July 5, 1938. R. A. BROOKS 2,122,834

SIPHON BREAKING WATER CLOSET

Filed Dec. 23, 1932

Fig. 1.

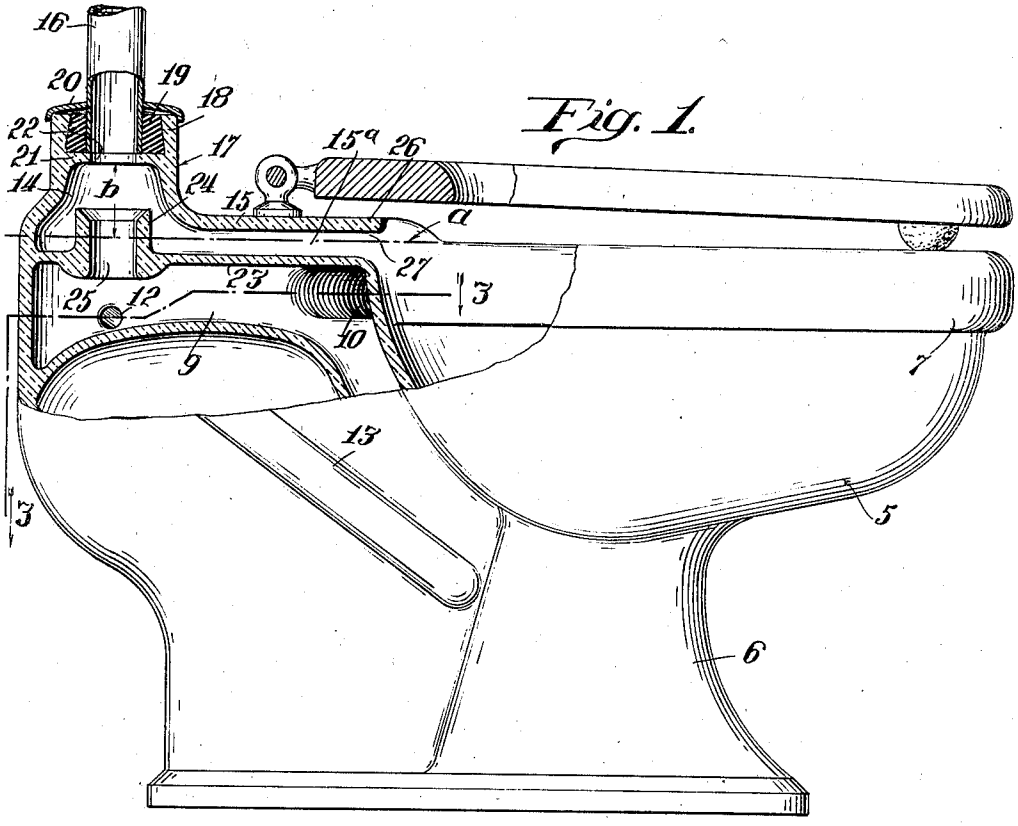


Fig. 2.

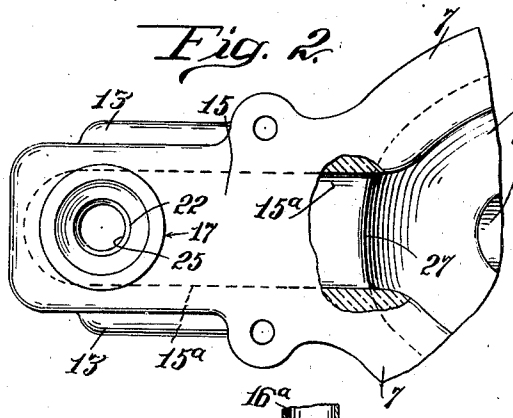


Fig. 3.

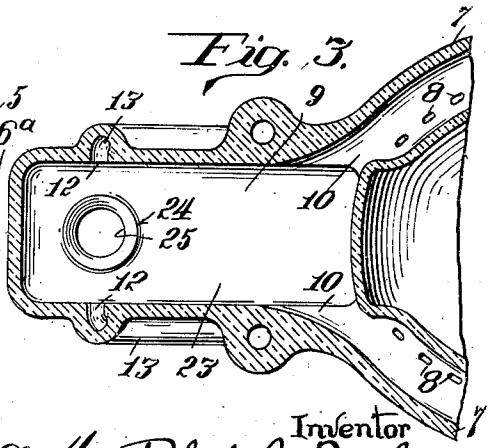
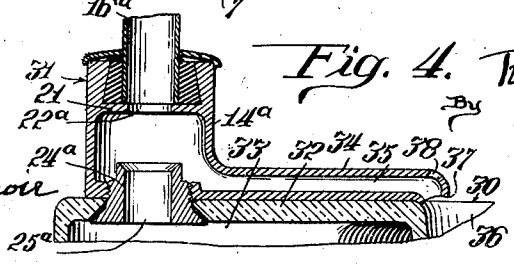


Fig. 4.



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UNITED STATES PATENT OFFICE

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SIPHON BREAKING WATER CLOSET

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21 Claims. (Cl. 4—70)

This invention relates to water closets and more particularly to a type of water closet which is adapted to receive its flushing water directly from a service water main of a building and which possesses certain novel features whereby the sewage disposal portion of the closet is not directly connected with the service water main but indirectly receives its flushing water from said main, thereby entirely eliminating pollution of the pure water in the service water mains through siphonic action under all conditions. In other words, the water closet of the type herein described represents a fixture which is interposed between the pure water supply system and the sewage system and which by its novel construction positively prevents any back flow from the sewage system into the pure water system, such as occurs in a great many of the present day water closet installations.

One of the main objects of the present invention is to provide a water closet that will allow the introduction of a sufficient volume of air in a very limited space of time into the service main with which the closet is connected as will, under all ordinary conditions, absolutely break siphonic action and thereby prevent back flow of the water from the sewage system to the pure water supply system, and which will also, under all extreme conditions such as might occur when the water closet is clogged and filled to the overflow level, function with equal rapidity and effectiveness to prevent the back flow under the latter conditions.

Another object of the present invention is to provide a water closet having all of the features and advantages herein set forth and described, which is constructed so as to be entirely devoid of any moving parts, such as valves or the like, thereby eliminating all of the disadvantages connected with a system or fixture wherein moving parts are utilized, it being apparent to those skilled in the art that the functions of the moving parts are frequently impaired or entirely nullified by foreign matter which is carried to those parts by the water.

A further object of the present invention is to provide a water closet of the siphon jet type having all of the features and advantages herein set forth and described.

Other features and advantages of the present invention will hereinafter appear in the following detailed description thereof having reference to the accompanying drawing.

In the drawing:

Figure 1 is a side elevational view of a water closet partially broken away and in section embodying the present invention;

Figure 2 is a fragmentary plan view of the rear portion of the water closet illustrated in Figure 1 partially broken away and in section, the service water pipe having been omitted;

Figure 3 is a fragmentary plan sectional view taken substantially in the plane of the line 3—3 in Figure 1; and

Figure 4 is a vertical sectional view through a fragmentary portion of a water closet embodying a modified construction of the present invention which comprises an attachment.

The present invention is associated with the usual and conventional type of water closet comprising a bowl 5 supported upon a leg or standard 6 which includes the usual type of trap 6a, see Figure 2, for maintaining a predetermined water level in the bowl, and a flushing rim 7 provided with a plurality of apertures 8, see Figure 3, through which water escapes from the flushing rim to flush the bowl. A hydraulic manifold 9 is disposed in the rear portion of the water closet and is provided with outlet openings 10 through which water is supplied to the flushing rim and openings 12 which are the inlet openings of the usual siphon jets 13 through which water passes from the hydraulic manifold to a point below the level of the trapped water in the bowl 5 to enhance the flushing operation in a manner well known to those skilled in the art.

In the present invention, an air manifold 14 is substantially superimposed above the hydraulic manifold and is provided with a forwardly extending conduit 15 that has a passageway or channel 15a communicating with the bowl 5 and with the atmosphere as will hereinafter be described.

A service water pipe or power nozzle 16, which leads from any conventional form of flush valve, is connected with the water closet in any desirable manner. Preferably this connection of the service water pipe 16 with the water closet is made in the manner illustrated in the drawing wherein a hollow upwardly projecting boss member 17 is provided which defines a greater portion of the upper part of the manifold 14 and which is provided at its upper end with a socket 18 adapted for the reception of a suitable sealing member 19, the latter cooperating between the walls of the socket 18 and pipe 16 to hold said pipe in place and to prevent leakage of water from the closet. In addition, a cover member 20 is provided to engage the pipe 16 and has its peripheral edges downturned for overlapping the

outer peripheral edge of the upper end of the boss 17 thereby cooperating with the sealing member 19 to center pipe 16 and to hold the same in place. The dividing wall 21 between the manifold 14 and the socket portion of the boss 17 is provided with an orifice 22 of substantially the same diameter as the internal diameter of pipe 16, the pipe 16 being substantially maintained in axial alignment with the orifice 22 by the means which connects the pipe with the water closet.

The rear wall of the bowl 5 is extended to provide a wall 23, which forms the partition between the manifolds 9 and 14, and a concentrator 24 is connected with wall 23 and disposed directly beneath the orifice 22 and substantially in alignment therewith. This concentrator 24 is in the form of a sleeve which projects upwardly into the manifold 14 and is provided with an opening 25 that is flared at its upper end so as to directly receive the stream of water that descends through pipe 16, orifice 22 and downwardly across the air manifold 14 into the concentrator. The internal diameter of the opening 25 is preferably somewhat larger than the internal diameter of the orifice 22. By flaring the upper end of the opening 25 in the concentrator 24, it is apparent that whatever slight expansion may occur in the column of water that is discharged from the nozzle means pipe 16 and orifice 22, is readily received and accommodated by the flared opening of the concentrator and collectively forced into the hydraulic manifold 9. The flared end of the opening 25 will cause whatever water that may spread from the jet of water being discharged from the orifice 22 to rebound inwardly towards the center of the jet or column of water thereby concentrating the incoming water for free passage through the concentrator and into the hydraulic manifold 9. In the event that any water should be lost or spilled while passing from the nozzle means to the concentrator 24, the same will drain into the bottom of the air manifold 14 from which it will automatically drain forwardly through the passageway or channel 15*a* into the bowl 5, and, therefore, such loss of water will not in any way impair the full and efficient operation of the device of this invention. Moreover, if any splashing of the incoming water should occur at the intake end of the concentrator 24, no water will be splashed forwardly out of the passageway or channel 15*a* toward the bowl because the receiving end of the concentrator is disposed above the passageway 15*a* and well within the walls of the manifold 14. Whatever spray or splash might occur at the intake end of the concentrator will, therefore, be directed against the walls of the manifold 14 and will hence forth drain into the bottom of the manifold chamber.

From the foregoing description it is apparent that manifolds 9 and 14 may be considered as separate manifolds having a common wall 23, but it is also possible to consider the two manifolds as a single manifold which is divided into an air chamber and a hydraulic chamber by the rearwardly extending wall 23 of the bowl 5.

Referring now more particularly to Figure 1, it will be noted that the overflow level of the water closet has been indicated by the dash and dot line *a*, this of course, being the extreme level to which the water will ever rise in the water closet under adverse conditions such as may be caused by a clogging of the water closet. It is a known fact that vacuum will not raise water from an open vessel into a pipe suspended above the surface of the water in that vessel at a distance equal to or greater than the internal diameter of the pipe, and therefore, as illustrated in Figure 1, the inner edge of the orifice 22 has been disposed above the high water level substantially at a distance *b* which is considerably greater than the internal diameter of the orifice 22 and pipe 16. Obviously, the disposition of the orifice 22 above the normal level of the trapped water in the water closet will be much higher above that level than the distance *b* which merely relates to the high water or overflow level.

Now in conjunction with the foregoing disposition of the orifice and the adjacent end of the service water main 16, it is to be noted that the passageway or channel 15*a* provides the means whereby a sufficient amount of air may be shunted or by-passed into manifold 14 and pipe 16 whenever a vacuous condition is created in the service water pipe system connected with the closet bowl. The upper wall 26 of the passageway or channel 15*a* is disposed at a suitable distance above the highwater or overflow level of the closet bowl so as to provide an air intake port or bleed 27 which will accommodate and by-pass a sufficient volume of air into pipe 16 in a relatively short space of time to prevent the formation of a vacuum that will draw the water from the closet bowl when the same is filled to the overflow level *a* or under normal conditions to prevent the siphon jets 13 from drawing water out of the trap through the hydraulic manifold 9 and into the pure water supply system.

During the flushing operation of the water closet, a solid stream of water will be admitted from the pipe 16 through the orifice 22, the latter in conjunction with pipe 16, acting as a nozzle to direct the water into the concentrator 24, and the latter will receive and maintain the solid stream of water in its concentrated form and direct the same into the hydraulic manifold 9. From the hydraulic manifold the water will be distributed in its usual manner into the openings 10 of the flushing rim to flush the bowl and into the openings 12 of the siphon jets 13 wherein the water will be carried to the trap to further aid and carry on the flushing operation.

In Figure 4, the apparatus for preventing the formation of any appreciable amount of vacuum in the pure water supply system is illustrated as being applied to an ordinary type of water closet 30 in the form of an attachment. In this construction, a container or manifold 31 is suitably secured to the upper wall 32 of the hydraulic chamber 33 by any suitable detachable means. In the preferred embodiment, the detachable means comprises a concentrator 24*a* having an upwardly flared opening 25*a* for communication between the manifold 14*a* and the hydraulic manifold 33. The pure water service main 16*a* is connected to the housing in the same manner as in the preferred form of construction, the partition wall 21*a* in the housing being provided with an orifice 22*a* as in the preferred construction.

The manifold 31 is provided with a forwardly extending leg or conduit 34 having a passageway or channel 35 therein communicating with the bowl 36 to drain any water into the bowl 36 which may be lost or spilled between the orifice 22*a* and the concentrator 24*a*.

In the modified construction illustrated in Figure 4 the manifold 14*a* is disposed entirely above the high water or overflow level of the water closet and the passageway or channel 35 provides means for by-passing air into the pure water supply

main 16a to counteract the creation of a vacuum in the system in the same manner as in the preferred form of construction. To counteract the vacuum, a sufficient quantity of air is rapidly admitted under the forward edge 37 of the conduit 34 and through the aperture or opening 38 formed as an additional vent in the upper wall of conduit 34. It is obvious that the exact location of the opening 38 may be varied from the position wherein it is shown in Figure 4.

It is to be understood that the foregoing detailed description merely relates to the preferred embodiment of the present invention as exemplified by the disclosure in the drawing, and that changes and variations are contemplated in the disclosed embodiment of the invention. Therefore, this invention is only to be structurally limited in the manner determined by the essence and scope of the appended claims.

What I claim is:

1. In a water closet, a bowl, a service water pipe for supplying flushing water for said bowl, an air manifold providing an air passageway entirely surrounding the discharge end of said service water pipe and serving to vent the latter to the atmosphere at a point above the overflow level of said bowl, said supply pipe being connected with said manifold and having its discharge end disposed above the overflow level of said bowl at a distance equal to or greater than the internal diameter of said pipe, and means arranged in axial alignment with the discharge end of said service pipe for delivering the flushing water under pressure from said air manifold to said bowl.

2. In a water closet, a bowl, a service water pipe for supplying flushing water for said bowl, a manifold associated with said bowl and defining an air chamber and providing an air passageway for venting said chamber to the atmosphere at a point above the overflow level of said bowl, said air manifold having an orifice disposed above the overflow level of said bowl at a distance equal to or greater than the diameter of said orifice, said service water pipe being connected with said manifold and terminating at said orifice to eject flushing water through the latter, and a hydraulic manifold separated from said air manifold but connected therewith by a nozzle spaced below said orifice and carried by the lower wall of said air manifold for delivering the flushing water to said bowl.

3. In a water closet, a bowl, a hydraulic manifold associated with said bowl and providing a chamber communicating with said bowl, an air manifold associated with said bowl and communicating with the atmosphere at a point above the overflow level of said bowl, said air manifold being adapted to contain air at all times and having an orifice, a water service pipe connected with said orifice and adapted to eject a solid column of water through said orifice and across the air space of said air manifold toward the hydraulic manifold, and concentrator means of substantially the same diameter as said orifice for receiving said column of water and for directing the same into said hydraulic manifold to establish a pressure therein.

4. In a water closet, a bowl, a hydraulic manifold associated with said bowl and providing a chamber communicating with said bowl, an air manifold associated with said bowl and communicating with the atmosphere at a point above the overflow level of said bowl, means serving as a wall separating said hydraulic manifold from said air manifold, the upper portion of the latter having an orifice, a water service pipe connected with said orifice and adapted to eject a solid column of water through said orifice and across the chamber of said air manifold, and concentrator means carried by said wall means for receiving said column of water and for directing the same into said hydraulic manifold to build up pressure therein, said air manifold having means communicating with said bowl whereby water that may collect in the bottom of said air manifold is drained into said bowl.

5. In combination with a water closet having a bowl and a hydraulic manifold communicating with said bowl to direct flushing water thereto, of an air manifold associated with said bowl comprising nozzle means for directing a solid stream of water across the air chamber of said air manifold, means for receiving said stream of water and to direct the same into said hydraulic manifold to build up pressure therein, means for draining water that may collect in the air manifold into said bowl, and means communicating between the chamber of said air manifold and the atmosphere to constantly maintain said air manifold chamber and the space surrounding the solid stream of water filled with air under atmospheric pressure to prevent back-siphonage from the hydraulic manifold.

6. In combination with a water closet having a bowl and a hydraulic manifold communicating with said bowl to direct flushing water thereto, of an air manifold associated with said bowl separate from said hydraulic manifold and including nozzle means for directing a solid stream of water across the air chamber of said air manifold and substantially surrounded by the air therein, means aligned with said nozzle means for receiving said stream of water and to direct the same in a solid stream filling said receiving means into said hydraulic manifold, the manifold being otherwise closed to the atmosphere except for its communication with the bowl, whereby the velocity head of said solid stream builds up flushing pressure in the hydraulic manifold, and conduit means connected with said air manifold and communicating with the atmosphere at a point above the overflow level of said bowl to maintain the air manifold chamber filled with air under atmospheric pressure, said conduit means being of sufficient cross-section to admit air into the air manifold at a rate adequate to prevent back-siphonage from the hydraulic manifold.

7. In combination with a water closet having a bowl and a hydraulic manifold communicating with said bowl to direct flushing water thereto, of an air manifold associated with said bowl separate from said hydraulic manifold and including nozzle means for directing a solid stream of water across the air chamber of said air manifold and substantially surrounded by the air therein, means aligned with said nozzle means for receiving said stream of water and to direct the same in a solid stream filling said receiving means into said hydraulic manifold, the manifold being otherwise closed to the atmosphere except for its communication with the bowl, whereby the velocity head of said solid stream builds up flushing pressure in the hydraulic manifold, conduit means connected with said air manifold and communicating with the atmosphere at a point above the overflow level of said bowl to maintain the air manifold chamber filled with air under atmospheric pressure, said conduit means being of sufficient cross section to admit air under at-

mospheric pressure into the air manifold at a rate adequate to prevent back-siphonage from the hydraulic manifold, and means providing a drain for delivering into the bowl such water that may collect in the air chamber of the air manifold.

8. In a water closet, a bowl, a manifold associated with said bowl, said bowl having one wall thereof dividing said manifold into an air chamber and a hydraulic chamber, the latter being adapted for directing flushing water into said bowl, nozzle means for directing a solid stream of flushing water across said air chamber in contact with the air therein, and nozzle means carried by the dividing wall of said bowl and disposed in alignment with said first nozzle means for receiving the stream of water discharged therefrom and to direct the same into said hydraulic chamber.

9. In a water closet, a bowl, a manifold associated with said bowl, said bowl having one wall thereof dividing said manifold into an air chamber and a hydraulic chamber, the latter being adapted for directing flushing water into said bowl, nozzle means for directing a solid stream of flushing water across said air chamber, and concentrator means carried by the dividing wall of said bowl and disposed substantially in alignment with and in spaced relation to the discharge end of said nozzle means, said dividing wall closing the upper portion of said hydraulic chamber and said concentrator means comprising a sleeve member having an upwardly flared opening therein to receive the stream of water discharged from said nozzle means and to direct the same into said hydraulic chamber at a pressure proportional to the velocity head of said stream.

10. In a water closet, a bowl, a manifold associated with said bowl, said bowl having one wall thereof extended to divide said manifold into an air chamber and a separate hydraulic chamber, the latter communicating with said bowl, a service water supply pipe connected with said manifold and adapted for directing a solid stream of flushing water across said air chamber, means having a cross-sectional area at least as great as the cross-sectional area of said supply pipe associated with said air chamber portion of said manifold and communicating with the atmosphere at a point above the overflow level of said bowl to maintain air at atmospheric pressure within the air chamber portion of said manifold, and concentrator means associated with the dividing wall of said bowl and adapted to receive the stream of water discharged from said supply pipe and to direct the same into said hydraulic chamber for flushing the bowl, said concentrator means comprising a sleeve member having an upwardly flared opening therein disposed substantially in alignment with the discharge end of said supply pipe, said sleeve member extending upwardly above the overflow level of said bowl and terminating in spaced relation to the discharge end of said supply pipe at a distance equal to or greater than the internal diameter of said supply pipe.

11. A siphon breaking apparatus for a water closet having a bowl and a hydraulic manifold communicating with said bowl, said apparatus comprising a nozzle member for discharging a jet of flushing water, a member spaced from the discharge end of said nozzle member a distance at least equal to the diameter of said nozzle member and connected with said hydraulic manifold to receive the stream of water discharged from said nozzle member and direct the same into said hydraulic manifold at a pressure proportional to the velocity head of said stream, and means interposed between said members to support said nozzle member in fixed relation to the other member and to expose the discharge end of said nozzle member to the atmosphere above the overflow level of said bowl whereby air may enter said nozzle member at a rate at least equal to the rate at which air can be drawn through said nozzle member whenever a vacuum is created therein.

12. A siphon breaking attachment associated with a water closet having a bowl and a hydraulic manifold connected therewith, said attachment comprising an air manifold disposed above the overflow level of said bowl, a supply pipe connected with the upper end of said manifold and adapted to discharge a jet of water across the air chamber in said air manifold, means having a greater cross-sectional area than said pipe for venting the air manifold to the atmosphere, said supply pipe terminating a distance above said hydraulic manifold at least equal to the diameter of the pipe, and means connecting said hydraulic manifold and said air manifold and disposed in axial alignment with said supply pipe so as to receive the stream of water discharged from said pipe and to direct the same into the hydraulic chamber at a substantially undiminished velocity.

13. A siphon breaking attachment associated with a water closet having a bowl and a hydraulic manifold connected therewith, said attachment comprising an air manifold having means providing a passageway for communicating with the atmosphere at a point above the overflow level of said bowl, a service water supply nozzle connected with said air manifold and adapted to discharge a solid stream of water across the air chamber in said air manifold, said passageway having an effective cross-sectional area at least as great as the cross-sectional area of said supply nozzle, whereby air may enter the air manifold at a rate at least as great as the rate at which the air can be drawn through said supply nozzle, and fastening means for detachably connecting said air manifold with said water closet, said fastening means comprising a tubular member having an opening substantially the same size as and in alignment with said supply nozzle for receiving the stream of water discharged from said supply nozzle and to direct the same into the hydraulic manifold at substantially undiminished velocity.

14. In a plumbing fixture, sewage disposal means, a service water main connected with said fixture and having an open end adapted to supply a jet of flushing water to said sewage disposal means, and air conduit means interposed between said sewage disposal means and said service water main and spacing the open end of the latter a distance from said sewage disposal means at least equal to the diameter of said water main, said air conduit means being vented to the atmosphere through an opening having an effective area at least as great as the cross-sectional area of said water main.

15. In a plumbing fixture, a service water supply system associated with said fixture to provide flushing water therefor, sewage disposal means separate from said supply system associated with said closet and adapted to receive flushing water from said supply system, a pair of nozzles arranged in axial alignment and of substantially the same diameter, one nozzle being connected with said supply system and the other

connected with said sewage disposal means, said nozzles being spaced apart a distance sufficient to provide an air gap having an effective area at least as great as the cross-sectional area of the supply nozzle, whereby air may be supplied to said supply nozzle at a rate which is at least equal to the rate at which air can be drawn through the nozzle into said supply system, and means connected with said axially aligned nozzles for venting their spaced apart ends to the atmosphere and for maintaining said nozzles in spaced apart relation.

16. In a water closet, a bowl, a hydraulic manifold associated with said bowl and providing a chamber communicating with said bowl, an air manifold associated with said bowl and communicating with the atmosphere at a point above the overflow level of said bowl, said air manifold being adapted to contain air at all times and having an orifice, a water service pipe connected with said orifice and adapted to eject a solid column of water through said orifice and across the air space of said air manifold toward the hydraulic manifold, and means serving as a conduit of substantially the same diameter as said orifice for receiving said column of water and for directing the same into said hydraulic manifold to establish a pressure therein, said conduit means being spaced from said orifice to provide an open air space therebetween accessible to the atmosphere and dimensioned to prevent back siphonage of liquid therefrom into said water service pipe.

17. In a water closet, a bowl, a substantially closed hydraulic manifold associated with said bowl and providing a chamber communicating with said bowl, an inlet opening for said hydraulic manifold disposed above the overflow level of the bowl, and conduit means for supplying flushing water to the hydraulic manifold including conduit means in alignment with said inlet opening but terminating at a distance therefrom to provide an air space therebetween having access to the atmosphere above the overflow level of the bowl over an effective area at least as great as the effective cross sectional area of said conduit means.

18. In a device of the class described, a water supply nozzle, a water receiving device, and a nozzle associated with said water receiving device and disposed in alignment with said first nozzle for receiving the water from said first nozzle and directing the same to said receiving device, said nozzles being spaced apart a distance to provide an air gap having an effective area at least as great as the cross-sectional area of the supply nozzle whereby air may be supplied to said supply nozzle at a rate which is at least equal to the rate at which air can be drawn through said supply nozzle.

19. In a plumbing fixture, a service water supply system associated with said fixture to provide flushing water therefor, sewage disposal means separate from said supply system and adapted to receive flushing water from said supply system, a pair of nozzles arranged in axial alignment and of substantially the same diameter, one nozzle being connected with said supply system and the other connected with said sewage disposal means, said nozzles being spaced apart a distance sufficient to provide an air gap having an effective area at least as great as the cross-sectional area of the supply nozzle whereby air may be supplied to said supply nozzle at a rate which is at least equal to the rate at which air can be drawn through the nozzle into said supply system, the spaced apart ends of said nozzles being vented to atmosphere.

20. In a plumbing fixture, a bowl, a manifold associated with said bowl, said bowl having a wall thereof dividing said manifold into an air chamber in communication with external air, and a hydraulic chamber, the latter being located for directing flushing water into said bowl, nozzle means for directing a solid stream of flushing water across said air chamber in contact with the air therein, and nozzle means extending from one side of said dividing wall to the other side thereof and disposed substantially in alignment with said first nozzle means for receiving the stream of water discharged therefrom and to direct the same into said hydraulic chamber.

21. In a plumbing fixture, a bowl, a manifold associated with said bowl, means including an apertured wall located to divide said manifold into a hydraulic chamber and an air chamber in free communication with external air, the hydraulic chamber being adapted for directing flushing water to said bowl, nozzle means for directing solid stream of flushing water across said air chamber in contact with the air therein, said nozzle means being disposed substantially in alignment with the aperture of the dividing wall, said aperture receiving the stream of water discharged from the nozzle means and directing the same into said hydraulic chamber.

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