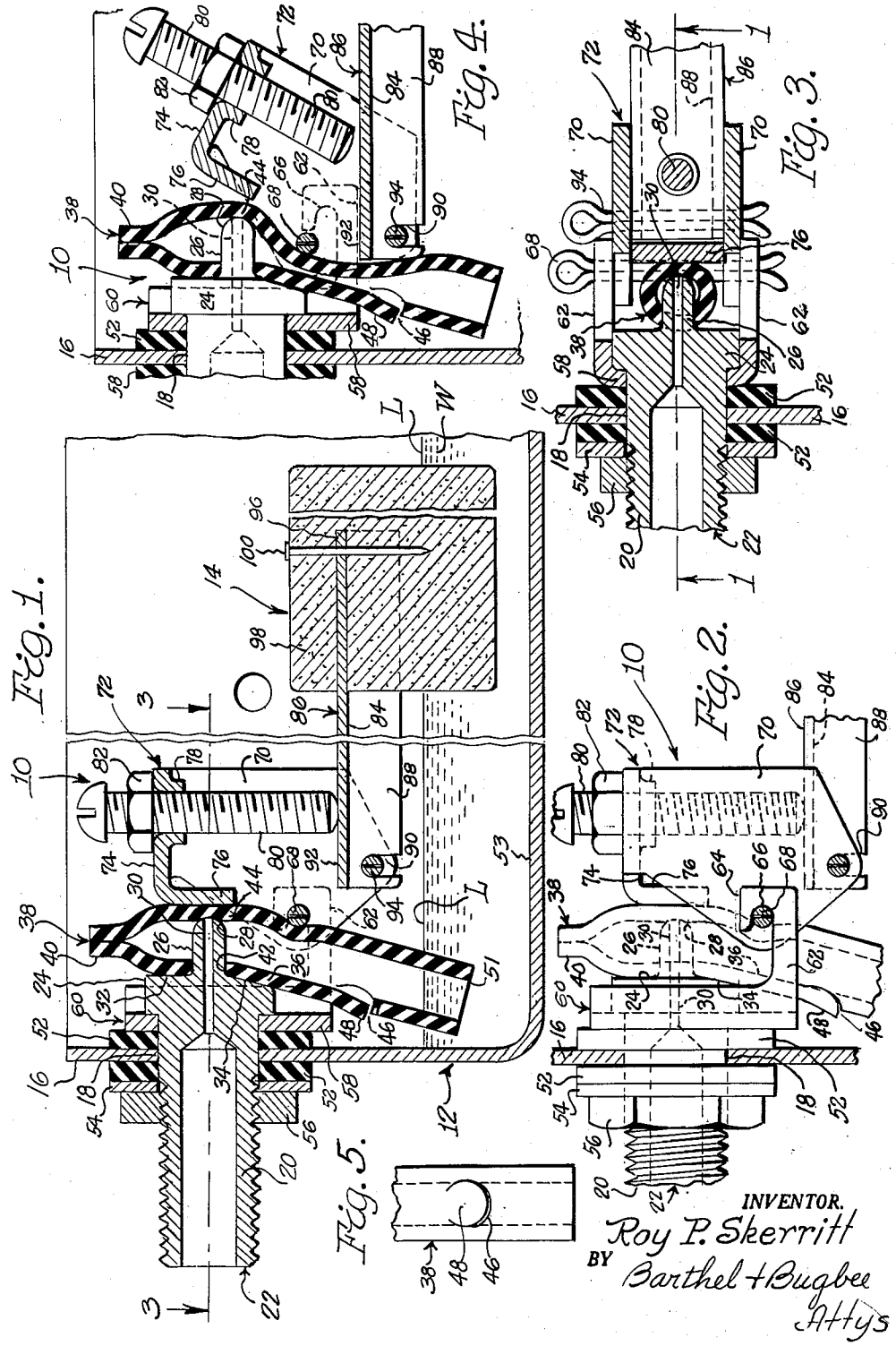
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FLOAT-OPERATED VALVE

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FLOAT-OPERATED VALVE

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This invention relates to valves and, in particular, to float-operated valves.

One object of this invention is to provide a float-operated valve wherein the parts of the valve and float mechanism are completely protected from damage resulting from water splashing upon them when the valve opens in response to a descent of the float as the result of a decline in the level of the liquid controlled by the float.

Another object is to provide a float-operated valve of the foregoing character wherein the discharge tube from the valve to the tank or pan is made of resilient material so as to serve as the movable valve member itself.

Another object is to provide a float-operated valve of the foregoing character which is easily and quickly disassembled for cleaning or repairs.

Another object is to provide a float-operated valve of the foregoing character wherein a simple and effective means is provided for preventing the standing of a column of water in the discharge tube adjacent the valve nozzle.

Other objects and advantages of the invention will become apparent during the course of the following description of the accompanying drawings, wherein:

Figure 1 is a central vertical section through a float-operated valve, according to one form of the invention, shown as mounted in a furnace humidifier pan for controlling the level of water therein, with the valve shown in its closed position, taken along the line 1—1 in Figure 3;

Figure 2 is a fragmentary side elevation of the float-operated valve shown in Figure 1;

Figure 3 is a fragmentary horizontal section taken along the line 3—3 in Figure 1;

Figure 4 is a fragmentary vertical section similar to that of Figure 1, but showing the valve in its partially disassembled condition; and

Figure 5 is a fragmentary left-hand side elevation of the lower portion of the water discharge tube of Figure 1, showing the vacuum-breaking perforation therein.

Referring to the drawings in detail, Figure 1 shows a float-operated valve, generally designated 10, mounted in a furnace humidifier pan 12, the level L of the water W in which is controlled by the rise and fall of a float unit, generally designated 14. An end wall 16 of the pan 12 is provided with a hole 18 through which the threaded stem 20 of the valve nipple 22 is inserted, with the flanged head 24 on the inside of the pan 12. The valve nipple 22 is provided with a valve nozzle 26 projecting forward from the head 24 and has a rounded end 28 which serves as a valve seat for the water passageway 30 therethrough. The valve nozzle 26 is of considerably smaller diameter than the head 24, thereby providing an annular abutment face 32 which has an inclined lower portion 34 for receiving the rearward wall 36 of a combined discharge and valve tube 38. The tube 38 is of synthetic rubber, resilient synthetic plastic or other suitable material and is tightly closed and sealed at its upper end 40. Its rearward wall 36 is provided with an undersized hole 42 through which the valve nozzle 26 is pushed so that the peripheral wall of the hole 42 exerts a constricting and consequently sealing action upon the valve nozzle 26 when the rear wall 36 of the tube 38 is backed up against the abutment surfaces 32 and 34.

The nozzle 26 is made of a sufficient length to reach the inner surface of the front wall 44 of the tube 38 in its normal position (Figure 1). A perforation 46 (Figures 1, 2 and 5) is made by partially severing a flap 48 from one wall of the tube 38 at a location slightly above the maximum level L of the water W in the pan so as to admit air in order to break any vacuum in the water chamber 50 of the tube 38 and thereby prevent water from standing therein while the valve is in its closed position. The tube 38 is of a sufficient length for its lower end 51 to lie close to the bottom wall 53 of the pan 12.

The valve nipple 22 is held in position on the end wall 16 of the pan 12 by a pair of resilient washers 52, a rigid washer 54 and a nut 56 threaded onto the threaded stem 20, and also supports the apertured rear wall 58 of a float-supporting bracket 60. The rear wall 58 of the float supporting bracket 60 is of approximately channel cross-section with parallel arms 62 projecting forward from its lower portion and terminating in hooked ends 64 provided with internal notches 66 (Figure 2). Fitting into the notches 66 and spanning the gap between the hooked ends 64 of the arms 62 is a pivot pin 68, such as a cotter pin, which passes through the correspondingly drilled parallel side walls 70 of a movable float arm support, generally designated 72.

The arms 62 of the bracket 60 are spaced apart from one another at such a distance that the side walls 70 of the float arm support 72 fit between them (Figure 3), pivoting on the pivot pin 68 in the notches 66. The side walls 70 are interconnected at their upper edges by a bridge portion 74 from the rearward edge of which a valve-operating tongue or movable valve member 76 extends downward outside the front wall 44 of the discharge tube 38 in line with the valve seat 28 on the end of the valve nozzle 26 and movable so as to push the forward wall 44 of the tube 38 into sealing engagement with the valve seat 28. The bridge portion 74 is also provided with a tubular boss 78 (Figure 1) which is internally threaded to receive the shank of a screw 80, the latter being locked in its adjusted position by a lock nut 82.

At its lower end, the screw 82 engages the web 84 of a channel arm 86 having flanges 88 which are notched as at 90 near the rearward end 92 to receive a pin 94, such as a cotter pin, the side walls 70 being suitably drilled to receive it. The forward end 96 of the channel arm 86 is embedded in a float block 98 of foam glass or the like and is drilled to receive a retaining fastener 100 inserted transversely thereto (Figure 1).

In the operation of the invention, let it be assumed that the device is assembled in the manner shown in Figure 1, and that the threaded stem 20 has been connected to a water pipe or other source of water supply. Let it also be assumed, for example, that the pan 12 has been inserted in a heating system, such as a furnace, where it is subjected to heat causing evaporation of the water W and a consequent decline in the water level L.

As the water level L falls, it permits a corresponding fall in the float 90 of the float unit 14 and this in turn permits the float arm support 72 and the valve member 76 to swing in a clockwise direction around the pivot pin 94, moving the movable valve member 76 away from the valve seat 28 of the nozzle 26 and also away from the front wall 44 of the discharge tube 38 between them. This action permits the pressure of the water in the passageway 30 to push the tube wall 44 away from the valve seat 28, permitting the water to flow downward through the tube chamber 50 and thence into the pan 12. Since the lower end 51 of the tube 38 is close

to the bottom wall 53 of the pan 12, little or no splashing can occur even when the water first enters the empty pan 12, and as the down-flowing water is confined wholly within the chamber 50 of the tube 38 and prevented by the walls thereof from splashing onto any of the surrounding parts. This protection thus given to the mechanism prevents the incrustation of lime thereon and also prevents erosion thereof by the action of electrolysis.

When a sufficient amount of water has passed downward through the tube 38 into the pan 12 and the water level L has consequently risen, the float unit 14 rises, swinging the float arm support 72 counterclockwise around the pivot pin 94, thereby causing the movable valve member 76 to press the front wall 44 of the resilient tube 38 firmly against the valve seat 28 at the forward end of the valve nozzle 26, sealing off the water passageway 30 therein and halting the flow of water. Water cannot remain standing in the tube 38, however, because any vacuum in the chamber 50 thereof is broken by air entering through the perforations 46 in the rear wall 36 thereof. Thus, the resilient discharge tube 38 acts not only as a discharge spout but also as a movable valve member.

In order to disassemble the parts of the float-operated valve 10, the lock nut 82 is loosened and the adjusting screw 80 threaded out of the tubular boss 78 in the manner shown in Figure 4, for a sufficient distance to permit the float support 72 to be swung clockwise relatively to the float unit 14, withdrawing the tongue 76 from engagement with the tube 38 a sufficient distance to permit the float support 72 to be pushed inward so as to detach and unhook the pivot pin 68 from the notches 66 in the ends 64 of the bracket arms 62. The entire assembly of the float support and float unit 14 may then be lifted away from the valve nipple 22 and discharge tube 38, whereupon the latter may be withdrawn from the valve nozzle 26. In this manner, all of the working parts of the valve are quickly and easily disassembled for repairs or maintenance.

What I claim is:

1. A float-operated valve for regulating the level of water in a container comprising a stationary valve member adapted to be connected to a source of water under pressure and having a valve nozzle with a valve seat thereon, a bracket structure mounted adjacent said stationary valve member, a combined water discharge and valve tube of resilient material connected to said stationary valve member and having an aperture in a wall on one side of said tube, said valve nozzle projecting through said aperture into engageability with the inner surface of the wall on the opposite side of said tube, a float arm support pivotally mounted on said bracket structure, said support carrying a movable valve member aligned with said valve seat with the wall of said tube disposed therebetween, a float arm connected to said support, and a float on said float arm responsive to a rise of water level in the container to move said movable valve member and urge said opposite side of said wall of said tube into closing engagement with said valve seat.

2. A float-operated valve for regulating the level of water in a container comprising a stationary valve member adapted to be connected to a source of water under pressure and having a valve nozzle with a valve seat thereon, a bracket structure mounted adjacent said stationary valve member, a combined water discharge and valve tube of resilient material connected to said stationary valve member and having an aperture in a wall on one side of said tube, said valve nozzle projecting through said aperture into engageability with the inner surface of the wall on the opposite side of said tube, a float arm support pivotally mounted on said bracket structure, said support carrying a movable valve member aligned with said valve seat with the wall of said tube disposed therebetween, a float arm connected to said support, and a float on said float arm responsive to a rise of water level in the container to move said movable valve member and urge said opposite side of said wall of said tube into closing engagement with said valve seat, said float arm having notches therein and said float arm support having a pin engaging said notches and a threaded fastener releasably urging said arm against said pin.

3. A float-operated valve for regulating the level of water in a container comprising a stationary valve member adapted to be connected to a source of water under pressure and having a valve nozzle with a valve seat thereon, a bracket structure mounted adjacent said stationary valve member, a combined water discharge and valve tube of resilient material connected to said stationary valve member and having an aperture in a wall on one side of said tube, said valve nozzle projecting through said aperture into engageability with the inner surface of the wall on the opposite side of said tube, a float arm support pivotally mounted on said bracket structure, said support carrying a movable valve member aligned with said valve seat with the wall of said tube disposed therebetween, a float arm connected to said support, and a float on said float arm responsive to a rise of water level in the container to move said movable valve member and urge said opposite side of said wall of said tube into closing engagement with said valve seat, said bracket structure having spaced bracket arms with hooked ends, and said float arm support having thereon a pivot pin adapted to detachably hook into said hooked ends.

4. A float-operated valve for regulating the level of water in a container comprising a stationary valve member adapted to be connected to a source of water under pressure and having a valve nozzle with a valve seat thereon, a bracket structure mounted adjacent said stationary valve member, a combined water discharge and valve tube of resilient material connected to said stationary valve member and having an aperture in a wall on one side of said tube, said valve nozzle projecting through said aperture into engageability with the inner surface of the wall on the opposite side of said tube, a float arm support pivotally mounted on said bracket structure, said support carrying a movable valve member aligned with said valve seat with the wall of said tube disposed therebetween, a float arm connected to said support, and a float on said float arm responsive to a rise of water level in the container to move said movable valve member and urge said opposite side of said wall of said tube into closing engagement with said valve seat, said float arm having notches therein and said float arm support having a pin engaging said notches and a threaded fastener releasably urging said arm against said pin, said bracket structure having spaced bracket arms with hooked ends, and said float arm support having thereon a pivot pin adapted to detachably hook into said hooked ends.

5. A float-operated valve for regulating the level of water in a container comprising a stationary valve member adapted to be connected to a source of water under pressure and having a valve nozzle with a valve seat thereon, a bracket structure mounted adjacent said stationary valve member, a combined water discharge and valve tube of resilient material connected to said stationary valve member and having an aperture in a wall on one side of said tube, said valve nozzle projecting through said aperture into engageability with the inner surface of the wall on the opposite side of said tube, a float arm support of approximately U-shaped cross-section having side walls pivotally mounted on said bracket structure, said support having a bridge portion interconnecting said side walls, said bridge portion carrying a movable valve member aligned with said valve seat with the wall of said tube disposed therebetween, a float arm connected to said support, and a float on said float arm responsive to a rise of water level in the container to move said movable valve member and urge said opposite side of said

wall of said tube into closing engagement with said valve seat.

6. A float-operated valve for regulating the level of water in a container comprising a stationary valve member adapted to be connected to a source of water under pressure and having a valve nozzle with a valve seat thereon, a bracket structure mounted adjacent said stationary valve member, a combined water discharge and valve tube of resilient material connected to said stationary valve member and having an aperture in a wall on one side of said tube, said valve nozzle projecting through said aperture into engageability with the inner surface of the wall on the opposite side of said tube, a float arm support of approximately U-shaped cross-section having side walls pivotally mounted on said bracket structure, said support having a bridge portion interconnecting said side walls, said bridge portion carrying a movable valve member aligned with said valve seat with the wall of said tube disposed therebetween, a float arm connected to said support, and a float on said float arm responsive to a rise of water level in the container to move said movable valve member and urge said opposite side of said wall of said tube into closing engagement with said valve seat, said bracket structure having spaced bracket arms with hooked ends, and said float arm support having thereon a pivot pin adapted to detachably hook into said hooked ends.

7. A float-operated valve for regulating the level of water in a container comprising a stationary valve member adapted to be connected to a source of water under pressure and having a valve nozzle with a valve seat thereon, a bracket structure mounted adjacent said stationary valve member, a combined water discharge and valve tube of resilient material connected to said stationary valve member and having an aperture in a wall on one side of said tube, said valve nozzle projecting through said aperture into engageability with the inner surface of the wall on the opposite side of said tube, a float arm support of approximately U-shaped cross-section having side walls pivotally mounted on said bracket structure, said support having a bridge portion interconnecting said side walls, said bridge portion carrying a movable valve member aligned with said valve seat with the wall of said tube disposed therebetween, a float arm connected to said support, and a float on said float arm responsive to a rise of water level in the container to move said movable valve member and urge said opposite side of said wall of said tube into closing engagement with said valve seat, said float arm having notches therein and said float arm support having a pin engaging said notches and a threaded fastener releasably urging said arm against said pin, said bracket structure having spaced bracket arms with hooked ends, and said float arm support having thereon a pivot pin adapted to detachably hook into said hooked ends.

8. A float-operated valve for regulating the level of water in a container comprising a stationary valve member adapted to be connected to a source of water under pressure and having a valve nozzle with a valve seat thereon, a bracket structure mounted adjacent said stationary valve member, a downwardly-directed combined water discharge and valve tube of resilient material connected to said stationary valve member, and having an aperture in a wall on one side of said tube, said valve nozzle projecting through said aperture into engageability with the inner surface of the wall on the opposite side of said tube, a float arm support pivotally mounted on said bracket structure, said support carrying a movable valve member aligned with said valve seat with the wall of said tube disposed therebetween, a float arm connected to said support, and a float on said float arm responsive to a rise of water level in the container to move said movable valve member and urge said opposite side of said wall of said tube into closing engagement with said valve seat, said discharge tube having an air vent in a wall thereof near its lower end above the maximum water level thereon.

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