

Dec. 30, 1930.

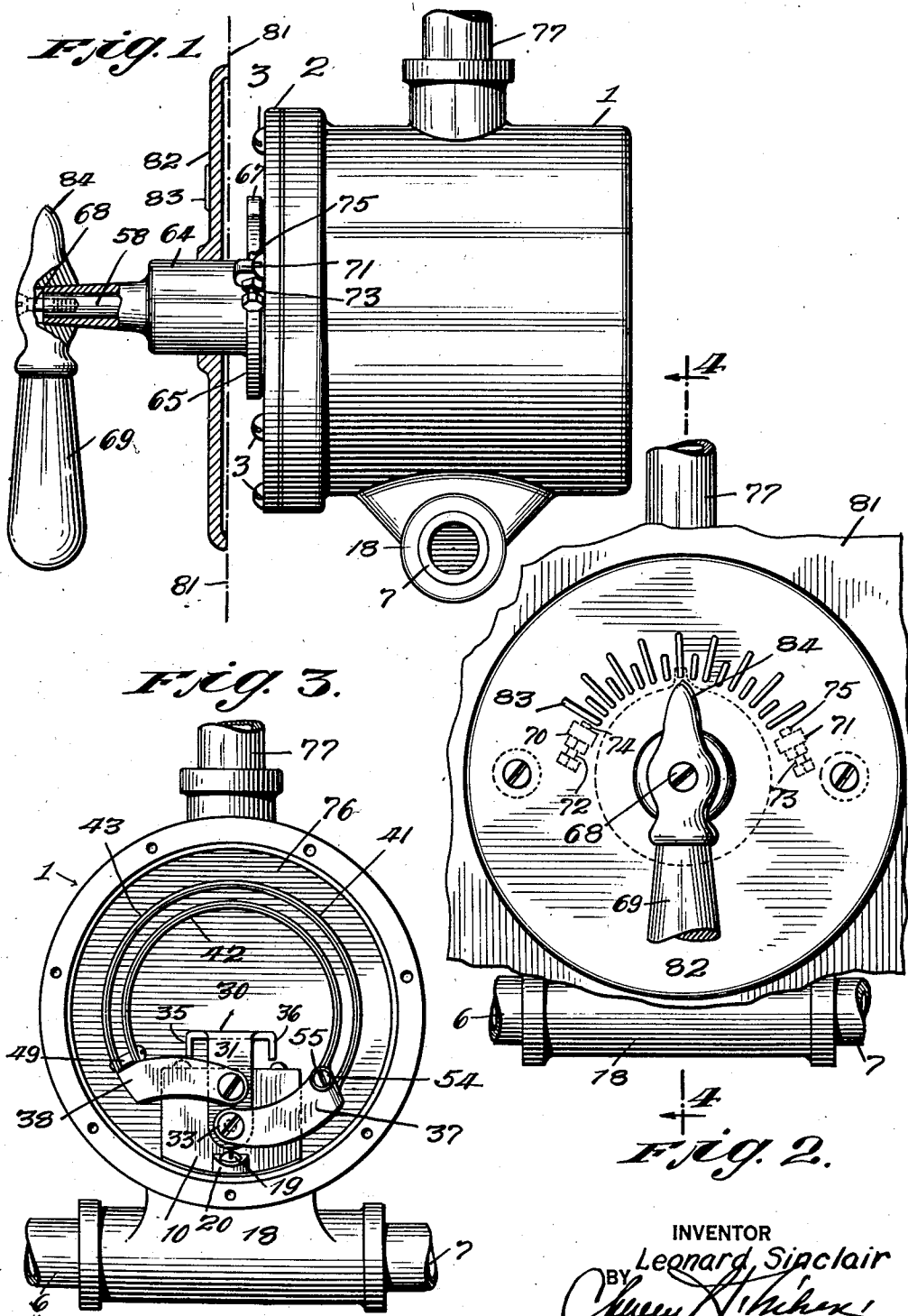
L. SINCLAIR

1,787,215

MIXING VALVE

Filed March 19, 1929

2 Sheets-Sheet 1



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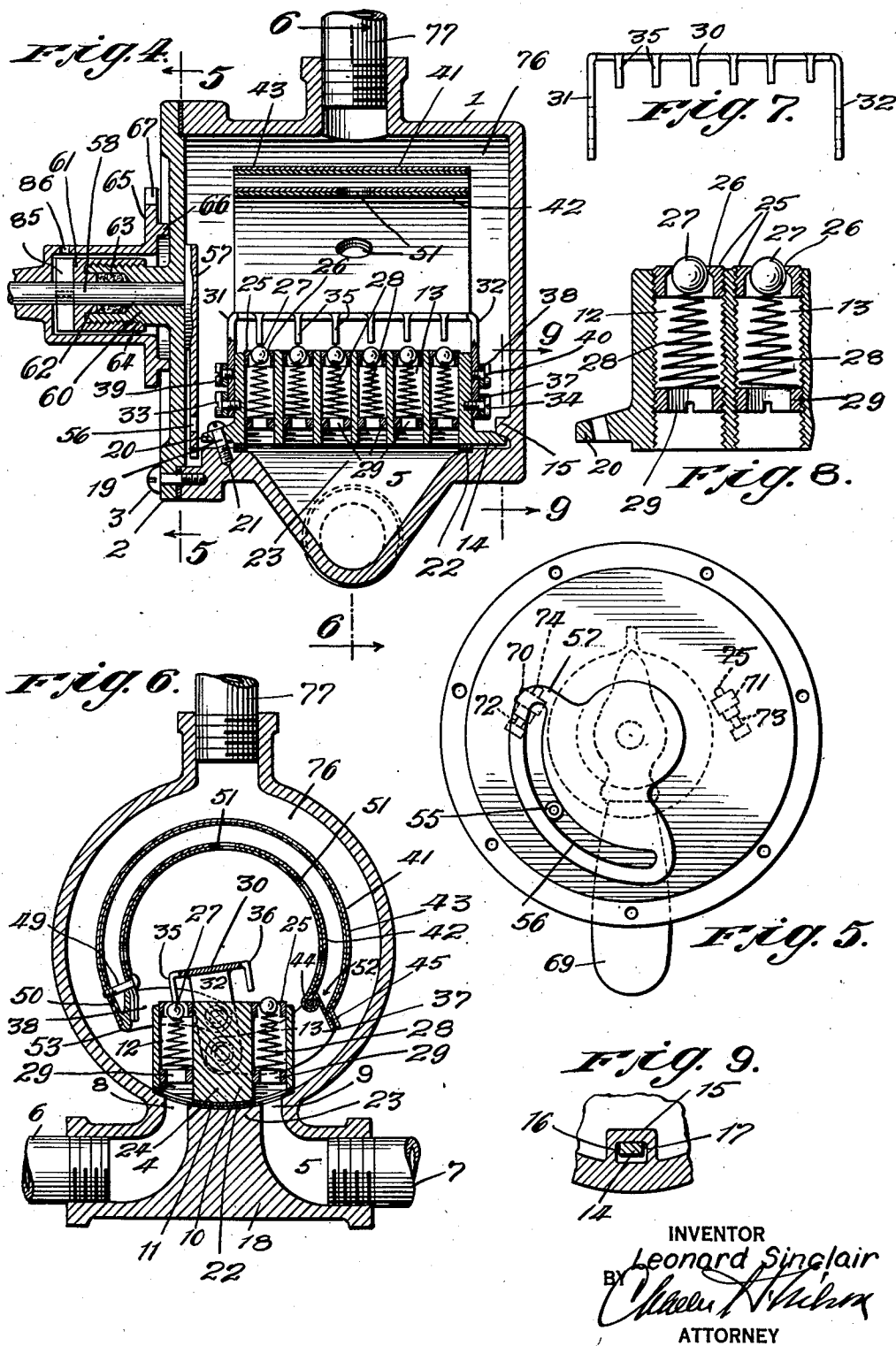
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UNITED STATES PATENT OFFICE

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MIXING VALVE

Application filed March 19, 1929. Serial No. 348,321.

This invention relates to mixing valves of the thermostatically controlled type, and the invention contemplates certain improvements over the valves disclosed in the pending application of Harold R. Becker, Serial No. 303,137.

One of the objects of the invention is to provide new and improved means for mixing liquids or gases and liquids, or gases, at different temperatures and different pressures, and to discharge the resultant mixture at a predetermined temperature.

Another object of the invention is to provide a device of the class described, wherein the parts are comparatively few and whereby the response of the thermostatic means employed to determine the temperature of the resultant mixture is almost instantly responsive.

Another object of the invention is to provide a thermostatic valve wherein the temperature of the discharged liquid may be regulated to a greater nicety than it has been possible to accomplish in valves of this character as hitherto constructed.

The invention accordingly consists in the series of steps about to be described and the relation of each of said steps to the others thereof; and also in the combinations of elements, arrangements of parts and applications of principles constituting the invention; and the scope of protection contemplated will be indicated in the appended claims.

In the accompanying drawings, wherein I have illustrated a preferred form of embodiment of my invention,

Figure 1 is a side elevational view of my proposed valve;

Figure 2 is a front elevational view of the valve;

Figure 3 is a front view of the valve with the face plate removed showing the valve operative mechanism within the casing;

Figure 4 is a vertical sectional view taken on the line 4—4 of Figure 2;

Figure 5 is a vertical sectional view taken substantially on the line 5—5 of Figure 4;

Figure 6 is also a vertical sectional view

taken substantially on a line 6—6 of Figure 4;

Figure 7 is an elevational view of the rocker arm showing the fingers adapted to open the valves;

Figure 8 is a sectional view upon an enlarged scale showing the valve mechanism, and

Figure 9 is a sectional view taken on the line 9—9 of Figure 4.

While in the present instance I have illustrated an embodiment of my invention adapted for domestic or household use, such as in connection with a bath tub or shower bath, it will be understood that the invention is adaptable to a variety of uses other than that herein described.

Referring now to the drawings wherein similar reference characters refer to similar parts throughout the several views thereof, the reference numeral 1 denotes the casing of the valve, the same comprising a hollow box-like structure preferably of cylindrical form and having a removable front plate 2, which may be clamped to the body of the casing so as to close the same as by means of the clamp screws 3, whereby to form a liquid tight closure. This casing forms a housing for the operative parts of the valve and also forms a mixing chamber for the liquids. The lower portion of the casing has formed therein the two ports 4 and 5, into which lead, respectively the conduits 6 and 7. It will be understood that, in practice, these conduits will be independently valved although the valves are not shown in the drawings.

In the present instance the valve will be described as adapted to receive and mix a liquid such as water entering the mixing chamber at different temperatures and pressures and to discharge the same at a predetermined temperature. The conduit 6 will be understood as adapted to discharge hot water into the port 4 of the casing and the conduit 7 to discharge cold water into the port 5.

The ports 4 and 5, it will be noted, extend inwardly and upwardly and preferably flattened out so as to form the elongated slots 8

and 9, which terminate within the cylindrically formed side wall of the casing.

The reference numeral 10 denotes a valve head, the same, in the present instance, consisting of a block of metal preferably of the form shown in Figures 3, 4, 6 and 8. The lower surface 11 of this block is arc shaped so that it will conform to and lie snugly against the inner wall of the casing. Extending through the valve head is a plurality of passageways 12 and 13. These passageways are formed by boring circular apertures through the valve head. In the present instance there are two rows of these apertures, the row of apertures indicated at 12 registering with the elongated aperture 8, and the row indicated by the reference numeral 13 registering with the elongated aperture 9 of the valve head.

In the present instance the valve head 10 is held in position by a wedge shaped lug 14, formed integrally upon the valve head, which lug engages a wedge shaped surface formed upon and opposing lug 15 cast upon the inner wall of the casing. Lug 15 is hollow, as shown in Figure 9, and the side walls 16 and 17 of this hollow lug serve to maintain the rear end of the valve head in its proper position relative to the slots 8 and 9 of the fitting 18 in which the ports 4 and 5 are located. The valve head 10 is held fixedly in place by the screw 19 which extends in a downward and inward direction through an apertured lug 20 formed upon the front surface of the valve head 10 and which screw is threaded into an aperture 21 formed in the fitting 18.

In the present instance a packing member 22 is positioned between the valve head and the inner wall of the casing so as to form a liquid-tight connection between the two parts. It may be desirable, in practice, to grind the contacting surfaces between these parts and thus dispense with the packing.

The fitting 18, it will be noted, is provided with a web 23, which separates the ports 4 and 5 and against which the middle part 24 of the valve head rests. The packing member 20 extends between these ports, forming a liquid-tight connection. Each of the passageways 12 and 13 of the valve head is independently valved, as is clearly shown in Figure 8 of the drawings. This valve construction comprises a collar 25 threaded into the passageway, each collar being provided with a valve seat 26, against which rests a ball valve 27. The ball valves are held in closed position as by means of the springs 28, which rest against the collars 29, also threaded in the passageways. These collars are, of course, adjustable, so as to regulate the force with which the springs 28 hold the valves 27 against their respective seats.

The reference numeral 30 denotes a rocker member having the legs 31 and 32 which

straddle the valve head 10, the lower ends of said legs being pivotally connected to the valve head as by means of the stud screws 33 and 34.

The rocker member 30 is provided with a plurality of downwardly extending fingers 35 and 36, there being two rows of these fingers, one finger being provided for each of the ball valves and each finger being located directly above the valve it is intended to operate. When the rocker member 30 is swung either to the right or to the left, the fingers of one row engage the ball valves on that side and open them against the tension of their springs while the fingers on the opposite row permit the ball valves with which they co-operate to close under the influence of their operating springs.

It will be noted by reference to Figures 4 and 7 of the drawings that the fingers of each row gradually diminish in length, the construction being such that when the rocker member is swung on its extreme position in one direction, the fingers on that side will open all of the valves, but the longest finger on the opposite side will barely engage the ball valve with which it co-operates. Thus, when the rocker member is swung to its extreme position in one direction, all of the valve members on that side will be opened while all of the valves on the opposite side will be closed. The heights of the fingers are so arranged that when the rocker member is in its neutral or central position an equal number of valves in each row will be opened and an equal number thereof closed. Thus, assuming the pressure exerted upon the hot and cold water ports to be equal, an equal volume of liquid will flow through the open passageways upon each side of the valve head when the rocker member is in normal position. Swinging the rocker member in either direction will permit a greater amount of liquid to flow into the mixing chamber through the passageways toward which the rocker member is swung with a proportionate diminution of flow through the passageways from which the rocker member is swung; in other words, the fingers 35 and 36, which depend in longitudinal alignment from each side of the rocker member, are so related to their respective valves that as the rocker member is swung to one side, the flow of liquid through the passageways on that side is increased in a ratio which is proportionate to the diminution of flow of liquid through the passageways upon the opposite side.

The reference numeral 37 denotes a U-shaped arm, the legs of which straddle the valve head 10 and also the legs of the rocker member, the ends of the arm being pivotally mounted on the stud screws 33 and 34. A similar U-shaped arm 38 straddles the valve head 10 and also the legs of the rocker member, the ends of said arms being pivotally

connected with the legs 31 and 32 of the rocker member as by means of the pivot screws 39 and 40.

The reference numeral 41 denotes a thermostatic unit, the latter comprising two strips, 42 and 43, each of which strips is in turn made up of laminated sheets of metal having different co-efficients of expansion. The neighboring ends 44 and 45 of the strips 42 and 43 are connected to the yoke of the arm 37, as shown in Figures 3 and 6 of the drawing, and the opposite ends 47 and 48 of these sheets are fastened as by means of a bolt 49 to the yoke 50 of the U-shaped arm 38. Thus it will be seen that the thermostatic unit composed of the spaced laminated strips 42 and 43 extends between the yokes, respectively, of the arms 37 and 38. The strips 42 and 43 are preferably apertured as at 51 so as to permit the mixing liquid to have more ready access to the exposed surfaces thereof. It will be noted that the end 52 of the thermostatic unit is anchored as by means of the U-shaped arm 37 to the valve head, but that the swinging movement of this U-shaped arm will move the end 52 of the thermostatic unit upwardly or downwardly in an arc of a circle, whereby the entire thermostatic unit will be moved, such movement being permitted inasmuch as the opposite end 53 of the thermostatic unit is connected to the yoke of the arm 38. The movement of the thermostatic unit through its connection with the rocker member 30, by means of the arm 38, will compel the rocking movement of the latter.

Rotatively mounted on a bearing formed by a screw 54 threaded into the arm 37 near its yoke is a cam follower 55. This cam follower 55 is received in the slot 56 of a cam plate 57 mounted upon the operating shaft 58. The cam slot 56 of this plate is formed in non-concentric relation with the axis of the shaft 58 so that a rotative movement of the shaft will, through the slot 56 of the cam plate 57, compel a swinging movement of the arm 37, whereby the entire thermostatic unit will be moved, as above explained. The shaft 58 extends through a bearing formed by a bore, provided in the circular boss 60 cast on the plate 2. A cap 61, apertured to receive the shaft 58, is mounted upon the boss 60, said cap having a circular rim 62 which engages with a packing member 63. This cap and the packing member form a gland to prevent leakage of the liquid around the shaft 58.

The reference numeral 64 denotes a thimble shaped boss or cap which encloses the boss 60 of the plate 2 and the cap 61, said cap 64 being provided with a laterally extending plate 65, provided with an inwardly extending collar or flange 66 which rides upon the out surface of the plate 2. This plate is also provided with a laterally extending finger 67. The shaft 58 extends through the cap 64, and the end of the shaft and also the end of

the cap are anchored as by means of the clamp screw 68 to an operating handle 69, the construction being such that when the handle 69 is operated, the cap 64 and the shaft 58 rotate as a unit.

Extending laterally from the plate 2 are the bosses 70 and 71, and threaded into these bosses are the screws 72 and 73. The ends 74 and 75 of these screws form stops or abutments through their engagement with the finger 67 to limit the rotative movement of the cam plate 57. It will be seen that by the adjustment of these stops the extent of the rotative movement of the cam plate may be varied at will, it being understood that the cam slot 56 is made sufficiently long to permit of these adjustments.

Leading from the mixing chamber of the casing, which is denoted generally by the reference numeral 76 is the liquid discharge conduit 77, said discharge conduit being preferably located at a position diametrically opposite the point where the differently temperatured liquids enter the mixing chamber.

The device as a unit, as described in connection with this embodiment of the invention, is intended to be mounted within a wall, as shown in Figure 1, the dotted line 81 indicating the face of the wall; and mounted upon the cap 64 and fastened to the wall is a plate 82, which is provided with a scale or dial, as indicated at 83, upon which may be marked, if desired, degrees of temperature, and that this dial co-operates with a pointer 84, formed as an extension of the operating handle 69.

Having thus described the construction of this preferred embodiment of my invention, the operation thereof, which should be largely obvious, may now be understood.

Assuming the parts to be positioned in the manner described and shown in Figures 1, 2 and 3 of the drawings with the operating handle in neutral position, the rocker member 30 will also be in neutral position. In this position, as above described, the valves for controlling the flow of liquid through the passageways upon each side of the valve head will be half opened and half closed so that an equal amount of hot and cold liquid will be discharged into the mixing chamber.

A swinging movement of the operating handle in either direction will, through its cam and follower connection with the arm 37, cause a bodily movement of the thermostatic assembly, whereby the depending fingers of the rocker member will cause a further opening of the valves on the side of the valve head toward which the rocker member is swung, and a corresponding closing operation of the valves upon the opposite side of the valve head. This manual operation is intended to set the valve mechanism in such a position that the resultant mixture discharged

through the outlet conduit 77 will be at the approximate temperature desired.

Having completed the manual setting of the valve mechanism, the mixture within the chamber 76 will cause such an operation of the thermostatic unit as will cause the free end 53 thereof, through the arm 38, to compel a further rocking movement of the rocker member 30, whereby the depending fingers thereof will cause such a relative opening and closing of the valves as will produce a resultant liquid discharge at the temperature desired.

As already described, it will be noted that the end 52 of the thermostatic unit is fixed against movement except as the whole thermostatic unit is moved by means of the cam plate 57, but that the end 53 of the thermostatic unit is free to move due to the expansion and contraction of the latter caused by the temperature of the mixing liquids. This operation causes such a complementary movement of the rocker member as will adjust the valves, whereby the proper amounts of hot and cold liquids will be admitted into the mixing chamber as when mixed will produce a discharged mixture at the desired temperature.

It will be noted that the device is constructed according to this embodiment of my invention in such a way that an easy access is provided to the interior of the chamber. By withdrawing the clamp screws of the face plate, that member and its associated parts may be entirely removed from the casing, exposing the thermostatic unit and its associated mechanism; and this assembly may be withdrawn bodily by merely unscrewing the clamp screw 19.

The cap 61 which encloses the gland is provided with outstanding flanges 85, and the cap 64 is provided with an aperture 86, through which a nail or a smaller instrument may be inserted so as to engage with the flanges 85 of the cap. By this means it will be seen that the gland may be tightened or loosened merely by a simple turning of the operating handle. In other words, the operating handle may be used as a lever to tighten or loosen the gland by forming a temporary connection between the cap 64 and the cap 61.

Another feature of construction which I desire to emphasize is that the parts may be so adjusted that the valves on either side of the valve head may be completely closed by the fingers of the rocker member. The reason for this construction is that should the flow of cold water through the conduit 7 for any reason be shut off, the thermostatic unit will immediately cause the valves controlling the flow of hot water to close completely, thereby preventing the discharge of scalding liquid through the outlet conduit 77. Moreover, if the hot water conduit 6

be entirely shut off, a similar closing movement will be had for the valves upon the cold water side of the valve head.

It will accordingly be seen that I have provided a construction, well adapted, among others, to attain all the ends and objects above enumerated in an extremely simple manner, and the valve, which is of very simple construction, may be adapted to a variety of uses, both domestic and industrial, without departing from the basic principles of the invention.

As many changes could be made in this construction without departing from the scope of the following claims, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative only and not in a limiting sense.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a mixing valve, in combination, a casing having an outlet and a pair of inlet ports, a valve head having passageways extending therethrough, said passageways being connected respectively with said inlet ports, a valve for controlling the flow of liquid through each of said passageways, a rocker member pivotally mounted upon the valve head, having fingers for opening said valves, and a thermostatic unit connected with said rocker member.

2. In a device of the class described, in combination, a casing having an outlet and a pair of inlet ports, a valve head having a plurality of sets of passageways connected respectively with said inlet ports, an independent valve for each of said passageways, a spring for closing each of said valves, a rocker member pivotally mounted upon the valve head having a plurality of fingers, each of which is adapted to engage with one of said valves to open it against the tension of its spring, and a thermostatic unit connected with said rocker member and adapted to operate the same.

3. In a device of the class described, in combination, a casing having an outlet and a pair of inlet ports, a valve head having a plurality of sets of aligned passageways connected respectively with said inlet ports, an independent valve for each of said passageways, a spring for holding each valve in a closed position, a rocker member pivotally mounted upon the valve head, having depending fingers, each of which is adapted to engage and open one of said valves, and thermostatically controlled means for operating said rocker member.

4. In a device of the class described, in combination, a casing having an outlet and a pair of inlet ports, a valve head located within said casing, said valve head having two sets of passageways, each set comprising a plural-

ity of aligned conduits which extend through the valve head, the passageways of each set having a common connection with one of the inlet ports, an independent valve for each passageway, a spring for holding each valve in closed position, a rocker member having depending arms which straddle the valve head and are pivotally mounted thereon, said rocker member having a plurality of depending fingers, there being a finger provided for each valve and a thermostatic unit, one end of which is anchored to the valve head and the other end of which has an operative connection with said rocker member.

5. In a device of the class described, in combination, a casing having a pair of inlet ports and an outlet port, a valve head located within said casing and having a plurality of rows of aligned passageways extending through said valve head, each of said passageways having a connection with one of said inlet ports and being provided with a valve seat, a valve located in each of said passageways, a spring for holding each of said valves against its seat, a rocker member pivotally mounted to the valve head and having a plurality of depending fingers of varying length adapted to engage and open the said valves, there being a finger provided for each valve and a thermostatic unit located within said chamber, having one end anchored to the valve head and its other end operatively connected with said rocker member.

6. In a device of the class described, in combination, a casing having a pair of inlet ports and an outlet port, a valve head located within said casing and having a plurality of rows of aligned passageways extending through said valve head, each of said passageways having a connection with one of said inlet ports and being provided with a valve seat, a valve located in each of said passageways, a spring for holding each of said valves against its seat, a rocker member pivotally mounted to the valve head and having a plurality of depending fingers of varying length adapted to engage and open the said valves, there being a finger provided for each valve, a thermostatic unit located within said chamber, having one end anchored to the valve head and its other end operatively connected with said rocker member, and an operating handle adapted bodily to move said thermostatic unit to an approximate position whereby liquid of a predetermined temperature will be discharged through said outlet port.

7. In a mixing valve, in combination, a casing having an outlet and a pair of inlet ports, a valve head having a plurality of sets of passageways connecting respectively with said inlet ports, a valve for each of said passageways, in said valve head and a rocker member having fingers adapted to open said

valves and a thermostatic unit connected with said rocker member.

8. In a mixing valve, in combination, a casing having an outlet and a pair of inlet ports, a valve head having a plurality of sets of passageways connecting respectively with said inlet ports, a valve for each of said passageways, in said valve head, and a rocker member having fingers of varying length adapted to act upon said valves to cause a sequential opening and closing of the same.

9. In a mixing valve, in combination, a casing having an outlet and a pair of inlet ports, said inlet ports being adapted to permit the flow of differently temperatured liquids into said casing, a valve head having a plurality of sets of passageways connecting respectively with said ports, a spring actuated valve mounted in each of said passageways in said valve head adapted to control the flow of liquid therethrough, and a rocker member having depending fingers, adapted to engage with and open said valves when said rocker member is swung in either direction and a thermostatic unit connected with said rocker member.

In testimony whereof, I affix hereunto my signature.

LEONARD SINCLAIR.