W. B. STORK.

AUTOMATIC STEAM STOP VALVE.

APPLICATION FILED OCT. 17, 1919.

1,424,949. Patented Aug. 8, 1922.

Fig. 2.

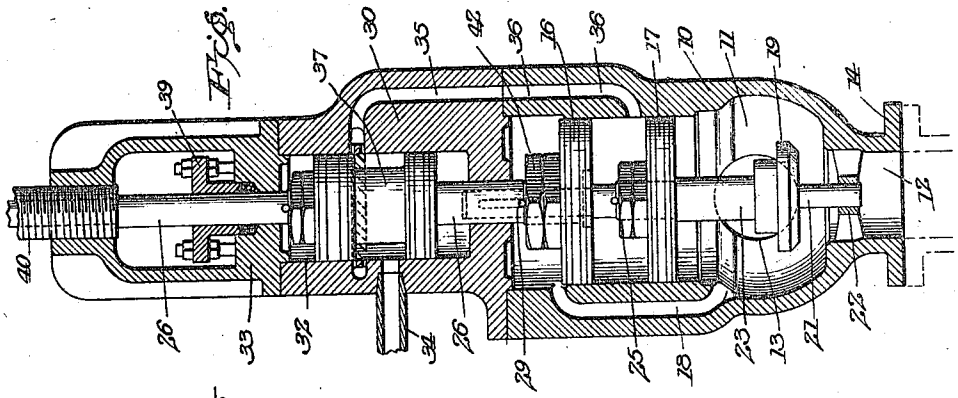


Fig. 3.

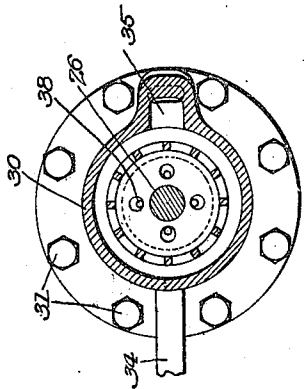


Fig. 4.

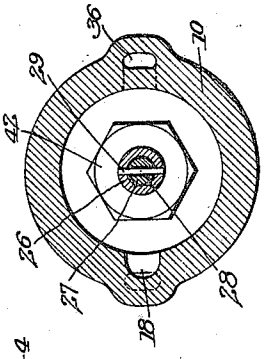
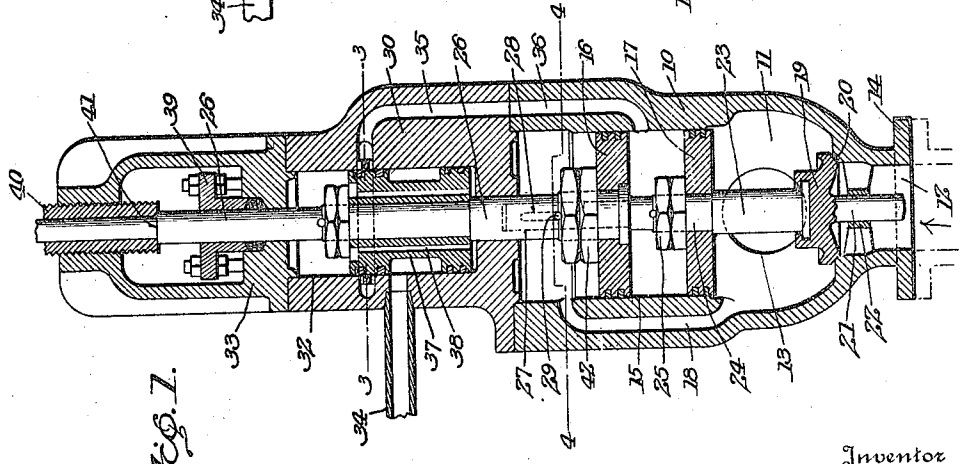


Fig. 7.



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UNITED STATES PATENT OFFICE.

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AUTOMATIC STEAM STOP VALVE.

1,424,949. Specification of Letters Patent. Patented Aug. 8, 1922.

Application filed October 17, 1919. Serial No. 331,432.

To all whom it may concern:

Be it known that I, WILLIAM B. STORK, a citizen of the United States, residing at Andover, Essex county, State of Massachusetts, have invented certain new and useful Improvements in Automatic Steam Stop Valves, of which the following is a specification.

The present invention relates to stop valves of the type especially adapted for use in connection with steam boilers.

The objects of the invention are to provide a valve which will automatically close when the pressure on the boiler side thereof is reduced, as when a tube bursts, and also to provide a valve which will automatically close when the pressure on the steam main side of the valve is reduced as when the steam main breaks. Other objects and features of novelty will be apparent from the discription taken in connection with the drawings in which:

Figure 1 is a sectional elevation taken through a valve constructed in accordance with the present invention, the valve being shown in closed position;

Figure 2 is a sectional elevation similar to Figure 1 but showing the valve open;

Figure 3 is a transverse sectional view taken on the line 3—3 of Figure 1; and

Figure 4 is a similar view taken on the line 4—4 of Figure 1.

Referring to the drawings it will be seen that the valve of the present invention comprises a body 10 formed with an interior chamber 11 having the fluid inlet 12 and the fluid outlet 13. Adjacent the inlet 12 the body is formed with a flange 14 for connecting the same to the outlet of the steam boiler, for example, although any other suitable means may be used for making this connection. The outlet 13 has communication with the steam main with which a plurality of boilers may have connection there being one of the present valves at the outlet of each of the boilers. Above the chamber 11 the body 10 is formed as a cylinder 15, there being a pair of spaced pistons 16 and 17 slidably disposed in this cylinder. Means is also provided to afford comunication between the chamber 11 and the space above the upper piston 16. As shown this is accomplished by the passage 18 formed in the wall of the body.

The inlet passage 12 is adapted to be controlled by the main valve which is in the form of a disk 19 adapted to engage the seat 20 of the body. In order to properly guide this disk in its opening and closing movements it may be provided with a depending pin 21 slidably mounted in the guide 22. A valve stem 23 loosely engages the upper side of the disk 19 in any suitable manner and also carries the piston 17. As shown the stem 23 is reduced at 24 for the piston 17 and the piston is clamped against the shoulder thus formed by the nuts 25. The other piston 16 is secured to the lower end of a spindle 26. This lower end is counterbored to receive the reduced upper end of the spindle 23. This reduced upper end 27 is slidably mounted within the counterbore of the spindle 26 for limited relative movement. As shown, this is accomplished by forming the upper end 27 of the stem with the longitudinal slot 28 through which a pin 29 extends, said pin being carried by the spindle 26. The object of this construction will be described later.

The upper end of the valve body 10 is closed by a cap member 30 secured to the body in any suitable manner as by means of the cap screws 31. The spindle 26 extends through this cap member 30 and the member is formed with a cylindrical chamber 32, which is closed at its upper end by a bonnet 33 through which the spindle 26 projects. The valve chamber 32 has communication with fluid at the same pressure as in the inlet passage 12, that is to say, the valve has communication with the boiler by means of the pipe 34. The valve chamber 32 also has communication with the space between the pistons 16 and 17, the aligned passages 35 and 36 in the walls of the cap and valve body respectively being provided for this purpose. Communication between the pipe 34 and the passage 35 is controlled by a piston valve 37 slidable in the chamber 32. This valve is secured to the spindle 26 and moves with the latter. When the main valve 19 is closed the piston valve 37 is in the position shown in Figure 1 and communication between the pipe 34 and passage 35 is cut off. However, when the spindle 26 moves upward with the opening movement of the main valve the piston valve 37 assumes the position shown in Figure 2 and thus the space between the pistons 16 and 17 is put in communication

with the boiler or with fluid at the same pressure as in the inlet passage 12 of the valve. In order to permit free longitudinal movement of the piston valve 37 in its chamber, the valve is formed with a plurality of longitudinally extending passages 38, so that fluid may pass from one side to the other of the piston valves without obstructing the latter.

A suitable stuffing box 39 is provided where the spindle 26 emerges from the bonnet 33. The main valve is closed by turning the sleeve 40 which operates against a shoulder 41 on the spindle 26. The valve is allowed to open by turning the sleeve 40 in the direction to raise the same.

In the operation of a valve constructed in accordance with this invention, the valve is opened by turning the sleeve 40 so as to raise the same. This permits the main valve 19 to rise from its seat when the pressure below the valve is sufficient or when the stem is positively raised until its upward movement is stopped by the nuts 42 striking the cap member 30, or the shoulder 41 on the spindle 26 striking the sleeve 40. When the valve is open, as illustrated in Figure 2, it will be observed that the pistons 16 and 17 on their opposite faces are subjected to pressure the same as in the chamber 11. The space between the pistons 16 and 17, however, is in communication with the boiler or inlet passage of the valve and consequently the pressure in this space is the same as in the boiler. The valve disk 19 is subjected to boiler pressure on its under face, and on its upper face, to the pressure of the main steam line, which is the same as the boiler pressure when the valve is open. It is to be noted further that the valve disk 19 has a loose connection with the bottom of the stem 23, this construction being common and permitting steam pressure to be exerted over the entire upper area of the valve disk. If the pressure in the boiler should fall considerably, as from a burst tube or similar cause, there would be a rush of steam from the main steam line toward the boiler, which in conjunction with the sudden reducing of pressure in the space immediately below the valve disk would force the valve shut. It will be observed that the pressures acting on the pistons 16 and 17 as described above are balanced and hence it is only the difference in pressures acting on the valve disk that causes it to close in this instance, the valve 19 and piston 17 being movable together and independently of the piston 16 in a direction to close the valve 19.

The valve will also be closed if the pressure in the steam main is reduced. When the pressure in the steam main falls the pressure in the space above the upper piston 16 also falls while the pressure in the space between the two pistons 16 and 17 is the same as the boiler pressure. Hence the high pressure on the lower face of piston 16 holds this piston upward as far as it will go. The pressure on the upper face of the lower piston 17 is greater than on its lower face. Hence it is moved downward thus carrying the valve 19 to its seat, this relative movement of the valve stem 23 and valve spindle 26 being permitted because of the pin and slot connection between them.

It will be seen therefore that a valve constructed in accordance with the present invention will automatically close when the pressure in the inlet passage is sufficiently reduced or when the pressure in the outlet passage is reduced. Furthermore, the present valve is a unitary structure, no outside pilot valves or other devices being required.

Although a specific embodiment of the invention has been described in detail, it is to be understood that the invention is not thus limited, but includes modifications and changes which come within the scope of the appended claims.

Having thus described the invention what is claimed as new and desired to be secured by Letters Patent is:

1. An automatic stop valve including in combination, a valve body formed with a chamber having an inlet passage and an outlet passage, a valve controlling the inlet passage constructed to close when the pressure in the inlet passage is less than in the chamber, a cylinder, a stem connected with the valve extending into said cylinder, a pair of spaced pistons in said cylinder, the one adjacent the valve being secured to said stem, a slidable spindle secured to the other piston and projecting outside the cylinder, said stem and second piston being connected for limited relative longitudinal movement, the spaces at the opposite ends of said pistons being in communication with fluid at the same pressure as in the outlet passage, and a valve controlling the supply of fluid at the same pressure as in the inlet, to the space between said pistons.

2. An automatic stop valve including in combination, a valve body having a chamber formed with an inlet passage and an outlet passage, a main valve controlling said inlet passage having a stem, a cylinder aligned with said stem, a pair of spaced pistons slidable in said cylinder the piston adjacent the valve being secured to said stem, a spindle secured to the second piston projecting outside the valve body, there being a connection between the stem and second piston to permit limited relative longitudinal movement, the space on the spindle side of said second piston being in communication with fluid at the same pressure as in the outlet passage, the space between the pistons being in communication with fluid at

the same pressure as in the inlet passage, and a valve controlling said last mentioned communication.

3. An automatic stop valve including in combination, a valve body formed with a chamber and cylinder, said chamber having an inlet passage and an outlet passage, a pair of spaced pistons slidable in said cylinder, a valve controlling said inlet having a stem connected to the adjacent piston, a second cylinder, a piston valve in said second cylinder, a slidable spindle connected with the piston valve and secured to the second of said pistons there being a connection between said stem and the second piston constructed to permit limited relative longitudinal movement, said piston valve being adapted to admit fluid at the same pressure as in the inlet passage, to the space between said pistons and the space above the second piston being in communication with said chamber.

4. An automatic stop valve including in combination, a valve body having a chamber provided with a fluid inlet passage and an outlet passage, a valve controlling said inlet constructed to close when the pressure in the inlet is less than in the outlet and means to close the valve when the pressure in the outlet is less than in the inlet including a cylinder, a piston movable in said cylinder and with said valve, said piston on one face being subject to fluid at the same pressure as in the chamber, and an auxiliary valve carried by said body controlling the supply of fluid at the same pressure as in the inlet, to the other face of said piston, said auxiliary valve being opened by the opening movement of the first mentioned valve.

5. An automatic stop valve including in combination, a valve body having a chamber provided with a fluid inlet passage and an outlet passage, a valve controlling said inlet constructed to close when the pressure in the inlet is less than in the outlet and means to close the valve when the pressure in the outlet is less than in the inlet including a cylinder, a piston movable in said cylinder and with said valve, said piston on one face being subject to fluid at the same pressure as in the chamber, and an auxiliary piston valve carried by said body coaxially with said piston controlling the supply of fluid at the same pressure as in the inlet to the other face of said piston, said piston valve being automatically opened simultaneously with the opening of the first mentioned valve.

6. An automatic stop valve including in combination, a valve body having a chamber provided with a fluid inlet passage and an outlet passage, a valve controlling said inlet constructed to close when the pressure in the inlet is less than in the outlet and means to close the valve when the pressure in the outlet is less than in the inlet including a cylinder in said body coaxial with said valve, a piston movable in said cylinder and secured to said valve, said piston on one face being subject to fluid at the same pressure as in the chamber, a conduit for supplying fluid at the same pressure as in the inlet, to the other face of the piston, a cap secured to the body, and an auxiliary valve in said cap controlling said conduit, said auxiliary valve being opened by the opening movement of the first mentioned valve.

7. An automatic stop valve including in combination, a valve body having a chamber formed with an inlet passage and an outlet passage, a main valve controlling said inlet passage having a stem, a cylinder aligned with said stem, a pair of spaced pistons slidable in said cylinder the piston adjacent the valve being secured to said stem, a spindle secured to the second piston projecting outside the valve body, there being a connection between the stem and second piston to permit limited relative longitudinal movement, the space on the spindle side of said second piston being in communication with fluid at the same pressure as in the outlet passage, the space between the pistons being in communication with fluid at the same pressure as in the inlet passage, and a valve controlling said last mentioned communication, said last mentioned valve being secured to said spindle.

8. In an automatic stop valve, the combination with a valve body having a chamber therein provided with an inlet opening having an inwardly facing valve seat and an outlet opening and a cylindrical extension in line with the inlet opening, of a valve in said chamber fitting said valve seat and movable therefrom in the line of said cylinder, a piston in the end portion of said cylinder facing the valve, a connection between said piston and valve, a second piston in said cylinder beyond and spaced from said first piston, the said pistons being movable within limits with reference to each other, cooperating means for limiting the approach of said pistons towards each other, means for maintaining fluid pressure on the outer face of said second piston equal to that in said chamber to which the face of said first piston is exposed, mechanical means for moving said second piston to such position as to close said valve through the interposed first piston and connection or to a position such as will permit said valve to open, and means controlled by said second piston for supplying fluid independent of but under substantially the same pressure as that in the chamber to the space in said cylinder between said pistons when the valve is open.

9. An automatic valve for connecting a

boiler to a steam main, comprising in combination, a valve body or casing having a chamber therein provided with an inlet opening from the boiler having an inwardly facing valve seat and an outlet connection to said steam main and a cylindrical extension in line with the inlet opening, of a valve in said chamber fitting said seat and movable therefrom towards said cylinder, a piston in said cylinder exposed on its under surface to the steam pressure in said chamber, connecting means between said piston and valve whereby they move together, means for supplying a fluid from a source separate from the steam main but under substantially the same pressure as the normal pressure in the steam main to the upper side of said piston, thus so balancing it normally as to permit the valve to automatically open or close as the relative pressure in the boiler and steam main varies, but causing the valve to close through the overbalance of pressure on said piston when the pressure in the main suddenly falls much below normal as by a break in it, and a second piston in said cylinder above said first piston exposed on its upper or outer face to the steam pressure in the main and movable within limits towards and away from said first piston adapted in its lower position to close the valve and the supply of fluid under pressure to the upper surface of the first mentioned piston, and in its upper position to open said fluid connection and to permit the valve to open.

10. An automatic valve for connecting a boiler to a steam main, comprising in combination, a valve body or casing provided with a chamber having an inlet from the boiler and an outlet to the steam main, an automatic control valve for said inlet adapted to normally open on an excess of pressure in the boiler, and close on an excess of pressure in the steam main, of a cylinder containing two spaced pistons having free limited relative movements substantially equal to the normal movement of the valve, means connecting one piston to move with the valve, means for normally balancing the pressure on said pistons by means of steam connection from the main to their outer surfaces and a connection from another source of fluid under substantially equal pressure to the space normally between the pistons, and means for moving said second piston and closing said connection when the valve is closed.

11. An automatic stop valve including in combination, a valve body formed with a chamber having an inlet passage and an outlet passage, a valve controlling the inlet passage constructed to close when the pressure in the inlet passage is less than in the chamber, an open ended cylinder in line with said valve opening having a connection at its upper end to said chamber and having an inlet connection near its central portion to admit fluid from an independent source under substantially the same pressure as the normal steam pressure in the main, a pair of spaced pistons in said cylinder below said upper connection and adapted when the valve is open to occupy positions above and below the inlet for fluid under pressure, a closure for the upper end of said cylinder, a rod slidably passing through said closure and secured to the upper piston, means including a limited amount of lost motion for moving said rod and its piston downwardly towards the valve to cut off supply of fluid under pressure through said inlet connection, means so connecting said pistons as to permit a limited amount of free relative movement, and a rod or stem connecting the inner or lower piston to said valve to move therewith.

In testimony whereof I affix my signature.

WILLIAM B. STORK.