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VACUUM BREAKING VALVE

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8 Claims. (Cl. 277-12)

This invention relates to valve structures and has particular relation to a valve structure of a vacuum breaking type, the principal objects being the provision of a valve of the type described that is simple in construction, efficient in operation and relatively economical to produce.

Objects of the invention include the provision of a valve structure which will automatically vent the interior of the valve to the atmosphere upon the occurrence of a suction or partial vacuum in the supply line; the construction of a valve of the type described wherein the vent is automatically rendered effective each time the valve is closed and is automatically sealed off from the interior of the valve each time the valve is opened when there is a positive pressure in the supply line; the provision of a valve of the type described so constructed and arranged as to automatically vent the interior of the valve to the atmosphere when the valve is closed and in which the vent is normally sealed from the atmosphere upon opening of the valve but is so constructed and arranged as to automatically vent the interior of the valve to the atmosphere when the valve is open and when a suction or partial pressure occurs in the supply line; the provision of a valve structure in which the valve is opened against the force of the pressure in the supply line and the means for opening the valve is movable independently thereof, the opening means and the valve cooperating to form a valvular means within the body of the valve controlling the venting of the interior of the valve body to the atmosphere; the provision of a valve structure including a main supply controlling valve and a vent controlling valve, both valves being operated with respect to their seats each time the main valve is opened and closed; and the provision of a valve structure which will not only vent the interior of the valve body upon the occurrence of a suction or partial pressure in the supply line but will positively seal off the interior of the valve structure from the supply line under such circumstances.

The above being among the objects of the present invention the same consists in certain novel features of construction and combinations of parts to be hereinafter described with reference to the accompanying drawing, and then claimed, having the above and other objects in view.

In the accompanying drawing which illustrates suitable embodiments and in which like numerals refer to like parts throughout the several different views,

Fig. 1 is a more or less diagrammatic view

illustrating the valves constructed in accordance with the present invention connected in the water supply lines leading to a closet seat and a wash basin of the type commonly found in bathrooms;

Fig. 2 is an enlarged partially broken vertical sectional view taken axially through the faucet for the wash basin illustrated in Fig. 1;

Fig. 3 is a transverse sectional view taken on the line 3-3 of Fig. 2;

Fig. 4 is an enlarged vertical sectional view taken centrally through the valve shown connected with the toilet seat in Fig. 1;

Fig. 5 is a transverse sectional view taken on the line 5-5 of Fig. 4; and,

Fig. 6 is a fragmentary sectional view of a valve similar to that shown in Fig. 4 but illustrating a modified form of construction for the lower end of the same.

The danger of cross-connections in plumbing systems is well understood by those skilled in the art and particularly to sanitary engineers. The term "cross-connection" applied to plumbing fixtures means that by joining the fixture to the supply pipe it makes it possible for liquids, such as household waste, water from lavatories, water closet tanks, sinks and bath tubs and excreta consisting of urine and faeces from water closets and the waste contents of instruments and utensil sterilizers, bar and soda fountain sinks, glass washers, flush rim floor drains, etc. to be transferred from plumbing fixtures to the water supply pipes. A cross-connection makes possible the transfer of sewage from a plumbing fixture to a water supply pipe by joining or linking the two together. The agency of transfer may be gravity or siphonage. The under-rim inlet type of supply connections makes possible the transfer of sewage, human excreta, body, domestic and other wastes or infectious material from a plumbing transfer to a water supply system furnishing safe water. In general it may be stated that the danger of a cross-connection causing contamination of a safe water supply is possible where the discharge from a valve or other water controlled fitting is submerged in a supply of contaminated water and the valve is opened at a time when the pressure in the supply line falls below atmospheric pressure. Submersion of the discharge end of a valve or other valve controlled fittings occurs naturally in some plumbing fixtures as, for instance, bottom inlet bath tubs; it occurs as a result of the stoppage of the drain or the overflow in under-the-rim types of wash basins, bath tubs, many types of toilets and a great many other types of fixtures; and occurs in any case

where a hose, tube or other conduit is attached to the discharge end of a faucet or nozzle and the opposite end of the hose or the like is submerged in a tank, basin, pail or any other open body of water.

Generally speaking, two conditions must occur simultaneously in order to render the possibility of a cross-connection polluting the water supply dangerous, namely (1) water supply pressure failure and emergency shut-off, and (2) stoppage. Water supply pressure failure may occur because of breaking of water mains or services; fluctuation in pressure of the municipal supply from above to below atmospheric pressure; improperly designed or undersized water distributing systems particularly in tall buildings; heavy demands in extended dry periods reducing normal working pressure in city mains; fire pumps connected to a fire plug; turning off the water supply at the foot of a pipe riser in the event of stoppage; turning off the water in the basement in emergencies; repairs, replacements, leaky pipes or other causes; and many other similar conditions. Stoppages in plumbing fixtures may be due to accidents, carelessness, abuse or to other causes and there are few if any plumbing fixtures that do not at some time become clogged. In any event wherever the pressure in a water supply pipe falls below atmospheric pressure and the discharge end of any plumbing fixture is simultaneously submerged in polluted water, unless some means are provided for preventing siphonage of the polluted water back into the water supply system the water supply system will be contaminated. For a more complete discussion of the dangers of cross-connections in plumbing systems reference may be had to the report of the research committee of the American Society of Sanitary Engineers on cross-connections submitted at the 1931 annual meeting of the American Society of Sanitary Engineers at Richmond, Virginia under date of Sept. 9, 1931.

The present invention provides a novel form of valve structure for use in plumbing systems and by the use of which danger of cross-connections because of siphonage is effectively eliminated. The present invention is based upon the principle that no contamination of a potable water supply can occur by siphonage if air in sufficient quantities is introduced into the high point of the siphon any time that the water pressure on the supply side of the valve falls below the pressure on the discharge side thereof, as in such case the two legs of the siphon are separated by a free body of air which prevents the weight of the water in the long leg of the siphon from exerting any appreciable effect upon the water in the short leg. Accordingly, by use of the present invention a water control valve is provided including a valve body, a supply control valve and means for moving the valve from its seat, the valve and its actuating means being relatively movable with respect to each other and vent means for the interior of said valve body being provided. The vent means is so constructed and arranged that when the valve is open under any condition in which the pressure in the supply line exceeds the pressure on the discharge side of the nozzle the vent will remain closed when the supply control valve is open, but while the supply control valve is open should the pressure in the supply line for any reason or other fall below the pressure of the discharge side of the valve the vent will immediately become effective to vent the interior of the valve body to the atmosphere and thereby

destroy the possibility from any siphonage taking place. The construction is also such that the interior of the valve body is vented to the atmosphere at all times when the supply control valve is closed thereby to eliminate the possibility of any partial vacuum in the valve body from maintaining or drawing contaminated water into the valve body and insuring free gravitational drainage of the contents of the valve body and its connected lines when the valve is in closed position.

Referring now to the accompanying drawing and particularly to Fig. 1 a toilet seat is illustrated at 10 and a wash basin at 12. A water supply pipe is indicated at 14 and for the purpose of illustration in the present case may be considered as being connected to a municipal water supply system and, therefore, normally filled with a supply of potable water under a material positive pressure. The supply line 14 is connected to the closet 10 by suitable fittings including, in this particular instance, a valve indicated generally at 16 constructed in accordance with the present invention. The supply line 14 is also connected by means of the pipe line 18 with a faucet indicated generally at 20 positioned to supply water to the wash basin 12, the faucet 20 also being constructed in accordance with the present invention.

As will be appreciated were it not for the special valve 16 any condition of stoppage of the toilet 10 which would cause the contents of the same to overflow its rim would endanger contamination of the water supply in the pipes 14 if the pressure in the pipe 14 fell below atmospheric pressure. That this might readily occur will be understood and that the most natural thing to do upon over-running of the toilet 10 would be to shut off the water supply in the basement whereupon the opening of any valve between the toilet 10 and the main supply valve which has been shut off would immediately render the supply pipe 14 the long leg of the siphon and immediately tend to withdraw the contents of the toilet 10 into the supply pipe 14. Likewise were the faucet 20 an under-the-rim type of faucet and the drain and/or the overflow of the basin 12 stopped up, or where a shampoo head or other tube or hose is fastened to the type of faucet 20 shown and its discharge end submerged in the water in the bowl 12, any reduction of pressure in the supply pipe 14 below atmospheric pressure when the faucet 20 is open would then tend to siphon out the contents of the bowl 12 into the supply pipe 14.

Referring to the faucet 20 illustrated in detail in Figs. 2 and 3 it will be noted that the same includes a valve body 24 having a conventional form of discharge spout 26 and an inlet opening 28 in this case formed with a valve seat 30 at its entrance end which in this case is at its lower edge. A nipple 32 is threadably received by the valve body 24 concentrically of and below the opening 28 and is centrally provided with a spider 34 which centrally receives therein the stem of the main supply valve 36 for axial sliding movement toward and from the valve seat 30. The valve 36 includes a disc 38 of a suitable or conventional type of valve seating material adapted to co-operate with the seat 30 to provide a fluid-tight joint. It will be appreciated that water under pressure in the nipple 32 which in the particular arrangement illustrated in Fig. 1 is connected with the supply pipe 14 through the line 18, is relied upon to maintain the valve 36 in closed position, and in order to open the faucet

the valve 36 is forced downwardly against the pressure of the water in the nipple 32 away from the seat 30. In the particular construction shown in order to move the valve 36 away from the seat 30 a post-like member 40 is secured to the valve 36 in axially concentric relation with respect thereto and projects upwardly therefrom into the interior of the valve body 24. In the particular case shown the post 40 is provided at its lower end with an annular flange 42 and a stud 44 extending axially therebeyond, the stud 44 passing through the seating material 38 and being threaded into the valve 36 not only to secure the post 40 fixedly with respect thereto but also to firmly clamp the seating material 38 in proper position on the valve 36.

In the broader aspects of the present invention the post 40 may be axially actuated to open the valve 36 by any suitable or conventional form of mechanism such as is conventionally employed for operating valves and particularly that type of mechanism employed in connection with valves which are constantly urged towards closing position, but for the purpose of illustration in the present case such means is shown in the form of a stem 46 provided with external threads 48 cooperating with complementarily formed threads in the valve body 24 and positioned in axially concentric relation with respect to the post 40 and valve 36. The stem 46 is adapted to be moved axially upon manual actuation of its handle 50 secured thereto in a conventional manner as by means of the pin 52. A conventional form of packing 54 and packing nut 56 cooperate between the stem 46 and the valve body to prevent leakage of water along the stem 46.

The stem 46 at its upper end is provided with a bore 58 in which the upper end of the post 40 is loosely and slidably received. Axially concentric with the bore 58 and extending axially therebeyond to a point above the upper face of the packing nut 56 is a smaller bore 60 forming a shoulder 62 at its junction with the bore 58 and which shoulder forms the seat of the vent valve. The vent valve itself is formed by the upper end of the post 40 and cooperates with the seat provided by the shoulder 62 to close the passage 60 to the interior of the valve body 24 as will hereinafter be more fully explained. The contact between the upper end of the post 40 and the valve seat 62 provides the connection between the stem 46 and the post 40 to enable the stem 46 to move the valve 36 from its seat 30. It will be appreciated that if the handle 50 is rotated to cause movement of the stem 46 axially downwardly as viewed in Fig. 2 the stem 46 in moving downwardly will first bring the valve seat 62 into contact with the upper end of the post 40, and then continued movement of the stem 46 downwardly will act through the stem 40 to force the valve 36 off of the seat 30 and thus open the passage 28 to the flow of water to the interior of the valve body 24 from the interior of the nipple 32 and discharge of such water from the spout 26. When the valve is in the thus described open position, if the direction of rotation of the handle 50 is now reversed the stem 46 will be caused to move upwardly and the pressure of the water acting on the valve 36 will cause the valve 36 and post 40 to follow the upward movement of the stem 46 until the valve 36 becomes seated, thus closing off the flow of water, and continued upward movement of the stem 46 will disengage the upper end of the post 40 from the seat 62.

In accordance with the present invention the

passage 60 may be connected to the atmosphere at any desired location above the seat 62 but preferably above the top of the nut 56. In the particular instance shown this connection to the atmosphere is made by means of a transverse passage 64 extending through the stem 46 and the hub of the handle 50. Accordingly, it will be recognized that when the operating parts of the faucet 20 are in the position indicated in Fig. 2 the valve 36 is closed to the flow of water from the interior of the nipple 32 to the interior of the valve body and the interior of the valve body is vented to the atmosphere independently of the spout 26 through the passages 64, 60 and through the clearance space between the exterior of the post 40 and the walls of the bore 58, this vent communicating with the atmosphere above the discharge end of the spout 26 which under some circumstances may in effect be submerged because of the employment of a hose, spray head, or other device sealed to it.

Where the discharge end of the spout 26 is connected by a hose or other means to some object which has the effect of placing the interior of the valve body 24 under a positive pressure at those times when the valve 36 is open, escape of the water under pressure through the vent openings provided will be impossible because of the fact that the upper end of the post 40 is at such times in contact with the seat 62 and, therefore, effectively closes the vent opening to the escape of fluid pressure from within the valve body. On the other hand, while the handle 50 is turned to such position as to force the valve 36 from its seat and the discharge end of the spout 26 be immersed in a body of polluted water, should the pressure in the supply line 14 fall below atmospheric pressure the valve 36 will immediately be moved downwardly because of such difference in pressure and unseat the upper end of the post 40 from the vent seat 62, immediately venting the interior of the valve body 24 to the atmosphere through the passages 60 and 64 and effectively destroying any sub-atmospheric pressure tending to siphon contaminated water through the faucet into the supply line 14.

An additional feature of the construction is that under a condition in which the discharge end 26 is submerged, for instance as by means of a hose or tube projected into a pail of contaminated water or the like located at a point below the discharge end of the spout 26, when the handle 50 is moved to permit closing of the valve 36 under the pressure of the water in the nipple 32 and, therefore, the supply line 14, the moment that the handle is turned beyond the position necessary to effect sealing of the valve 36, the upper end of the post 40 will be separated from the valve seat 62, and the interior of the valve body 24 being thus vented, immediately permits the contents of the valve body 24 and the connected line of hose to drain by gravity into the bucket or the like, thus clearing out the interior of the valve body and any connected line of hose or the like even though submerged and preventing any possibility of contaminated water circulating through the hose under such conditions to contaminate the interior of the spout 26.

It will be appreciated that as a result of the present invention a valve structure is provided in which the interior of the valve body is at all times vented to the atmosphere whenever the supply control valve is closed, it provides a vented valve structure in which the vent is posi-

tively closed when the valve is opened against a positive pressure of water in the supply line thus permitting the valve to be employed in constructions in which the interior of the valve body is placed under the same pressure as the water in the supply line during operation; and provides a construction in which when the valve is in open position and sub-atmospheric pressure occurs in the supply line, siphonage between the inlet and outlet ends of the valve is immediately prevented by freely venting the interior of the valve to the atmosphere. Accordingly, a valve constructed in accordance with the present invention provides a safeguard against the contamination of a water supply through cross-connections because of possible siphonage through the valve.

Referring now to the form of the valve 16 illustrated in detail in Figs. 4 and 5 it will, of course, be understood that this valve is not only applicable in connection with toilet seats as in Fig. 1 but is applicable for use in any plumbing system for controlling the flow of water therethrough. To obtain the benefit of the construction in order to prevent any siphonage because of cross-connections and to guard the possible danger of cross-connections by gravity drainage through the valve, the valve should always be placed at the top of any piping system which might function as a siphon and above the top of any basin, tank, or other open receptacle to which it controls the flow of water. The valve 16 illustrated is particularly adaptable for a greater flow of water therethrough than the faucet 20 and consequently requires provision for a greater amount of venting air, and its proportions are such as to effect this result.

Referring now to Figs. 4 and 5 the valve 16 is shown as being provided with a hollow body 70 the lower end of which is enlarged as at 72 with its terminus internally threaded as at 74 for reception of a suitable pipe, and as being provided with a valve seat 76 at the junction of the enlarged portion 72 with the main body portion 70. An outlet connection 78 is provided in the body 70 above the seat 76. The body 70 is internally provided with a pair of axially spaced spiders 80 between which is axially slidably received the stem 82 of the water supply control valve indicated generally at 84. The valve 84 comprises a supporting cup or disc 86 and a disc 88 of conventional valve seating material, the members 86 and 88 being clamped between the nut 90 threaded on the lower end of the stem 82 and the washer 92 which abuts against the shoulder formed at the junction of the reduced lower end of the stem 82 with the main body portion thereof. The upper end of the stem 82 is enlarged above the upper spider 80 to form an upwardly opening cup 94 in which is received a disc 96 of conventional valve seating material. Contact of the valve 84 with the seat 76 and of the cup 94 with the upper spider 80 limits the axial movement of the valve assembly in the opposite direction.

The upper end of the body 70 is provided with a centrally apertured cap member 98 threaded thereon and sealed thereto by means of a gasket 100. The central aperture in the cap member 98 is threaded for co-operation with the threads 102 formed on the exterior of the hollow handle stem 104. A packing nut 106 and packing 108 provide a water-tight connection between the cap 98 and the stem 104. An operating handle 110 is formed integrally with the upper end of

the stem 104 and is hollow, its hollow interior being fully open to the interior of the hollow stem 104 and being open to the atmosphere by means of openings 112 formed in the lower face of the handle 110. The lower end of the stem 104 is preferably beveled off as at 114 so that the lower end of the stem 104 will act as a valve in cooperating with the seating material 96.

The enlarged lower end 72 of the main body portion 70 serves as the inlet connection for the valve and, accordingly, the supply controlling valve 84 is normally maintained in contact with the seat 76 to keep the valve in closed position when there is a positive pressure on the supply side of the valve. Turning of the handle 110 acts through the threads 102 to force the stem 104 downwardly to open the valve 84 against pressure of the water on the supply side, the first or initial movement of the stem 104 acting to bring the lower beveled edge 114 thereof into sealing relation with respect to the seating material 96 and thereafter to force the valve 84 from the seat 76 to permit a flow of water through the structure, the pressure of the water in the supply line maintaining sealed relation between the edge 114 and seating material 96 while there is a positive pressure in the supply line and when the valve is in open position.

To close the valve when once in open position the handle 110 is rotated to raise the stem 104 and thus permit the pressure of the water in the supply line to move the valve 84 into contact with the seat 76, further movement of the stem 104 upwardly separating the end 114 from the seating material 96 and thus freely venting the interior of the valve body to the atmosphere. In this valve, in a manner similar to the valve or faucet previously described, it will be readily understood that any condition tending to reduce the pressure in the inlet 74 below atmospheric pressure will immediately permit the valve 84 to drop away from the seat 76 and immediately place the interior of the valve body and the supply pipe in open communication with the atmosphere, the size of the vent passages in this case being so large that regardless of the intensity of the suction that might occur in the supply line it will be impossible to build up any appreciable suction in the outlet connection 78 to withdraw any liquid back into the interior of the valve body and consequently the supply line through the outlet connection. Likewise should the valve 84 be closed at any time that the pressure in the supply line falls below atmospheric pressure, the valve 84 will immediately drop away from the seat 76 and similarly freely vent the interior of the supply line to the atmosphere.

One feature of the valve construction in accordance with the present invention is in connection with the drainage of the discharge line extending therefrom. For instance where a hose or the like is connected with the discharge nipple 78 of the valve shown in Figs. 4 and 5, immediately upon seating of the valve 84 a slight continued rotation of the handle 110 in a closing direction raises the end 114 of the stem 104 from the valve seating material 96 and vents the interior of the valve body to the atmosphere. This venting then permits any water or other liquid in the discharge line from the valve to drain by gravity from the line. It will be appreciated that this is of advantage in many instances. It is particularly advantageous in connection with lawn sprinkling systems as more fully brought out in my co-pending application for Letters Patent of the

United States filed March 10, 1938, and serially numbered 195,134. Briefly the importance in connection with lawn sprinkling systems is that under some circumstances pools of water contaminated by fertilizers of different characters or poisons applied to a lawn to control insects or the like may accumulate over one or more of the sprinkler heads and if the various lines of pipes constituting the sprinkler system are not permitted to freely drain by gravity the danger of pollution of the water supply line is greatly increased.

The safety feature of the present valve construction in its application to the control of lawn sprinkling systems may be increased in the manner illustrated in Fig. 6 wherein the supply controlling valve is provided with a second seat which becomes effective upon reduction in pressure in the supply line to less than atmospheric to positively seal the supply line against reversal of flow at the valve. Referring to Fig. 6 it will be noted that this modification includes the provision of a second valve seat 76' which is threadably inserted into the enlarged lower end 72 of the valve body 70 so as to be positioned in opposed and axially spaced relation with respect to the valve seat 76. The control valve 84' in this case is modified to provide an additional disc 88' of valve seating material on its lower face for cooperation with the seat 76', the lower end of the stem 82 being sufficiently elongated to accommodate this added thickness of the valve 84'. This modified construction will operate very similar to the construction shown in Fig. 4 except that upon reduction in pressure of the water in the supply line to the valve to less than atmospheric pressure the valve 84' will immediately drop upon the seat 76', whether it is in open or closed position, and positively seal off the interior of the supply line to a reverse flow. At the same time this action freely vents the interior of the valve body and consequently the outlet connection 78 and any line connected thereto to the atmosphere. While the construction shown in Fig. 6 may be desirable in connection with lawn sprinkling systems for the reasons heretofore stated it generally is not desirable in connection with the various fixtures in a building for the reason that it will act to prevent complete drainage of the supply line connected thereto.

Formal changes may be made in the specific embodiments of the invention described without departing from the spirit or substance of the broad invention, the scope of which is commensurate with the appended claims.

What I claim is:

1. In a valve structure, in combination, a body having an inlet and an outlet, a valve seat formed between said inlet and outlet, a valve on the inlet side of said valve seat cooperable therewith to control the flow of fluid through said body, means for guiding said valve for movement toward and from said seat, said valve being unrestricted in its movement toward and from said seat in response to fluid pressure acting thereon, manually controllable means supported by said body movable toward and from said valve seat, means slidably associated with said manually controllable means interposed between said manually controllable means and said valve whereby to enable said manually controllable means to be operated to move said valve away from said seat, said manually controllable means being provided with an air vent therein communicating the interior of said valve body with the atmosphere exterior thereto and the second mentioned means cooperating with said manually controllable means to provide a valve for said duct, the last mentioned means and said manually controllable means being so constructed and arranged that movement of said valve away from said seat when said manually controllable means is in valve opening position automatically opens said vent to the passage of air therethrough to the interior of said valve body.

2. A valve structure comprising, in combination, a valve body having an inlet and an outlet, a valve seat formed between said inlet and outlet, a valve cooperable with said seat and adapted to be constantly urged towards seated position with respect thereto only by fluid under positive pressure in the inlet, means associated with said body movable toward and away from said valve for normally controlling the position of said valve with respect to said seat, said valve structure being provided with a vent passage communicating the interior of said body with the exterior thereof, said means forming a valve part for controlling said vent passage, said parts being so constructed and arranged that movement of said valve away from said seat independently of said means renders said vent passage effective for the purpose of venting air to the interior of said valve body, and movement of said means to move said valve from said seat against a positive pressure in said inlet renders said means effective to close said vent passage.

3. In a valve structure, in combination, a valve body having an inlet and an outlet, a valve seat between said inlet and outlet, a valve device within said body including a part cooperable with said seat to interrupt the flow through said body between said inlet and said outlet and including a second valve forming part, said valve being movable toward said seat only by a differential of fluid pressure acting on opposite faces thereof, means associated with said body and movable toward and away from said valve part cooperable with said valve device to move said valve from said seat and providing a second valve part cooperable with the first mentioned valve part, and means forming a vent passage closable by cooperation of said valve parts, said parts being so constructed and arranged that movement of said valve device away from said seat without a corresponding movement of said means automatically effects relative movement between said valve parts to render said passage open for the purpose of venting air to the interior of said body.

4. A valve structure comprising, in combination, a body part providing an inlet and an outlet, a valve seat formed between said inlet and said outlet, a valve device including a head cooperable with said seat to close said body part to the flow of fluid between said inlet and said outlet, a hollow stem associated with said body part the interior of which is constantly open to the atmosphere, said stem being movable toward and from said valve device and being cooperable therewith to force said head from said seat, said valve device cooperating with said hollow stem to control communication between the interior of said hollow stem and the interior of said body part, said cooperation being such that movement of said valve device in a direction to move said head away from said seat, without a corresponding movement of said stem, opens said stem to the free passage of air therethrough to

the interior of said body part, and said valve device being movable toward said seat only in response to fluid pressure acting thereon.

5 5. In a valve structure, in combination, a valve
body providing an inlet and an outlet, a seat
fixed with respect to said body between said in-
let and said outlet, a valve cooperating with
said seat to control the flow of fluid through
10 said valve body between said inlet and said
outlet and movable toward said seat solely in
response to fluid pressure acting thereon, means
associated with and movable directly with said
valve providing a valve part, a stem providing
15 a vent passage between the interior of said valve
body and the atmosphere exterior thereto, said
stem cooperating with said valve part to form
valvular means to control the effectiveness of
said vent passage for body venting purposes, said
20 stem being movable into contact with said valve
part and cooperable therethrough to move said
valve from said seat, the relation between said
stem and said valve part being such that move-
ment of said valve from said seat without a cor-
responding movement of said stem affects sepa-
25 ration of said valve part and said stem and
renders said vent passage effective for the pur-
pose of permitting a flow of air through said
vent passage into said valve body.

6. In a valve structure, in combination, a valve
30 body providing an inlet and an outlet, a valve
seat between said inlet and said outlet, a valve
associated with said seat and movable toward
said seat solely in response to fluid pressure
acting thereon, a valve seat carried by said valve,
35 a hollow operating stem associated with said
body and movable toward and away from the
first mentioned valve seat, the interior of said
hollow stem being open to the atmosphere ex-
terior of said body and an end of said stem
40 cooperating with said second valve seat to close
communication through said stem between the
interior of said valve body and the atmosphere
therethrough, said communication being ren-

dered ineffective when said stem is in contact
with said second valve seat and being rendered
effective when separated therefrom.

7. In a valve structure, in combination, a valve
body having an inlet and an outlet, a valve seat 5
in said body between said inlet and said out-
let, a valve associated with said seat for con-
trolling the flow of fluid therethrough and mov-
able toward said seat solely in response to fluid
pressure acting thereon, a post secured to said 10
valve and movable therewith, a stem movable
toward and from said seat, said stem providing
a vent passage therein connecting the interior
of said valve body with the atmosphere exterior
thereto, a shoulder formed in said vent passage, 15
said post cooperable with said shoulder to render
said vent passage inoperative when in contact
therewith and to render it operative when sepa-
rated therefrom, said stem cooperating with
said post through said shoulder to enable move- 20
ment of said stem toward said seat to move
said valve from said seat, said post automatically
separating from said shoulder upon movement
of said valve away from said seat independently
of a corresponding movement of said stem. 25

8. In a valve structure, in combination, a valve
body providing an inlet and an outlet, a pair of
axially spaced valve seats within said body be-
tween said inlet and said outlet, a valve posi-
tioned between said valve seats and movable 30
therebetween into contact with either one there-
of to interrupt the flow of fluid through said body
between said inlet and said outlet, means asso-
ciated with said valve providing a valve part,
a stem movable toward and from said valve seats 35
cooperable with said valve part to move said
valve from one of the first mentioned seats, and
said stem forming a second valve part cooper-
ating with the first mentioned valve part to pro-
vide valvular means controlling the venting of 40
the interior of said valve part to the atmosphere
independently of said inlet and said outlet.

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