Aug. 7, 1951 S. CASSESE 2,563,211

LIQUID PROPORTIONER

Filed Feb. 20, 1948

Fig. 1.

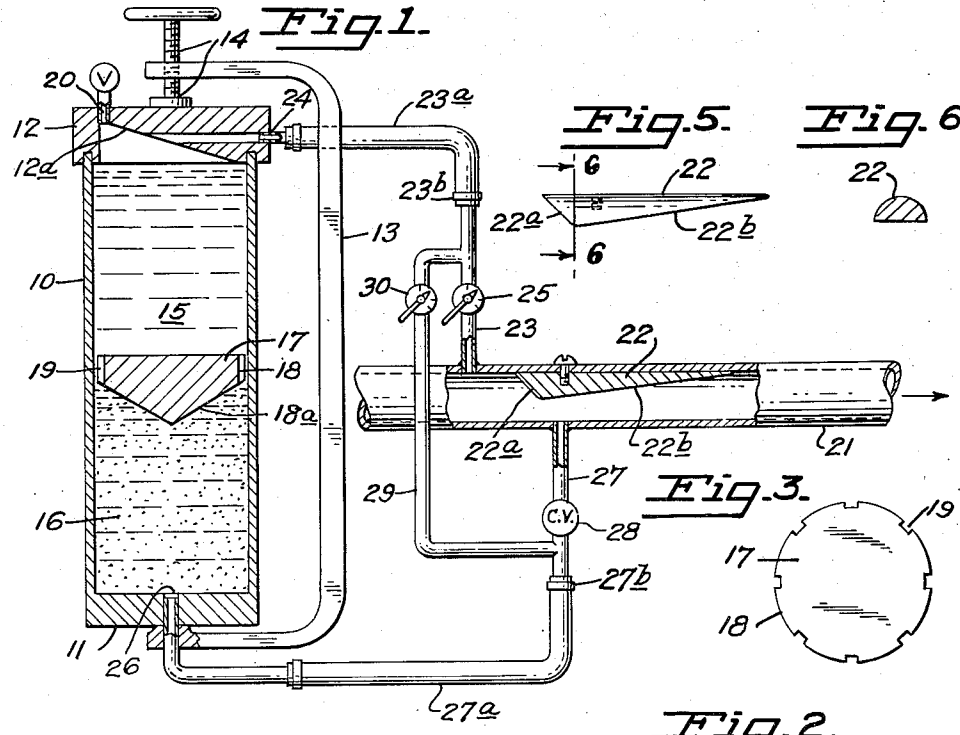


Fig. 5.

Fig. 6.

Fig. 3.

Fig. 2.

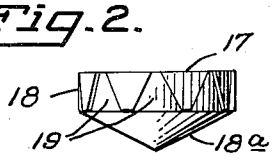


Fig. 7.

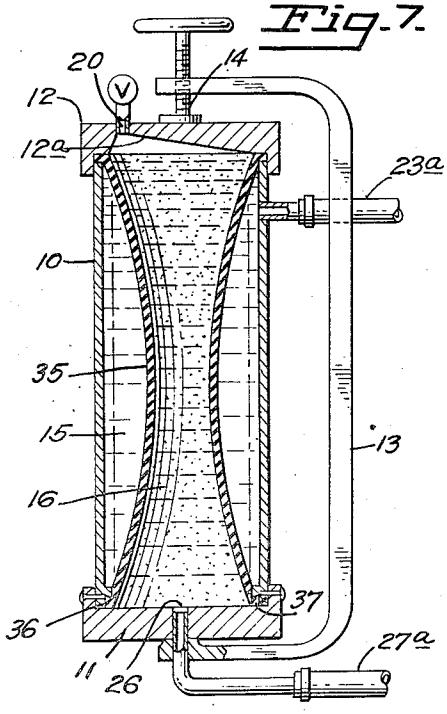
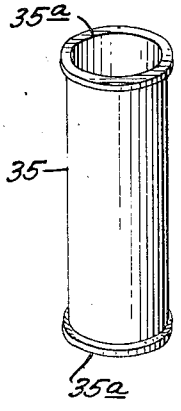


Fig. 8.



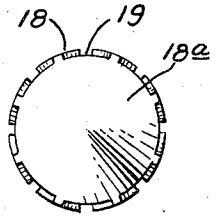


Fig 4.

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LIQUID PROPORTIONER

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5 Claims. (Cl. 210—31)

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This invention relates to improvements in systems or apparatus for controlling relative liquid flow, and particularly for controlling the proportional relative rate of flow of liquids of differing specific gravity, such as flow of a chemical solution proportional to the rate of flow of another fluid, such as water, to be treated with the chemical.

Since control of relative proportional flow of water and a chemical provides one example of advantageous employment of the invention, the description herein is directed to embodiment of the invention to that purpose, it being understood that other liquids may be utilized in the same manner.

In supplying water flow to swimming pools, boilers, or to drinking supply or other domestic purposes, it is often desirable to proportionally introduce a chemical into the raw water to counteract other chemicals or impurities therein.

An object of the invention is to provide a means for introducing small regulated quantities of liquids, such as a chemical solution into another primary liquid flow, responsive to the pressure of the primary liquid flow.

Another object is to proportionalize a controlled flow of liquid relative to another responsive to the flow pressure of one of the liquids.

Another object is to provide means for exhausting air or gas accumulations from the liquids being proportioned.

A further object is to provide a proportioner device simplified mechanically, economical in manufacture, and efficient in operation, and generally to improve on proportioner devices of the character described.

With the foregoing and other objects in view which will be apparent, or specifically pointed out in this specification in connection with the accompanying drawings, the one embodiment illustrated and described is a preferred example of employment of the invention, but various other forms may be resorted to within the scope of the appended claims without departing from the spirit of the invention.

In the drawings:

Fig. 1 is a schematic front elevation view of the invention partly in section.

Fig. 2 is a side elevation of a float member of Fig. 1.

Fig. 3 is a top view of float member of Fig. 1.

Fig. 4 is a bottom view of float member of Fig. 1.

Fig. 5 is a side view of a constriction member which is also shown in Fig. 1.

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Fig. 6 is a lateral transverse section of constriction member on line 6—6 of Fig. 5.

Fig. 7 is a schematic side elevational view of a modified form of the invention, partly in section.

Fig. 8 is a side elevational view of tubular elastic diaphragm as shown in Fig. 7.

Referring to the drawings in which like reference characters indicate corresponding operational parts in the several views, 10 is a hollow pressure tank or cylindrical container normally disposed vertically as shown in the drawing, of suitable size generally circular in lateral horizontal transverse section, and preferably of transparent material, though its mechanical operation would be similar if translucent or opaque material were employed. The bottom 11 of the tank container may be fixed relative to the side walls, but the tank container is provided with a top closure 12 readily removable.

The pressure tank may be supported on a bracket 13 having a screw clamp 14 at its upper end for bearing on the top 12 to removably secure the top upon the tank.

Means are provided within the tank for separating a primary liquid such as water indicated 15, and another or secondary liquid such as a supply of chemical reagent 16 the secondary liquid being of greater specific gravity.

As illustrated in its preferred form in Fig. 1 the separator means comprises a float 17 having greater specific gravity than the water or other primary liquid into which another or secondary liquid is to be proportionately injected, the float being of lesser specific gravity than the secondary liquid which is to be fed into the primary liquid, whereby the float will be suspended between the two liquids in the tank and float upon the upper surface of secondary liquids of greater specific gravity, and in that sense may be termed partially buoyant, or buoyant with relation only to the secondary liquid which is to be injected into the main line conduit. The internal diameter of the tank is uniform in that portion within which the float operates.

The float is of over-all diameter so as to have snug but not restricted slidable clearance with the inner wall of the tank, and preferably has the upper portion of its body formed as a disc of substantial thickness providing a circumferential side wall 18 of sufficient depth for facilitating the maintenance of the float co-axial with the tank independently and free of other aligning means, the side wall having a plurality of recessed or grooved vents 19 from its bottom to top, which, as shown in a preferred form, have op-

posed side walls tapered or inclined divergently outward from top to bottom, the grooved vents being sufficient in number so that the major portion of the lower edge of the side wall is included within the grooved vents and the vent area at the bottom of the side wall is substantially continual circumferential of the float. The bottom wall 18*a* of the float is invertedly conical, thus the better to maintain buoyancy of the float and dispose it co-axial with the axis of the tank, as well as to provide an upwardly inclined surface at the bottom face of the float along which air or gas bubbles flow to the vents 19 with practically no surface tension and rise through the upper body of water to be exhausted through an air vent 20 in the cover, the cover preferably having its inner plane face inclined towards the air vent as shown at 12*a*.

The grooved vent 19 in the side wall of the float also serves to reduce the area of the side wall in slidable contact with the inner wall of the tank thus reducing resistance to the very sensitive movement of the float axially of the tank so that the movement of the float is slidably unrestricted.

The flow system associated with the tank comprises a main feed conduit 21 for a primary liquid such as water which is to be treated by relative proportioning of another or secondary liquid. It is to be assumed that the water has a pressure head, otherwise it would not flow. At a position adjacent the tank 10 the main feed conduit 21 has therein means to constrict its tubular area, such as a baffle or constriction member 22, or it may also comprise a venturi. The constriction member shown in a preferred form herein, is an elongated member semi-circular in section at one end portion with an inclined face presenting a parabolic face 22*a* in the direction of the source of pressure flow, and having its body tapered cuneiform from the semi-circular section towards its opposite end as at 22*b*.

Forwardly of the constriction member, that is, toward the source of flow, the main conduit is tapped by a branch tap line conduit 23, the other end of which communicates with one end of the tank which is to contain the liquid water from the main feed line. Preferably such communication is accomplished by forming a portion 23*a* of flexible tubing connected at joint 23*b* and entering the tank through the cover member 12 as at 24, whereby the cover may be removed and replaced with the conduit tube attached thereto. Intermediate the joint 23*b* and connection with the feed line, the tap line conduit is provided with a regulated calibrated control valve 25.

The opposite or bottom end 11 of the tank is provided with an outlet orifice 26 which has connected therein an end of an injection line conduit 27 having a flexible portion 27*a* coupled as at 27*b* and communicating with the opening 26 of the tank and also having its opposite end communicating with the main feed line beyond the constriction member at a position farther removed from the tank in the direction of main line flow than the connection of the tap line 23. Preferably the connection of the injection line is adjacently beyond the rear or parabolic wall 22*a* of the constricting baffle 22. The injection line 27 likewise has a control valve 28 which may be of check valve type, between the connecting joint 27*b* and the communication with the main feed line.

A by-pass conduit 29 is provided communicating between the non-flexible portion of the tap line 23 beyond the valve 25 and the injection line 27 beyond the valve 28, the by-pass conduit also having a calibrated regulating control valve 30 intermediate its length.

In operation the chemical reagent 16 is placed in the tank by removal of the cover 12, this being convenient by reason of the releasable threaded clamp 14 and the flexibility of the conduit 23*a*. The float is then inserted or is already within the tank, and, since the float is of greater specific gravity than the chemical and lesser specific gravity than the water it floats between and thereby separates the two liquids of varying specific gravity as indicated 15 and 16.

The top cover being replaced, and flow pressure being assumed in the main feed line, the valve 25 is opened to a predetermined calibrated position, the back-pressure or resistance to flow created by the constriction member or baffle wall at 22*a* thereby causing water to flow through the tap line conduit 23 and fill the upper compartment of the tank. Thus, pressure as regulated by the valve 25 is exerted upon the float 17 thereby forcing the chemical reagent 16 through the outlet conduit 27*a* through the check valve 28 and into the main feed conduit through the injector conduit 27. As stated, the injector conduit 27 communicates with the main conduit farther removed than the tap line and preferably beyond the rear end wall of the constriction baffle member, the latter acting in the nature of a venturi increasing velocity of flow in the main feed conduit at the constricted area, whereby the injected chemical is carried to the stream of the primary liquid or water.

If it is desired to dilute the proportion of the chemical relative to the volume of water, especially for any temporary purpose, this may be accomplished by suitably regulating the valve 30 in the by-pass line to cause flow of water direct from tap line conduit 23 into the injection line 27.

Preference for a transparent tank is for the reason it is desired that the supply of chemical be always open to view, this system being devised for simplification, and no attempt being made to incorporate into the structure an automatic continuous feed for the chemical. When a supply of chemical is exhausted from the tank, a cycle of operation is completed, the cover is removed by loosening the clamp 14 without necessity for detaching the conduit 23*a*, the tank may be inverted, due to flexibility of the tube 27*a*, its water content and float removed, and the complete tank cleaned before refilling and replacing in operation.

In the modification of Figs. 7 and 8, the float 17 is eliminated from the tank 10 and in lieu thereof the separator for the two liquids is an elastic diaphragm tubular open-ended sleeve 35 provided to fit within the tank and hold the supply of chemical 16. The opposite ends of the tube are outwardly flanged as at 35*a*, one end of the diaphragm tube such as the bottom, may tightly be secured to the inner face of the tank wall by an inwardly opening annular groove 36 to supplement which the bottom of the tank may engage the end of the tube to press it into the groove as at 37. The opposite end of the diaphragm tube may be tightly held by its flange engagement with the tank wall and impingement thereon of the inner face of the cover. In this modification, the tap line feed conduit 23*a* enters the tank through the wall thereof adjacent the top, and thus feeds water into the tank from the main supply line, circumferentially about the diaphragm tube and

thus exerts pressure on the chemical within the elastic diaphragm to extrude it through the bottom outlet 26 into injector conduit 27*a*. Otherwise the pipe system operatively between the tap line conduit 23*a* and the injector conduit 27*a* may be the same as in Fig. 1.

Having thus described the invention, I claim:

1. A liquid proportioner device for connection to a main line feed conduit which has a flow constricting baffle therein, comprising a cylindrical tank, a separator unrestrictedly snugly slidable in the tank for dividing it into two compartments for respectively receiving a primary liquid from the main line and a secondary liquid which is to be proportionally fed into the main line, said separator comprising a float buoyant with relation only to said secondary liquid which is to be proportionally fed whereby it is adapted to float between said liquids, and said separator having a circumferential side wall of sufficient depth to align the separator coaxially with the tank, a tap line conduit connected into the main line conduit operatively forward of the constricting baffle and communicating between the main line conduit and the primary liquid compartment of the tank, and a second conduit communicating between an outlet of the secondary liquid compartment of the tank and the main feed conduit beyond said baffle, for injecting secondary liquid from said secondary liquid compartment into the main line conduit, said float having a vent area therethrough from its bottom to top, the walls leading to the outlet of the vent area being convergingly tapered, and the open area at the bottom of the vent area extending substantially continually circumferentially of the float side wall.

2. A liquid proportioner device for connection to a main line feed conduit which has a constricting baffle therein, comprising a cylindrical tank having an air-vented cover, a separator unrestrictedly snugly slidable in the tank for dividing it into two compartments for respectively receiving a primary liquid from the main line and a secondary liquid which is to be proportionally fed into the main line, said separator comprising a float buoyant with relation only to said secondary liquid which is to be proportionally fed, and said separator having a circumferential side wall of sufficient depth to align the separator coaxial with the tank, a tap line conduit connected into the main line conduit operatively forwardly of the constricting baffle and communicating between the main conduit and the primary liquid compartment of the tank, and a second conduit communicating between an outlet of the secondary liquid compartment of the tank and the main line conduit operatively beyond the constricting means, for injecting secondary fluid from said other compartment into the main line conduit, the circumferential side walls of the float having a plurality of circumferentially spaced vents grooved therein through the body of the float, said grooved vents having an area of opening at the underface of the float occupying a major portion of the circumference of the float.

3. A device of the character described for connection to a main line feed conduit which has a flow constricting baffle therein, comprising the combination of a cylindrical tank, a separator in the tank for dividing it into two compartments for respectively receiving a primary liquid from the main line and a secondary liquid which is to be proportionally fed into the main line, a tap line conduit connected into the main line forwardly of the baffle and communicating between

the main line conduit and the primary liquid compartment of the tank, and a second conduit connected into the main line beyond said baffle and communicating between the secondary liquid compartment of the tank and the main conduit for injecting liquid from said secondary liquid compartment into the main line conduit, said separator in the tank comprising a float buoyant with relation to the secondary liquid only, said float having a plurality of vents therethrough and being provided with a circumferential side wall of substantial depth which has unrestricted snug slidable clearance with the tank wall and said float having its underside invertedly conical from the edge of its side walls in the direction of the outlet opening with which said second conduit communicates, said vents comprising grooves circumferentially spaced in the side wall of the float, and the grooves having a greater area of opening at the lower face of the float than at the upper face, the openings at the lower face of the float occupying a major portion of the circumference of the float.

4. A device of the character described for connection to a main line feed conduit which has a flow constricting baffle therein, comprising a cylindrical tank, a separator float in the tank for dividing it into two compartments for respectively receiving a primary liquid from the main line conduit and a secondary liquid which is to be proportionally fed to the main line conduit, a tap line conduit connected into the main line conduit operatively forwardly of the constricting means and communicating between the main line conduit and the primary liquid compartment of the tank, and a second conduit communicating between an outlet of the secondary liquid compartment of the tank and the main line conduit at a connection operatively beyond the constricting means, for injecting liquid from said secondary liquid compartment into the main line conduit, said separator float having a circumferential side wall of sufficient depth to align the float coaxially with the tank free of other aligning means, the side wall of the float having snug slidable clearance with the tank wall and having its underside invertedly conical from the edge of the side walls toward the outlet opening with which said second conduit communicates, the side wall of said float having a plurality of circumferentially spaced grooved vents therein converging from the bottom to top, the lower openings of the vents occupying a major portion of the circumference of the lower edge of the circumference of the side wall of the float.

5. A liquid proportioner device for connection to a main line feed conduit which has a flow constricting baffle therein, comprising a cylindrical tank, a separator float in the tank for dividing it into two compartments for respectively receiving a primary liquid from the main line and a secondary liquid which is to be proportionally fed into the main line, a tap line conduit connected into the main line forwardly of the baffle communicating between the main conduit and the primary liquid compartment of the tank, and a second conduit connected into the main line beyond said baffle and communicating between an outlet of the secondary liquid compartment of the tank and the main line conduit for injecting liquid from said secondary fluid compartment into the main line conduit, said separator float being partially buoyant so as to float only with relation to the secondary liquid which is to be fed to the main line conduit, and comprising a

disc body having a circumferential side wall in snug slidable clearance with the tank wall and having its underside invertedly conical from the edge of the side wall towards the outlet opening with which said second conduit communicates, the disc body having axially disposed grooved vents spaced circumferentially thereof whereby air and gas may escape through said vent past the float, said grooved vents converging from bottom to top of side wall, and a major portion of the circumference of the lower edge of the side wall being occupied by said vents.

SALVATORE CASSESE.

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