June 11, 1940. J. B. POWERS 2,204,257

VALVE

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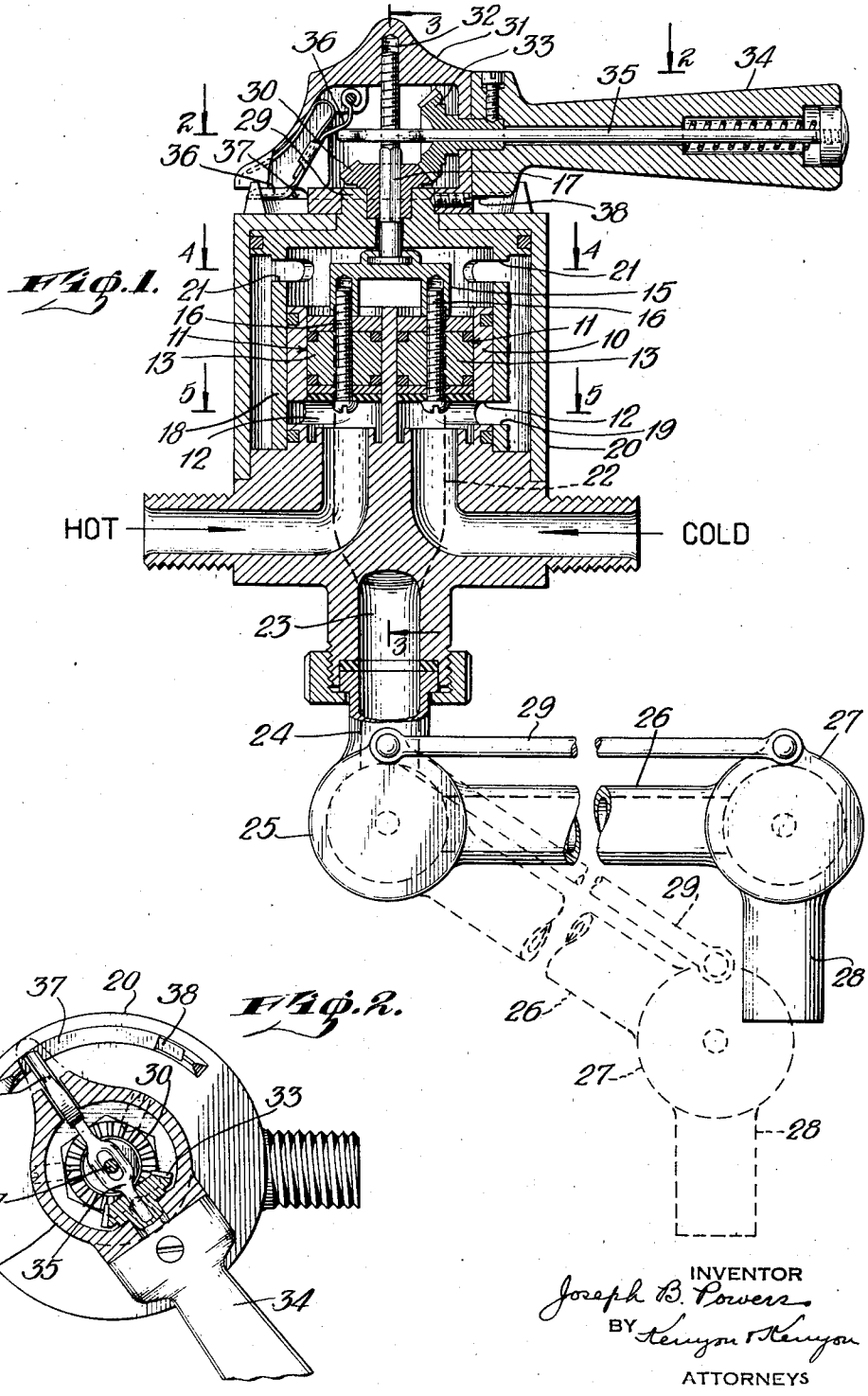


Fig. 1.

Fig. 2.

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VALVE

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Fig. 3.

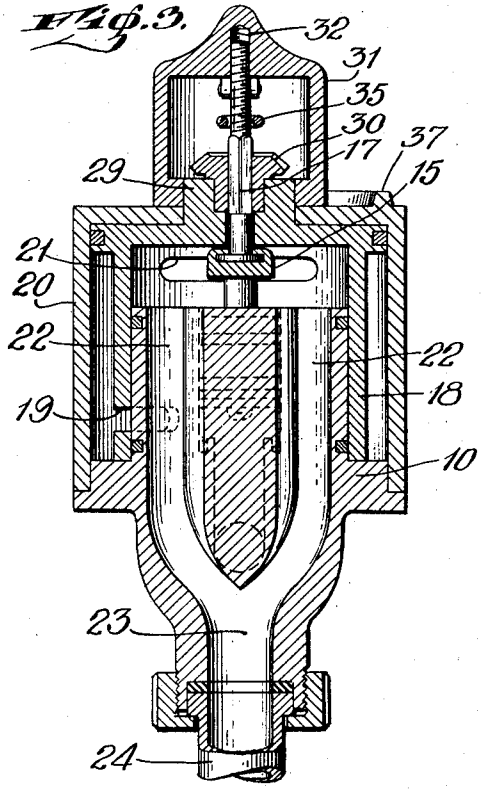


Fig. 4.

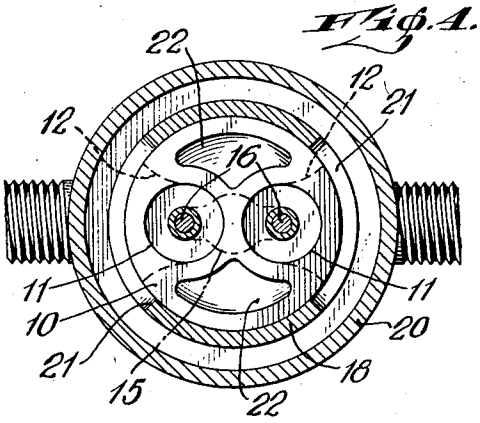


Fig. 5.

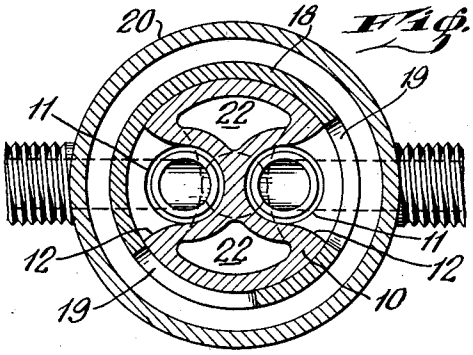


Fig. 6.

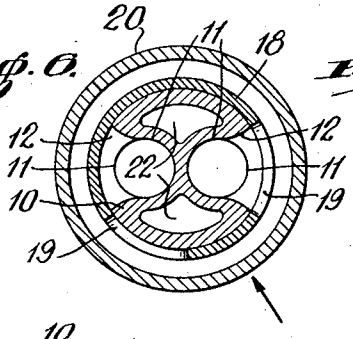


Fig. 7.

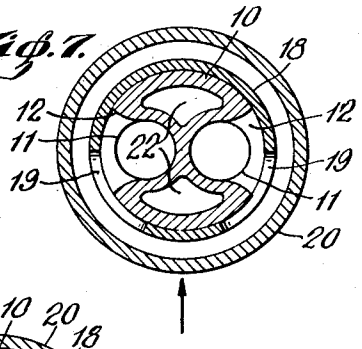
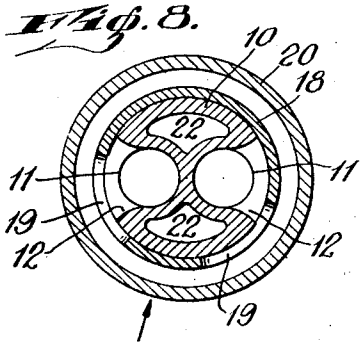


Fig. 8.



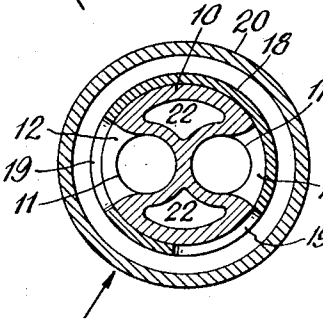


Fig. 9.

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UNITED STATES PATENT OFFICE

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VALVE

Joseph Blair Powers, Flushing, N. Y.

Application February 10, 1939, Serial No. 255,638

17 Claims. (Cl. 277—18)

This invention relates to mixing valves for use in connection with hot and cold water supply pipes to deliver water of desired temperature. Previous valves of this type have not been capable of regulating both the flow rate and temperature by operation of a single handle.

An object of this invention is a valve of the type above referred to of such construction that both the flow rate and temperature are controllable by operation of a single handle.

In a preferred embodiment of the invention, the valve comprises a cylindrical block containing a pair of cylindrical passages having radial ports. A piston is provided in each passage and the block is enclosed by a sleeve having ports adapted upon rotation of the sleeve to register with said block ports in varying ratio. Around the sleeve is a casing forming with the sleeve a chamber into which the sleeve ports discharge and being in communication with the valve outlet. A handle is connected to said sleeve for bodily movement therewith and for rotation about an interior axis. Connections are provided between the handle and the pistons by means of which rotation of the handle about its axis effects simultaneous movement of the pistons longitudinally of the passages. In operation of the valve, the handle is rotated about its axis to vary the rate of flow by controlling the effective area of the block parts and is bodily moved to rotate the sleeve relative to the block to vary the ratio of flow of hot and cold water, thus controlling the temperature.

Other objects, novel features and advantages of this invention will become apparent from the following specification and accompanying drawings, wherein:

Fig. 1 is a vertical section partly in elevation of a valve embodying the invention;

Fig. 2 is a section on the line 2—2 of Fig. 1;

Fig. 3 is a section on the line 3—3 of Fig. 1;

Fig. 4 is a section on the line 4—4 of Fig. 1;

Fig. 5 is a section on the line 5—5 of Fig. 1; and

Figs. 6 to 9 inclusive are sections substantially on the line 5—5 of Fig. 1 showing different positions of adjustment.

As shown in Fig. 1, a cast metal body portion has a cylindrical block 10 in which are provided two cylindrical passages 11, one of which communicates at its bottom with a cold water inlet and the other of which communicates at its bottom with a hot water inlet. At the lower end of each of the passages 11, the block is provided with a pair of opposed radial ports 12, one of which communicates with one passage 11 and the other of which communicates with the remaining passage 11. A piston 13 is provided in each passage 11 for movement longitudinally thereof, both to control the inlet to such passage and also to vary the effective area of the port 12 for the corresponding passage. A single yoke 15 is connected to both the pistons 13 by means of screws 16 and to the yoke 15 is rotatably connected a screw-threaded rod 17. A sleeve 18 encloses the block 11 and is rotatable relative thereto. At its lower end, the sleeve is provided with ports 19 adapted upon rotation of the sleeve to register with the ports 12, the arrangement of the ports 19 being such that when one port is in complete register with a port 12, the remaining port 19 is completely out of register with the remaining port 12. Thus, upon rotation of the sleeve 18, the ratio of registration between a port 12 and a port 19 varies from complete registration to zero registration while the ratio of registration between the two remaining ports varies exactly oppositely, so that the total effective outlet area from the two passages 11 remains constant in so far as rotation of the sleeve 18 is concerned.

A casing 20 encloses the sleeve 18 and is spaced therefrom to define a mixing chamber into which hot and cold water are discharged from the passages 11 through the ports 12. At the upper end of the sleeve 18 are provided ports 21 leading from the mixing chamber into the interior of the sleeve above the top of the block 10. In the block 10 are provided passageways 22 leading downwardly to the valve outlet 23. In alinement with the outlet 23 is swivelly connected one arm 24 of a fitting 25 having a second arm 26 capable of vertical swinging movement relative to the arm 24. The arm 26 also constitutes part of a fitting 27 having an arm 28 capable of vertical swinging movement relative to the arm 26. A link 29 interconnects portions of the two fittings 25 and 27 so that, as indicated in dotted lines in Fig. 1, the arm 28 remains vertical in different positions of adjustment. The arrangement just described permits the arm 28 or delivery nozzle to swing to different positions as well as to be raised and lowered.

The sleeve 18 is closed at its upper end and is provided with a boss 29 extending through the top wall of the casing 20. A bevel gear 30 is journalled in the boss and the rod 17 extends therethrough. A head 31 is fixed to the boss 29 and is provided with an interiorly threaded bore 32 into which extends the threaded end of the rod 17. That portion of the rod 17 arranged

within the gear 30 is of square cross-section while that portion of the rod passing through the top of the sleeve 18 is cylindrical and the bore of the gear 30 likewise is of square cross-section so that the rod 17 and the gear rotate together. Rotation of the rod 17 relative to the head 31 effects vertical movement thereof by reason of its screw-threaded engagement with the head 31. In the head 31 is journalled a bevel gear 33 in mesh with the gear 30. A handle 34 is connected to said gear for rotation therewith. The handle 34 may be operated to effect rotation of the head 31 about a vertical axis or may be rotated to effect rotation of the gear 33. Bodily movement of the handle 34 is effective to rotate the sleeve 18 to vary the ratio of hot and cold water delivered to the mixing chamber, while rotation of the handle is effective to produce vertical movement of the rod 17 with concomitant movement of the pistons 13 to vary the rate of flow into the mixing chamber. Bodily movement of the handle 34 does not effect vertical movement of the rod 17 due to the fact that such movement does not cause relative rotation of the head 31 and rod 17.

In the operation of the valve above described, the rate of flow is controlled by varying the elevation of the pistons 13 by rotation of the handle 34, thereby varying the effective area of the ports 12. The temperature is varied by bodily movement of the handle 34 to effect rotation of the sleeve 18 with consequent variation in the ratio of hot and cold water delivered to the mixing chamber.

In the handle 34 is provided a rod 35 extending through the gear 33 and across the head 31, the rod being provided with a slot through which the rod 17 extends. The end of the rod 35 is adapted to engage a spring latch 36 having one end riding on a ridge 37 at the top of the casing 20. In the ridge is provided a notch 38 into which the latch 36 is adapted to fit to hold the head 31 against rotation. The notch 38 is so arranged that the latch 36 will become effective before the head 31 and with it the sleeve 18 can be turned sufficiently to close off completely the cold water passage into the mixing chamber and open completely the hot water passage. The purpose of this arrangement is to prevent injury to a person using the valve by reason of inadvertently swinging the valve handle into the position in which the valve delivers only hot water. After the latch has dropped into the notch, it may be lifted out of the notch by pushing inwardly on the rod 35, thus permitting further rotation of the sleeve 18.

Reference to Figs. 6, 7, 8 and 9, will illustrate the various positions assumed by the sleeve 18 in going from a position in which the valve delivers cold water only to a position in which it delivers hot water only. Fig. 6 illustrates the position of the sleeve for cold water only. Fig. 7 illustrates the position of the sleeve for tepid water, while Fig. 8 represents the position of the sleeve when the latch 36 is seated in the notch 38. In this position, the proportion of hot water materially exceeds the proportion of cold water, but a mixture of hot and cold is still obtained. Fig. 9 represents the position to which the sleeve is swung after disengagement of the latch 36 from the notch 38 in order to get delivery of hot water direct from the hot water inlet without admixture of any cold water.

I claim:

1. A mixing valve comprising a cylindrical block containing a pair of cylindrical passages having radial ports, a piston in each passage, a sleeve enclosing said block and having ports effective upon rotation of the cylinder to register with said block ports in varying ratio, a chamber communicating with both said sleeve ports, a handle connected to said sleeve for bodily movement therewith and for rotation about an interior axis, and means operated by rotation of said handle to effect simultaneous movement of said pistons longitudinally of the passages to vary the effective area of said block ports.

2. A mixing valve comprising a cylindrical block containing a pair of cylindrical passages having radial ports, a piston in each passage, a sleeve enclosing said block and having ports adapted upon rotation of said sleeve to register with said block ports in varying ratio, a chamber in communication with said sleeve ports, a handle connected to said sleeve for bodily movement therewith and for rotation about an axis interior of said handle, a pair of interengaging screw-threaded members of which one is connected to said handle for rotation thereby and the other is fixed to said sleeve, and connections between one of said members and both said pistons whereby rotation of said handle is effective to produce simultaneous movement of said pistons longitudinally of the passages to vary the effective area of said block ports.

3. A mixing valve comprising a cylindrical block containing a pair of cylindrical passages having radial ports, a piston in each passage, a sleeve enclosing said block and having ports adapted upon rotation of said sleeve to register with said block ports in varying ratio, a chamber in communication with said sleeve ports, a handle connected to said sleeve for bodily movement therewith and for rotation about an axis interior of said handle, a screw-threaded rod rotatably connected to both pistons, a member fixed to said sleeve and having a screw-threaded bore into which said rod extends, and means interconnecting said rod and handle for effecting rotation of the former by rotation of the latter, thereby causing simultaneous movement of said pistons longitudinally of the passages to vary the effective area of said block ports.

4. A mixing valve comprising a body including a cylindrical block having a pair of cylindrical longitudinal passageways provided with radial ports and a second pair of passages, a sleeve closed at one end snugly fitting said block and rotatable relative thereto, said sleeve having its end spaced from the block end to form an enclosure therewith and having ports adapted upon rotation of the sleeve to register with said block ports in oppositely varying ratios, a casing surrounding said sleeve in spaced relation thereto to form a mixing chamber, said sleeve having ports permitting communication between said chamber and said enclosure, pistons in said cylindrical passages, a handle connected to said sleeve for bodily movement therewith and for rotation about an interior axis, and means operated by rotation of said handle to effect simultaneous movement of said pistons, longitudinally of the passages to vary the effective area of said block ports.

5. A mixing valve comprising a body including a cylindrical block having a pair of cylindrical longitudinal passageways provided with radial ports and a second pair of passages, a sleeve closed at one end snugly fitting said block and rotatable relative thereto, said sleeve having its end spaced from the block end to form an enclosure therewith and having ports adapted upon

rotation of the sleeve to register with said block ports in oppositely varying ratios, a casing surrounding said sleeve in spaced relation thereto to form a mixing chamber, said sleeve having ports permitting communication between said chamber and said enclosure, pistons in said cylindrical passages, a handle connected to said sleeve for bodily movement therewith and for rotation about an interior axis, a pair of inter-engaging screw threaded members of which one is connected to said handle for rotation thereby and the other is fixed to said sleeve, and connections between one of said members and both said pistons whereby rotation of said handle is effective to produce simultaneous movement of said pistons longitudinally of the passages to vary the effective area of said block ports.

6. A mixing valve comprising a body including a cylindrical block having a pair of cylindrical longitudinal passageways provided with radial ports and a second pair of passages, a sleeve closed at one end snugly fitting said block and rotatable relative thereto, said sleeve having its end spaced from the block end to form an enclosure therewith and having ports adapted upon rotation of the sleeve to register with said block ports in oppositely varying ratios, a casing surrounding said sleeve in spaced relation thereto to form a mixing chamber, said sleeve having ports permitting communication between said chamber and said enclosure, pistons in said cylindrical passages, a handle connected to said sleeve for bodily movement therewith and for rotation about an interior axis, a screw-threaded rod rotatably connected to both said pistons, a member fixed to said sleeve and having a screw-threaded bore into which said rod extends, and means interconnecting said rod and handle for effecting rotation of the former by rotation of the latter, thereby causing simultaneous movement of said pistons longitudinally of the passages to vary the effective area of said block ports.

7. A mixing valve comprising a cylindrical block containing a pair of cylindrical passages having radial ports, a piston in each passage, a sleeve enclosing said block and having ports effective upon rotation of the sleeve to register with said block ports in varying ratio, a chamber communicating with both said sleeve ports, a rod screw-threaded at one end and rotatably connected at its other end to both said pistons, a head fixed to said sleeve and having a screw-threaded bore into which extends the threaded end of said rod, a bevel gear slidably keyed to said rod and journalled in said sleeve, a second bevel gear meshing with said first bevel gear and journalled in said head, and a handle fixed to said second bevel gear for effecting rotation thereof relative to said head and for effecting rotation of said head.

8. A mixing valve comprising a body including a cylindrical block having a pair of cylindrical longitudinal passageways provided with radial ports and a second pair of passages, a sleeve closed at one end snugly fitting said block and rotatable relative thereto, said sleeve having its end spaced from the block end to form an enclosure therewith and having ports adapted upon rotation of the sleeve to register with said block ports in oppositely varying ratios, a casing surrounding said sleeve in spaced relation thereto to form a mixing chamber, said sleeve having ports permitting communication between said chamber and said enclosure, pistons in said cylindrical passages, a rod screw-threaded at one end and rotatably connected at its other end to both said pistons, a head fixed to said sleeve and having a screw-threaded bore into which extends the threaded end of said rod, a bevel gear slidably keyed to said rod and journalled in said sleeve, a second bevel gear meshing with said first bevel gear and journalled in said head, and a handle fixed to said second bevel gear for effecting rotation thereof relative to said head and for effecting rotation of said head.

9. A mixing valve comprising a cylindrical block containing hot and cold water cylindrical passages having radial ports, a piston in each passage, a sleeve enclosing said block and having ports effective upon rotation of the cylinder to register with said block ports in oppositely varying ratio, a chamber communicating with both said sleeve ports, a handle connected to said sleeve for bodily movement therewith and for rotation about an interior axis, means operated by rotation of said handle to effect simultaneous movement of said pistons longitudinally of the passages to vary the effective area of said block ports, a latch for limiting movement of said handle into position to fully close the cold water passage port and fully open the hot water passage port, and means carried by said handle for moving said latch into inoperative position.

10. A mixing valve comprising a body including a cylindrical block having a pair of cylindrical longitudinal passageways provided with radial ports and a second pair of passages, a sleeve closed at one end snugly fitting said block and rotatable relative thereto, said sleeve having its end spaced from the block end to form an enclosure therewith and having ports adapted upon rotation of the sleeve to register with said block ports in oppositely varying ratios, a casing surrounding said sleeve in spaced relation thereto to form a mixing chamber, said sleeve having ports permitting communication between said chamber and said enclosure, pistons in said cylindrical passages, a handle connected to said sleeve for bodily movement therewith and for rotation about an interior axis, means operated by rotation of said handle to effect simultaneous movement of said pistons longitudinally of the passages to vary the effective area of said block ports, a latch associated with said sleeve for limiting movement thereof toward full hot water position, and means carried by said handle for moving said latch into inoperative position.

11. A mixing valve according to claim 7 characterized by a latch carried by said head for limiting rotation thereof toward full hot water position, and means carried by said handle for moving said latch into inoperative position.

12. A mixing valve according to claim 2 characterized by a latch for limiting movement of said sleeve into position fully to open one block port and close the remaining block port, and means carried by said handle for moving said latch into inoperative position.

13. A mixing valve according to claim 3 characterized by a latch for limiting movement of said handle into position fully to close one block port and open the other block port, and means carried by said handle for moving said latch into inoperative position.

14. A mixing valve according to claim 4 characterized by a latch for limiting movement of said handle into position fully to close one block port and open the other block port, and means carried by said handle for moving said latch into inoperative position.

15. A mixing valve according to claim 5 characterized by a latch for limiting movement of said handle into position fully to close one block port and open the other block port, and means carried by said handle for moving said latch into inoperative position.

16. A mixing valve according to claim 6 characterized by a latch for limiting movement of said handle into position fully to close one block port and open the other block port, and means carried by said handle for moving said latch into inoperative position.

17. A mixing valve according to claim 8 characterized by a latch for limiting movement of said handle into position fully to close one block port and open the other block port, and means carried by said handle for moving said latch into inoperative position.

JOSEPH BLAIR POWERS.