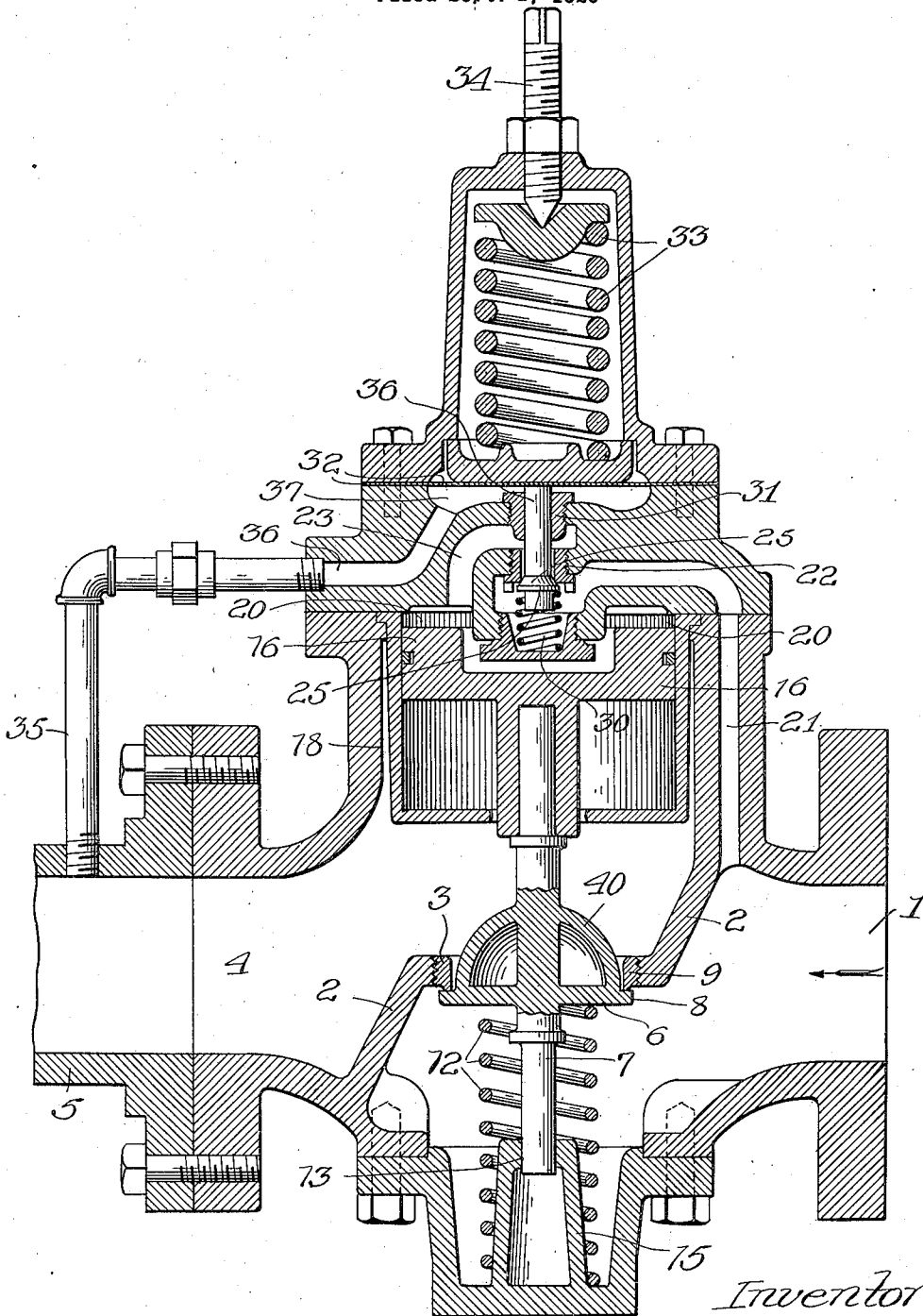


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H. J. RICHTER
REGULATING VALVE

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HARRY J. RICHTER, OF WILMETTE, ILLINOIS.

REGULATING VALVE.

Application filed September 1, 1920. Serial No. 407,359.

To all whom it may concern:

Be it known that I, HARRY J. RICHTER, a citizen of the United States, residing at 707 Greenwood Ave., Wilmette, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Regulating Valves, of which the following is a specification.

This invention relates to improvements in regulating valves and more especially to that type of regulating valves known as pressure regulating valves or reducing valves which are designed to be placed in a steam line for the purpose of constantly delivering steam at a predetermined pressure regardless of variations in the initial pressure or volume of discharge. Although the valve is described and referred to in connection with its use in a steam line, it is obvious, that, without detracting from the spirit of this invention, the valve may be used with any other fluid.

One of the features of my invention is to provide a regulating valve of the type referred to above, which will be positive, accurate, and quick in operation, and which will not pulsate or chatter even though the steam demand be very slight or intermittent.

The features referred to above, and others, will appear more fully as I proceed with my specification.

In the accompanying drawing there is shown a vertical cross sectional view of a valve embodying the features of my invention.

As shown in said drawing, 1 indicates the opening into the valve which is connected to the boiler or other source of supply of steam. The course of travel of steam into the valve is indicated by the arrow. The main passage 1 into the valve passes below the obliquely arranged diaphragm 2, thence upwardly through the circular opening 3 in the diaphragm 2, thence outwardly from the valve on the service side, through the passage 4 to which is attached the delivery pipe 5.

The opening 3 in the diaphragm 2 is controlled by a vertically movable valve disk 6 mounted on the stem 7, and provided with a radial flange 8 adapted to rest on a seat 9 at the edge of the opening 3. Arranged below the valve disk 6 and surrounding the lower end of the stem 7 is a spiral spring 12 tending to raise the valve disk and hold the

flange 8 in engagement with the seat 9. The lower end of the stem 7 is guided in a hole 13 provided in the upwardly projecting boss 15. The upper end of the valve stem 7 has mounted upon it a piston 16 adapted to operate in a cylinder 18. Communication between the passage 1 and the space 20 in the cylinder 18 above the piston 16 is afforded by means of the port 21 leading from the passage 1 to the opening 22, and the port 23 leading from the opening 22 to the space 20. The opening 22 is controlled by an auxiliary valve comprising the valve disk 25 mounted on the vertically slidable stem 26. The valve disk 25 rests on a spiral spring 30 tending to hold the disk up to close the opening 22. The valve stem 36 is slidably mounted in a suitable bushing 31. The upper end of the valve stem 26 bears against a metal diaphragm 32 which is adapted to be pressed down by the spiral spring 33 which in turn is adapted to be adjusted by means of the adjusting screw 34. A small pipe 35 is adapted to admit steam from the delivery pipe 5 into the port 36 which leads to the space 37 below the diaphragm 32.

In operation, the valve is controlled by the reduced pressure on the service side communicating through the pipe 35 to the under side of the diaphragm 32 which is balanced by the spring 33 which can be adjusted by the screw 35 for any pressure that may be desired on the outlet or service side of the valve. The small auxiliary valve disk 25 controlling the opening 22 is held in contact with the diaphragm 32 by means of the spring 30 and opens or closes with changes in the pressure of the steam in the pipe 5 on the service side of the valve. When the opening 22 is opened, the initial pressure from the boiler side of the valve is admitted into the space 20 above the piston 16 by means of the ports 21 and 23 and opening 22, to force the piston 16 down and open the main valve disk 6, thus admitting steam through the main passage of the valve to the service side. Pressure on the piston 16 will lower the same because the area of the valve disk 6 is only about one-half that of the piston 16.

When the pressure in the system or service side has reached a point determined by the spring 33, the diaphragm 32 is forced upward thus allowing the auxiliary valve 25 to close, shutting off steam to the space 20 above the piston 16, thus permitting the

main valve disk 6 to be seated by the initial pressure. Any pressure left on top of piston 16 exhausts around the same and passes off into the system. The spring 12 below the valve disk 6 takes the weight of the piston 16 and valve disk, and operates to close the valve when the steam is off.

It is obvious, that in cases where the demand for steam is slight, so that only a small quantity passes through the opening 3, and in other cases where the opening 3 is required to be opened but a small amount, or rapidly opened and closed, that there is a likelihood of the valve disk 6 pulsating, vibrating or chattering against the seat 9. In order to prevent such vibrating, pulsating and chattering, I form the valve disk 6 with a hemispherical part or closure extension 40 on its upper surface projecting upwardly through the opening 3. The diameter of such closure extension at its lower edge is substantially the same as the diameter of the opening 3. It will be noted, that because of the extension 40 on the valve disk 6, that the extent to which the opening 3 will be opened by downward travel of the disk 6 will not be in direct proportion to the distance of such travel; but that the first part of the downward movement of such disk 6 will serve to open the opening 3 but a small amount, and further movement will open it more rapidly. In other words, in order to open the opening 3, a small amount at first, considerable downward movement of the valve disk 6 is required. During the downward travel of the disk 6, however, as the extension 40 is drawn out of the opening 3, such opening will be opened more and more rapidly. The purpose of this construction of the valve disk 6 with the extension part 40, is thus to require considerable movement of the disk 6 at the start in order to give a small opening. Because of this construction, therefore, where the demand for steam is slight so that only a small quantity passes through the opening 3, the valve disk 6 will nevertheless be a considerable distance below the seat 9 so that there is no possibility of its chattering or vibrating or pulsating against such seat. Also, in cases where the demand for steam is slight and intermittent, causing successive small openings, each such opening will require a movement of the disk 6 downwardly a considerable distance from the seat 9, thus preventing any chattering on the seat. Although I have shown the extension 40 on the valve disk 6 as being substantially hemispherical in shape, it is obvious, that without detracting from the spirit of this invention, it may have any one of a great variety of shapes. For example, it may be ellipsoidal. In general, it may be said, that the disk 6 must be provided with an extension of any suitable

shape, projecting through the opening 3 so that considerable downward movement of the disk will be required at the start to open such opening a small distance.

While I have shown and described certain embodiments of my invention, it is to be understood that it is capable of many modifications. Changes therefore in the construction and arrangement may be made without departing from the spirit and scope of the invention as disclosed in the appended claims, in which it is my intention to claim all novelty inherent in my invention as broadly as possible in view of the prior art.

What I claim as new, and desire to secure by Letters Patent is:

1. A regulating valve comprising, in combination, a valve casing having inlet and outlet chambers and an opening connecting said chambers, a valve seat about said opening, a valve disk coacting with said seat, a projection carried by said disk extending into said opening and substantially filling the same when the valve is closed, said disk so shaped as to require a substantial movement of the valve to allow small quantities of fluid to pass and to increase the effective opening by a rapidly increasing ratio as the valve is opened further, a valve stem on the valve disk, a piston on the valve stem adapted to operate in a cylinder, a passage leading from the inlet chamber to one end of said cylinder, and a valve in said passage controlled by pressure on the service side of the regulating valve.

2. A regulating valve comprising, in combination, a valve casing having inlet and outlet chambers and an opening connecting said chambers, a valve seat about said opening, a valve disk coacting with said seat, a projection carried by said disk extending into said opening and substantially filling the same when the valve is closed, said disk so shaped as to require a substantial movement of the valve to allow small quantities of fluid to pass and to increase the effective opening by a rapidly increasing ratio as the valve is opened further, a valve stem on the valve disk, a piston on the valve stem adapted to operate in a cylinder, a passage leading from the inlet chamber to one end of said cylinder, a valve in said passage, a valve stem on said valve, and a diaphragm adapted to move said valve stem, said diaphragm adapted to be moved by pressure on the service side of the regulating valve.

3. In a regulating valve, a supply opening on one side, a service opening on the other side, a main passage through the valve connecting said openings, a valve surrounding said opening in said passage, a seat surrounding said opening, said valve comprising a valve disk with its periphery adapted to seat on the seat surrounding said opening and

having a closure extension projecting through the opening inside of and free from the surrounding seat and substantially closing said opening when the periphery of the valve disk is seated, said extension being relatively wide where it is joined to the disk and narrow towards its other end, whereby substantial movement of the valve is required to allow small quantities of fluid to pass and further movement opens the opening in increasing ratio, said valve disk also being provided with a valve stem, a piston on the valve stem adapted to operate in a cylinder, a passage leading from the inlet chamber to one end of said cylinder, and a valve in said passage controlled by pressure on the service side of the regulating valve.

4. In a regulating valve, a supply opening on one side, a service opening on the other side, a main passage through the valve connecting said openings, a valve controlled opening in said passage, a seat surrounding said opening, a valve regulating said open-

ing, said valve comprising a valve disk with its periphery adapted to seat on the seat surrounding said opening and having a closure extension projecting through the opening inside of and free from the surrounding seat and substantially closing said opening when the periphery of the valve disk is seated, said extension being substantially hemispherical in shape, whereby substantial movement of the valve is required to allow small quantities of fluid to pass and further movement opens the opening in increasing ratio, said valve disk also being provided with a valve stem, a piston on the valve stem adapted to operate in a cylinder, a passage leading from the inlet chamber to one end of said cylinder, and a valve in said passage controlled by pressure on the service side of the regulating valve.

In testimony whereof, I have hereunto set my hand and seal this 12th day of August, A. D. 1920.

HARRY J. RICHTER. [L. S.]