4.



Inventor

Robert A. Brooks

Witness

Milton Lenoir

By Brown, Jackson, Boettcher & Dienner

Attorneys

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Fig. 5.

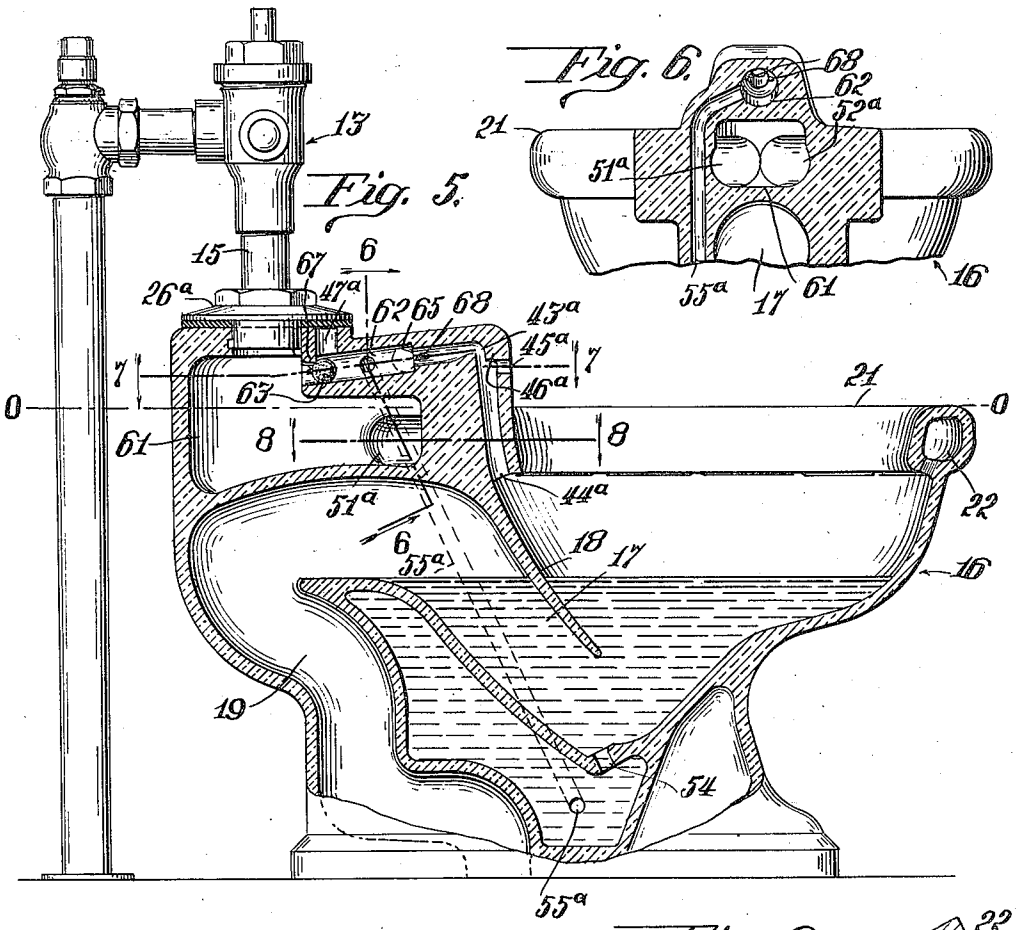


Fig. 6.

Fig. 7.

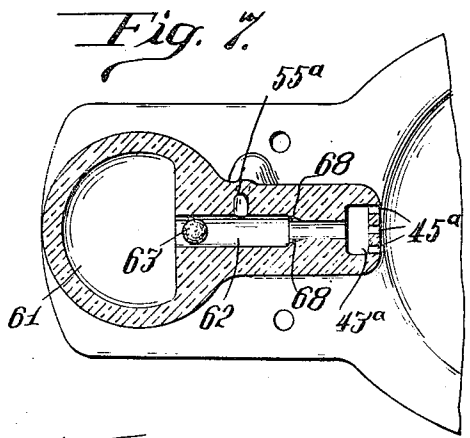
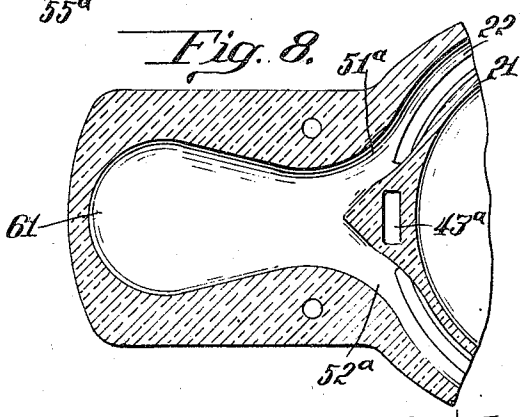


Fig. 8.



Inventor

Robert A. Brooks

Witness

Milton Lenoir

By Brown, Jackson, Boettcher & Dienner

Attorneys

March 17, 1936. R. A. BROOKS 2,034,173

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Fig. 9.

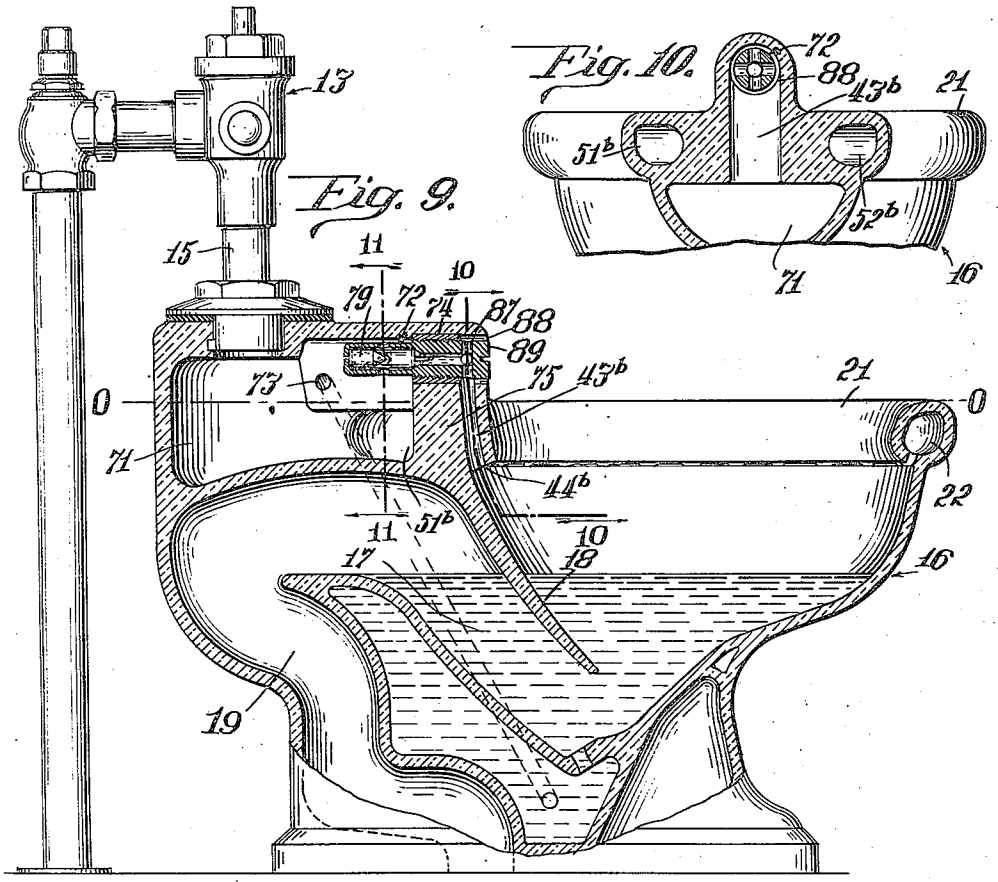


Fig. 10.

Fig. 12.

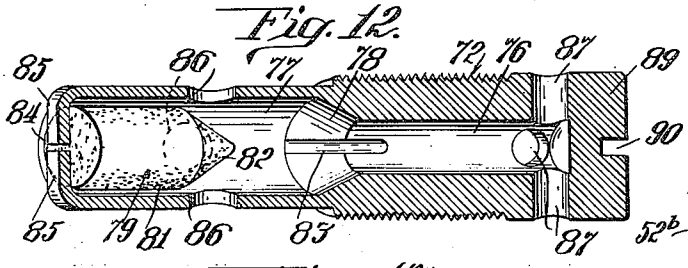


Fig. 11.

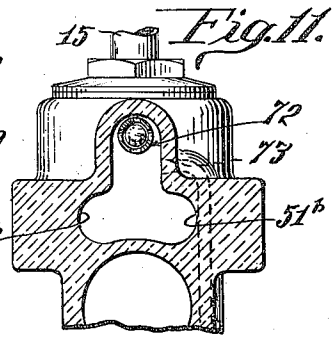
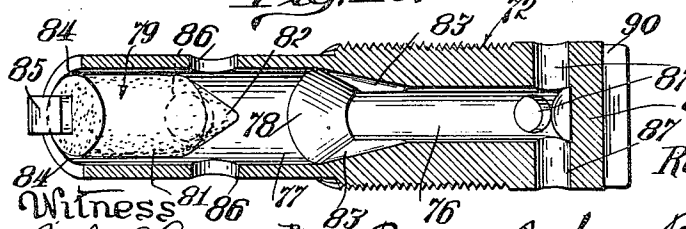


Fig. 13.



Inventor

Robert A. Brooks

Witness

Milton Lenoir

By Broun, Jackson, Boettcher & Dienner

Attorneys.

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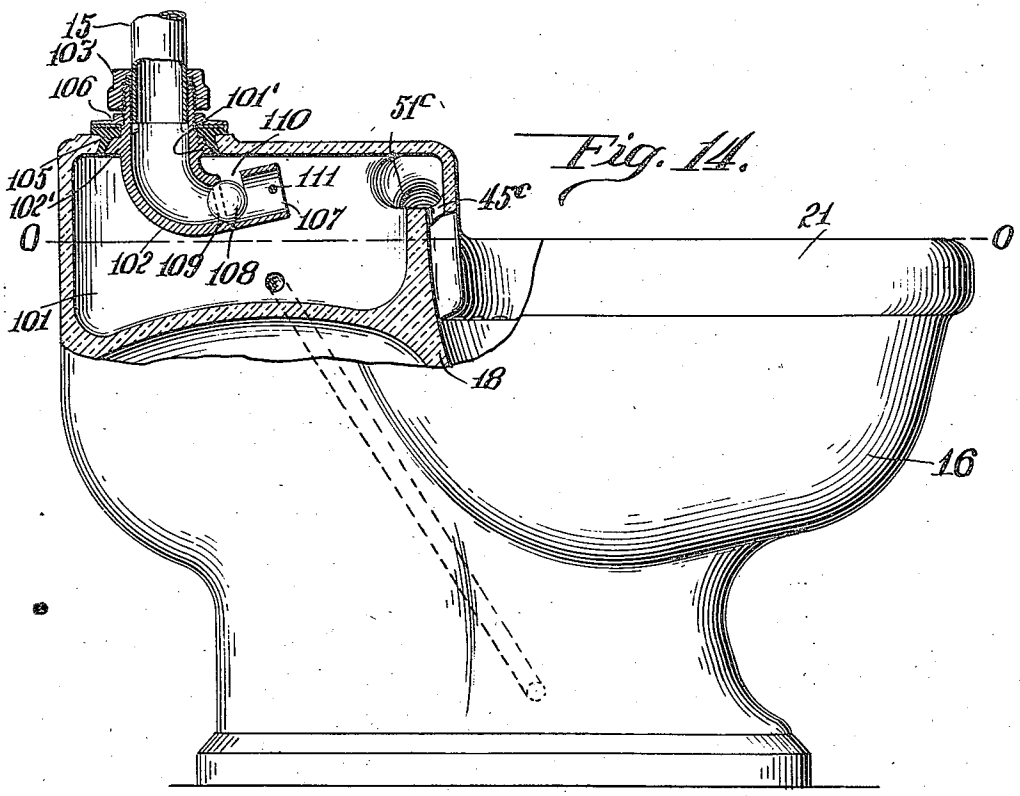


Fig. 14.

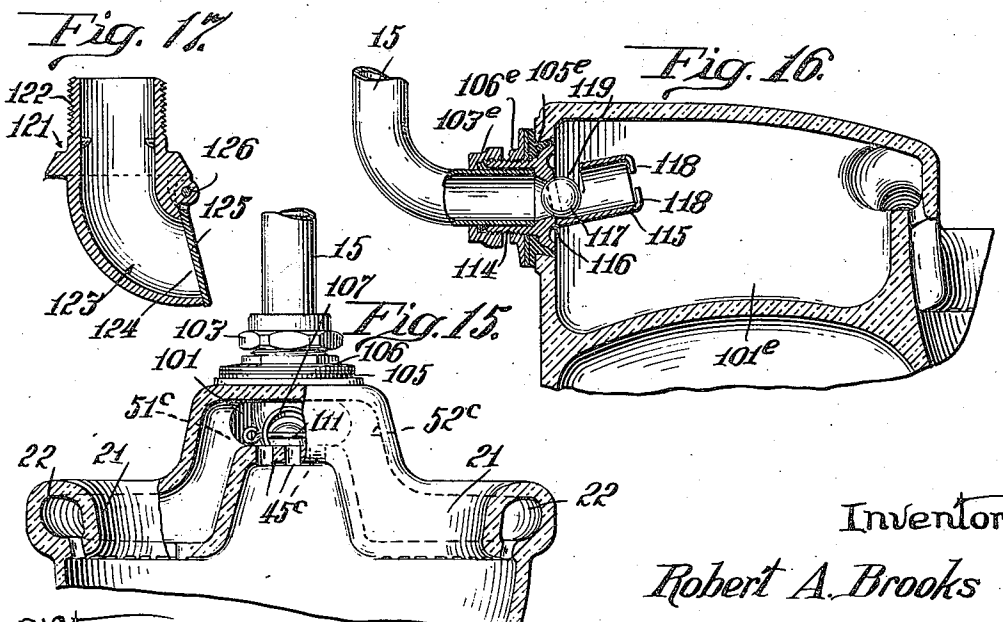


Fig. 17.

Fig. 15.

Fig. 16.

Inventor

Robert A. Brooks

Witness

Milton Lencir

By Brown, Jackson, Boettcher & Dienner

Attorneys.

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Fig. 20

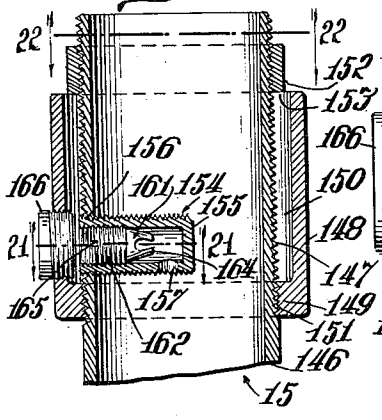


Fig. 21.

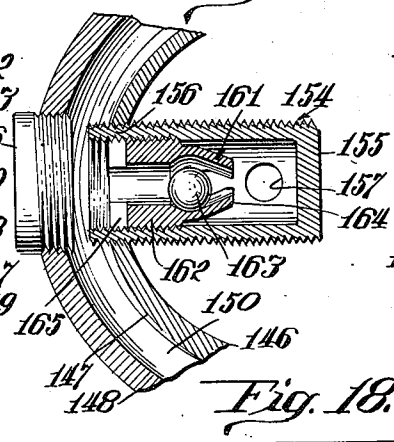


Fig. 18.

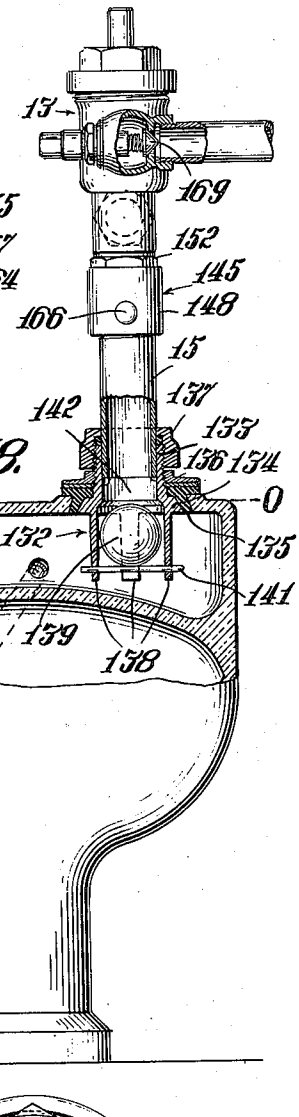


Fig. 23.

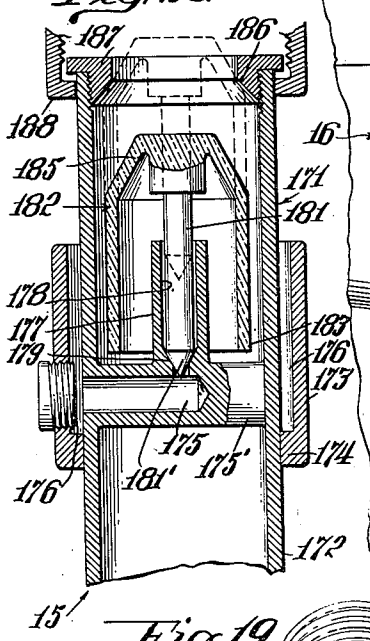


Fig. 19.

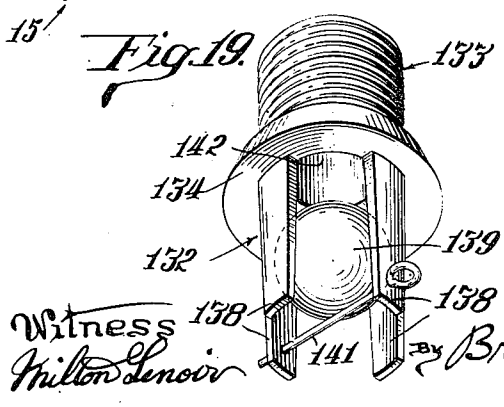
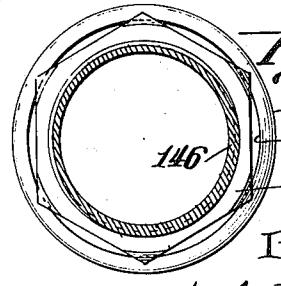


Fig. 22.



Witness
Milton Lenoir

Inventor
Robert A. Brooks
By Brown, Jackson, Boettcher & Dienner
Attorneys

Patented Mar. 17, 1936 2,034,173

UNITED STATES PATENT OFFICE

2,034,173

SIPHON BREAKER FOR WATER CLOSETS

Robert A. Brooks, Chicago, Ill.

Application May 28, 1931, Serial No. 540,557

29 Claims. (Cl. 4—70)

My invention has to do with improvements in closet bowls of the type which are generally connected directly to a city supply line. The invention provides an improved closet bowl designed to prevent contamination of the water in the service mains such as is frequently caused by a siphonic back flow from the water closet bowl.

It is the common practice in the plumbing industry in the installation of closet bowls to connect them directly to the city supply mains, thus eliminating reservoirs and associated mechanisms. It has become manifest to the public that, in such installations, a great danger exists in the possibility of contaminating the water supply of a building, or even that of a whole neighborhood, where a back flow or siphonic action might occur in the supply pipes which would draw up liquid from the closet bowl into the city supply mains.

This back flow or siphonic action could develop in various ways, as for instance, in a tall building where the closet is located on an upper floor. It is common for the water pressure in such buildings to fall, especially at night, to such an extent that the water will not always reach the upper floors, thus it is evident that, should considerable water be withdrawn from the floors below or in the neighborhood, as would occur in the case of a fire, a back flow or siphonic action might develop in the water supply pipes of such upper floors to such an extent that liquid might be drawn from a closet bowl into the supply pipe where it would circulate generally throughout the system causing contamination of a whole vicinity. It is readily conceivable that such contamination might be caused from innumerable conditions occurring in the water supply systems.

In some types of closet bowls the likelihood of such siphonic action tending to draw water from the bowl into the water system is increased by the inherent construction of the bowl. This is true in a "siphonic jet" type of closet bowl in common usage today, which type of bowl relies chiefly upon a conduit leading from the supply line to an orifice in the liquid seal trap through which water is siphoned to expel the contents from the bowl in the flushing operation. Should a reverse siphonic action occur in the water supply pipe, the liquid in the bowl might readily be drawn up into the fresh water supply pipe through the conduit providing this siphonic or power jet.

One of the objects of the present invention is to provide improved siphon breaking means embodied in a specially constructed closet bowl designed for that purpose.

Another object of the invention is to provide improved siphon breaking or preventing means which can be disposed within closet bowls of conventional design without necessitating any alteration thereof. This type of construction can be used as an attachment or accessory for conventional bowls already installed or to be installed.

Another object of the invention is to provide improved siphon breaking or preventing means which can be associated with the water supply pipe leading to the bowl. This construction can also be used as an attachment or fitting in association with any conventional bowl.

It is a further object of the present invention to provide an improved closet bowl of the "siphon jet" type having a vented chamber with a novel valve means which is responsive to the flow of water from the supply pipe to close the vented chamber. Thus, the vented chamber is in communication with the atmosphere outside of the bowl at all times except during the flushing operation when it is wholly or partially closed by the valve whereby a more efficient operation of the siphon jet is obtained.

Another object of my invention is the provision of a novel valve means which is responsive to the passage of water from the supply connection to automatically open and close ports or passageways in a manifold chamber of the closet bowl whereby water may readily pass through the manifold chamber in a flushing operation but a back flow of water will be prevented by the automatic actuation of said valve.

It is a still further object of my invention to provide a closet bowl of the siphonic jet type having a vented passageway above the overflow level of the bowl which vented passageway is of greater cross sectional area than that of the siphon jet conduit leading to the liquid seal trap at the bottom of the bowl, and valve means to check the flow of water through said air passageway during a flushing operation to thereby increase the operating efficiency of the siphon jet action.

Other objects and advantages will become apparent from the following detailed description of preferred constructions shown in the accompanying drawings, in which:

Figure 1 is a vertical section of a closet bowl, connected by means of a typical flushing valve to a water supply system;

Figure 2 is a fragmentary transverse sectional

view taken along the line 2—2 of Figure 1, looking in the direction of the arrows;

Figure 3 is a fragmentary plan view of a rear portion of the bowl;

Figure 4 is a fragmentary transverse sectional view taken along the line 4—4 of Figure 1, looking in the direction of the arrows;

Figure 5 is a vertical section of a closet bowl, showing a modified form of my invention;

Figures 6, 7 and 8 are fragmentary sectional views of the bowl, shown in Figure 5, taken along the lines 6—6, 7—7 and 8—8, respectively;

Figure 9 is a vertical sectional view of another modification of my invention;

Figures 10 and 11 are fragmentary transverse views taken along the lines 10—10 and 11—11, respectively, of Figure 9;

Figure 12 is an enlarged longitudinal view, in section, of an air vent as employed in the construction shown in Figure 9;

Figure 13 is a view similar to Figure 12 but taken at right angles thereto;

Figure 14 is a side elevation of a further modification showing a rear portion of the bowl in section;

Figure 15 is a fragmentary transverse view of Figure 14, parts being broken away to show the details of construction;

Figure 16 is a fragmentary sectional view of a slightly modified form of bowl as shown in Figure 14;

Figure 17 is still another form embodying the broad aspects of my invention;

Figure 18 illustrates the installation of a slightly different form of siphon breaking arrangement that can be readily assembled in the typical closet bowl for breaking or preventing siphonic back flow;

Figure 19 is a perspective view of the novel back flow or siphon preventing valve employed in the construction shown in Figure 18;

Figure 20 is an enlarged vertical view, in section, taken through the air venting device provided in the supply pipe;

Figures 21 and 22 are transverse views taken on the lines 21—21 and 22—22, respectively, of Figure 20; and

Figure 23 is a vertical sectional view of a further modification of siphon breaking assembly or unit which is adapted to be employed in the supply connection of any type of plumbing fixture.

Referring now more particularly to Figures 1 to 4, inclusive, a closet bowl, indicated generally at 11, receives water from a city main or other source through the supply pipe 12. A conventional flushing valve 13 controls the admission of water into the closet in a flushing action and this water passes through a connecting pipe 15 into a rear portion of the closet bowl. The bowl is shown as being of the "siphon or power jet" type. It has a large bowl proper 16 in communication with the usual liquid seal trap, the latter consisting of an upwardly extending leg 17 connecting with a downwardly extending leg 19. The downwardly extending leg 19 is connected to a waste pipe (not shown). A sloping transverse wall 18 defines the back wall of the main bowl and the forward wall of the upwardly extending leg 17. The construction of the bowl proper and the liquid seal trap are shown by way of illustration only and obviously these parts may be modified within the teachings of my invention.

A flushing rim 21 extends around the upper margin of the bowl proper 16 and contains the usual annular passageway 22 for conducting the water to flush the side walls of the bowl. Slot-like apertures 23 are formed around the underside of the flushing rim 21 adjacent the wall of the bowl 16 and these apertures open into the passageway 22 for discharging the water. The slot-like apertures 23 are preferably of narrow cross section so as to allow only a limited amount of water to pass therethrough, the quantity being sufficient to flush the side walls of the bowl 16 but not hindering the siphonic action of the bowl during the flushing operation.

The water used in the flushing operation passes through the pipe 15 into a first chamber or compartment 25. The compartment 25 is shown as comprising a cylindrical opening in the rear portion 14 of the bowl, and a coupling 26 connects the pipe 15 to said compartment 25. A flange ring 27 is formed on the inner wall of the compartment and this ring provides a stop or abutment against which a pipe or extension 28 of the coupling 26 rests. A cylindrical opening or port 31 is formed in the front wall of the compartment 25 as best seen in Figures 1 and 4. The water passes from the first compartment 25 through the port 31 into a second compartment or manifold chamber 32, from whence the water is directed into the flushing rim 21. The manifold chamber 32 appears as a rectangular chamber in transverse section, as seen in Figure 4. Extending longitudinally of the manifold chamber 32 and connecting with the opposite ends thereof is a raised portion 33 forming a channeled runway or trough 34. This runway or trough 34 has upwardly curved side walls 34' for retaining a ball valve 35 thereon. The ball valve 35 may consist of hard rubber, porcelain, or other material of relatively light weight so as to move freely upon the channeled runway responsive to the flow of water passing through the manifold chamber. The runway is inclined at an angle, the forward end being somewhat higher than the rear end thereof, as clearly seen in Figure 1, so that the ball valve 35 will normally close the port 31. The port 31 is located slightly above the rear end of the runway, and the edge 36 of the port affords a seat for the ball valve, thus sealing the port against the flow of a fluid in a reverse direction from the manifold chamber into the supply line. That is, water will pass readily through the port 31 into the chamber 32 due to the pressure of the water moving the ball 35 forwardly on the trough and when the pressure subsides, the ball will return on the runway to again seal the opening of the port against the reverse flow of fluid.

The forward end of the channeled runway 34 is disposed slightly below a second port 41 formed in the forward end 42 of the manifold chamber. This port 41 leads into a vertical passageway 43 which has an outlet 44 disposed centrally of the back wall 18 of the bowl 16. At the outset of the flushing action, the water will move the ball 35 forwardly on the runway 34 to close the port 41 against the outward passage of water through this opening. Should the ball 35 get stuck or be prevented from positively sealing the port 41, water may pass through this port into the passage 43 and thence into the bowl. The passage 43 is vented to the atmosphere outside of the bowl by means of openings 45 formed in the front face of the rear portion 14. In case water escapes past the ball 35 into the port 41, as in the case just mentioned, the water will be directed upwardly and against a deflecting wall 46 and

then downwardly into the passage 44. None of this water will have occasion to escape through the vent openings 45 due to the latter openings being located beneath the overhanging ledge of the abutment wall 46. It will be manifest that the ball 35 will reciprocate freely in the channeled runway 34 responsive to the water flow when the valve 13 is opened and closed to effect closing of one of the ports 31, 41. The atmospheric vents 45 are disposed above the overflow level of the bowl, which level is indicated by the line 0—0. The rear portion of the flushing rim 21 is shown as depressed, which enables the standard type of seat to be used with these atmospherically vented bowls.

As best seen in Figure 2, the vertical space between the curved sides 34' of the runway and the ceiling 38 of the manifold chamber is less than the diameter of the ball 35 so that the latter can not escape from the channeled runway 34 during the flushing operation. A cylindrical opening 47 extends vertically beneath the cover plate 48 of the coupling 26 into the chamber 32 directly above the runway 34. In first installing the fixture, the ball 35 is dropped through this hole into position on the runway and the cover plate is secured in place to prevent removal of the ball. The cover plate is preferably provided with a depending pin 49 which prevents the ball 35 from being forced into the cylindrical opening 47 under pressure of the water. The ball valve 35 may be readily removed for replacement or the like by merely removing the cover plate 48.

Referring now to Figures 2 and 4, it will be seen that the passageway 22 which encircles the bowl originates in the chamber 32, the open ends 51, 52 of this passageway entering the chamber on opposite sides of the raised runway 34. A quantity of the water will flow into this passageway during the flushing action and then escape through the slots 23 into the bowl proper 16.

In the siphon jet type of bowl, a chamber 53 is formed in the lower portion between the upwardly and downwardly extending leg portions of the bowl and a siphon jet port 54 discharges water upwardly into the ascending leg 17 of the trap. Water is conducted from the manifold chamber 32 down to this lower chamber 53 through a siphon jet passageway or conduit 55. The siphon jet passageway 55 receives water during the flushing action from the manifold chamber through the opening 56. The opening 41 and associated venting passageway is shown as being of greater cross-sectional area than the opening 56 of the passageway 55, although this relation is obviously not essential. In case a back suction or vacuum develops in the supply line 12, caused by more water being withdrawn in the vicinity of the present installation than is available to keep the pipe 12 filled, and should the flush valve 13 remain open or leak, the ball valve 35 will seal the port 31 to prevent any fluid whether air or water from being sucked into the supply line 12. Should the ball valve 35 not entirely seal the port 31, a ready supply of air will be present to be drawn into the supply line 12 responsive to the back suction or vacuum.

As before mentioned the vent openings 45 are located above the overflow level of the bowl, so that the chamber 32 will always be vented to the atmosphere outside of the bowl. It is now clear that should the bowl 16 be stopped up and receive water to the extent of overflowing on the floor, the siphon breaking action in the manifold chamber 32 will not be affected or impaired by virtue of the vented openings 45 being disposed sufficiently above the level that the water will reach when spilling on the floor.

Due to the provision of the port 41 and flushing outlet 44 in the manifold chamber, water during the flushing period might more readily flow through the port 41 than the opening 56 of the siphon jet passageway, and consequently impair the efficiency of the siphon jet action in evacuating the bowl. However, I overcome the possibility of such result by providing the ball valve 35 which closes the port 41 instantly upon the flow of water through the manifold chamber, thus checking and diverting the flow through the opening 56 of the siphon jet passageway 55 and the openings 51 and 52 into the flushing rim 21.

Even though the ball valve 35 does not completely seal the port 41 with the consequent leaking of water past the valve and into the passageway 43, enough of the water will be checked so that the siphonic action of the jet 55 will not be seriously affected. It will thus be seen that I have perfected a double acting ball valve arrangement in connection with the air passageway above the overflow level of the bowl which conducts the water in the flushing operation, the ball valve being operative on an inclined surface and responsive automatically to the flow of flushing water to alternatively open and close ports in the passageway, thus checking or stopping the outflow of water through the air passageway and also preventing fluid from being sucked back through this passageway into the supply connection. This construction is formed as an integral part of the bowl with the exception of the ball valve member—thus having little possibility of becoming inoperative. The ball member itself obviously may take any other form where found convenient or necessary.

The construction shown in Figures 5 to 8 inclusive has the same general relation of flushing rim 21, siphon trap 17, 19 and siphon jet 54. In this construction the supply pipe 15 opens directly into a manifold chamber 61. The end ports 51*a* and 52*a* of the flushing rim passageway 22 open directly into this manifold chamber. Formed in the upper part of said chamber is an inclined passageway 62 in which a ball valve 63 rolls. The rear end of said passageway opens into the manifold chamber, and the front end of said passageway has a port 65 which opens into an atmospheric vent channel 43*a* which leads downwardly and has an outlet 44*a* disposed centrally of the back wall 18 of the bowl. Atmospheric vent ports 45*a* open into this channel above the overflow level 0—0 of the bowl. Said ports are located below the deflecting wall 46*a* so that water can not splash outwardly through said ports. In this and in the preceding embodiment the channel is formed of larger sectional area below the atmospheric vents to aid in preventing the outward splash of water therethrough.

The ball 63 is of smaller diameter than the passageway 62. The rear end of said passageway has a lug or stop 67 projecting into position to hold the ball in the passageway but when in this position there is ample venting area around the ball to permit a rapid flow of siphon breaking air from the vents 45*a* back into the manifold chamber 61. The port 65 at the front end of the passageway 62 is preferably provided with one or more restricted by-pass passages 68, which may be formed as notches in the valve seat against which the ball valve seats when in

its forward position. These by-pass channels permit a restricted flow of water through the venting channel 43*a*, 44*a* and down along the back wall 18 of the bowl during the flushing operation for cleaning said back wall. However, said by-pass channels permit only a comparatively restricted flow which does not impair the efficiency of the siphon jet or other flushing orifices. This same arrangement of by-pass channels may, if desired, be associated with the port 41 in the embodiment of Figures 1 to 4, inclusive.

In this modified embodiment shown in Figures 5 to 8, the siphon jet passage 55*a* opens into the passageway 62 at a point intermediate the ends thereof. At the start of the flushing operation, the ball valve 63 moves upwardly past the opening of passage 55*a* to close the port 65 hence causing most of the water entering the passageway 62 to be directed down through the siphon jet passage 55*a*. A vertical opening 47*a* is provided in the bowl beneath the coupling member 26*a* for permitting installation of the ball valve member into the inclined passageway 62. In this construction an air passageway or channel comprising the passageway 62, channel 43*a* and openings 45*a* exists in the bowl above the overflow level 0—0 at all times except during the flushing operation when it directs water into the bowl. This air passageway is in direct communication with the atmosphere and provides for an adequate supply of air to be drawn back into the fresh water supply pipe in the event of a back suction developing therein.

The construction shown in Figures 9 to 13 is similar to the modification shown in Figure 5. As seen in Figure 9, the same general type of closet bowl 16 is employed having the usual flushing trap 17 and 19, flushing rim 21 and flushing passageway 22. The end ports 51*b* and 52*b* of the flushing passageway 22 open into the manifold chamber 71. The manifold chamber 71 receives the flushing water directly from the usual connection 15. The manifold chamber 71 of Figure 9 is identical to the manifold chamber 61 shown in Figure 5 with the exception of the construction of the siphon breaking means. In Figure 5 the siphon breaking means or passageway is shown as being an integral part of the bowl, being formed or cast above the manifold chamber 61. In the construction shown in Fig. ure 9, the siphon breaking means includes a removable unit 72 being positioned in the manifold chamber 71 above the overflow level 0—0 of the bowl. As seen in Figures 9 and 11, the usual siphon jet passage opens at 73 into one side of the manifold chamber 71.

The removable unit 72 consists of an externally threaded tube or plug which is screwed into an internally threaded sleeve portion 74 extending through the forward wall 75 of the manifold chamber. As best seen in Figures 12 and 13, the removable plug has central bore and counterbore portions 76 and 77, respectively, with a flared or conical wall portion separating the bore and counterbore. The flared wall 78 provides a valve seat for a sliding or reciprocating valve member 79. The valve member 79 in this instance comprises a cylindrical portion 81 having a tapered or conical forward end 82 which corresponds to the valve seat 78. The valve seat 78 is preferably grooved at 83 to provide a by-pass for allowing a restricted flow of liquid to pass into the bore 76 when the member 79 has moved forwardly into engagement with valve seat 78. The valve member 79 is of smaller transverse dimension than the diameter of the counterbore 77, and this member is adapted for free longitudinal movement therein. The inner end 84 is open except for the provision of two tabs or fingers 85, which are bent or lapped over after the installation of the valve member 79. The counterbore 77 is provided with a plurality of openings 86 to allow free passage of water and air into and out of this portion of the tube or plug.

The bore 76 extends forwardly and opens into transverse or radial openings 87, and when the plug 72 is installed, as viewed in Figure 9, these radial openings 87 extend in the same plane with the vertical flushing passageway 43*b* which opens at 44*b* centrally above the back wall 18. The diameter of the opening 88, into which the sleeve 74 is installed, is somewhat larger than the diameter of the plug itself thus leaving a circular area or space around the cap portion 89 of the plug. Air may then enter around the cap portion 89 and into the manifold chamber through the radial openings 87 and bores 76 and 77. The cap portion 89 is provided with a suitable slot 90 for receiving a screw driver or other suitable tool employed when installing the plug.

In flushing the bowl, the water moves the valve member 79 forwardly to its closed position in the valve seat 78. The restricted flow of water passing through the by-pass 83 will drain through one of the radial openings 87 and down through the vertical passageway 43*b* to flush the back wall 18. During the flushing operation water will discharge out of the manifold chamber 71 into the flushing rim 21 through the openings 51*b* and 52*b* of passageway 22 and will also discharge down through the siphon jet supply passage 73. At the end of the flushing operation, as the water lowers in the manifold chamber, the valve member 79 will be sucked or drawn back from its forward position to thereby allow an unrestricted passage of air to enter the chamber. It will thus be seen that the valve member 79 reciprocates back and forth in the unit 72 responsive to the flow of water in the chamber 71. This valve construction normally vents the manifold chamber to the atmosphere above the overflow level 0—0 of the bowl so that the air admitted through said valve will prevent any siphonic back flow.

Referring now to the modification shown in Figures 14 and 15, a conventional closet bowl is disclosed at 16 having a manifold chamber 101. The manifold chamber in this instance consists of a substantially rectangular chamber with the flushing rim ports 51*c* and 52*c* opening into the upper front portion thereof. Venting apertures 45*c* are positioned in the forward wall above the overflow level of the bowl indicated by the dotted line 0—0. The openings 45*c* vent the manifold chamber to the atmosphere above the overflow level of the bowl as well as allow a quantity of water to pass therethrough to wash the back wall 18 during the flushing period.

Water is supplied to the manifold chamber 101 through the usual supply pipe, a fragmentary portion of which is here shown at 15. The pipe 15 is connected to a bent or elbow pipe 102 by a suitable coupling 103. The elbow pipe 102 extends forwardly into the manifold chamber and is secured in place by a suitable packing ring 105 and threaded plate 106. Although the elbow pipe 102 is here shown as installed in a specially built closet, it is to be understood that the elbow pipe 102 can be conveniently installed in all standard makes of closets. When installing the pipe 102 into the manifod chamber 101, the forward

end 107 is inserted into the opening 101' in a downwardy and forwardly direction until the collar 102' lies in substantially the same horizontal plane with the opening 101'. The collar is wedge shape in cross section hence providing a flared peripheral edge for wedging engagement with the similarly flared packing ring 105, and by tightening the flanged ring 106 down upon the packing ring 105, the pipe 102 is securely held in place. The forward end 107 forms an inclined spout through which water flows into the manifold chamber. An opening 110 is formed in the upper periphery of the spout 107 through which water may pass into the manifold chamber. The spout 107 provides an inclined runway for a ball valve member 108, the latter normally resting by gravity in a valve seat 109 sealing the supply connection 102 against the reverse flow of water. The flushing water moves the ball valve 108 forwardly during the flushing period, and a pin 111 extending across the mouth of the spout prevents the ball from leaving the spout under the force of the water.

As soon as the flow ceases, the ball valve will close the valve seat 109 against the reverse flow of water, air, etc., into the fresh water supply pipe. Should the bowl become stopped up and subsequently filled up with water to the extent of overflowing on the floor, the manifold chamber might fill up to a height even with the top of the rim 21 or on a plane with line 0—0 after which water will spill over on the floor. In such condition, an air chamber will then exist in the upper portion of the manifold chamber communicating with the atmosphere through openings 45c and with the supply connection 15 above the overflow level of the bowl. If the bowl be negligently allowed to remain in this condition and a back suction or vacuum develop in the fresh water supply line, the ball valve 108 will prevent the reverse flow of liquid into the supply line. In the event that the ball 108 does not close the valve seat 109 properly, a ready supply of air passing through the upper portion of the manifold chamber will prevent any water present in the manifold chamber from being drawn back into the supply pipe.

The construction shown in Figure 16 illustrates the application of the embodiment shown in Figures 14 and 15 to a supply connection entering the rear of the manifold chamber. As shown in Figure 16, a manifold chamber 101e receives flushing water from a supply pipe 15, the latter being connected by a suitable coupling 103e to a sleeved connection 114 in the back wall of the manifold chamber. A gasket 105e is employed with a flanged tightening plate or nut 106e to secure the connection in the wall of the chamber. The connection 114 has an inclined spout 115 extending into the manifold chamber 101e, and this spout has a reduced or flared portion forming a valve seat 116 to receive the ball valve member 117. A pair of tabs or fingers 118 extend radially of the forward end of the spout to limit the forward movement of the ball 117 therein. A peripheral opening 119 is formed in the spout through which water passes into the manifold chamber. The operation of this construction is identical with that of Figures 14 and 15 and need not be explained further.

Figure 17 shows a somewhat different embodiment of my invention. In this figure a curved pipe or connection 121 is formed with a peripheral shoulder which may be mounted in the manifold wall in the same relation shown in Figure 14. The upper end of the pipe is exteriorly threaded at 122 for coupling to the usual supply connection. The lower end 123 of the pipe curves forwardly at an angle to the threaded portion 122, and the lower opening or mouth 124 is covered by a plate 125 hinged at 126. The mouth 124 of the pipe is formed at an angle so that the lid or plate 125 will normally rest by gravity covering that opening. The hinged cover plate 125 is free to swing open responsive to the flow of water through the pipe or connection 121 and to close the mouth on the subsiding of the flow of water, thus preventing a back flow of water entering the fresh water supply.

The modification shown in Figure 18 shows a conventional closet bowl at 16 having the usual type of manifold chamber 131 in the rear portion thereof. This closet bowl differs from those of Figures 1, 5, 9, etc., principally in that it does not have any atmospheric vent disposed above the overflow level 0—0, and in that sense typically represents the majority of closet bowls now in use. That is to say in this construction there is no venting passage built into the bowl itself and communicating with the atmosphere and with the supply connection above the overflow level of the bowl to conduct air to the supply connection in case a back suction or vacuum should develop therein. To prevent a back flow of liquid from the manifold chamber should a siphonic action develop in the supply system, I provide siphon preventing or breaking apparatus which can readily be installed in association with any type of bowl, and which preferably comprises the cooperative combination of a check valve and an automatically operating atmospheric vent both associated with the supply connection 15 leading to the bowl. Referring first to the check valve attachment, indicated generally at 132, this attachment comprises a sleeved portion 133 and a flanged collar 134. The flanged collar 134 and circular packing 135 are firmly secured in the manifold chamber by a flanged threaded member 136. The sleeve portion 133 is secured to the supply connection 15 by the usual coupling 137. Extending downwardly from the flanged collar 134 are four prong-like members 138 which provide a retaining structure or cage for holding a ball valve member 139. The ball member here shown rests by gravity on a cross pin 141 and allows the water to flow freely into the manifold chamber 131. In this instance, the ball valve 139 is lighter than water and if water should rise in the manifold chamber, such as might occur responsive to a siphonic condition developing in the supply connection, the ball valve 139 will be actuated upwardly in the prong structure 138 to close the opening 142, thus preventing any liquid from being drawn or sucked up into the pipe 15. This ball valve attachment 132 can be mounted in practically all standard bowls.

Mounted in the supply connection or pipe 15 (Fig. 18) is the cooperating siphon preventing attachment 145 which coacts with the ball valve attachment 132, the latter attachment 145 venting the supply system to the atmosphere above the overflow level of the bowl. As best seen in Figures 20–22, this unit comprises a section of tubing 146, which may be the supply pipe 15, exteriorly threaded at 147 for receiving a sleeve 148 having an inwardly flanged end 149 interiorly threaded at 151 for engagement with threads 147. This sleeve 148 is of greater inside diameter than the diameter of the tubing 146, thus providing a circular space or area 150 between these members.

A hexagonal locking nut 151 is threaded on the tubing and against the top or open end 153 of the sleeve 148 leaving openings for the circulation of air into the space 150 between the sleeve and the tubing. An air tube 154 closed at its inner end 155 is threaded into the tubing 146 and the opposite end 156 of this tube opens into the air space 150. An orifice 157 adjacent the closed end 155 of the tube 154 opens downwardly to allow air to pass into the tubing 146 but to prevent flushing water to flow into the tube 154. A check valve 161 is provided in the tube 154 to further insure against the reverse flow of water through the air tube. This check valve consists of a sleeve portion 162 threaded into tube 154. The sleeve portion 162 has a central bore adapted to be closed by a ball valve 163 which is loosely held in a cage-like structure 164. A diametrically extending slot 165 is provided in the end of the check valve for receiving a screw driver or other suitable tool. A plug 166 is threaded into the sleeve 148 at a point opposite to the tube 154 for facilitating removal of the jet plug without removing the sleeve 148. The check valve structure 161 and jet tube 154 allow an unrestricted flow of air into the tubing 146 but prevent the passage of water in a reverse direction. In the flushing operation there is only a minimum possibility of water leaking past the air venting check valve 163 and out through the air vent plug 162. However, if this leakage should occur the water will accumulate in the reservoir space 150 and then at the end of the flushing operation this accumulation of water will drain back through the plug 162, past the valve 163, and down into the supply pipe 15. The possibility of this air venting attachment leaking water is greatly reduced by making the device of relatively small port area, enabling a small, light weight valve 163 to be used, this small port area also restricting the volume of leakage water in the event of leakage so that the water can be accumulated in the reservoir 150 until the end of the flushing operation.

The provision of the back flow preventing check valve 139 has cooperation with the air venting attachment 145 in that by providing this check valve 139 the latter will under most circumstances seal the supply pipe against back flow of water but if through imperfect seating of the valve 139 there should be a tendency for leakage past this valve the area of leakage opening will be so small that the relatively small air venting plug 162 will supply ample air to prevent complete back siphonage through this leakage opening and into the supply line 12. The small size of the air venting attachment 145 also enables it to be installed directly in the supply pipe 15.

However, it will be understood that the air venting device 145 might be made of sufficient capacity to supply ample air for breaking a back siphon independently of any back flow preventing check valve 139, 108, 117 or 125.

Figure 18 discloses the usual flushing valve at 13 located above the siphon breaking unit 145 and a pressure reducing valve 168 having a spring pressed plunger 169 on the supply line side of the flushing valve 13. Thus, in this figure three separate agencies besides the flushing valve 13 act to prevent a siphonic flow of water back into the fresh water supply.

Figure 23 shows another form of siphon breaking unit which can be installed directly in the supply connection to prevent a possible back flow of liquid from the bowl into the fresh water supply system. In this instance, the siphon breaking unit 171 may comprise a short piece of tubing or pipe 172, such as a specially constructed supply pipe 15, with a sleeve 173 mounted exteriorly thereon. The sleeve 173 has a flanged portion 174 which is sweated, soldered, or otherwise secured to the tubing for holding the sleeve in position. An opening in the pipe 172 forms an inlet opening into a central bore 175 of a transversely extending rib or bridge 175'. The rib 175' is here shown as comprising a member extending diametrically across the pipe 172 and may be cast integral with the pipe or it may be a separate member soldered, brazed or otherwise fixed in the pipe 172. The bore 174 as here shown does not extend the entire length of the rib but this bore could obviously open at both ends into the space 176 if desired. The rib 175' has a vertically extending sleeve portion 177 having a central bore 178 in communication with the transverse bore 175 in the rib. The lower portion of the vertical bore 178 has a flared portion 179 forming a valve seat for a complementary conical portion 181' of a needle valve stem 181. The valve stem 181 is carried in the central bore of a plunger member 182 shown in the preferred form as an inverted cup or bell. The cup or bell has a cylindrical body portion open at its lower end 183 and converging at its upper end into a conical portion 185. The member 182 with its conical end 185 performs a plunger-like action for closing the upper opening 186 of the pipe. That is, the plunger member 182 is made of light weight material, preferably lighter than water, and should the water in the manifold chamber be sucked up into the pipe 172, the plunger will be carried upwardly to close the opening 186. The opening 186 is provided with a collar 187 which is preferably threaded into the upper end of the pipe 172, and this collar has a flanged portion extending radially thereof for engaging with a suitable coupling member 188. The coupling 188 is provided for making a connection with a flushing valve or other suitable pipe. The collar 187 has an inner flared wall which forms a complementary seating surface for the conical end 185 of the plunger member as shown in dotted lines, hence sealing the opening 186 against the flow of water upwardly in the pipe 172.

In practice, the plunger member 182 will rest by gravity in its lowermost position as shown by the solid lines in Figure 23, thus sealing the air inlet opening at 179 by virtue of the needle valve arrangement. Therefore, under no condition will the flushing water have occasion to leak from the bores 174—175 into the sleeve 173. The plunger 182 is of such diameter with respect to the interior of the pipe that the flow of flushing water is not materially reduced by its presence in the pipe. In the event that a siphonic action develops in the fresh water supply system tending to draw water from the manifold chamber into the pipe 172, the column of water raised in the pipe will cause the plunger member 182 to seat in the collar 187 to seal the opening 186 against any further siphonic action affecting the water in the bowl. When the plunger 182 raises, air will enter through the needle valve 179—181' responsive to the back suction or vacuum created in the pipe 172, and this air being trapped within the bell-shaped member 182 increases its buoyancy and retains the upper end of the sleeve portion 177 always in an air space. Upon the plunger rising to completely seal the upper opening 186, the air drawn in through the needle

valve will cause the water sucked up into the pipe 172 to drain back into the manifold chamber. The plunger 182 will remain in its upper or dotted line position until the vacuum or siphonic condition is broken or otherwise overcome. It will be manifest from the above description that the valve construction shown in Figure 23 has substantially the same utility and function as the arrangement shown in Figures 18 and 20 and hence may be adapted for those or like situations mentioned in connection with the latter arrangement. In the event that the valve portion 185 should not have perfect seating at 186 the volume of air admitted through the air vent 179 will still prevent back siphonage.

It will be evident that numerous modifications and rearrangements of parts may be made without departing from the essence of my invention.

I claim:

1. In a water closet, the combination of a manifold chamber adapted to receive flushing water from a supply connection, a passageway leading from the manifold chamber to the bowl of the closet, a separate outlet opening in said manifold chamber through which water may flow and of sufficient size to break any siphon established by virtue of negative pressure in said manifold chamber, and valve means operable to close said outlet opening responsive to the flow of flushing water to prevent loss of positive pressure from the manifold chamber.

2. In a water closet, the combination with a siphonic action bowl having a liquid seal trap, a water supply connection for flushing said bowl and a channel for conducting water from said supply connection to said liquid seal trap, of a manifold chamber directly connected with said channel to allow an unrestricted flow of water directly from said supply connection into said channel for flushing said bowl, a portion of said chamber providing an air passageway venting said supply connection to the atmosphere above the overflow level of the bowl, and means movable responsive to the flow of a fluid to close said passageway, the latter being disposed above said bowl in such a position relative thereto that fluid flowing therethrough before said movable means closes the passageway will discharge into the bowl.

3. A water closet bowl adapted to receive flushing water from a supply connection and comprising a chamber, means establishing a passageway between the supply connection and the chamber, means establishing an air opening in said passageway at points adapted to communicate with both said supply connection and said chamber and being disposed above the overflow level of the bowl, and means independent of said air inlet opening for preventing any reverse flow of a fluid from said chamber into said supply connection.

4. A water closet bowl adapted to receive water from a supply connection having an outlet in said bowl above the overflow level of the latter, a flushing rim extending around the upper margin of said bowl and adapted to receive water from said manifold chamber during the flushing operation, the rear portion of said rim being depressed and lower than the front portion of the seat, a portion of said bowl forming an air passageway venting said supply connection to the atmosphere above the overflow level of the bowl, and valve means in said air passageway adapted to check the flow of water through the passageway to the bowl during the flushing operation.

5. In a water closet, the combination with a siphonic action bowl having a liquid seal trap, a flushing rim surrounding the upper margin of said bowl, a water supply connection for flushing said bowl, of a manifold chamber for receiving water from said supply connection and directing the water to said flushing rim, a passage conducting some of the water from said manifold chamber to the liquid seal trap for effecting a siphonic jet action in the flushing of the bowl, a passageway venting said manifold chamber to the atmosphere to thereby prevent liquid in the bowl from being sucked back into said water supply connection, and a member tending to check the flow of water through said venting passageway in the normal flushing action, whereby normal pressure conditions in said manifold chamber and normal operation of said siphonic jet action are maintained.

6. In a water closet, the combination with a siphonic action bowl having a liquid seal trap, a flushing rim surrounding the upper margin of said bowl, a water supply connection for flushing said bowl, of a manifold chamber for receiving water from said supply connection and directing water to said flushing rim, a passage conducting water received from said supply connection to said liquid seal trap for providing a siphonic jet action in the flushing of the bowl, a passageway venting said manifold chamber to the atmosphere, said passageway being of greater cross sectional area than the siphonic passage thereby preventing liquid in the bowl from being sucked up into the supply connection, and an automatic valve acting to check the outward flow of water through said vent passageway to prevent loss of water from said chamber to thereby maintain efficient operation of said siphonic jet action.

7. A water closet bowl comprising a manifold chamber adapted to receive flushing water from a supply connection, said supply connection having an outlet from said manifold chamber above the overflow level of the bowl, a flushing rim extending around the upper margin of said bowl and adapted to receive water from said manifold chamber during a flushing operation, said manifold chamber having an atmospheric vent communicating therewith at a point above the overflow level of the bowl, and a retractable valve member normally tending to seal the outlet of said supply connection against the reverse flow of a fluid responsive to a back suction developing in the supply connection.

8. In a water closet bowl, the combination of a manifold chamber adapted to receive flushing water from a supply connection, openings in said manifold chamber through which said water flows into the bowl, an inclined surface between certain of said openings, and a ball valve operable on said inclined surface to close one of said openings responsive to the flow of flushing water.

9. In a water closet bowl, the combination of a manifold chamber adapted to receive flushing water from a supply connection, a port in said manifold chamber through which said water enters, a second port normally venting said chamber to the atmosphere, said supply connection communicating with the atmosphere through said ports, an inclined surface between said ports, a ball valve on said inclined surface normally closing said first named port and movable re-

sponsive to the flow of water to close the other of said ports.

10. In a water closet bowl, the combination of a flushing rim, a manifold chamber, atmospheric vent means communicating with the manifold chamber at a point above the overflow level of the bowl, a water supply pipe connected to said manifold chamber and having an outlet in said chamber above said vent means, said outlet having valve means normally sealing said supply connection against the reverse flow of a fluid, said valve means being automatically operable to allow passage of flushing water.

11. In a water closet bowl, the combination of a flushing rim, a manifold chamber, means for venting said chamber to the atmosphere above the overflow level of the bowl, means for supplying water to said manifold chamber, said means comprising a spout extending into said manifold chamber above the overflow level of the bowl, and a valve in said spout for sealing said supply means against the reverse flow of a liquid into said supply means.

12. A water closet bowl adapted to receive flushing water from a supply connection and comprising a passageway communicating with the supply connection and having an atmospheric vent communicating with the atmosphere at a point above the overflow level of the bowl for preventing a siphonic flow of water back through said supply connection, said passageway discharging flushing water into the bowl in the flushing operation, and removable valve means for checking the flow of fluid through said passageway, said valve means comprising a central bore portion and a counterbore portion, a by-pass in said central bore portion, and a retractable member adapted to seat in said counterbore portion during the flow of flushing water whereby water will escape through said by-pass into the bowl.

13. In a water closet bowl of the class described, the combination of a manifold chamber adapted to receive flushing water from a supply connection, a liquid seal trap, a flushing rim around the upper margin of said bowl and opening into said manifold chamber for receiving water therefrom, a passageway in the upper portion of said manifold chamber communicating with said supply connection and having an atmospheric vent communicating with the atmosphere above the overflow level of the bowl, said passageway normally acting to vent said manifold chamber to the atmosphere and to receive water during the flushing operation, a siphon jet passage conducting water during the flushing operation from said passageway to said liquid seal trap, said passageway comprising bore and counterbore portions with a valve seat therebetween, a by-pass in said valve seat through which water may flow into the bowl, a retractable valve member adapted to close said valve seat during a flushing operation whereby efficient operation of said siphon jet action is effected.

14. In a water closet bowl of the class described, the combination of a manifold chamber adapted to receive flushing water from a supply connection, valve means in said manifold chamber for preventing the back flow of water from said chamber into said supply connection, said valve means comprising a port through which water may flow into said manifold chamber, a cage adjacent said port, and a reciprocating member in said cage adapted to close said port responsive to the flow of water from said manifold chamber into said supply connection, and means for supplying air to said supply connection.

15. In a water closet bowl, the combination of a manifold chamber adapted to receive flushing water from a supply connection, an air inlet opening into said supply connection for communicating with the atmosphere, a movable valve member normally sealing said inlet opening against the passage of a fluid therethrough in the flushing operation, a second opening above said inlet opening through which water passes in the flushing operation, said member adapted to rise with a reverse flow of liquid into said supply connection to seal said second opening against the passage of said liquid into the fresh water supply connection whereby air is admitted through said first named valve opening thereby causing the liquid raised in the supply connection to drain back into said manifold chamber.

16. A siphon breaking assembly for water closet bowls comprising a body portion adapted to be mounted in a supply connection, spaced valve openings in said body portion, a valve member adapted to alternatively close one or the other of said openings, said valve member resting by gravity to close one of said openings during normal operation of said bowl, a reservoir associated with said one opening for conducting air into said body portion and for receiving leakage water should said valve member not positively close said one opening, said valve member movable with a reverse flow of liquid into said body portion to seal the other of said openings against the back flow of liquid into said supply connection whereby air will enter through said valve opening to cause the liquid raised in the supply connection to drain back into said bowl.

17. A water closet comprising a bowl having a manifold chamber adapted to receive flushing water, a supply connection for furnishing flushing water to said chamber, check valve means disposed in said manifold chamber above the overflow level of the bowl and operative to prevent backward siphoning of fluid into the supply connection, and atmospheric air vent means connected to said bowl at a point above the overflow level thereof for supplying air to said supply connection.

18. A water closet comprising a bowl of the siphon jet type having a manifold chamber, a trap, a siphon jet extending from said manifold to said trap, a supply connection adapted to furnish flushing water to said manifold and jet, check valve means operative to prevent backward siphoning of fluid from the jet and manifold into said supply connection, and air vent means associated with said check valve means and operative to vent the supply connection to the atmosphere, said air vent means being disposed on the house side of said check valve means and communicating with the latter at a point above the overflow level of said bowl.

19. A water closet comprising a bowl, a supply connection adapted to furnish flushing water to the bowl, check valve means disposed in said supply connection and movable therein to prevent backward flow of fluid from the bowl through the supply connection, and air vent means normally closed by said valve means at all times for venting said supply connection to the atmosphere except when said check valve means moves to prevent a backward flow of fluid toward the supply connection.

20. A water closet comprising a bowl, a supply connection adapted to furnish flushing water to

said bowl, a check valve operative to prevent backward siphoning of fluid from the bowl into the supply connection, and valved air vent means for venting the supply connection to the atmosphere upon backward flow of fluid therethrough, said vent means including a valve having a stem operatively connected with said check valve.

21. A water closet comprising a bowl, a supply connection adapted to furnish flushing water to said bowl, a check valve operative to prevent backward siphoning of fluid from the bowl into the supply connection, said check valve comprising a valve seat disposed in said supply connection and a corresponding valve closure movable upwardly by any back flow through the supply connection to prevent backward siphoning, and air vent means for venting said supply connection to the atmosphere when said check valve is held to its seat by any backward flow of fluid through the supply connection.

22. A water closet comprising a bowl, a supply connection adapted to furnish flushing water to said bowl, a check valve operative to prevent backward siphoning of fluid from the bowl into the supply connection, said check valve comprising an upper closure portion movable upwardly into engagement with a seat in said supply connection and a lower portion having a lower open end to trap a quantity of air within the check valve to render the same buoyant upon any backward flow of liquid through the supply connection, and air vent means for the supply connection sealed by said check valve in its lower position and opened to vent the supply connection to the atmosphere when said check valve is in its upper seated position.

23. A water closet comprising a bowl having a manifold chamber adapted to receive flushing water, a supply connection for furnishing flushing water to said chamber, air vent means including a passageway having a valve seat, and a valve closure having a valve movable into and out of engagement with said seat for closing and opening communication between said passageway and said manifold chamber and supply connection, and means subjected to the impact of the flushing flow through said supply connection for forcibly holding said valve on said seat during the flushing operation.

24. A water closet comprising a bowl, a supply connection adapted to furnish flushing water to said bowl, a buoyant check valve disposed in said supply connection to prevent backward flow of fluid from the bowl through the supply connection, and an air vent for said supply connection disposed below said check valve, the latter being adapted to close said vent in its lower position and to prevent backward flow of liquid from the bowl through the supply connection in its upper position.

25. A water closet comprising a bowl, a supply connection adapted to furnish flushing water to said bowl, a substantially cylindrical valve closure disposed in said supply connection and having a closed upper end and an open lower end, the upper end being adapted to seat against a valve seat in said supply connection when in its upper position to prevent backward siphoning of liquid from the bowl into the supply connection, and air vent means including a passageway opening from the outside into the supply connection, said passageway being adapted to be sealed by said valve when the latter is in its lower position.

26. A water closet comprising a bowl, a supply connection adapted to furnish flushing water to the bowl, a vertically movable check valve disposed in said supply connection, said check valve including a seat disposed in the supply connection and a vertically movable valve closure adapted to engage said valve seat in its upper position and said valve closure being of smaller diameter than the interior diameter of said supply connection, air vent means disposed below said valve seat and including a passageway extending into the supply connection, and means carried by said valve closure for sealing off said passageway when the valve is in its lower position, said valve closure being held in that position by the flow of water to the bowl during the flushing operation.

27. A water closet comprising a bowl, a supply connection adapted to furnish flushing water to the bowl, a vertically movable check valve disposed in said supply connection, said check valve including a seat disposed in the supply connection and a vertically movable valve closure adapted to engage said valve seat in its upper position and said valve closure being of smaller diameter than the interior diameter of said supply connection, air vent means disposed below said valve seat and including a passageway extending into the supply connection, means carried by said valve closure for sealing off said passageway when the valve is in its lower position, said valve closure being held in that position by the flow of water to the bowl during the flushing operation, and rservoir means associated with the air vent means exteriorly of the supply connection and adapted to intercept water flowing out of the air vent.

28. An article of manufacture comprising a water closet bowl having a flushing rim, a compartment in the rear portion of the bowl for receiving flushing water from a supply connection, a hydraulic manifold chamber communicating with said compartment through an opening in the bowl between said compartment and chamber, and passages leading from said manifold chamber to said flushing rim.

29. An article of manufacture comprising a water closet bowl having a flushing rim, a first chamber in the rear portion of the bowl for receiving flushing water from a supply connection, a second chamber communicating with said first chamber through an opening in the bowl wall between said first and second chambers, passages leading from said second chamber to said flushing rim, and air vent means associated with one of said chambers.

ROBERT A. BROOKS.