

May 10, 1938.

D. W. McNEIL

2,116,529

FLUSH BOWL STRUCTURE

Filed April 20, 1936

3 Sheets-Sheet 1

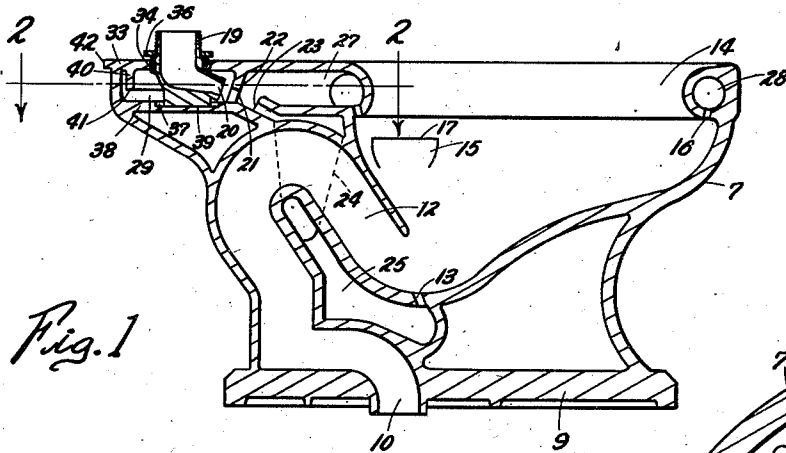


Fig. 1

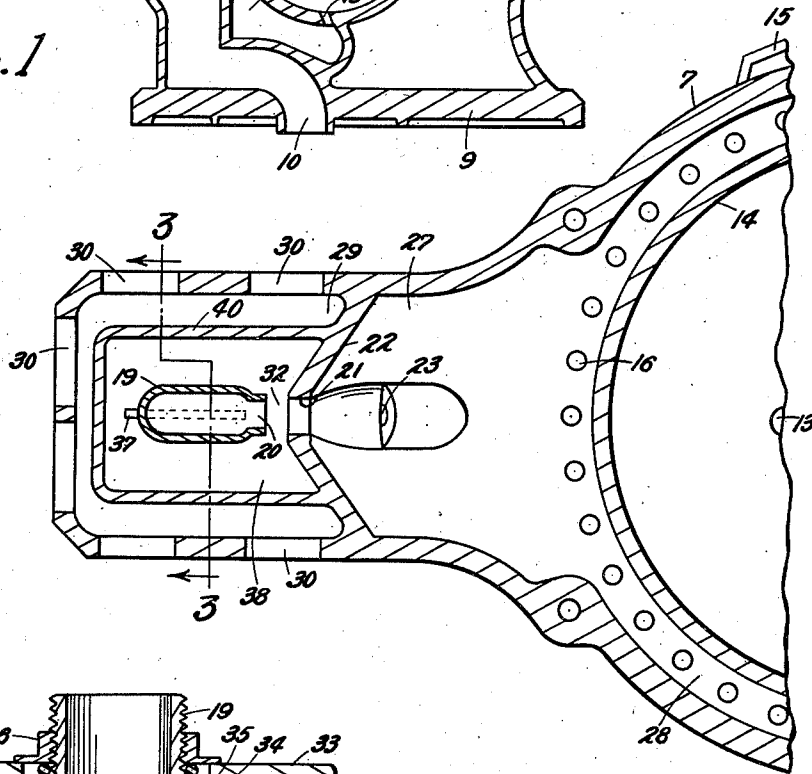


Fig. 2

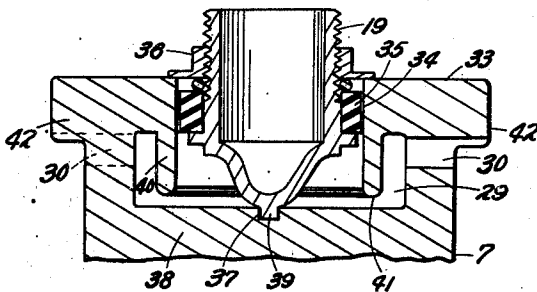


Fig. 3

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3 Sheets-Sheet 2

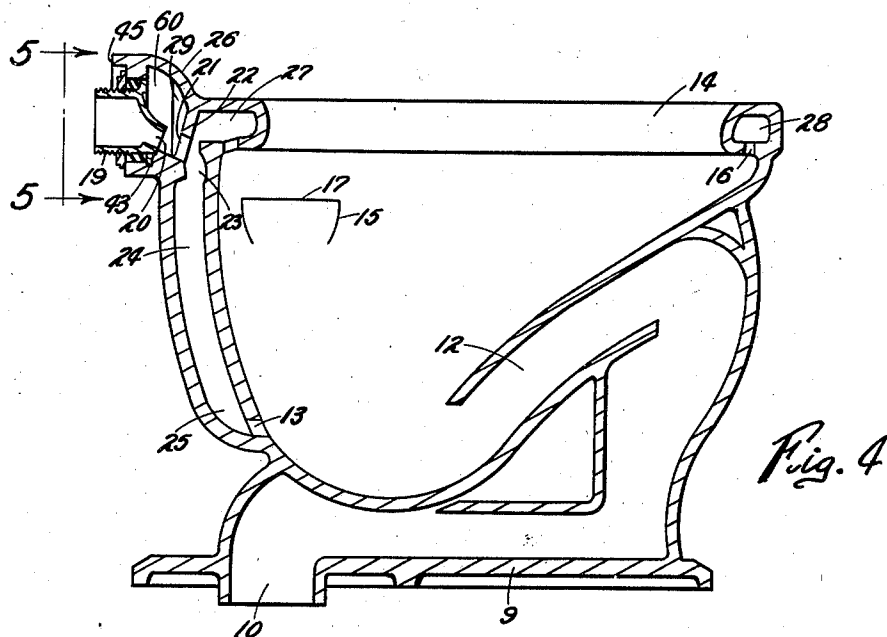


Fig. 4

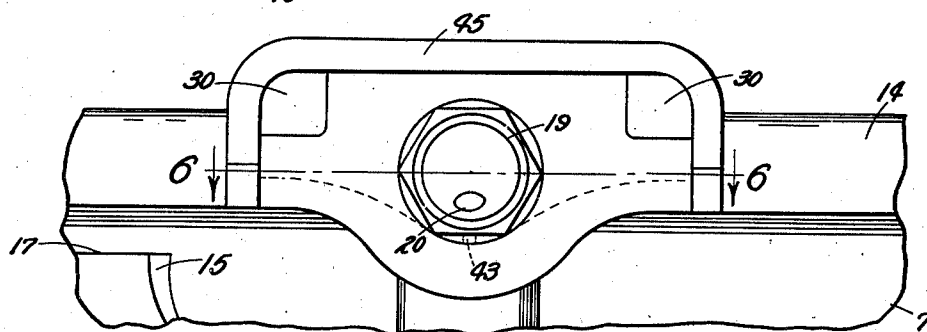


Fig. 5

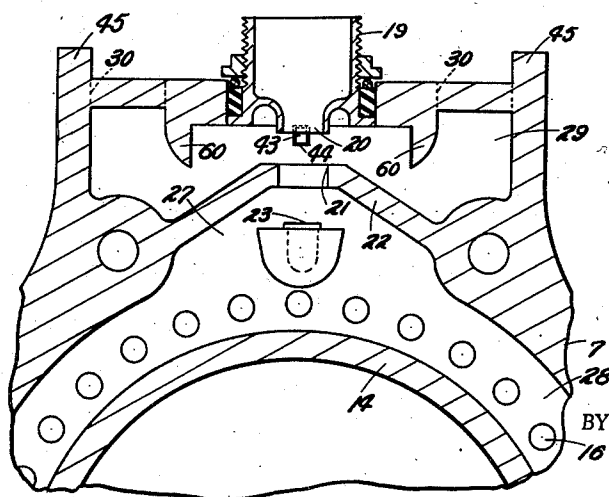


Fig. 6

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3 Sheets-Sheet 3

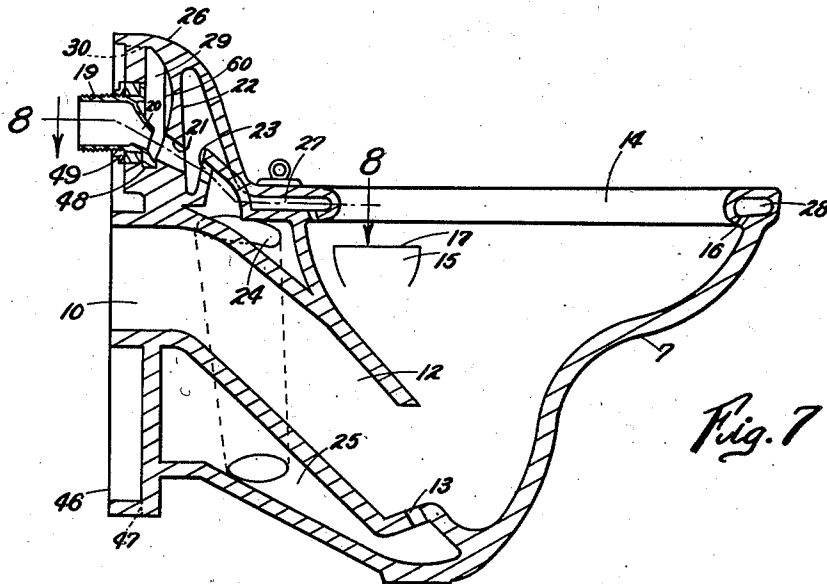


Fig. 7

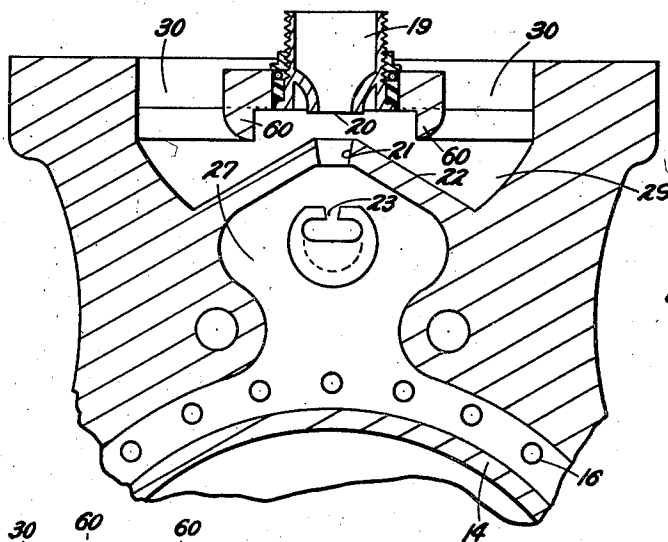


Fig. 8

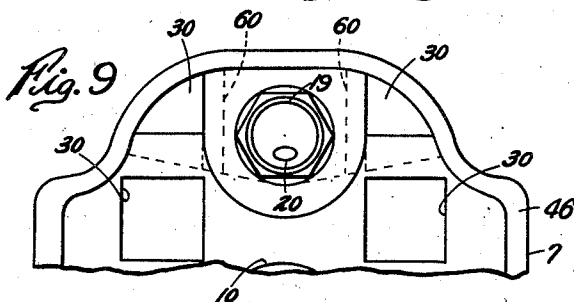


Fig. 9

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UNITED STATES PATENT OFFICE

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FLUSH BOWL STRUCTURE

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Application April 20, 1936, Serial No. 75,336

8 Claims. (Cl. 4—70)

The present application is a continuation in part of my copending applications Serial No. 756,491 filed December 7, 1934, and Serial No. 1,517 filed January 12, 1935.

This invention relates to a flush bowl, and particularly to that type which has its flushing means directly connected to a water main or supply pipe, without the intervention of a water storage compartment or gravity feed tank, there being only a valve interposed between the flushing means of the bowl and the source of water supply.

An object of the present invention is to provide a flush bowl arrangement of the character above referred to, in which there is obviated all possibility of contamination of the fresh water supply by reason of a so-called "back-siphonage" action.

Another object of the invention is to accomplish the above object by the use of simple means which are non-mechanical, positive in action, and require no maintenance.

Further objects are to provide means for the purpose stated, which do not wear out, require no adjustments or periodic testing to determine the working order thereof, require no changes in existing equipment when installed, and which safeguard health and promote sanitation.

Still another object of the invention is to provide a structure of the character stated, wherein the various ducts and ports are so related and proportioned that as much as a thirty inch vacuum in the water supply line will not suck polluted water or mist back into said supply line, and in which the amount of water fed into the flushing rim is not so large as to interfere with the proper functioning of the jet stream.

A further object of the invention is to provide means in a flush bowl whereby a relatively high pressure of water is directed forcefully and squarely to the jet of the bowl, while the rim flushing means receives an indirect low pressure supply of water resulting from restricting the carrying capacity of the jet passage. This construction permits safe and unrestricted communication between the spud interior and the atmosphere outside the bowl, to the end that back-siphonage and resultant pollution of the fresh water supply are rendered impossible.

Further objects of the invention are to provide means in a device of the character referred to, which simplify the design and assembly of the device, and preclude all possibility of objectionable splashing of water.

The foregoing and other objects are attained by the means described herein and disclosed in the accompanying drawings, in which:

Fig. 1 is a central longitudinal cross-sectional view of a flush bowl embodying the present invention.

Fig. 2 is an enlarged fragmental cross-sectional view taken on line 2—2 of Fig. 1.

Fig. 3 is an enlarged cross-sectional view taken on line 3—3 of Fig. 2.

Fig. 4 is a view similar to Fig. 1, showing a modified form of the device of the invention.

Fig. 5 is an enlarged fragmental plan view taken on line 5—5 of Fig. 4.

Fig. 6 is a cross-sectional view taken on line 6—6 of Fig. 5.

Fig. 7 is a longitudinal cross-sectional view of a second modified form of flush bowl.

Fig. 8 is an enlarged fragmental cross-sectional view taken on line 8—8 of Fig. 7.

Fig. 9 is a fragmental rear view of the Fig. 7 device.

The present invention being a continuation of my copending applications, reference may be properly made herein to certain explanations of custom and practice in the plumbing art as more fully set forth in said copending applications. As explained in said copending applications, it is common practice to connect flush bowls with a water supply pipe or riser for supplying fresh flushing water under pressure to a suitable hand-operated valve located conveniently relative to the bowl. In such installations, a shut-off valve ordinarily is included in the supply pipe and located in the basement of the building. The fresh water supply pipe or riser supplies fresh water also to fixtures such as drinking fountains, wash bowls and other flush bowls located on floors intermediate the basement and the floor upon which the flush bowl illustrated herein is located.

Prior to the present invention, flush bowl constructions permitted back-siphonage from the rim and/or trap upon application of a vacuum to the fresh water inlet, whether the waste pipe was clogged or not due to retreating air swiftly passing the jet supply passage and carrying with it foul water from the bowl itself. The occurrence of stoppage in the sewer connection or waste discharging outlet aggravated the condition, as the flush rim carried the fresh water supply and there was established, at the time of overflow, a definite cross-communication between the fresh water supply and the waste pipe by way of the flushing rim passages. In the event that the pressure of the fresh water supply failed or diminished for any reason, or in the event of an emergency shut-off under the condition of stoppage referred to, then a back-siphonage of the

polluted water into the fresh water supply would occur. Under the conditions above set forth, a person drawing water from a drinking fountain or the like which may be connected to the supply line or a branch pipe thereof, would drink the polluted water from the clogged flush bowl. The condition which has been described has actually occurred at various times and has resulted in the pollution of the fresh water supply of large buildings, such as hotels, hospitals and office buildings, and on such occasions persons drinking such polluted water contracted various diseases. It is accordingly made one of the objects of the present invention to eliminate all possibility of cross-connections between the sewer or waste pipe and the fresh water supply which might result from back-siphonage occurring in flush bowls or other plumbing fixtures wherein such conditions may occur.

Prior to the present invention the problem was attacked by inserting mechanical means, such as check valves and the like, but those means were open to the objection that they required frequent inspection, testing and maintenance, possibly by careless or unskilled workmen, with the result that at least a few fixtures were not in perfect working order at all times, thereby constituting a potential menace to the health of users of the fixtures. The means of the present invention may be termed "non-mechanical", as it includes no moving or adjustable parts and its proper operation is not dependent upon proper maintenance or periodic inspection.

To avoid the possibility of conditions of filth and fresh water contamination as referred to above, the present flush bowl has been designed in the following manner, reference being made first to the device of Figs. 1, 2 and 3. For the convenience of the reader, most of the elements which are common to all forms of the device bear the same reference characters in all the views.

In Figs. 1, 2 and 3, the bowl element 7 is constituted of the customary base part 9, the waste discharge outlet or sewer connection 10, a water trap 12, preferably of the goose neck variety, the jet 13, and a peripheral flushing rim 14 which in accordance with common practice, provides a seat or a support for a seat or cover.

At one or both sides of the bowl element is provided a relief port or overflow 15 which is so located as to conduct excess water from the bowl element before the water level therein can reach the apertures 16 which supply fresh water to the bowl by way of the hollow peripheral rim. The upper edge 17 of the relief port or overflow is below the plane of the apertures of the flushing rim, so that a siphon break is provided in the event of stoppage in the waste pipe. Any overflow of the polluted water through the port or ports 15 is directed onto the floor or perhaps into a container located outside of the bowl element. The height of the partition of the water trap is so related to the other parts of the bowl as to maintain always a predetermined normal level of water in the bowl element, said normal level being considerably below the top of each overflow port 15. Normally, the water level in the bowl stands several inches below the top edge 17 of the overflow port or ports. The character 19 indicates a spud or fresh water intake port which is customarily connected with a hand-operated valve (not shown), and said port may be provided with a single constricted fresh water outlet opening or nozzle element 20. The opening 20 is quite definitely aligned with an inter-

mediate port 21 which is formed in a transverse wall 22 of the bowl structure. The opening 21 preferably is slightly larger than the fresh water outlet 20, so that a stream of water under pressure leaving the compartment 19 by way of the opening 20, will pass fully and unrestrictedly through the opening 21. A third opening indicated at 23, is or constitutes the mouth of a jet supply passage 24—25, which latter conveys fresh flushing water to the relatively small jet 13 that initiates flow of the bowl content from the bowl to the sewer or waste pipe. The fresh water supply passage formed by the elements 20, 21, 23, 24, 25 and 13, constitutes a high pressure flushing means whereby a swift and copious stream of flushing water is directed forcefully from the jet into the sewer passage 12. To secure the high pressure stream, I may make the opening 23 large enough to receive substantially all of the water from the nozzle 20, the opening 23 being preferably tapered to preclude spreading of the stream at 23; and the jet 13 preferably would be reduced in size or otherwise constricted so as to insure a stream directed forcefully into the waste pipe. By so constricting the jet opening at 13, the jet supply passage 23—24—25—13 is rendered incapable of receiving and transmitting the entire stream of water directed therein through the passages 20 and 21, so that a certain amount of excess flushing water flows into the low pressure rim chamber or passage 27, which latter is in fluid communication with the series of rim apertures 16. Thus, it will be understood that the rim flushing means receives an indirect low pressure supply of water which results from inability of the jet passage to transmit fully the high pressure stream projected through the aperture 20. The compartment 27 and its continuation 28, together with the series of apertures 16, are made sufficiently large to preclude the building up of water pressure within the rim flushing means, so that a spacious and unobstructed air intake chamber 29 may, without the danger of overflowing, be placed in direct and complete communication with the atmosphere through the series of air intake ports 30. Thus it will be understood that a solid stream of water, in passing from port 20 to port 23, will traverse or span the air intake chamber 29 without filling said chamber. The air intake chamber, as best shown in Fig. 2 is quite large and fully open to the atmosphere, and the various intake ports 30 thereof are located at the back and sides of the device so as to be incapable of fouling by reason of proximity thereof to the bowl.

With further reference to the spacious air intake chamber 29, it is to be noted that said chamber definitely is not a flushing means, because the passage of flushing water from port 20 through port 21 and into jet mouth and rim supply port 23 and 27, respectively, is as a solid stream and as such it spans the space 32 (Fig. 2) between the ports 20 and 21. From the disclosure of Fig. 2, it should be evident that a reversal of fluid flow through the fresh water intake port 19, for any reason, results in drawing atmospheric air mainly through the spacious air intake member 29 by way of the series of large openings 30 thereof, rather than through the small opening 21 which communicates with the jet and rim supply passages. By thus drawing the atmospheric air through the spacious, clean and unobstructed air intake chamber 29, the reverse flow of air resulting from a vacuum in the fresh water supply line cannot possibly agitate

or carry any filth which may be standing in the vertical jet supply passage 24—25, and such return flow of air therefore will not be contaminated by any mist or drops of water emanating from filthy portions of the structure. It should readily be evident that, were the openings 30 plugged, thereby to eliminate the spacious air intake feature a very strong rush of air from 16 through the passages 28, 27, 21 and 20 would agitate any filthy water in the jet supply passage and thereby contaminate the fresh water supply line to the fixture and perhaps numerous branches thereof as explained above. With the ample sized openings 30, however, a suction through the opening 20 (Fig. 2) will effect a maximum flow of air through the intake chamber 29, and very little, if any, flow will occur through the comparatively small opening 21 and the ports in communication therewith. It will be noted that except for the comparatively small opening 21 the parts of the fixture which might possibly become filthy are, in effect, closed off from the air intake chamber 29 by means of the wall or partition 22.

All of the foregoing applies to the devices of Figs. 4 and 7, as well as to the Fig. 1 device. The description proceeds now with a disclosure of the details which distinguish the several forms of the device illustrated in the drawings.

As illustrated by Figs. 1 to 3 inclusive, the device has a top slab 33 with an opening 34 for the reception of the spud or nozzle element 19 and the washer 35 which is expanded in the opening 34 by means of a nut or the like 36, to maintain the spud in proper position. The spud is initially located to align the nozzle 20 thereof with the port 21, by means of a keyway 37 formed in the wall 38, which key way receives the key 39 on the bottom of the spud. By means of this arrangement it is impossible for the installer to improperly assemble the fresh water connection, and the parts must assume and maintain a proper relationship, thereby assuring maximum effectiveness of operation.

The top slab 33 has depending therefrom a baffle or flange 40 which extends about the nozzle portion of the spud sufficiently to intercept any spray or drops of water that might under certain conditions be directed toward and through the air intake apertures 30. In order that the inflow of air may not be unduly impeded by the baffle, the baffle is suspended from the top slab to a position at which its lower edge 41 is spaced from the wall 38 while at the same time said edge is below the apertures 30. The baffle preferably extends about two or more sides of the nozzle element, and its shape may be of U or V formation, or substantially so. To prevent any drippings or dirt from slab 33 from entering the air intake chamber 29, the slab is provided with an overhang 42 or other suitable means for the purpose.

With reference now to Figs. 4, 5 and 6, which disclose a modified form of the device, it may be noted that the jet passage 24—25 extends down the back of the bowl element, and the air intake ports 30 to prevent back-siphonage are located at the extreme rear of the fixture so as to be entirely imperceptible. This form of the device has a spud key 43 which engages a keyhole 44 formed in the material of the bowl for the purpose set forth in the description of Figs. 1 to 3. The nozzle 20 is seen to be elevated above the abnormal water level which is determined by the upper edge 17 of overflow port 15. The spud may be secured in place by a washer and nut, as ex-

plained previously in connection with Figs. 1 to 3. The opening 23 is made slightly smaller than the nozzle 20 aperture, to provide for a limited low pressure water supply to the flushing rim while the jet receives a high pressure charge. The rear flange or extension 45 in some installations may abut a vertical wall, permitting air to pass upwardly toward and through the intake ports 30.

The bowl of Figs. 7 to 9 is of the blow-out type, and carries a rear wall portion 46 adapted for hanging the fixture onto a vertical wall. In the modified form illustrated, air may enter the spacious air intake chamber 29 of dome 26 by way of ports 30 in the rear of the fixture, which may be fed by other ports such as 47 in the rear wall. This form of the device need not include the overflow or relief ports 15, as the nozzle 20 of the spud and aperture 21 are located well above the flushing rim and would not therefore provide a cross-connection between the bowl and the fresh water supply line even in the event of an overflowing condition of the bowl. Like the devices of Figs. 1 and 4, the Fig. 7 device has its various passages 20, 21, 23 and 13 so related and proportioned as to provide a high pressure jet stream and a low pressure rim supply, as previously explained herein and in my copending applications. The spud of the Fig. 7 device also has a keyed relationship with the body of the device, as indicated at 48, and a spud securing means 49 corresponding to that of the Fig. 4 device.

Under a severe test with a 30 inch vacuum at the fresh water intake, and with the bowl clogged to abnormally raise the water level therein, there was found no evidence of foul water or mist from the bowl or its jet supply passage at an inspection point in the water supply pipe. Inasmuch as a 30 inch vacuum is nearly a complete vacuum which would probably never be encountered in actual service, it may be said that the improved device of this invention is insured against back-siphonage and cross-connection between the waste portion of the bowl element and the fresh water supply line. It should be observed, that the structures illustrated and described herein provide for a desirable, limited and properly proportioned flow of flushing water from the flushing rim so that the jets may function properly with the passage therethrough of the necessary quantity and pressure of water to initiate discharge of the bowl content. The spacious air intakes are always clear and unobstructed due to the fact that the dynamic pressure of water which spans the intake chambers in passing to the jet and rim supply passages insures a low loss of pressure so that the full force and volume of the flushing water is rendered effective for flushing the bowl without diversion of water into the air intake chambers.

In the foregoing description I have taught that the opening 23 may be made sufficiently large to receive squarely and fully the high pressure stream of flushing water ejected from the nozzle of the fresh water inlet chamber, in which case the jet opening of the waste pipe is reduced to cause a high pressure jet stream, and also a low-pressure overflow at 23 for the flushing rim. However, I wish it to be understood that the present invention is to embrace also a construction wherein the low pressure supply of flushing water for the rim is secured by limiting or sufficiently reducing the cross-sectional area of the opening 23 to at once divert into the rim flushing passage a portion of the stream from 20, re-

ardless of the size of the jet opening 13. In fact, any other suitable means may be employed for obtaining the high pressure jet discharge and the low pressure rim supply, cooperating with means to eliminate back-siphonage and cross-communication between the fresh water supply and the bowl or sewer passages, so long as such other means is embraced in the language of the claims. It is to be understood that various other modifications and changes in the structural details of the device may be made, within the scope of the appended claims, without departing from the spirit of the invention.

As will be observed, each of the disclosed forms of the invention includes a spacious air intake chamber communicating with atmospheric air at locations remote from the bowl of the fixture, to prevent possible clogging and contamination of the air intake by the contents of the bowl in the event of suction in the fresh water supply pipe. Due to this construction, the baffle 40 of Figs. 1, 2 and 3 becomes an important addition to the combination, as it precludes the possibility of water splashing out through the ports or openings 30 in the event that a second flushing of the fixture be initiated before a previous flushing operation is completed. For example, the fixture of Fig. 2, upon being flushed, will at some stage of the flushing operation build up a rim flushing supply of water in the chamber surrounding the opening 23. If at this time the fixture be again flushed, there will result a collision of the second flushing stream with the built-up rim flushing water aforesaid, resulting in a splash that could reach the apertures 30 and be directed therethrough onto the floor. The splashed water would of course be clean water, but it would nevertheless be objectionable in the operation of the fixture. Baffle means for intercepting splash through the air intake openings are provided also on the modified devices illustrated in the accompanying drawings, and are indicated by the character 60. It will be noted that the present invention prevents back siphonage more effectively than do fixtures adapted to draw air from the bowl or from a location near the bowl, because nothing in the nature of floating objects or substances can interrupt the free drawing of air into the water supply pipe of the device herein disclosed.

What is claimed is:

1. A plumbing fixture adapted to preclude back-siphonage of sewage into a flush water supply connected thereto, said fixture comprising in combination, a bowl element including an apertured flushing rim, a jet, and a sewage overflow port in the bowl element below the level of the rim, a hollow top slab located rearwardly of the bowl element and disposed in a plane which includes the upper edge of the flushing rim, said slab having an inclined wall provided with a port for feeding an abundance of atmospheric air to the space below the slab, a flush water supply spud including a nozzle disposed below the slab at an angle to the plane of the slab, a jet supply passage including a mouth spaced from the nozzle, said nozzle and mouth both being located below the level of the flushing rim, an apertured wall between the nozzle and said mouth, said aperture being axially aligned with the nozzle and mouth, and baffle means spaced from the spud and extending substantially about the nozzle portion of the spud to intercept any water or spray directed toward said air feeding port.

2. A plumbing fixture adapted to preclude

back-siphonage of sewage into a flush water supply connected thereto, said fixture comprising in combination, a bowl element including an apertured flushing rim, a jet, and a sewage overflow port in the bowl element below the level of the rim, a hollow top slab located rearwardly of the bowl element and having an inclined wall provided with a port for feeding an abundance of atmospheric air from a location remote from the flushing rim to the hollow interior of the slab, a flush water supply spud including a nozzle disposed below the slab at an angle to the plane of the slab, a jet supply passage in the fixture including a mouth spaced from the nozzle, said nozzle and mouth both being located below the level of the flushing rim, an apertured wall between the nozzle and said mouth, the axis of said aperture being substantially in line with the jet mouth, baffle means extending rearwardly of the apertured wall and located to intercept water splash originating between said wall and the nozzle and directed toward the air feeding ports of the top slab.

3. A plumbing fixture adapted to preclude back-siphonage of sewage into a flush water supply connected thereto, said fixture comprising in combination, a bowl element including an apertured flushing rim, a jet, and a sewage overflow port in the bowl element below the level of the rim, a hollow top slab located rearwardly of the bowl element and having an inclined wall provided with a port for feeding an abundance of atmospheric air from a location remote from the flushing rim to the hollow interior of the slab, a flush water supply spud including a nozzle disposed below the slab at an angle to the plane of the slab, a jet supply passage in the fixture including a mouth spaced from the nozzle, said nozzle and mouth both being located below the level of the flushing rim, an apertured wall between the nozzle and said mouth, the axis of said aperture being substantially in line with the jet mouth, baffle means extending rearwardly of the apertured wall and depending a sufficient distance from the top slab to intercept water splash originating between said wall and the nozzle and directed toward the air feeding ports of the top slab.

4. A plumbing fixture adapted to preclude back-siphonage of sewage into a flush water supply connected thereto, said fixture comprising in combination, a bowl element including an apertured flushing rim, a jet, and a sewage overflow port in the bowl element below the level of the rim, a hollow apertured top slab located rearwardly of the bowl element and having a bottom wall and an inclined wall, the latter being provided with a port elevated above the bottom wall and adapted to feed an abundance of atmospheric air from a location remote from the flushing rim to the hollow interior of the slab, a flush water supply spud extending through the slab aperture and including a nozzle disposed within the slab interior, a jet supply passage in the fixture including a mouth spaced from the nozzle and arranged to direct a stream of flushing water thereto, an apertured wall between the nozzle and said mouth, with the aperture of the wall aligned to permit passage of said water stream but otherwise closing off the jet passage from the ports of the slab, and cooperative disengageable means on the bottom wall of the slab and on the spud, for keeping the nozzle in alignment with the jet mouth.

5. A plumbing fixture adapted to preclude back-siphonage of sewage into a flush water supply

connected thereto, said fixture comprising in combination, a bowl element including an apertured flushing rim, a jet, and a sewage overflow port in the bowl element below the level of the rim, a hollow apertured top slab located rearwardly of the bowl element and having a bottom wall and an inclined wall, the latter being provided with a port elevated above the bottom wall and adapted to feed an abundance of atmospheric air from a location remote from the flushing rim to the hollow interior of the slab, a flush water supply spud extending through the slab aperture and including a nozzle disposed within the slab interior, a jet supply passage in the fixture including a mouth spaced from the nozzle and arranged to direct a stream of flushing water thereto, an apertured wall between the nozzle and said mouth, with the aperture of the wall aligned to permit passage of said water stream but otherwise closing off the jet passage from the ports of the slab, cooperative disengageable means on the bottom wall of the slab and on the spud, for keeping the nozzle in alignment with the jet mouth, and baffle means depending from the top slab as a curtain reaching to a plane below the lowest point of the elevated port, and cooperating with the said apertured wall to substantially surround the spud.

6. A plumbing fixture adapted to preclude back-siphonage of sewage into the flush water supply, said fixture comprising in combination, a bowl element including an apertured flushing rim, a sewage disposal passage, and a sewage overflow port in the bowl element below the level of the rim, a hollow dome located rearwardly of the rim and including a substantially vertical apertured wall for mounting a horizontal flush water supply spud, a spud including a forwardly directed nozzle and means for mounting the spud upon said wall of the dome, a jet and a passage therefor having a mouth spaced from the supply nozzle, an apertured upright wall in the dome dividing it into separate compartments one of which compartments houses the nozzle and the other of which houses the jet mouth, said nozzle housing

compartment having free access to atmospheric air at a rear of the dome, and said upright wall having its aperture arranged to permit a flushing water stream to pass from the nozzle to the jet mouth.

7. A plumbing fixture adapted to preclude back-siphonage of sewage into the flush water supply, said fixture comprising in combination, a bowl element including an apertured flushing rim, a sewage disposal passage, and a sewage overflow port in the bowl element below the level of the rim, a hollow dome located rearwardly of the rim and including a substantially vertical apertured wall for mounting a horizontal flush water supply spud, a spud including a forwardly directed nozzle and means for mounting the spud upon said wall of the dome, a jet and a passage therefor having a mouth spaced from the supply nozzle, an apertured upright wall in the dome dividing it into separate compartments one of which compartments houses the nozzle and the other of which houses the jet mouth, said nozzle housing compartment having free access to atmospheric air at the rear of the dome, and a rear portion behind the dome for hanging the fixture upon an upright support.

8. A plumbing fixture adapted to preclude back-siphonage of sewage into the flush water supply, said fixture comprising in combination, a bowl element including an apertured flushing rim, a sewage disposal passage, and a sewage overflow port in the bowl element below the level of the rim to preclude contents of the bowl from reaching the rim, a rear mounting means for supporting the fixture upon an upright support, and an arrangement of flushing water supply means including a spud having a flush water outlet port and a fresh air intake port in the rear mounting means, said air intake port being larger than the water outlet port of the spud whereby to supply an abundance of air to the spud in the event of a suction in the source of water supply.

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