

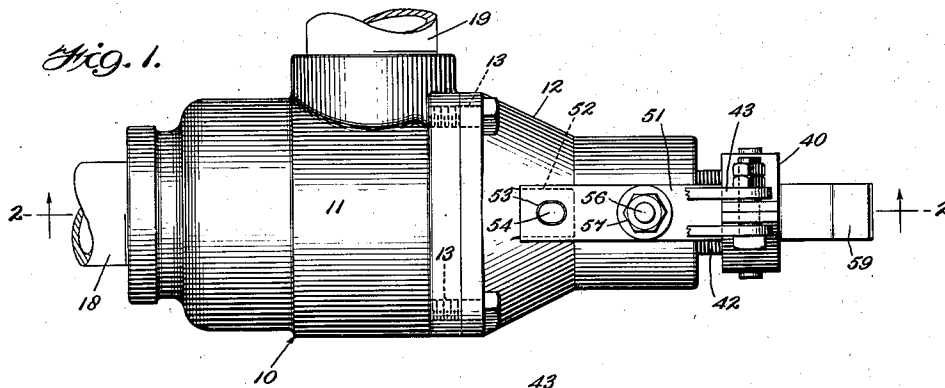
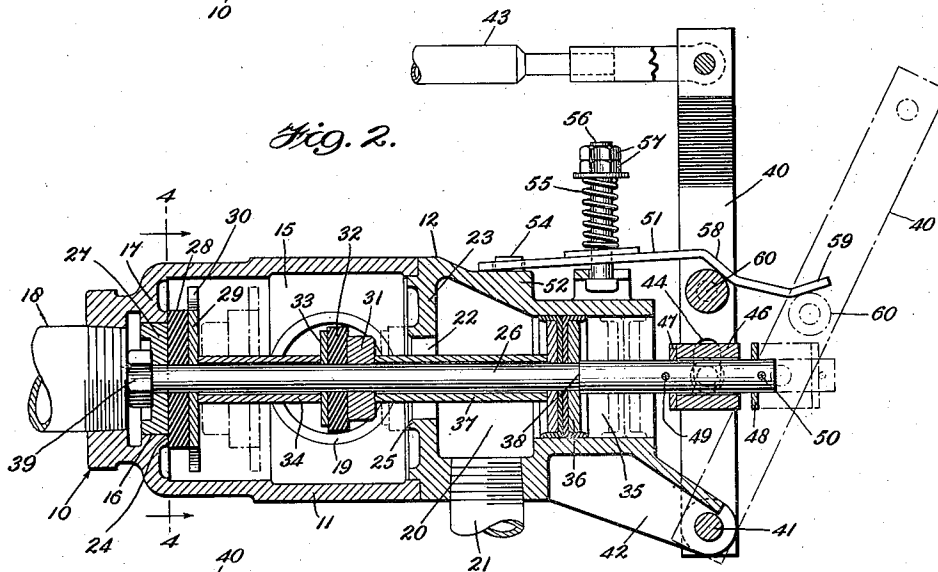
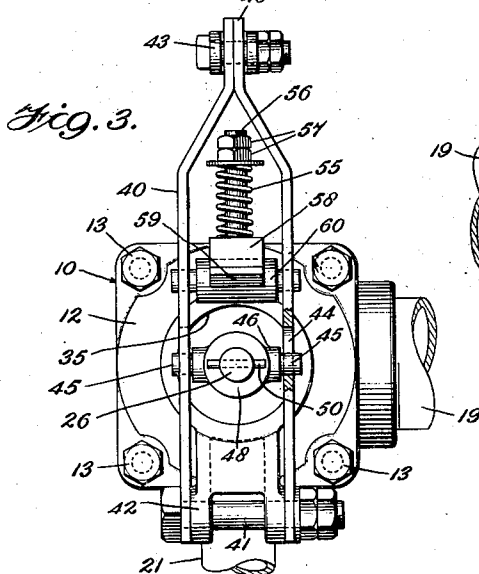
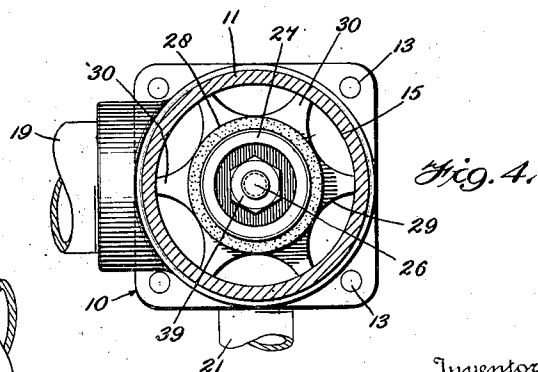
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MULTIWAY LIQUID VALVE

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MULTIWAY LIQUID VALVE

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The invention relates to multi-way valves, and has for one of its objects the provision of an improved valve construction primarily although not solely adapted for use upon concrete mixing machines to control the water which is supplied to the mixing chamber for incorporation into the mixture.

Under present day practice relatively accurate measurement and control of such water is required, and the usual procedure is to first transfer the water from the available source of supply to a tank or reservoir, from which an accurately measured quantity is subsequently transferred to the mixing chamber for each batch of concrete. Various systems have been devised for carrying out these functions, in some of which a power driven pump carried by the mixing machine is employed to force the water from the source of supply to the measuring tank. In some instances the arrangement is such that the said pump may also be used to withdraw the water from the measuring tank and force it to the mixing chamber, while in other cases the transfer from the measuring tank to the mixing chamber is accomplished solely by gravity flow.

In all these systems it is important for the sake of the required accurate control of the water supplied to the mixing chamber that the valves of the system cut off sharply, and prevent by-passing of the measuring tank, or in other words, prevent direct flow from the pump to the mixing chamber; and it is one of the principal objects of the invention to provide a simple and effective valve structure whereby such results may be accomplished.

One form of such a valve is illustrated in the accompanying drawing forming a part of this specification, in which like reference characters designate like parts in all the views, and in which:

Figure 1 is a top plan view of the valve;

Fig. 2 is a central longitudinal sectional view on approximately the plane indicated by the line 2-2 of Fig. 1, looking in the direction of the arrows;

Fig. 3 is an end elevational view, as seen from the right of Fig. 2; and

Fig. 4 is a transverse sectional view on approximately the plane indicated by the line 4-4 of Fig. 2, looking toward the right.

As here shown, the valve body 10 comprises two hollow members 11 and 12 normally secured together in end-to-end relationship by bolts 13. The interior of the body member 11 provides a valve chamber 15 which communicates through a port 16 formed in the end wall 17 of the chamber, 55

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with a pipe 18 which may lead to the mixing chamber of the concrete mixer. A pipe 19 also communicates with the valve chamber 15 at the side thereof, and leads to the water measuring tank or receptacle mentioned above.

The interior of the valve body member 12 provides a chamber 20 to which water from the pump may be supplied by a pipe 21, and said chamber 20 communicates with chamber 15 of body member 11 through a port 22 formed in the end wall 23 of the body member 12. The ports 16 and 22 are surrounded respectively by seats 24 and 25 facing one another, as will be clear from Fig. 2.

A valve stem comprising a rod 26 passes axially through the chambers 15 and 20, and at one end carries a valve member 27 of a size adapted to have a sliding fit in the port 16, as shown in said Fig. 2. Behind the said valve member the stem 26 carries a yieldable washer 28 of rubber or equivalent material, which is adapted to be compressed against the seat 24 to completely seal the port 16 against the passage of liquid there-through when the parts are in the full line positions of Fig. 2. Backing the washer 28 is a spider 29, also carried by the stem 26 and having the outer peripheral surfaces of its legs 30 slidably engaging the inner wall surface of the chamber 15.

Adjacent the port 22 the valve stem 26 carries a valve member 31 of a diameter adapted to slidably fit in the said port, which member is backed by a compressible washer 32, seatable on the seat 25, and a rigid washer 33. As will be clear from Fig. 2, both valve members 27 and 31, and their associated parts, are disposed in the valve chamber 15, and they are maintained in appropriate spaced relation on the stem 26 by a sleeve 34, whereby through reciprocating movements of the stem the valve members 27 and 31 may be alternately entered into their respective ports 16 and 22, and their companion washers 28 and 32 alternately compressed against their respective seats 24 and 25.

The chamber 20 of the body member 12 has a cylindrical extension 35 in which is mounted a piston 36 carried by the stem 26 and maintained in spaced relation to the valve member 31 by a spacing sleeve 37. The said piston abuts a shoulder 38 formed on the stem 26, and it, together with the parts 37, 31, 32, 33, 34, 29, 28 and 27 are rigidly retained in position on the stem by a nut 39 threaded on the end of the latter. The piston 36 is subject to the pressure of the water supplied to the chamber 20 by the pump, and the

effective area of the said piston is slightly greater than that of the valve 31, and slightly less than that of the valve elements 28, 29. Thus, when the parts are in the full line positions shown in Fig. 2 the pressure on the spider 29 slightly overbalances that on the piston 36 and tends to hold the valve structure 27, 28 in its closed position, while when the parts are moved to the broken line positions of said figure the pressure on the piston slightly overbalances that on the valve member 31 and tends to hold this valve closed.

The movements of the valves may be accomplished by means of a bifurcated lever 40 one end of which is pivotally mounted as at 41 on an extension 42 of the body member 12, and to the other end of which an operating rod 43 is connected. The arms of the said lever are provided with slots 44 receiving trunnions 45 of a collar 46 which is slidably mounted on the stem 26 for lost-motion movement between a pair of washers or similar abutments 47 and 48 carried by the said stem and positioned thereon by pins 49 and 50.

Since the pressure differentials between the piston 36 and the respective valve structures are not great in order that the valve movements may be accomplished with a minimum of force, detent means are preferably provided to additionally insure retention of the parts in the closed position of each of the valves 27 and 31, whereby to guard against the unintentional opening of such valves. As here shown, such means comprise a detent bar 51 having one end fulcrumed on a boss 52 formed on the body member 12. This end portion of the said bar is formed with an aperture 53 for the reception of a lug 54 which extends upwardly from the said boss, whereby lateral and longitudinal displacement of the bar is prevented. The bar is pressed downwardly by a compression spring 55 surrounding a bolt 56 which is attached to the body member 12 and is provided with nuts 57 by means of which the force exerted by the spring 55 may be varied as desired. At its outer end, which extends between the arms of the bifurcated lever 40, the bar is bent to provide the spaced oppositely disposed angularly extending portions 58 and 59 which are adapted to be engaged by and co-operate with a roller 60 journaled in the said lever arms, as will be clear from Figs. 2 and 3. Thus, as either of the valve members 27 and 31 approaches its closed position, the roller 60 is brought into co-operative engagement with one or the other of the angularly disposed bar portions 58 and 59 and through the pressure exerted by the spring 55 on the bar the parts will be retained in such position. The lost motion provided between the collar 46 and the abutments 47, 48 permits the roller 60 to be moved out of engagement with the respective detent portions 58 and 59 of the bar 51 before movement is imparted to the stem 26 to unseat each valve.

The valve members 27 and 31 are so spaced upon the rod 26 that, assuming the parts to be in the full line positions shown in Fig. 2, upon movement to the right toward the broken line positions illustrated therein, the valve member 31 will be almost ready to begin its entry into the port 22 before the valve member 27 completely leaves its port 16, and as the movement is fairly rapid there is substantially no opportunity for liquid to by-pass directly from the pump to the mixing chamber; and of course the same is true during movement from the broken to the full line positions. Thus, all liquid sup-

plied to the mixing chamber must come from the measuring tank, and the accuracy of the quantities supplied is preserved.

As above explained, the entry of either of the slide-fit valve members 27 or 31 into its port 16 or 22 substantially cuts off the flow of liquid through such port, and the subsequent compression of the yieldable washers 28 and 32 against their respective seats 24 and 25 completely seals the ports 16 and 22 against the passage of liquid. This action is facilitated through the co-operation of the roller 60 with the inclined portions 58 and 59 of the spring pressed detent bar 51.

While one form of the invention has been illustrated and described, it will be obvious that those skilled in the art may vary the details of construction as well as the precise arrangement of parts without departing from the spirit of the invention, and therefore it is not wished to be limited to the above disclosure except as may be required by the claims.

What is claimed is:

1. In a multi-way valve, a body providing a valve chamber having a pair of spaced ports, and an intake chamber having a port communicating with said valve chamber in alinement with and spaced from one of said first named ports, each of such alined ports being surrounded by a seat; a valve stem mounted in the body for reciprocation co-axially with said alined ports; a pair of valve members carried by said stem for alternative sliding engagement in the respective alined ports whereby to cut off flow of fluid through one of such ports while opening the other; a compressible washer carried by the stem behind each of said valve members for pressural engagement with the seat of the port controlled by such member in sequence to entry of the member into such port, to completely seal the port against fluid flow; a piston carried by the valve stem in a portion of said intake chamber, said piston being subject to and operable by the pressure of fluid introduced into the intake chamber to overbalance the effect of such pressure upon one of the valve members and under-balance such effect on the other member; and means for reciprocating said valve stem.

2. In a multi-way valve, a body providing a valve chamber having a pair of spaced ports, and an intake chamber having a port communicating with said valve chamber in alinement with and spaced from one of said first named ports, each of such alined ports being surrounded by a seat; a valve stem mounted in the body for reciprocation co-axially with said alined ports; a pair of valve members carried by said stem for alternative sliding engagement in the respective alined ports whereby to cut off flow of fluid through one of such ports while opening the other; a compressible washer carried by the stem behind each of said valve members for pressural engagement with the seat of the port controlled by such member in sequence to entry of the member into such port, to completely seal the port against fluid flow; a piston carried by the valve stem in a portion of said intake chamber, said piston being subject to and operable by the pressure of fluid introduced into the intake chamber to overbalance the effect of such pressure upon one of the valve members and to underbalance such effect on the other member; a spider carried by the stem within the valve chamber for guiding the stem therein; spacing sleeves surrounding the stem intermediate the valve members, and be-

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tween the piston and adjacent valve member; and means for reciprocating said valve stem.

3. In a multi-way valve, a body providing a valve chamber having a pair of spaced ports, and an intake chamber having a port communicating with said valve chamber in alinement with and spaced from one of said first named ports; a reciprocable valve stem disposed co-axially with said alined ports; a pair of valve members carried by said stem for alternative sliding engagement in the respective alined ports to close the latter; a piston carried by the valve stem in said intake chamber, said piston being subject to and operable by the pressure of fluid introduced into such chamber to overbalance and underbalance the effect of such pressure upon the respective valve members; a lever pivoted to the valve body, for reciprocating the valve stem; and a detent bar mounted on the valve body and co-operable with said lever to yieldably retain the parts in either of the valve-closing positions.

4. In a multi-way valve, a body providing a valve chamber having a pair of spaced ports, and an intake chamber having a port communicating with said valve chamber in alinement with and spaced from one of said first named ports; a reciprocable valve stem disposed co-axially with said alined ports; a pair of valve members carried by said stem for alternative sliding engagement in the respective alined ports to close the latter; a piston carried by the valve stem in said intake chamber, said piston being subject to and operable by the pressure of fluid introduced into such chamber to respectively overbalance and underbalance the effect of such pressure upon the two valve members; a lever pivoted to the valve body, for reciprocating the valve stem; a roller carried by said lever; and a spring pressed detent bar mounted on the valve body and having oppositely inclined angularly disposed portions co-operable with said lever roller to yieldably retain the parts in either of the valve-closing positions.

5. In a multi-way valve, the combination of a body providing a valve chamber having an inlet and an outlet port; valve means for controlling the respective ports, mounted in said chamber for unitary movement between alternative positions in each of which one of the ports is open while the other is closed, the respective valve means having differential areas subject to pressure of fluid in the body; means for moving said valve means between said positions; and a piston mounted in the body and connected to the valve means, said piston also being subject to said fluid pressure and having an effective pressure area intermediate the pressure areas of the respective valve means, whereby the pressure effect on the piston may overbalance the pressure effect on one of the valve means and underbalance that on the other valve means.

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6. In a multi-way valve, the combination of a body providing a valve chamber having an inlet and an outlet port; a valve member for each of said ports, said members being mounted in said chamber for unitary movements between alternative positions in each of which one of the ports is open while the other is closed, the respective valve members being subject to pressure of fluid in the body, and the member controlling the outlet port having a greater effective pressure area than the one controlling the inlet port; means for moving said valve members between said positions; and a piston mounted in the body and connected to the valve members, said piston also being subject to said fluid pressure and having an effective pressure area intermediate the pressure areas of the respective valve members, whereby the pressure effect on the piston may overbalance the pressure effect on the valve member controlling the inlet port, and underbalance that on the valve member controlling the outlet port.

7. In a multi-way valve, the combination of a body providing a valve chamber having an inlet port and an outlet port; a valve member for each of said ports, mounted in said chamber for unitary movements between alternative positions in each of which one of the ports is open while the other is closed, the respective valve members being subject to pressure of fluid in the valve body, and the outlet valve member being of greater diameter than the inlet valve member; means for shifting the valve members between said positions; and a piston mounted in the valve body and connected to said valve members, one side of said piston also being subject to said fluid pressure, and the piston being of a diameter greater than that of the inlet valve member but less than that of the outlet valve member, whereby the pressure effect on the piston may overbalance the pressure effect on the inlet valve member and underbalance that on the outlet valve member.

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