No. 895,343. PATENTED AUG. 4, 1908.

G. W. COLLIN.

REDUCING VALVE.

APPLICATION FILED AUG. 17, 1907.

Fig. 1.

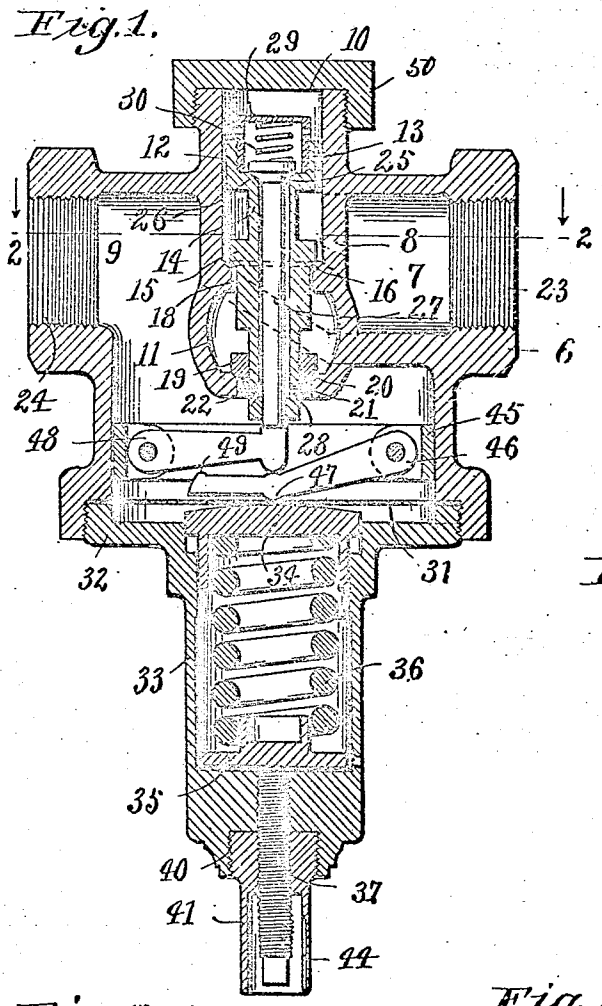


Fig. 3.

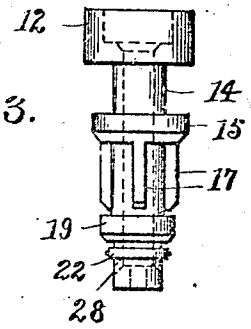


Fig. 4.

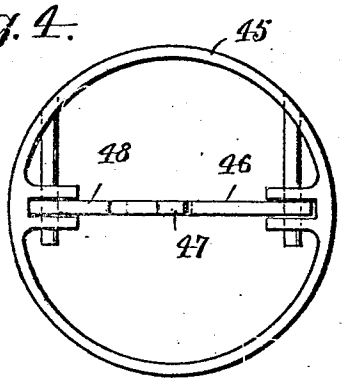


Fig. 5.

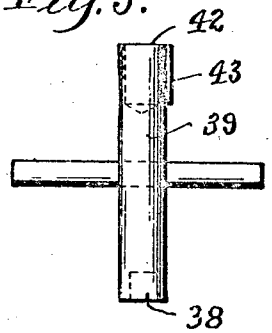
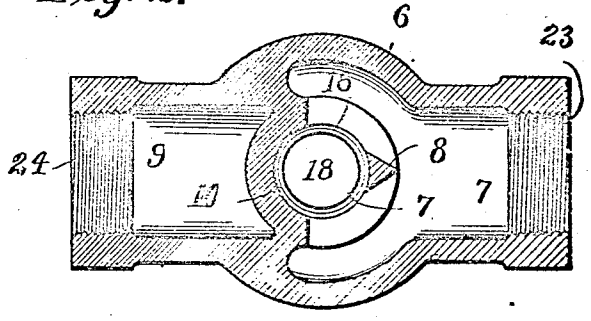


Fig. 2.



Witnesses

R. H. Newman

Edward K. Nicholson

Inventor

George W. Collin

By Chambulain & Newman

Attorneys

UNITED STATES PATENT OFFICE.

GEORGE W. COLLIN, OF MANSFIELD, OHIO.

REDUCING-VALVE.

No. 895,343. Specification of Letters Patent. Patented Aug. 4, 1908.

Application filed August 17, 1907. Serial No. 389,062.

To all whom it may concern:

Be it known that I, GEORGE W. COLLIN, a citizen of the United States, and resident of Mansfield, in the county of Richland and State of Ohio, have invented certain new and useful Improvements in Reducing-Valves, of which the following is a specification.

My invention relates to steam pressure reducing and regulating valves and particularly to low pressure valves adapted for individual railroad car heating systems as well as for many other services.

The object of the invention is to provide an automatically operated reducing valve which will be especially applicable to low pressures of steam in that it is sensitive to slight variations of pressure and effective in its operations; to provide means intermediate the valve and the diaphragm for increasing the movement of the valve; to provide in connection with a piston a double valve wherein lost movement of one valve with relation to the other is obtained and whereby the main valve is saved from steam cutting, and to employ in connection with such a double valve, a cushion chamber and ports all of which insure the even balancing of the valve and perfect operation of the device; further to provide means for adjusting the tension of the steam actuating device which includes mechanism for holding said adjustment in position when the valve is open.

My invention particularly refers to that class of reducing valves, comprising in part a high and low pressure chamber with a combined piston valve operating intermediate thereof, an auxiliary valve intermediate the high and low pressure chambers, but so arranged with relation to the main piston valve as to control its operation actuated by the steam pressure and finally to an adjustable diaphragm actuated by the steam in low pressure side of valve for manipulating the auxiliary valve, and which produces an automatically operated or balanced valve controlled by the steam pressure in low pressure side.

Similar characters of reference denote like or corresponding parts throughout the several figures of the accompanying drawings, and of which,

Figure 1, shows a central, vertical longitudinal section through my improved type of reducing valve. Fig. 2, is a longitudinal section taken through the valve body on line 2—2 of Fig. 1. Fig. 3, is a detached side elevation of double piston valve. Fig. 4, is a detached inverted plan view of the ring shown in Fig. 1, with multiplying levers connected. Fig. 5, is a side elevation of key for operating and locking the regulating screw.

Referring in detail to the characters of reference marked upon the drawings 6 indicates a body which is chambered to form the several compartments of my valve including inlet chamber 7, having a vertically disposed spreader 8 located central of the intake, an outlet chamber 9, valve chamber 10 and cushion chamber 11. The chamber 10 as will be seen is divided by a piston 12 which is provided with a small perforation 13 that admits a passage of steam from the inlet chamber 7 to the upper part of chamber 10. The said piston 12 is mounted upon a stem 14 to which is also integrally formed a valve 15 fitted to a seating 16 and having depending guide wings 17 which operate vertically in the port 18 secured in bottom of valve chamber 10. Upon the lower portion of the valve stem 14 is slidably mounted a valve 19 which is fitted to the seat 20 surrounding the lower port 21. Said slidable valve being retained in operative position upon the stem by a collar 22 secured to the stem.

It will be noted from the above that when the valve is open the high pressure chamber 7 and cushion chamber 11 are connected through the before mentioned port 18 and that the cushion chamber 11 communicates through port 21 with the lower pressure side 9. It will further be apparent that the live steam enters the high pressure chamber 7 through the inlet 23 and its inflow is divided by the vertically disposed spreader 8 which serves to distribute the steam and equalize the pressure upon all sides of the valve and that the outlet 24 from low pressure side 9 of valve is located on opposite side from the intake.

The double piston valve 12 is chambered to receive the auxiliary valve 25 that engages an annular seat 26 in piston chamber and contains a depending stem 27 the lower end of which is guided in the contracted portion of opening as shown. Small ports 28 in side of piston valve stem admit of a passage of steam therethrough when auxiliary valve is open. A perforated cap 29 threadably engages the piston and serves to inclose a light pressure spring 30 which bears upon top of auxiliary valve to insure the proper seating of same.

In the lower portion of the casing A is mounted a diaphragm 31 secured in position by the threaded head 32 of the spring casing 33. Within the spring casing is mounted an upper hub 34, a lower hub 35, and a spring 36 against the opposite ends of which the said bushing rests. The top of the upper bushing 34 engages the before mentioned diaphragm 31 while the lower bushing 35 is engaged by an adjusting screw 37. This adjusting screw contains a shouldered square head for the engagement of the socket 38 in one end of key 39 whereby the tension of the spring against the diaphragm may be changed if desired to increase or decrease the amount of pressure required to operate the valve. The lower end of the spring case is chambered as at 40 and tapped to receive an externally threaded locking shield 41 which is also threaded upon the inside with a different pitch thread to form a differential lock for the screw. The said shield is obviously operated by inserting the opposite end 42 of the key 39 in the shield, the pocket in this end of the key loosely covers the shouldered end of the screw while its rib 43 engages the groove 44 of the shield to insure the turning of the latter by the manipulation of the key when the end 42 is placed therein.

The means for multiplying the movement of the valves actuated by the diaphragm, comprises a multiple lever connection that is mounted in the lower portion of the valve and for convenience of assemblage is attached to a ring 45 within said hub. To the inner edge of one side of this ring is pivoted a lower lever 46 having an intermediate enlargement 47 thereon, and an upper short lever 48 also pivoted upon the inner but opposite edge of the ring. The lower side of the inner end of this lever is in engagement with the top of the enlargement 47 while the opposite or top side of the end of the lever serves to engage the lower extremity of the auxiliary valve stem, and likewise the main valve stem when in operation. The underside of the enlargement 47 of the long lever 46 rests upon the top surface of the diaphragm while the extreme end portion 49 is normally free from engagement with the lever 48. The preliminary engagement or movement of greatest resistance, is direct through the intermediate portion 47 and the inner end of short lever 48 to auxiliary valve stem 27, while the final movement imparted from the diaphragm is through the end 49 of long lever 46 to intermediate portion of short lever 48 the free end of which engages the lower end of stem of the main valve 15.

From the foregoing construction it will be noted that the several operative parts, of the valve are made detachable and in a way to permit of their removal without disturbing the other parts. For instance, the combined piston and double valves as well as the auxiliary valve can be taken out by simply removing the screw cap 50. The diaphragm and tension mechanism can also be disconnected for cleaning or repairs by unscrewing the head 32 to disconnect the spring case. This latter feature can be accomplished while the main steam pressure is one valve.

Assuming that the valve is in use with the several chambers filled in their respective capacities, but all parts being in a closed position, it will be noted that the decreasing pressure in the low pressure chamber 9 connected with the heating system, would permit the central portion of the diaphragm to be forced up by the action of the spring 36 thus first acting direct through the engagement of the lever 46 and end of lever 48 to move the auxiliary valve 25 to release the pressure from chamber 10 above the piston. Immediately following this initial movement the levers would separate at that point, and the movement of the lower lever would be imparted to the upper one through the contact 49 and from said upper lever to the lower end of stem of valve 15 to open the same, thus requiring but a slight movement of the diaphragm and lower lever to effectively operate both valves.

With the parts in the position shown in the drawing the operation of the valves would be as follows: Steam being admitted to the valve through the intake 23 and divided by the splitter bar S it passes through the small perforation in the piston 12 equalizing the pressure on both sides of the piston in a way to hold the valve 16 closed with a force equal to the initial pressure. The steam is next admitted to low pressure side 9 of the valve by a manual operation of screw 37 which through the medium of spring 36, lifts diaphragm 31, levers 46 and 48, and the valves 25 and 15. With the rising of the steam pressure above normal in the low pressure side 9 of the valve, the diaphragm is forced outward or downward against the pressure of the spring and allows the valves to approach their seat, should the pressure fail in low pressure side below normal the action of the spring against the diaphragm through the medium of the levers lifts the valve allowing more steam to enter the low pressure side. The slightest increase of service pressure will force the diaphragm outward, to a point regulated by the tension of the spring, reducing the flow of steam through the valve.

In relation to the operation of the main valves with respect to its cushion chamber and ports leading to and from the same, it will be noted that the valve 15 is lifted from its seat by the piston 12 without raising the lower valve 19 until the said upper valve 15 is clear off its seat, in a way to allow a free flow of steam into the cushion chamber. The continued movement of the valve and its stem however brings the collar 22 into en-

gagement with the underside of the valve 19 in a way to also raise it from its seat thus providing for a free passage of steam through the valve. It is also apparent that in the closing of the valve the lower valve 19 is first seated in a way to check the flow of steam, whereupon the main valve is seated to effectively close the valve.

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

1. In a reducing valve, the combination of a piston valve, an auxiliary valve, a diaphragm and spring for operating the same and means for imparting a direct preliminary movement to the auxiliary valve and a multiplied final movement to both the auxiliary and piston valve.

2. In a reducing valve of the class described, the combination of a piston valve, an auxiliary valve, a diaphragm and spring for operating the same, means for imparting a direct preliminary movement of the diaphragm to the auxiliary valve and a multiplied movement to the piston valve.

3. In a reducing valve, the combination of a piston valve, an auxiliary valve, a diaphragm and spring for operating the same, a pair of levers intermediate the diaphragm and valves so connected and arranged as to impart a direct preliminary movement to the auxiliary valve and a multiplied final movement to both the auxiliary and main valve.

4. A reducing valve of the class described the combination with a main valve, an auxiliary valve, a diaphragm and spring for operating the same, a pair of coacting levers intermediate the diaphragm and valves for imparting a multiplying movement to the auxiliary valve, and a detachable ring to which the levers are connected.

5. In a reducing valve, the combination with a piston, a main valve, an auxiliary valve, a diaphragm to operate the valves, a spring to regulate the tension of the diaphragm, a casing to inclose the spring, a screw for adjusting the spring, and a shield threadably engaging both the screw and casing, and having an open chamber in its end to receive a key, with different pitch threads to form a differential thread lock for the regulating screw.

6. In a reducing valve, the combination with a main valve, an auxiliary valve, a diaphragm to operate the valves, a spring to regulate the tension of the diaphragm, a casing to inclose the spring, a shield threadably engaging the casing and having a groove therein for the engagement of a key, and an adjusting screw engaging both the casing and shield.

7. In a reducing valve, the combination of a casing having a steam chamber, a cushion chamber and ports leading from one chamber to the other and to an outlet, a piston valve having a stem, a valve loosely mounted upon the stem and whereby a preliminary movement of one valve is permitted with relation to the ports in advance of the other valve.

8. In a valve, the combination of a casing having a steam chamber, a cushion chamber, ports leading from one chamber to the other end to an outlet, a piston valve having guide wings to engage the port intermediate of steam and cushion chamber and having an integral stem extended below the guide wings, a supplementary valve loosely mounted upon the stem whereby a preliminary movement of the valve upon the stem is permitted with relation to the ports in advance of the other valve.

9. In a valve, the combination of a piston and an auxiliary valve, a diaphragm for operating the same, a steam chamber, having an outlet port to a cushion chamber, a cushion chamber having an outlet port to low pressure side of valve, a supplementary valve loosely mounted upon the stem of main valve whereby a preliminary movement of one valve upon the stem is permitted with relation to its port, in advance of the other valve on stem.

10. A reducing valve comprising a diaphragm, a main valve chamber, and a cushion chamber having an inlet port from the main steam chamber and an outlet, of a piston mounted in the main steam chamber, a valve to close the port leading to the cushion chamber, a second valve loosely connected with the stem of the first valve for engaging outlet port from the cushion chamber, whereby a movement of one valve is effected by the movement of the stem and in advance of the movement of the other valve.

Signed at Mansfield, in the county of Richland, and State of Ohio this 29th day of July, A. D., 1907.

GEORGE W. COLLIN.

Witnesses:
J. ROWLAND BROWN,
P. J. KELLEY.