Aug. 20, 1968 E CHRIS SKOUSGAARD 3,397,408

WATER CLOSET

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Fig. 1

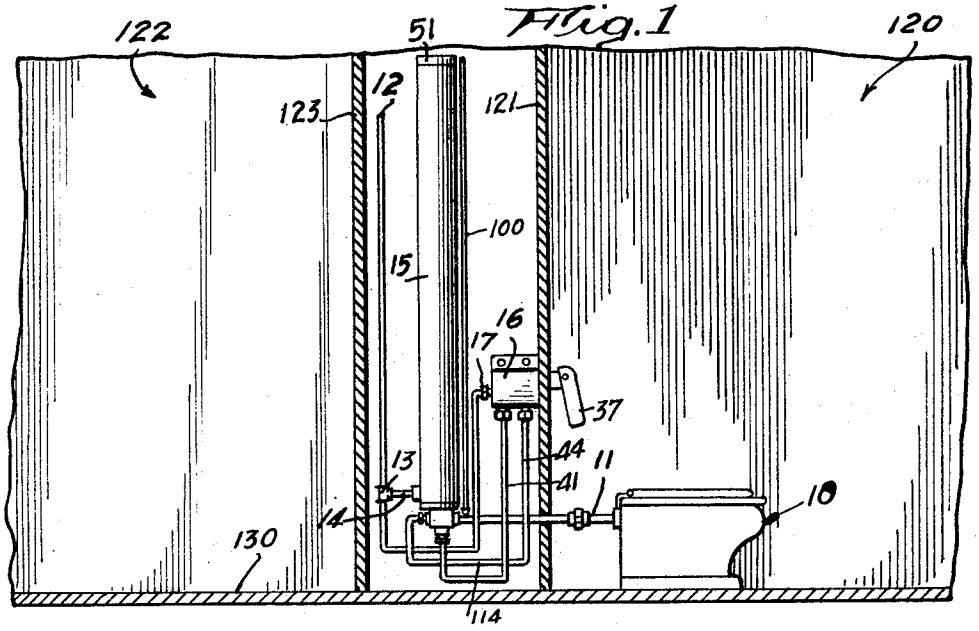
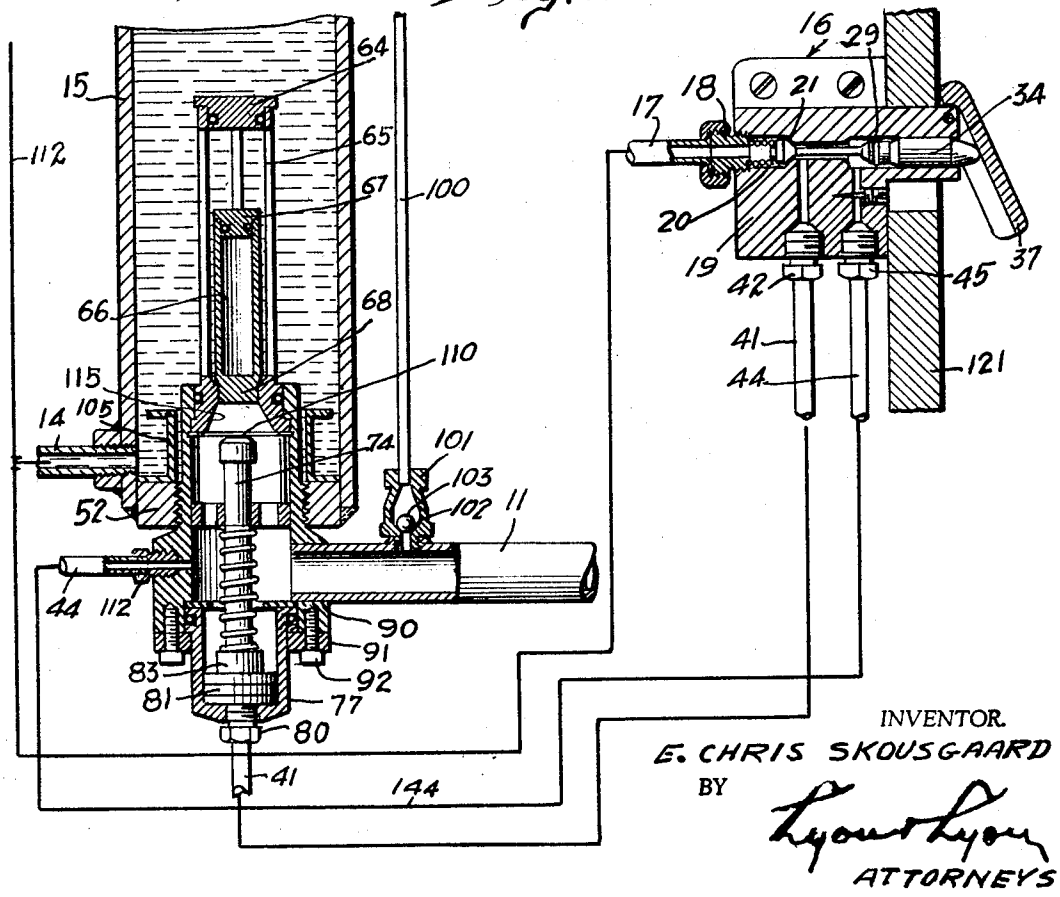


Fig. 2



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Fig. 3

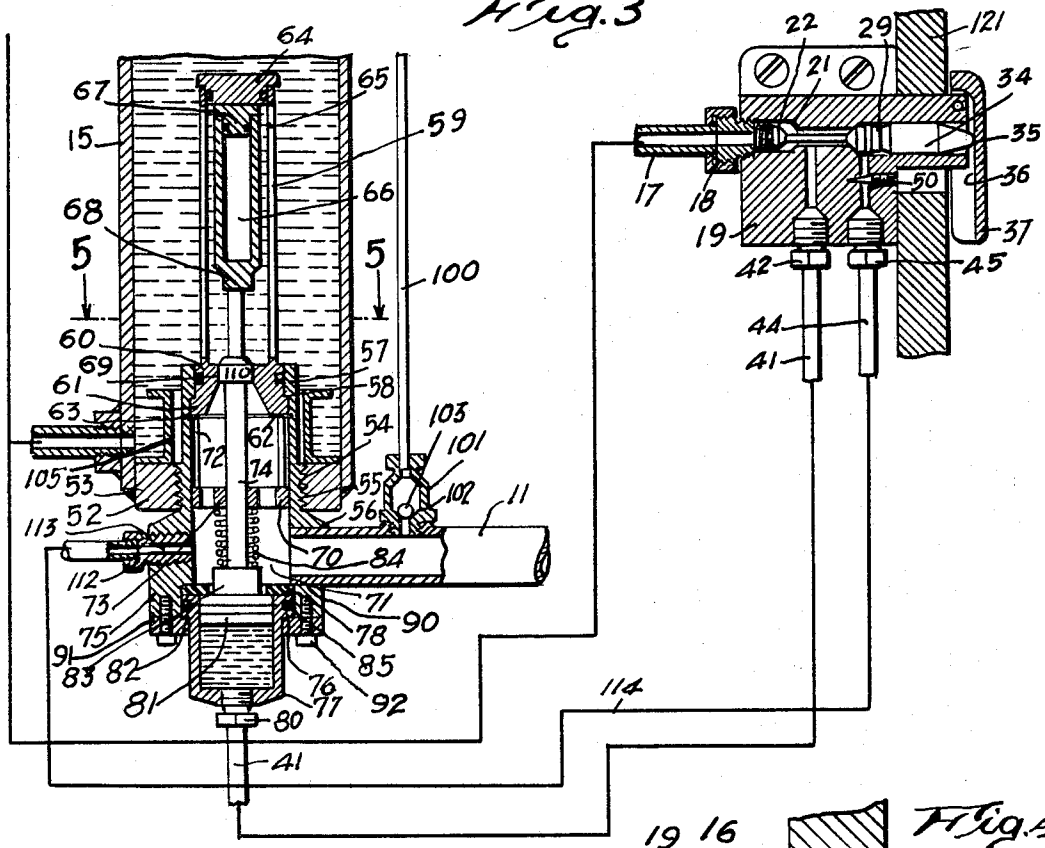


Fig. 4

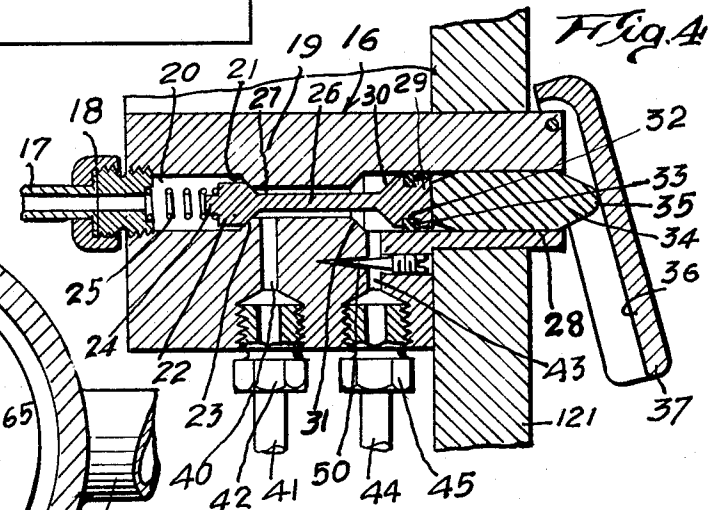
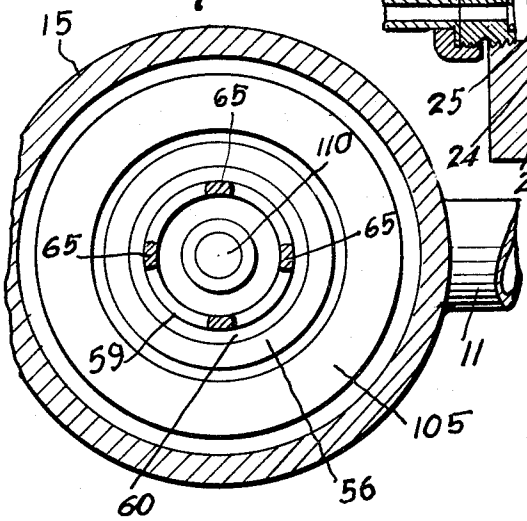


Fig. 5



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WATER CLOSET

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9 Claims. (Cl. 4—26)

ABSTRACT OF THE DISCLOSURE

A water closet employing a tank closed at its upper end and having an open connection to the domestic water supply adjacent its bottom end including an outlet adjacent the bottom end of said tank normally closed by a float valve; valve means, preferably remotely from said tank for applying domestic water pressure to the bottom of a piston associated with the tank, said piston being spring biased towards a position to permit closing of said outlet valve by said float, but operating under domestic water pressure to engage and dislodge said float; the outlet being connected to a water closet bowl; and in which said outlet is larger than said inlet to permit draining of said tank on flushing and the diameter of the piston is greater than the diameter of the outlet valve to permit dislodging of the float. Needle valve means are incorporated in the outet mechanism to prevent surging and the entire mechanism is substantially noiseless as the pressures in the tank approach equilibrium as the float reseats with the result that the reseating of the float valve is accomplished from substantially full open to closed position without gradual tapering off of water discharge.

This invention relates to a water closet and more particularly to such a device which utilizes the line pressure on the domestic water supply controlled by a single valve member and which is designed to operate without producing any or substantially any objectionable noise.

More particularly, this invention relates to such a water closet which utilizes a pressurized water tank which normally contains a sufficient supply of water to provide all requirements and in which all of the operating parts except the bowl itsef, its supply line and a valve actuator are concealed within the walls, within the structure involved. It is also a feature of this invention that the external water supply line pressure is always communicated directly to the supply tank.

It is a further feature of this invention that valve means are interposed in the supply line beyond the pressurized tank which, when desired, may be operated to dislodge, temporarily, a float in the pressurized tank to permit delivery of the contents of the tank to the water closet bowl and that such delivery is thereafter closed off in a time cycle.

It is a further feature of this invention that the same pressure, that is external water supply pressure, which is used to pressurize the tank is also used to dislodge the float valve which controls the discharge of the water from the pressurized tank to the bowl and that this is accomplished by means of a differential between the area to which the tank pressure is applied and the piston which operates against this tank pressure to dislodge the float valve.

It is a further object and feature of this invention to provide control means for controlling the rate of discharge of the water from the pressurized tank which prevents any sudden surging.

It is a further feature of this invention that by reason of the selection of the size of the various openings for the flow of water there is no place in the mechanism wherein the flow of water can at any time create any significant objectionable noise.

It is a further feature of this invention that by reason of the fact that substantially all of the operating structure is mounted in the wall or rather between walls, a significant saving of floor space in the bathroom is achieved.

It is a further feature of this invention that there is no passage small enough to create noise with the result that the only sound involved in the operation of the device is that of water flowing in the pipes themselves which is barely audible.

It is a further feature of this invention that whereas conventional line valves shut off gradually which causes extreme erosion on the valve seat and consequently a relatively short valve life, the valve in this invention is either completely open or completely closed and there is therefore no gradual tapering off of the water flow.

In the present conventional system the flow of water into the bowl is caused by gravity only and as there is a very small drop in elevation only this small amount of power is available, whereas in the present invention the full pressure in the domestic water supply is available.

It is a further feature of this invention that the control of discharge from the pressurized tank can be regulated from full line pressure to as little as five (5) pounds p.s.i., which makes possible a much more efficient flushing action and the need for as much as thirty percent (30%) less water.

It is a further feature of this invention that after a flush has been completed the pressurized tank is completely filled within fifteen (15) seconds in contrast to the requirement of a minute and a half to three (3) minutes in conventional tank type water closets.

It is a further feature of this invention that the parts are simplified and the cost is reduced thereof and the system is more efficient and durable.

It is a further feature of this invention that the actuating handle for the control valve may be located wherever desired.

It is a further feature of this invention that the tank and all controls may be installed between the studding in the walls, may not be immediately adjacent the bowl and may thus be located at any desired point to facilitate servicing.

These and other objects, features and advantages will be apparent from the annexed specification in which:

FIGURE 1 is a side view of an installation embodying the present invention with the floors and walls of the associated structure shown in section;

FIGURE 2 is a vertical section partly diagrammatic and partly fragmentary through the operating mechanism of this invention;

FIGURE 3 is a view similar to FIGURE 2 showing the device with the actuating member depressed and the device arranged to begin delivery of water from the pressurized tank to the bowl;

FIGURE 4 is an enlarged vertical section through the actuating valve; and

FIGURE 5 is a section taken along the line 5—5 of FIGURE 3.

Referring now more particularly to the drawings and particularly to FIGURE 1, there is shown a toilet bowl **10** to which leads a supply line **11**. A main water supply line **12** supplies water under pressure through a T **13** and pipe **14** to tank **15**. The supply line **12** supplies water to a valve **16** as by connection **17**. A nipple **18** attaches the pipe **17** to the body **19** of the valve **16**. Bore **20** in the body **19** communicates with the nipple **18** and has a seat **21** formed therein. A valve **22** having a tapered inner end **23** is provided and has a stud **24** formed on the outer end thereof which forms a retaining seat for a spring **25**. The valve **22** has a reduced portion **26** extending through a bore **27** which communicates with the bore **20** and also with an en-

larged bore **28** formed in the valve body **19**. The other end of the valve **22** carries a valve **29** which has a tapered inner end **30** designed to seat on a tapered end wall **31** of the bore **28**. The valve **29** has an annular ring **32** formed on the exterior thereof and in which is seated an O-ring **33**. A push rod **34** is seated in the bore **28** and has its inner end contacting to the outer end of the valve **29** and has an outer end **35** adapted to engage the inner edge **36** of a pivoted valve actuator **37**. The body **19** has a bore **40** communicating with a pipe **41** through a nipple **42** threaded into an enlarged portion of the bore **43**. The body **19** has a bore **43** communicating with a pipe **44** through a nipple **45** threaded into an enlarged portion of the bore **43**. The bore **40** communicates with the interior of the bore **28**. A needle valve **50** controls the flow of water through the bore **43** as shown in FIGURE 4.

The tank **15** is closed at the top **51** and is in the form of a hollow cylinder having an open lower end. The tank **15** has a ring **52** welded as at **53** to the bottom of the tank **15** and has female threads **54** adapted to receive the male threads **55** of a casting **56**. The casting **56** has a reduced portion **57** having an inturned flange **58**. A cage **59** is provided having a portion **60** fitting within the reduced portion **57** of the casting **56** and having a flange **61** seating on the shoulder **58** and retained therein by a split rig **62** seated in an annular groove **63**. The cage **59** has an end cover **64** and the cage **59** consists of a plurality spaced longitudinally extending members **65**. A float **66** in a form of a hollow cylinder having a closed top **67** and a reduced bottom portion **68** is provided with the reduced bottom portion normally seated in an opening **69** in the member **60** and forming a seal therein.

A spider **70** is affixed in a bore **71** in the casting **56** and has portions **72** engaging the split ring **62** and has a central guide member **73** through which passes a shaft **74**. The casting **56** has an enlarged portion **75** against which is seated an enlarged portion **76** of a fitting **77**. The portion **76** engages a washer **78** and forms a seal. The bottom of the fitting **77** has a nipple **80** to which is attached the pipe **41**. A piston **81** having an O-ring **82** is formed upon the end of the shaft **74** and carries a collar **83** against which bears the bottom end of a coil spring **84** the upper end of which engages the central portion **73** of the spider **70**. The enlarged portion **76** carries an O-ring **85**.

The pipe **11** leading to the bowl **10** is received in an opening **90** in the casting **56**. A retaining ring **91** bears against the lower end of the casting **56** and is held therein by a plurality of cap screws **92** and, a shoulder **86** on the fitting **77** is engaged by the ring **91** to retain the fitting **77** therein. An anti-siphon pipe **100** is provided which is connected at one end to a check valve **101** and which has its other end opened to the atmosphere. The check valve **101** has a tapering seat **102** against which a ball valve **103** may be floated. It has been found in practice that where the line **11** has any appreciable length i.e. exceeding 6", and is filled with water, when the float **66** seats and closes off flow of water from the tank **15** that resurgence may occur in the entrapped water sufficient to dislodge the float **66**. This phenomenon, sometimes called hammering, is overcome in the present invention by the use of the anti-siphon pipe **100** and the check valve **101** which breaks the vacuum existing in the line **11** so that the water therein drains into the bowl **10** rather than resurging so as to dislodge the float **66**.

The operation of the above-identified device is as follows:

As the water supply pipe **12** connected through the T **13** and pipe **14** is always open, water will pass into the interior of the tank **15**. An annular channel **105** is seated in a tank **15** to prevent turbulence of the water under pressure into the tank **15**. The tank **15** is therefore normally filled with water to the extent that air entrapped in the space above the water in the closed upper end of the tank **51** permits. This, of course, means that the tank **15** is pressurized in normal operation. When it is desired to flush the bowl **10** the actuator **37** is depressed as shown in FIGURE 3.

By reference to FIGURE 3 it will be noted that communication has been opened from the water supply pipe **17** to the pipe **41** and thence to the bottom of the fitting **77**. This causes the piston **81** to rise against the force of the spring **84** and forces the upper end **110** of the rod **74** to dislodge the float **66** from its seat, all as shown in FIGURE 3. Release of the actuator **37** then cuts off pressure from the water line **41** and permits the valve to close the supply and return to its normal position as shown in FIGURE 2, under pressure of the spring **25**.

In this position of the valve it will be noted that communication is open from the water line **41** through the bore **27** to the line **44**. A fitting **112** is threaded into the casting **56** and communicates with a bore **113**. A by-pass line **114** is attached to the fitting **112** and in fact constitutes a portion of the pipe **44**. Once the pressure is released from the actuator **37** and pressure removed from the pipe **41** the spring **84** causes the piston **81** to move downwardly. As this is done the water entrapped below the piston **81** will pass downwardly through the line **41** up to the bore **27** down through the pipe **44** and its extension **114** and will enter the fitting **112** and pass to the pipe **11** leading to the bowl **10**. At the same time the water in the tank **15** will be forced under the pressure of the air down through the cage **59** and enter the pipe **11** leading to the bowl **10**. As the contents of the tank **15** empty into the bowl **10** the float **66** will reseat as shown in FIGURE 2 and the tank will refill though the supply line **14** and the device is in condition for a subsequent use.

It will be noted that in the foregoing description that the bowl **10**, the pipe **11** and actuating member **37** are the only portions of this device which are in the bathroom **120** which has a wall **121**. The adjoining room **122** has a wall **123** and between the two walls **121** and **123** are housed the tank **15** and all of the associated mechanism.

Attention is called to the diameter of the pipe **14** which supplies water to the tank **15** which is the same diameter as that of the supply line **12** and offers no resistance to the flow of water therein. However, diameter of the pipe **14** is less than that of the outlet opening **69** so that when the float valve **66** is fully dislodged and the upper end **110** of the rod **74** is completely free of the opening **69** the contents of the pressurized tank **15** will empty into the bowl **10** at a greater rate than the tank will be refilled by water entering the supply line **14**. However, it will be noted that the inner walls **115** of the portion **60** of the cage **59** are tapered as is the top of the upper end **110**.

It will be further noted that the diameter of the piston **81** is greater than the diameter of the opening **69** or of the bottom portion **68** of the float **66** so that although the pressure within the tank **15** is line pressure and is substantially equal to the pressure supplied to the piston **81** through the pipe **41**, the force applied to the piston **81** is greater than the force applied upon the float valve **66** with the result that the float valve **66** may be dislodged when pressure is applied to the piston **81**.

As herein above described, after the float valve **66** has been dislodged the rod **74** returns to its initial position under the force of the spring **84**. However, water is entrapped below the piston **81** as shown in FIGURE 3 and the return of this water to the pipe **41**, the bore **27**, the bore **43** and the pipe **44** is controlled by the needle valve **50** so that the return of the rod **74** is retarded. This, together with the tapered walls **115** results in the fact that the initial flow of water from the tank **15**, after the float valve **66** has been dislodged is metered and there is no sudden surge of water from the tank **15** through the opening **69** and thence to the line **11** to the bowl **10**, and it is not until the end **110** of the rod **74** is completely free of the opening **69** that full communication between the tank **15** to the bowl **10** is established and this does not occur until substantially all of the water entrapped below

the piston **81** has been forced through the pipe **44**, **114**, and the fitting **112** to join the water being supplied to the bowl **10**.

It is to be further noted that there is no direct connection between the actuating member **37** and the bowl **10** or its supply line **11** with the result that the valve **16** may be positioned anywhere in the bathroom that is desired and while it is shown here as being mounted directly on the wall **121** behind the bowl **10** it could be on the side of the room **120** or in the floor **130**, which simply means that there is no restriction imposed by the invention upon placing the valve **16** and its actuating member **37** at any desired place in the bathroom.

While there has been described what is at present considered a preferred embodiment of the present invention, it will be appreciated by those skilled in the art that various changes and modifications can be made therein without departing from the essence of the invention and it is intended to cover herein all such changes and modifications as come within the true spirit and scope of the appended claims.

I claim:

1. A water closet comprising: a tank having a closed upper end and a water inlet adjacent the bottom end thereof open to the domestic water supply; an outlet adjacent the bottom of said tank; a float normally closing said outlet; a valve connected to the domestic water supply; a piston mounted below said outlet; a conduit from said valve to said tank below said float and operative in one position of said valve to conduct water under pressure to said piston, said piston being spring biased towards one position but operative under pressure of water applied thereto to move to another position and dislodge said float and a conduit from said tank to a closet bowl to conduct water from said tank to said bowl to flush said bowl when said float is dislodged.

2. A water closet as set forth in claim **1** in which said valve has an actuator adapted to be mounted in a bathroom adjacent said bowl and in which said valve, said tank and all other associated mechanism, except a portion of the conduit to said bowl and said bowl, are adapted to be mounted within a bathroom wall.

3. A water closet as set forth in claim **1** in which said inlet is smaller in diameter than said outlet.

4. A water closet as set forth in claim **1** in which said piston is larger in diameter than said outlet.

5. A water closet as set forth in claim **3** in which said piston is larger in diameter than said outlet.

6. A water closet as set forth in claim **5** having a fitting adjacent the bottom of said tank, said piston being operably mounted in said fitting; an opening in said fitting between said piston and said float and a water line controlled by said valve whereby water in said fitting and below said piston may be passed back through said conduit, through said valve, said water line and into said opening.

7. A water closet as set forth in claim **5** having a fitting adjacent the bottom of said tank, said piston being operably mounted in said fitting; an opening in said fitting between said piston and said float and a water line controlled by said valve whereby water in said fitting and below said piston may be passed back through said conduit, through said valve, said water line and into said opening; and a needle valve in said water line to control the rate of water flow therethrough.

8. A water closet as set forth in claim **7** in which said valve has an actuator adapted to be mounted in a bathroom adjacent said bowl and in which said valve, said tank and all other associate mechanism except a portion of the conduit to said bowl and said bowl are adapted to be mounted on a bathroom wall.

9. A water closet as set forth in claim **7** including an anti-siphon tube connected to said last-mentioned conduit from said tank and between said bowl, a check valve in said anti-siphon tube to prevent resurgence of water back through last-mentioned conduit and consequent dislodging of said float when receded.

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HOUSTON S. BELL, JR., *Primary Examiner.*

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 3,397,408 August 20, 1968

E Chris Skousgaard

It is certified that error appears in the above identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, line 33, "receded" should read -- reseated --.

Signed and sealed this 3rd day of February 1970.

(SEAL)
Attest:

Edward M. Fletcher, Jr.
Attesting Officer

WILLIAM E. SCHUYLER, JR.
Commissioner of Patents