

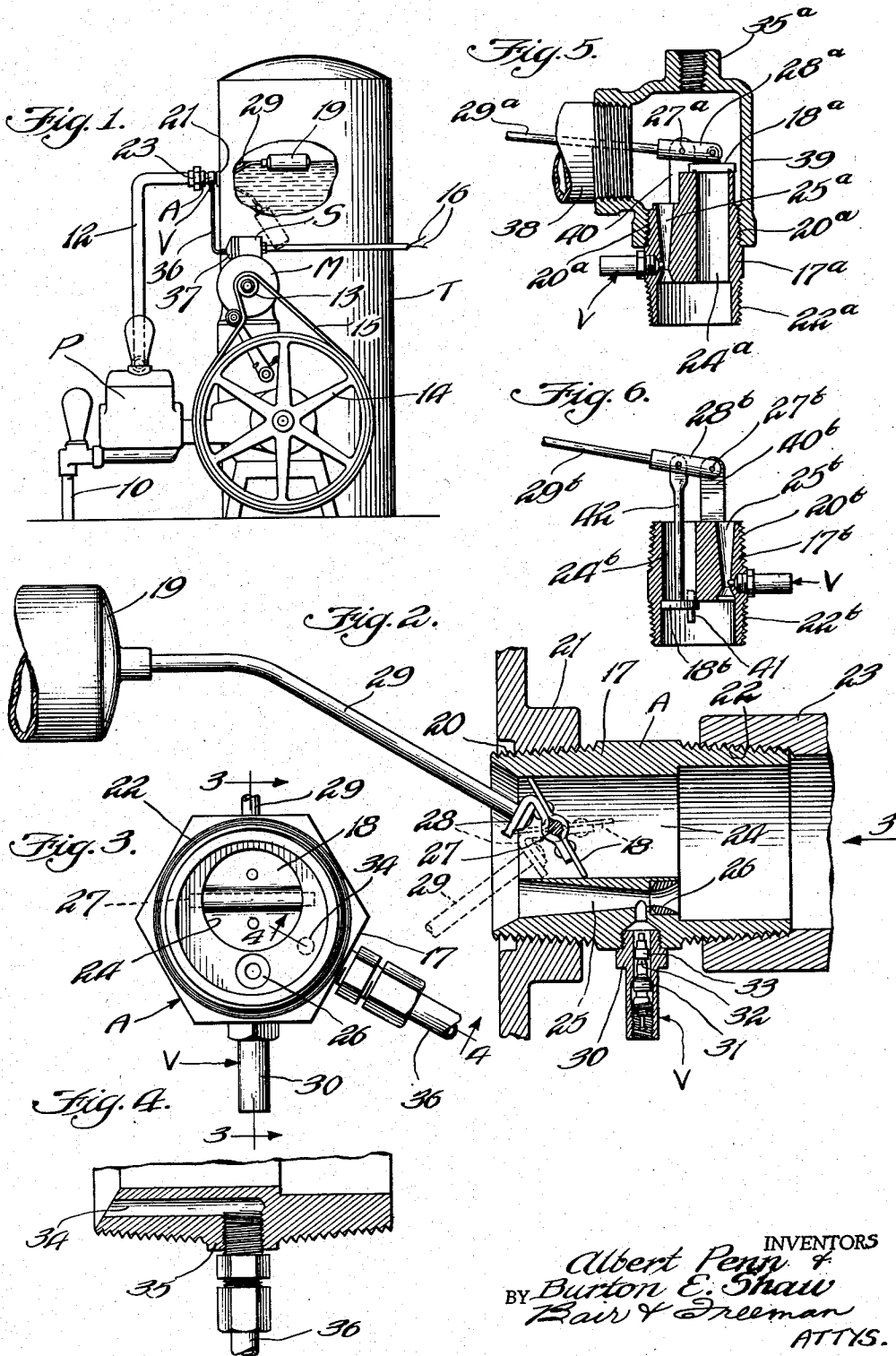
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UNIVERSAL AIR VOLUME CONTROLLING DEVICE

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UNIVERSAL AIR VOLUME CONTROLLING
DEVICE

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Our present invention relates to an air volume controlling device which is universal in that it may be connected with a pumping system employing either a shallow well pump or a deep well pump or one employing any other type of device, such as an injector or the like, for supplying fluid to a storage tank.

One object of the invention is to provide an air volume controlling device which is very simple and inexpensive to manufacture.

Another object is to provide a device of the general character referred to wherein the necessity of sealing diaphragms, bellows and the like is entirely eliminated by so designing the device that a float and float arm extend directly into a passageway of the fitting and air is admitted by Venturi action, requiring merely an air admission valve of the check valve type without the necessity of a mechanical connection between the float and the air admission valve.

Another object is to provide an air volume controlling device in the form of a fitting which may be screwed into the intake opening of a tank and to which the water supply pipe may be connected without the necessity of any further hydraulic or pneumatic connections.

Still another object is to provide means for controlling the admission of air to a hydropneumatic pumping system which permits substantially full fluid flow when there is sufficient air in the tank and restricts the flow to provide Venturi action to effect intake of air when the fluid level is too high.

A further object is to provide an all-purpose air volume control designed for interposition in the supply line to a water storage tank, having a main passageway therethrough and an auxiliary passageway, the auxiliary passageway being effective when the main passageway is closed by a float controlled butterfly valve to effect intake of air by Venturi action.

Still a further object is to provide the fitting or valve body of our controlling device with a passageway from the interior of the tank to a pressure fitting for communicating the tank pressure to a pressure switch or the like for controlling the motor of the pump which supplies fluid to the tank, thereby preventing improper operation of the switch due to variations of pressure in the supply pipe due to the main passageway at times being open and at other times being closed to force the fluid through the auxiliary or Venturi passageway.

With these and other objects in view, our invention with respect to its features which we

believe to be novel and patentable will be pointed out in the claims appended hereto. For a better detailed understanding of the invention, and further objects relating to details of economy of our invention, reference is made to the following description and to the accompanying drawing wherein such further objects will definitely appear, and in which

Figure 1 is an elevational view of a water pumping system in which our invention has been installed, a portion of the tank being broken away to show a float therein in relation to the level of water in the tank;

Figure 2 is an enlarged vertical sectional view (reversed relative to Figure 1), showing the fitting constituting our invention;

Figure 3 is an end elevation of the fitting looking in the direction of the arrow 3 adjacent Figure 2;

Figure 4 is a sectional view on the line 4—4 of Figure 3 showing a pressure connection of our fitting;

Figure 5 is a vertical sectional view of a modified form of the invention, and

Figure 6 is a similar view of still another modified form.

On the accompanying drawing, we have used the reference character T to indicate generally a storage tank, P a pump, M an electric motor for operating the pump, and A our air volume controlling device. The pump P is adapted to pump water from a pipe 10 through a pipe 12 and the fitting A to the tank T. The pump P is belt driven through pulleys 13 and 14 and a belt 15 from the motor M. A control switch S is provided for the motor M, the switch being of the usual pressure operated type and the current supply wires thereto being indicated at 16.

Our air volume controlling device A comprises a body member 17, a butterfly valve 18, a float 19 and an air admission valve V. The body 17 is screw threaded on one end at 20 for mounting in a boss 21 of the tank T. On its other end the body 17 is threaded at 22 to communicate with the supply pipe 12 as through a union 23. The air volume controlling device A is thereby interposed between the supply pipe 12 and the tank T, although obviously it may be located at other points in the supply pipe 12 is desired.

The body 17 has a main passageway 24 and an auxiliary passageway 25. The main passageway 24 is large enough to freely pass substantially all of the fluid pumped by the pump P through the supply pipe 12, although obviously a small percentage of the fluid may pass through the pas-

sageway 25. The passageway 25 is of Venturi shape and preferably has a Venturi inlet nozzle 26 of removable character so that nozzles 26 of different size to suit the installation may be installed as required.

A cross pin 27 is provided for the butterfly valve 18. The valve 18 has a bracket 28 secured thereto into which a float arm or rod 29 is screwed. The rod 29 projects from the inner end of the valve body 17 and the float 19 is mounted thereon by screw-threading or otherwise.

The air admission valve V consists of a body member 30 in which an ordinary tire valve core 31 is screwed. The valve core 31 constitutes a check valve and is arranged to open inwardly, its valve seat being indicated at 32 and the valve plug seating thereagainst being indicated at 33.

The valve body 17 includes a third passageway 34, shown particularly in Figure 4, which passageway terminates in a threaded boss 35 opening to atmosphere. The inner end of the passageway 34 communicates with the interior of the tank T. A pressure connection 36, such as a copper tube or the like, communicates at one end with the boss 35 and at its other end with the pressure or diaphragm housing 37 of the control switch S.

In Figure 5, we show a modified construction in which a valve body 17a takes the place of the valve body 17 in the preceding figures. Other equivalent parts are given the same reference numerals with the addition of the character a. The threaded end 22a of the valve body 17a is adapted to connect with the supply line 12 of Figure 1, while a nipple 38 for mounting in the boss 21 of the tank is connected by a T fitting 39 with the threads 20a. The valve 18a in this instance is pivoted to a float arm bracket 28a which in turn is pivoted to a pair of ears 40 by means of a pivot pin 27a. The valve 18a is of disclike character adapted to seat against the upper end of the main passageway 24a. The valve 18a thereby seats against incoming water pressure.

In Figure 6, similar parts are given the same reference numerals with the addition of the character b. In this type of air volume controlling device, a disc valve 18b seats with, rather than against, water pressure. The disc 18b may be guided or located properly by pins 41 and is adapted to seat against the lower end of the main passageway 24b instead of against its upper end. The disc 18b has a stem 42 pivoted to the float arm bracket 28b which in turn is pivoted to a pair of ears 40b.

The valve bodies 17a and 17b of Figures 5 and 6 are adapted to receive air admission valves V of the same construction illustrated in Figure 2. Either the fitting 17a or the fitting 17b are adapted to be screwed into a T fitting 39, as illustrated in Figure 5, which fitting has a threaded boss 35a for the pressure connection 36 of Figure 1.

Practical operation

In the operation of our air volume controlling device, whenever there is a proper amount of air in the tank T the float 19 and the float arm 29 will assume a lowered position, as shown by dotted lines in Figures 1 and 2. This will permit substantially free flow of fluid through the main passageway 24 as the butterfly valve 18 is wide open. What little fluid flow there is through the passageway 27 will not produce suf-

ficient Venturi action to open the check valve V and admit air therethrough.

Whenever the water level becomes too high, which is usually called a "water-logged condition" of the tank T, then the float 18 will be raised above its dotted position more or less, its maximum raised position being shown in solid lines. The solid line position shows the valve 18 closed, whereby the water from the supply pipe 12 must pass through the auxiliary or Venturi passageway 25. This will cause Venturi action which permits atmospheric pressure to unseat the valve plug 33 from the seat 32 against the action of a light spring usually provided in a tire core 31 of the character illustrated, so that air will be introduced into the tank T for lowering the water level therein and replenishing the supply of air required to form a cushion in the top of the tank to displace water therefrom when the pump P is not in operation. The amount of air introduced through the valve V will vary, depending on the position of the valve 18 and the consequent force of water through the Venturi passageway 25. In actual operation, there will be some air admitted during the last portion of each cycle of operation of the pump P due to variation in the water level caused by such cycles of operation. Air admission, however, will not take place when there is a sufficient head of air in the tank to prevent raising of the float 19 during such portion of the operating cycle of the pump.

Since the valve 18 is of butterfly type and the valve is pivoted at its center, it will be balanced so that there is neither a tendency to raise or lower the float, due to the passage of water through the main passageway 24. In some installations, it may be desirable to either have the water oppose the float or tend to raise the float, whereupon either the construction of Figure 5 or the construction of Figure 6 may be used.

Since the valve 18, when closed, produces a higher back pressure in the supply pipe 12 than when the valve is open, it is not feasible to connect the pressure connection 36 of the automatic control switch S into the supply pipe 12. Instead, it is desirable to have the switch S respond to pressure within the tank T, and accordingly we provide the passageway 34 of Figure 4 for communicating pressure from the interior of the tank to the pressure diaphragm 37 of the switch. In this manner a satisfactory pressure connection is provided without the necessity of any further fittings or a second connection between the tube 36 and some part of the tank.

It is obvious that our air volume controlling device is universal in application in that it may be used in connection with any type of pumping mechanism and will effect air introduction into the storage tank in accordance with the level of the water in the tank. The design of controlling device illustrated eliminates the necessity of any mechanical connection between the air valve and the float, and accordingly eliminates any necessity for a diaphragm or other sealing means between the interior of the tank and atmosphere.

Having described certain specific embodiments of our invention together with the operation thereof, we desire it to be understood that these forms are selected merely for the purpose of facilitating disclosure of the invention rather than for the purpose of limiting the number of forms which it may assume. It is to be further understood that various modifications, adapta-

tions and alterations may be applied to the specific forms disclosed to meet the requirements of practice without in any manner departing from the spirit and scope of the present invention except as set forth in the claims appended hereto.

We claim as our invention and desire to secure by Letters Patent of the United States:

1. In a universal air volume controlling device, a tank, a water supply line thereto, a fitting interposed in said water supply line, a pump for pumping water to said water supply line, a pair of passageways through said fitting, one of said passageways being large enough to permit substantially the entire output of water from said pump to be pumped through said passageway, the other of said passageways being restricted and of Venturi shape and having a removable Venturi intake nozzle, an air valve communicating with said Venturi passageway, a butterfly valve for controlling the flow of water through said first passageway, and a float for operating said butterfly valve to permit water flow through said first passageway when said butterfly valve is open in response to a low level of water in said tank and prevent such flow in response to a high level of water in said tank, whereupon the flow of water through said Venturi passageway effects introduction of air through said air valve and into said tank.

2. In a universal air volume controlling device, a tank, a fluid supply pipe, a fitting adapted to be screwed into said tank between said fluid supply pipe and the tank, a pair of passageways through said fitting communicating on opposite ends respectively with the supply pipe and the tank, one of said passageways constituting a main passageway to permit substantially the entire output of fluid from said fluid supply pipe to flow there-through, the other of said passageways by-passing said main passageway and of Venturi shape, an air admission valve communicating with said Venturi passageway, a control valve, and a float responsive to the level of fluid in said tank for opening said control valve to permit fluid flow through said first passageway and for closing said control valve to effect flow of fluid through said Venturi passageway with sufficient force to effect introduction of air through said air admission valve to said tank.

3. A universal air volume controlling device comprising a tank, a fluid supply pipe, a body member interposed between said tank and said fluid supply pipe, a pair of passageways through said body member communicating on opposite ends respectively with the supply pipe and the tank, one of said passageways permitting substantially the entire flow of fluid from said supply pipe to said tank, the other of said passageways being restricted and of Venturi shape, an air admission valve communicating with said Venturi passageway, a butterfly control valve in said first passageway, and a float connected with said control valve and positioned in said tank.

4. In a universal air volume controlling device, a water storage tank, a water supply pipe, a fitting interposed between said water supply pipe and said water storage tank, a pair of passageways through said fitting communicating on opposite ends respectively with the supply pipe and the tank, one of said passageways being restricted and of Venturi shape, an air admission valve communicating therewith, a control valve for said passageways, and a float for operating said control valve to permit water flow selectively

through said first passageways with said Venturi passageway effecting introduction of air through said air admission valve to said tank when the water flow is mainly through the Venturi passageway.

5. In a pumping system, a pump, a fluid supply pipe from the discharge side thereof, a storage tank to receive fluid from said pipe, said pump being motor operated, a pressure operated electric switch device for controlling said motor, and a fitting in the fluid supply line, said fitting having a main passageway and an auxiliary passageway, said main passageway permitting passage of substantially the entire output of said pump, said auxiliary passageway being of Venturi shape, an air admission valve connected with said Venturi passageway for introducing air thereto, said air admission valve having check means opening toward the interior of the Venturi passageway, a control valve for said main passageway, and a float responsive to the level of water in said storage tank for operating said control valve to close it when the water level is high and open it when the water level is low, said fitting having a passageway from the discharge side thereof to the exterior of the fitting and a pressure connection from said last passageway to said pressure operated switch.

6. A pumping system comprising a pump, a fluid supply pipe from the discharge side thereof, a storage tank to receive fluid from said pipe, and a fitting in the fluid supply line, said fitting having a pair of passageways therethrough, one of said passageways being of Venturi shape, an air valve connected with said Venturi passageway for introducing air thereto, said air valve including check means opening toward said Venturi passageway, a control valve for said passageways and a float responsive to the level of water in said storage tank for operating said control valve to effect majority flow of water through said Venturi passageway when the water level is high and to effect majority flow of water through the other of said passageways when the water level is low.

7. The combination with a storage tank adapted to be supplied with air and water under pressure, of means for maintaining the proportion of air and water substantially constant and including a fitting interposed between the supply of water and the storage tank, said fitting having a pair of passageways therethrough communicating at opposite ends with the water supply and the storage tank, one of said passageways being relatively large and the other having a restriction, valve means in said large passageway, a float connected with said valve means and extending directly therefrom into the storage tank for response to water level therein, and an air admission valve connected with the restriction of said second passageway for introducing air by Venturi action thereinto upon sufficient flow of water through said other passageway as effected by closure of said valve means.

8. In a water system including a storage tank and means for supplying air and water to the tank under pressure, means for maintaining the proportion of air and water within the tank substantially constant and including a member adapted at one end to communicate with the tank interior adjacent the water line and at its other end to communicate with a water supply pipe, said member having passageway means

therethrough from end to end thereof and including a restricted portion, float valve means associated with said passageway means and having its float responsive to the level of the water in said storage tank, and an air admission valve affording communication between the exterior of said member and the interior thereof for admitting air by Venturi action to said restricted portion of said passageway means upon said valve means assuming a predetermined position in response to a relatively high water level in said storage tank.

9. In a water system including a storage tank and means for supplying air and water to the tank under pressure, means for maintaining the proportion of air and water substantially constant within said tank, said means including a member communicating with the tank interior and with a water supply pipe, said member having passageway means therethrough including a restricted portion, float valve means associated with said passageway means and having its float responsive to the level of the water in said storage tank, and an air admission valve affording communication between the exterior of said member and the interior thereof for admitting air by Venturi action to said restricted portion of said passageway means upon said valve means assuming closed position in response to a relatively high water level in said storage tank.

10. A tank adapted to hold air and water under pressure, a water supply pipe therefor, a device for introducing air thereto when the tank requires additional air due to a high water level therein comprising a fitting secured in an aperture in one wall of the tank, said fitting having a bore communicating with the interior of the tank adjacent the water level therein and with said water supply pipe, valve means in said bore, a float for operating said valve means to close it in response to a high water level in said tank, an air admission valve connected with said fitting for communicating the interior of said tank with atmosphere, and Venturi means by-passing said bore for accomplishing intake of air to said tank through said air admission valve in response to closing of said valve means.

11. A water supply tank of an air pressure system, an automatic air regulator for said water supply tank comprising a fitting normally permitting free supply of water to the tank, valve means in said fitting to restrict the supply of fluid to the tank, a float arm extending from said valve means through the discharge opening of said fitting into said tank, a float thereon for controlling said valve means, and Venturi means in said fitting adapted to permit admission of air to said tank when said valve means is closed.

12. A tank, a fluid supply line, a float controlled air valve comprising a fitting adapted to be interposed between said fluid supply line and said tank, said fitting having a pair of openings therethrough, one for substantially unrestricted fluid flow and the other having a portion for restricted fluid flow, an air admission valve communicating with the restricted portion of said other passageway to permit intake of air into said fitting by Venturi action caused by fluid flow through said last passageway when said first passageway is closed, and means for closing said first passageway comprising a balanced valve and a float responsive to the water level in said tank and connected with said valve to close it in the raised position of the float.

13. A tank, a fluid supply line therefor, a float

controlled air valve of the character disclosed comprising a fitting adapted to be interposed between said fluid supply line and said tank, said fitting having main and auxiliary openings therethrough said auxiliary opening having a restriction, an air admission valve connected with the restriction of said auxiliary passageway to permit intake of air into said fitting by Venturi action caused by fluid flow through said auxiliary passageway when said main passageway is closed, and float means responsive to high water level in said tank for closing said main passageway.

14. In a device of the class described, a fitting, a pair of passageways therethrough, one of said passageways having a restriction, valve means for spanning one of said passageways, a float responsive to the level of liquid adjacent said fitting connected with said valve means and extending from the discharge end of said passageway in which the valve means is mounted for closing said valve means, and an air admission check valve connected into the side of the constriction of said other of said passageways for permitting air admission to said fitting by Venturi action upon said valve means spanning said first passageway.

15. A tank, a fluid supply line, a device of the class described comprising a fitting for interposition between said fluid supply line and said tank, a pair of openings through said fitting, one of said openings having a restriction, valve means for closing the other of said openings, a float connected with said valve means and extending from the discharge end of said opening in which the valve means is mounted for closing said valve means in response to a high fluid level within a tank with which the discharge end of said fitting is connected, and a valve connected into the side of said restriction and communicating with atmosphere for permitting air admission to said fitting by Venturi action upon closure of said other opening by said valve means.

16. A tank having a fluid intake opening, a source of fluid supply for said tank, automatic air volume controlling means comprising a fitting provided with means to detachably secure it in said fluid intake opening of said tank, a pump for supplying fluid to said fitting, said fitting having an intake end adapted to be connected with said source of fluid supply for said tank, a pair of passageways through said fitting, one for substantially unrestricted fluid flow and the other for restricted fluid flow with Venturi action, valve means for controlling the flow of fluid through said first passageway, a float responsive to high fluid level in the tank for closing said valve means, and air admission check valve means connected laterally into the side of said second passageway to permit entrance of air thereinto upon predominant fluid flow through said second passageway resulting from closure of said valve means, said fitting having a third passageway opening into the interior of the tank at one end and arranged adjacent its opposite end to receive a pressure connection for a pressure operated control device for controlling the operation of the pump supplying fluid to said fitting.

17. A tank having a fluid intake opening, a source of fluid supply for said tank, automatic air volume controlling means comprising a fitting provided with means to detachably secure a discharge end thereof in said fluid intake opening of said tank, said fitting having an intake end adapted to be connected with said source of fluid

supply for said tank, a pair of passageways through said fitting, one having a constriction, the other of said passageways constituting a main passageway for substantially unrestricted fluid flow and the first passageway constituting a by-pass passageway for restricted fluid flow with Venturi action, valve means for controlling the flow of fluid through said main passageway, a float responsive to high fluid level in the tank for closing said valve means, an air admission check valve means connected with said constriction of said by-pass passageway to permit entrance of air thereunto upon predominant fluid flow there-through resulting from closure of said valve means.

18. A hydropneumatic tank, a supply of fluid, a valve device adapted to regulate the relative volume of air and water within said hydropneumatic tank, a valve body attachable to the tank and having a main passageway to communicate the tank interior with said supply of fluid, a float controlled valve in said main passageway, a float responsive to the fluid level in said hydropneumatic tank and mounted on said valve to actuate it, a by-pass passageway through said valve body having a constricted portion through which the fluid flows when said valve is closed, and a check valve communicating atmosphere with said con-

stricted portion of said last passageway to admit air by Venturi action thereto during the time said valve is closed.

19. A hydropneumatic tank having an opening in one wall thereof, a supply of fluid, a valve device adapted to regulate the volume of air within said hydropneumatic tank, a valve body securable in said opening of said tank and having a passageway to communicate the tank interior with said supply of fluid, a float controlled valve in said passageway, a float responsive to the fluid level in said hydropneumatic tank and mounted on said valve body and adapted to actuate said valve, a by-pass passageway through said valve body and having a constriction through which the fluid flows when said valve is closed, and an air admission valve communicating laterally with said constriction and adapted to admit air by Venturi action thereto during the time said valve is closed, said valve body having a third passageway adapted at its inner end to communicate with the interior of the tank and at its outer end to communicate the pressure of the interior of the tank to a control device for the pumping mechanism supplying fluid to said valve body.

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