Sept. 10, 1929. H. B. FRIDSTEIN ET AL 1,727,591

FLOW CONTROL VALVE

Filed Oct. 7, 1927

Fig. 1.

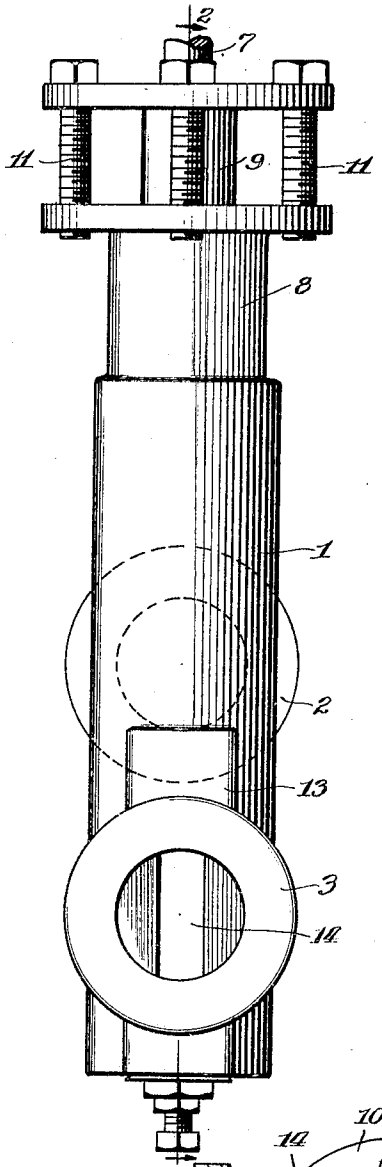
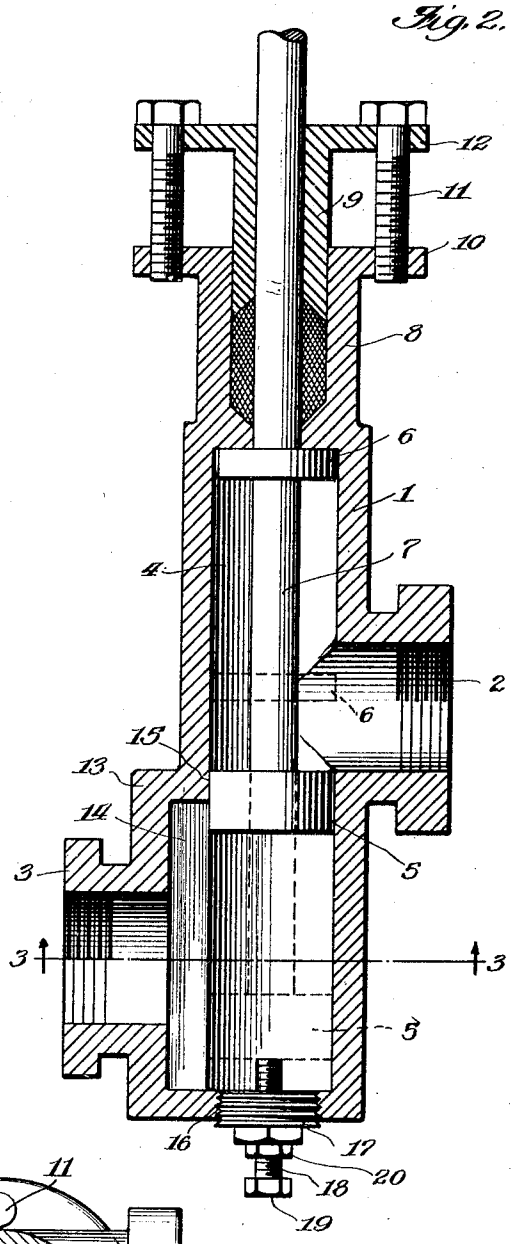


Fig. 2.



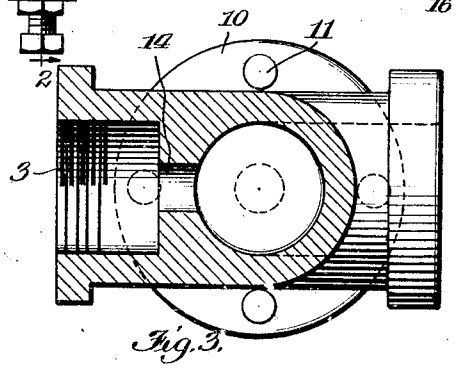


Fig. 3.

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UNITED STATES PATENT OFFICE.

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FLOW-CONTROL VALVE.

Application filed October 7, 1927. Serial No. 224,703.

This invention relates to certain new and useful improvements in automatic valve mechanism, and has particular reference to automatic valve mechanism such as is employed with hot water heating systems, wherein the act of turning on the water causes the valve to operate a valve set in a steam line so as to turn on the steam, or the valve of a gas heater so as to turn on the gas, as water flows through the automatic valve mechanism. The invention has wide application, however, and may be put to various uses, which will suggest themselves to those skilled in the art to which the invention appertains.

Hot water for domestic purposes is generally obtained by means of heaters connected with the service branch of the water supply, in a manner that water drawn off for use is caused to pass through such a heater so that it becomes hot during this passage. In most cases steam, gas or any other heating agent is used in the heaters, said heating agent being supplied by means of suitable burners, in the case where gas is used, and by means of suitable steam pipes in the case where steam is used. The steam or gas supply to these heaters or burners, as the case may be, is automatically controlled in a manner that steam or gas is furnished only when water is taken and passes through the heater, the steam or gas supply at all other times being cut off. Whenever water is taken the water valve is rendered active by the flow of the water through the valve mechanism and causes by means of suitable intermediate connections to actuate in a proper manner a valve which controls the flow of steam or gas to the heaters or burners.

This invention relates to such water actuated means or devices for automatically controlling the steam or gas supply to a heater or burner, and has for its main object the provision of a device of the character described which will act positively in two directions, one when the water is turned on through the piston chamber or valve casing, and the other when the water is held under a state of static pressure, within the chamber or casing, the opening of the valve in either direction being proportional to the rate of flow of the water through the chamber or casing.

Another object of this invention is the provision of a device of the character described in which the piston or water valve is adapted to assume any intermediate position between its fully opened and fully closed position, whereby the heating agent supplied to the heaters will be proportional to the amount of water passing through the heater to be heated.

A further object of this invention is the provision of a device of the character described, having means for adjustably limiting the extreme low position of the piston or water valve, whereby the flow through the device may be controlled.

A still further object of this invention is the provision of a device of the character described, having a single casing, an inlet and outlet in said casing, a piston valve for closing communication between said inlet and outlet, said piston valve being adapted for opening communication between said inlet and outlet upon the flow of water through the casing, and a second piston within said casing for causing said first piston to close communication between said inlet and outlet upon the cessation of flow of water through the casing.

A still further object of this invention is the provision of a device of the character described, which will be efficient and reliable in operation, easily and cheaply manufactured and installed, and which furthermore, embodies the desirable features of simplicity and durability.

Other objects and advantages of this invention will become apparent during the course of the following description taken in connection with the accompanying drawings.

In the accompanying drawings forming a part of this application and in which like numerals designate like parts throughout the several views:—

Figure 1, is a front elevational view of a flow control valve embodying the invention;

Figure 2, is a central longitudinal sectional view of the same; and

Figure 3, is a sectional view taken on line 3—3 of Fig. 2.

In the form selected for illustration, 1, indicates a valve casing or housing, having formed integral therewith on each side thereof interiorly screw threaded collars 2, 3, which collars form the water inlet and the water outlet respectively for the casing 1. As shown in the drawings the water inlet 2, is formed above the water outlet 3. The casing 1, forms a communicating part of the water-heater circulation and of the water pipe supplying the heater, so that, whenever water is drawn causing a flow through the heater, the water through the casing 1, commences also to flow.

The interior of the casing or housing 1, comprises a substantially elongated chamber 4, the lower portion of which is adapted to receive for sliding movement therein a piston valve 5, and the upper portion of which chamber is adapted to receive for sliding movement therein the piston 6, which in the form shown, has a clearance of a fraction of an inch all the way around from the inner wall of the chamber 4, and which we will call the auxiliary piston. The pistons 5 and 6, are mounted on a single piston rod 7, the former being secured to the lower end of the rod, and the latter being secured on the rod intermediate the ends thereof, and at such a point on the rod that when the piston valve 5, has its upper face on a level with the lower wall of the inlet 2, the piston 6, will be against the uppermost wall of the chamber 4, as shown in full lines in Fig. 2, of the drawings. The portion of the piston rod 7, beyond the piston 6, extends through the upper portion of the casing 1, and through a stuffing box 8, formed integral with said casing, said stuffing box containing packing which is held in place by a gland 9, which gland may be adjustably secured to the upper portion of the casing or stuffing box, by means of an outwardly extending annular flange 10, formed integral with said casing 1, and the bolts 11, which bolts extend through an annular flange 12, provided at the upper portion of the gland 9, and are received in screw-threaded openings provided therefor in the annular flange 10. The free end of the piston rod 7, may be connected to the steam valve supplying steam to a water heater, or to the gas valve if gas is used as the heating agent, or it may be connected to a water valve if the device is to be used as a motor.

On the outlet side of the casing 1, at the lower portion thereof, is provided a lateral extension 13, said extension extending from the bottom of the casing to a point opposite the lowermost wall of the inlet 2, and being formed integral with the casing. Formed integral with said extension 13, is the outlet 3, which communicates with the interior of the casing or the chamber 4, by means of a longitudinal slot 14, formed in said casing 1, adjacent the extension 13, said slot 14, extending from the bottom of the chamber 4, to a point near the top of the extension. The portion of the casing not cut away by the slot 14, near the top of the extension goes to form an annular seat 15, against which is adapted to seat the piston valve 5, for closing communication between the inlet 2 and the outlet 3.

The normal position of the parts is shown in Fig. 2, of the drawings, and in which the annular seat 15, prevents passage of water through the casing and thereby communication between inlet 2 and outlet 3. The upper portion of the chamber 4, is always open to the inlet 2, as shown. If now water is drawn from any one of the outlets in communication with the outlet 3, the diminishing pressure below the piston valve 5, plus the weight of the pistons and rod will cause the said pistons to descend. The piston valve 5, will descend until it completely uncovers the seat 15, and then gradually uncovers the slot 14, permitting flow of water through the casing. This operation is taken care of by the kinetic energy of the water flow from the inlet to the outlet pipe, since the slot 14, will not take care of a full flow. The distance the piston valve 5, descends depends upon the rate of flow of water at the open outlet where the water is being drawn. It will be noted that the auxiliary piston 6, will aid in maintaining the lower piston in a static condition, thus permitting the piston valve 5, to assume any intermediate position between the fully opened and fully closed position. Thus the piston valve 5, will be partially lowered by a small withdrawal of water from the heater, causing only a partial opening of the steam or gas valve connected to the piston rod, allowing a small quantity of steam or gas to pass to the heater or burner, as the case may be, sufficient to heat the amount of water which has entered the heater. In this manner only the amount of steam necessary to heat the water is used, and in the case where gas is used as the heating agent, the danger of overheating the heating coil is eliminated.

The bottom of the casing 1, may be provided with a screw-threaded opening 16, to facilitate the cleaning of the same, and in which is threaded for closing the same, a plug 17. In order to limit the extreme low point of the piston valve 5, in the chamber 4, and to provide a clearance at all times between the bottom wall of the chamber and the lower face of the piston valve, a stud 18, is provided, said stud being threaded through the plug 17, and extends into the bottom of the chamber 4. A head 19, is provided on the stud 18, on the outside of the casing to facilitate the turning of the same. By adjusting the stud 18, the extreme low point of the piston valve 5, may be varied. A lock nut 20, may be provided on the stud 18, for locking the same in any desired adjusted position.

The adjusting means just described may be placed inside the body of the valve casing, and adjusted at the time of the assembly of the device.

The rise of the pistons 5 and 6 when the outflow is stopped is due to the fact that the exposed area of the lower face of the piston 5 is greater than the exposed area of the upper face of that piston by the cross-sectional area of the rod 7. Thus, under static water condition, such as exists when there is no flow through the valve, the piston 5 will rise from its position as seated on the screw 18. Moreover, as soon as the piston leaves the screw 18 the lower exposed area of the piston is increased. Thus the excess pressure tending to raise the piston may overcome the weight, friction, etc., of the valve parts, and restore the valve to the full line position shown in Figure 2 of the drawings. This travel of the pistons 5 and 6 will, of course, cause a corresponding movement of the steam or gas valve, closing the same to shut off gas or steam applied to the heater.

The improved regulator or flow control valve is preferably constructed of strong and durable metal such as brass or the like, and while we have not illustrated the same in connection with a steam or gas water heater it is obvious that the valve may be readily used in connection with a conventional form of heater.

While the device has been illustrated as a water valve, it will be understood that it will operate on air, gas or other fluid or gaseous pressure, and may be used to control the flow of other media than steam or gas.

From the above description it will be apparent that we have produced a flow control valve embodying the features of advantages enumerated, and while we have illustrated and described the preferred embodiment of the invention we wish it to be understood that we do not desire to be restricted to the exact details of construction shown and described, as various modifications will suggest themselves to those skilled in the art.

What we claim and desire to secure by Letters Patent, is:—

1. A device of the character described, comprising a single casing, said casing having inlet and outlet ports out of line with each other, a piston-rod slidably mounted in said casing and passing through the same, a piston valve carried by one extremity of said rod and slidable in a portion of said casing and adapted to open and close communication between the inlet and outlet ports, a second piston carried intermediate the ends of said piston rod and slidable in another portion of said casing, and an elongated slot formed in said first mentioned portion of the casing, said slot forming the means of communication between that portion of the casing and the outlet port.

2. A device of the character described, comprising a single casing, said casing having inlet and outlet ports out of line with each other, a piston-rod slidably mounted in said casing and passing through the same, a piston valve carried by one end of said rod and slidable in a portion of said casing to one side of said inlet port and adapted to open and close communication between the inlet and outlet ports, a second piston carried by said rod intermediate the ends thereof and slidable in a second portion of said casing, and a longitudinal slot formed in said first mentioned portion of the casing, said slot extending substantially the full length of said portion of the casing and forming the means of communication between that portion of the casing and the outlet port.

3. A device of the character described, comprising a single casing, said casing having inlet and outlet ports out of line with each other, a piston-rod slidably mounted in said casing and passing through the same, a piston valve carried by one end of said rod and slidable in a portion of said casing and adapted to open and close communication between said inlet and outlet ports, an elongated longitudinal slot formed in said portion of the casing housing the said piston valve, said slot forming the means of communication between said portion of the casing and the outlet port, said piston valve being adapted to move to open position upon the flow of a pressure medium through the casing, and a second piston slidable in a second portion of the casing and adapted upon the cessation of flow of the pressure medium to move the first mentioned piston valve to closed position.

4. A device of the character described, comprising a single casing, said casing having inlet and outlet ports out of line with each other, a piston-rod slidably mounted in said casing and passing through the same, a piston carried by said rod and slidably mounted in a portion of said casing to one side of said inlet port and adapted to open and close communication between said inlet and outlet ports, means for adjustably limiting the movement of said piston in one direction, means for restricting communication between the portion of the casing housing the piston and the outlet port of said casing, said piston being adapted upon a flow of a pressure medium through the casing to gradually uncover said restricted means of communication to permit a gradual flow of the pressure medium through the outlet port, and means mounted in said casing adapted to move said piston to close communication between said inlet and outlet ports upon the cessation of flow of the pressure medium through the casing.

5. A device of the character described comprising a single casing having inlet and outlet ports for a pressure medium, a piston-rod slidably mounted in said casing and ex-

tending through the same, a piston valve carried by said rod and adapted to close communication between said inlet and outlet ports when the pressure medium is at rest and to open communication between said inlet and outlet ports when the pressure medium is flowing through the casing, a longitudinal slot formed in said casing adjacent the outlet port for restricting the passage therethrough, said slot being adapted to be covered and uncovered by said piston valve in its movement from its open to its closed position, and a second piston mounted in said casing for sliding movement therein and adapted to aid in moving the piston valve from its open to its closed position upon the cessation of the flow of the pressure medium through the casing.

6. A device of the character described, comprising a casing having inlet and outlet ports out of line with each other, a piston-rod slidably mounted in said casing and extending through the same at one end thereof, a piston valve carried by one end of said rod and adapted to slide in a portion of said casing, said piston valve controlling communication between said inlet and outlet ports, a seat formed in said casing for said piston valve on one side of said inlet port, said piston valve resting on its seat when the pressure medium is at rest, closing communication between said inlet and outlet ports, and being adapted to move away from said seat to open communication between said ports upon a flow of pressure medium on one side thereof, means formed in said casing adjacent the outlet port for causing an equalizing of pressure on said piston valve on both sides thereof upon the cessation of flow of pressure medium, and a second piston mounted in said casing for moving said piston valve to its closed position on said seat when the flow of said pressure medium ceases.

In testimony whereof we affix our signatures.

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DAVID F. PRISER.