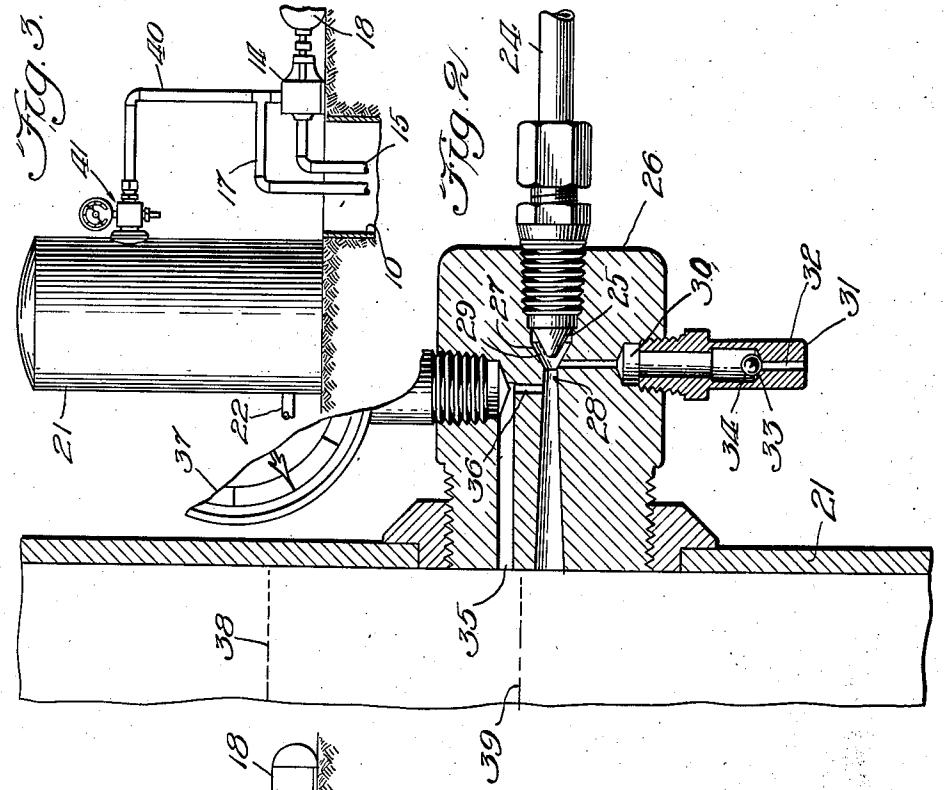
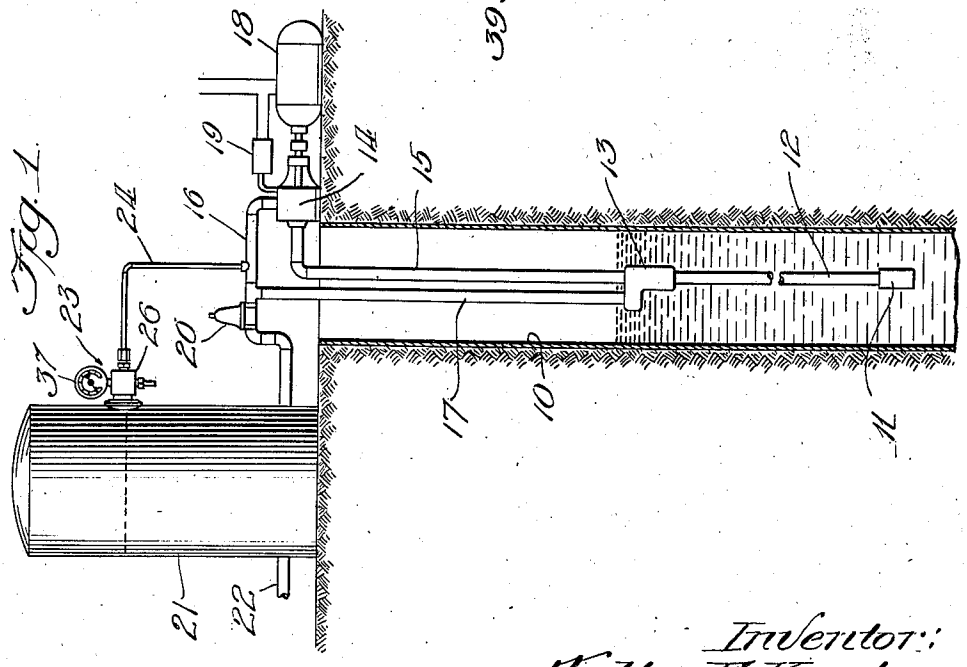
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AIR VOLUME CONTROL

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Inventor:
Walter E. Kent.
by John L. Darley Atty.

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AIR VOLUME CONTROL

Walter E. Kent, Decatur, Ill.

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6 Claims. (Cl. 103—6)

My invention relates to automatic air controls for self-contained water systems of the type in which distribution is effected by pressure established in the storage tank, as distinguished from gravity flow systems. Arrangements of this character are customarily used in country districts or in other locations which do not have access to central pumping stations.

Cardinal requirements of such a system are an automatic introduction of air into the storage tank and the maintaining of this air at a predetermined pressure above the surface of the water to insure adequate flow at the various outlets of this system. Failure to introduce air in proper amounts results in water logged tanks, sluggish distribution in the system, increased wear of the motor and pump, and higher operating costs.

It is therefore the principal object of my invention to devise a control for automatically introducing air into the storage tank of a system of the above type and in which the air inlet valve constitutes the only moving part.

A further object is to provide a device of the type indicated wherein the introduction of air is responsive to the water level in the storage tank.

A further object is to devise an air volume control in which at least a portion of the water supply is utilized to set up an aspirating action for the purpose of inducing a flow of air through an intake valve into the storage tank.

These and further objects of my invention will be set forth in the following specification, reference being had to the accompanying drawing, and the novel means by which said objects are effectuated will be definitely pointed out in the claims.

In the drawing:

Fig. 1 is an elevation showing a characteristic deep well, water system equipped with my improved air volume control device.

Fig. 2 is an enlarged, sectional elevation of the control device shown in Fig. 1.

Fig. 3 shows a modified arrangement in which the entire discharge from the pump passes through the control.

Referring to the drawing, the numeral 10 designates a deep well in which is submerged the usual foot valve 11 carried at the lower end of a drop pipe 12 whose upper end is connected to an ejector 13. The ejector is connected to a pump 14 by means of a suction pipe 15 and the discharge from the pump is delivered to a supply pipe 16. The circuit between the pipe 16 and the ejector 13 is completed by a pressure pipe 17.

The pump may be driven by an electric motor 18 under the control of a pressure switch 19, the arrangement being such that at a predetermined pump pressure, which pressure may be varied in accordance with the conditions of operation, the pump 14 will be thrown into or out of operation as circumstances may require. The internal construction of the switch 19 forms no part of the invention and therefore has not been particularly illustrated or described. Switches of this type are now commonly used in water systems of the character described.

Beyond the junction of the pipes 16 and 17, a control valve 20 of standard construction may be incorporated in the pipe 16 in order to automatically regulate the pressure in a tank 21 to which the delivery end of the supply pipe 16 is connected. This valve may be set to close at a pressure of thirty pounds per square inch in the tank or at any desired pressure. Water within the tank 21 may be delivered to any desired number of service outlets by a pipe 22.

The system as described above in and of itself forms no part of the invention in as much as it typifies a characteristic water system for withdrawing water from a deep well and supplying this water at a more or less constant pressure to a number of outlets. It will be understood, however, that the specific device presently described is not restricted to use on a deep well, but may be just as readily incorporated in a shallow well system.

The control for automatically introducing air into the tank 21 is generally indicated by the numeral 23 in Fig. 1. One end of a tube or small pipe 24 is connected to the supply pipe 16 between the junction of the pipe 17 and the pump 14 while the opposite end is connected to a nozzle 25 which is mounted in a member 26 that is threaded in the wall of the tank 21. The head of the nozzle is axially aligned with one end of a Venturi passage 27 and sufficiently close to the throat 28 of this passage to establish a low pressure zone 29 at the delivery end of the nozzle.

An air inlet passage 30 extends transversely from the low pressure zone 29 and the outer end of this passage is enlarged to receive a nipple 31 having a passage 32 extending therethrough. The passage 32 is provided with a valve seat 33 which is normally engaged by a ball 34 to close the passage.

Located above the Venturi passage 27 is a relieving passage 35, one end of which communi-

cates with the interior of the tank 21, while the opposite end is connected by a passage 36 with the Venturi passage 29 sufficiently close to the throat 28 to be included within the low pressure zone 29. If desired, a pressure gage 37 may be mounted in the member 26 in communication with the passage 36 for the purpose of indicating the pressure in the tank 21.

In the operation of my improved device, the pump 14 withdraws water from the well 10 in the usual manner and pumps the same into the tank 21 through the supply pipe 16. Due to the bypass provided by the pipe 24, a portion of this water flows through the last named pipe, the nozzle 25, and Venturi passage 27 into the tank. As long as the water level in the tank 21 is above the relieving passage 35, the discharge of water from the nozzle 25 into the Venturi passage sets up an aspirating action which is characterized by the usual low pressure zone 29 in the neighborhood of the throat 28, thus causing the ball 34 to be raised from its seat by atmospheric pressure and permitting an induction of air into the passage 27. This air is mixed with the water therein for final delivery into the tank 21 where the air is liberated and collects above the water level to establish the desired water pressure in the tank.

As the water level falls due to sustained withdrawals, it may drop below the tank end of the passage 35 and when this condition occurs, the aspirating action in the Venturi passage is interrupted whereupon the ball 34 is moved to a closed position by gravity. The pump 14 continues to deliver water through the pipes 16 and 24 until the water level in the tank rises above the passage 35 and at this time the aspirating action is resumed. High and low water levels in the tank may be indicated by the numbers 38 and 39 respectively.

My improved control is characterized by a positive and entirely automatic air charging action and one that possesses only a single moving part, namely, the ball 34 whose movement is very slight. Wear is therefore reduced to a minimum. It should be particularly noted that in the operation of this device, no air passes through the pump 14 which would otherwise result in a loss of capacity and suction lift.

In Fig. 3 is illustrated a modified arrangement wherein all of the water discharged by the pump 14 passes through my improved device. For this purpose, a pipe 40 is connected to the discharge side of the pump and at the other end to a control 41 mounted in the wall of the tank 21. The pipe 40 corresponds to the pipe 24, but is sufficiently larger in diameter to handle the full discharge of the pump, while the internal construction of the control 41 is identical with the control 23 except that the several passages are enlarged to accommodate the increased flow of water. As before, the pipes 15 and 17 indicate the suction and pressure pumps leading to the well.

In either of the above modifications, it will be understood that the passages 35 and 36 may have other locations than those illustrated in Fig. 2, since their sole function is an automatic control on the introduction of air into the storage tank in response to the height of water in the tank.

The invention is not restricted for use in connection with a water system, but is broadly applicable to the introduction of air into a tank by the aspirating action of a liquid discharged into a tank and in which the aspirating action is controlled by the liquid level in the tank.

I claim:

1. An air volume control for a water system having a storage tank and a pump of supplying water from a well to the tank comprising aspirating means communicating with the tank and pump and through which a portion of the water is delivered to the tank, a valve controlled air inlet communicating with the low pressure zone of the aspirating means, the inlet being open during aspiration and closed at all other times, and a passage connecting the tank and the low pressure zone of the aspirating means for interrupting the aspirating action when the water level in the tank drops below the tank end of the passage.

2. An air volume control for a water system having a storage tank and a pump for supplying water from a well to the tank comprising a member mounted in the tank wall and having a Venturi passage extending therethrough and communicating with the interior of the tank, a nozzle connected to the pump discharge with its terminal disposed adjacent the Venturi throat, the venturi and nozzle constituting an aspirating means, a valve controlled air inlet communicating with the low pressure zone of the aspirating means, the inlet being open during aspiration and closed at all other times, and a second passage disposed above the Venturi passage and connecting the tank with the low pressure zone of the aspirating means for interrupting the aspirating action when the water level in the tank drops below the tank end of the second passage.

3. In a liquid system, the combination of a tank for storing a liquid under a cushion of air at a predetermined pressure, a pump connected to a liquid source, main and auxiliary supply connections from the pump to the tank disposed in parallel flow relation, and an air charging device in and comprising aspirating means having a passage constituting part of the auxiliary connection, an air inlet communicating with the low pressure zone of the aspirating means, the inlet being open during aspiration and closed at all other times, and a second passage connecting the tank with the low pressure zone of the aspirating means for interrupting the aspirating action when the liquid level in the tank drops below the tank end of the second passage.

4. In a liquid system, the combination of a tank for storing a liquid under a cushion of air at a predetermined pressure, a pump connected to a liquid source, a supply connection from the pump to the tank and an air charging device in and comprising aspirating means having a passage constituting part of the connection, an air inlet communicating with the low pressure zone of the aspirating means, the inlet being open during aspiration and closed at all other times, and a second passage connecting the tank with the low pressure zone of the aspirating means for interrupting the aspirating action when the liquid level in the tank drops below the tank end of the second passage.

5. An air volume control for a water system having a storage tank and a pump for supplying water from a well to the tank comprising aspirating means communicating with the tank and pump and through which all water is delivered to the tank, a valve controlled air inlet communicating with the low pressure zone of the aspirating means, the inlet being open during aspiration and closed at all other times, and a

passage connecting the tank and the low pressure zone of the aspirating means for interrupting the aspirating action when the water level in the tank drops below the tank end of the passage.

6. An air charging device for a liquid system having a tank for storing the liquid under a cushion of air at a predetermined pressure and a pump for supplying liquid to the tank comprising aspirating means having a passage connecting the tank and pump and constituting the sole liquid connection between the tank and pump, an air inlet communicating with the low pressure zone of the aspirating means, the inlet being open during aspiration and closed at all other times, and a second passage connecting the tank with the low pressure zone of the aspirating means for interrupting the aspirating action when the liquid level in the tank drops below the tank end of the second passage.

WALTER E. KENT.