A. J. RICHMOND.

VALVE MECHANISM.

APPLICATION FILED JULY 15, 1896.

993,621. Patented May 30, 1911.

Fig. 1.

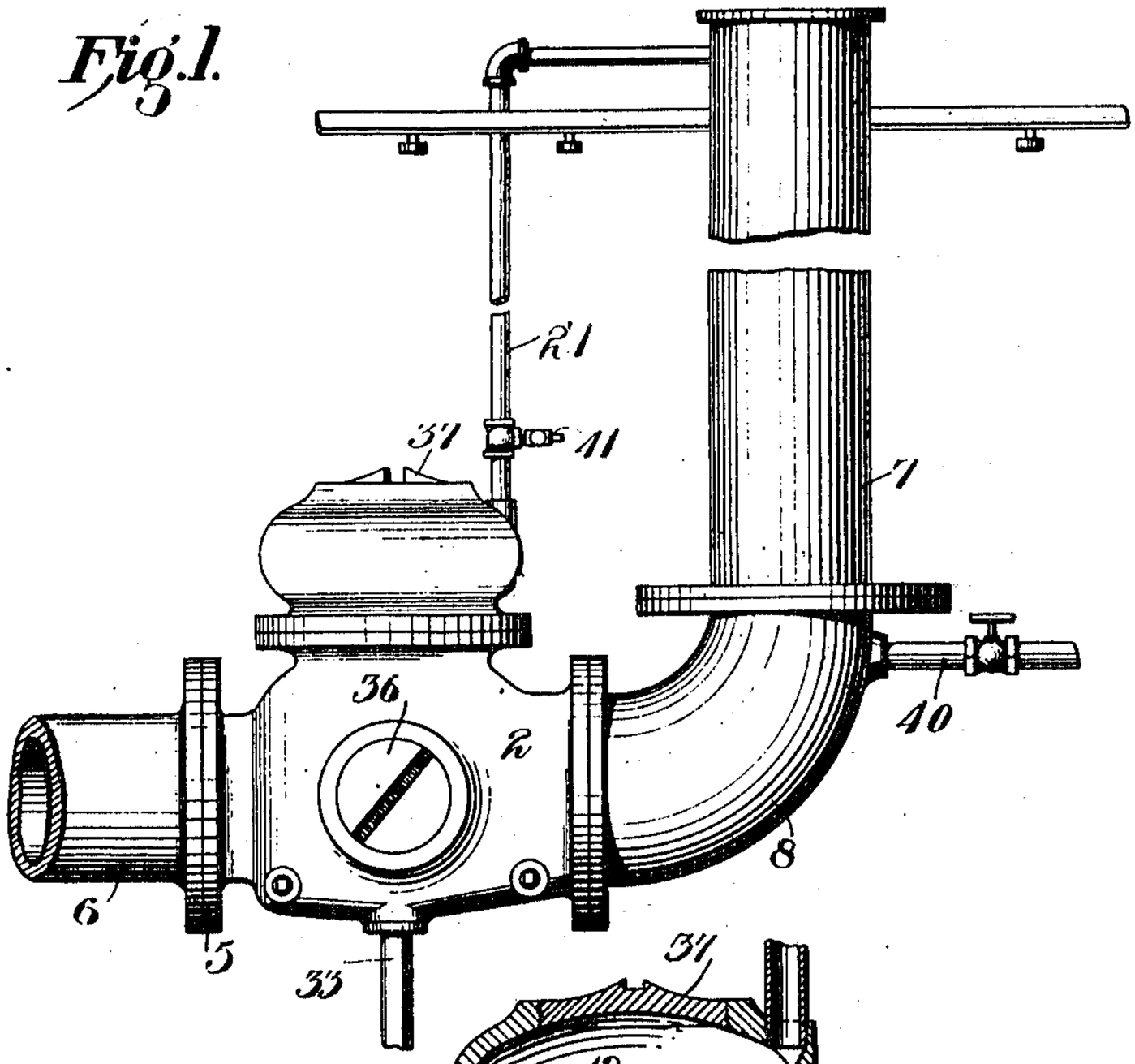
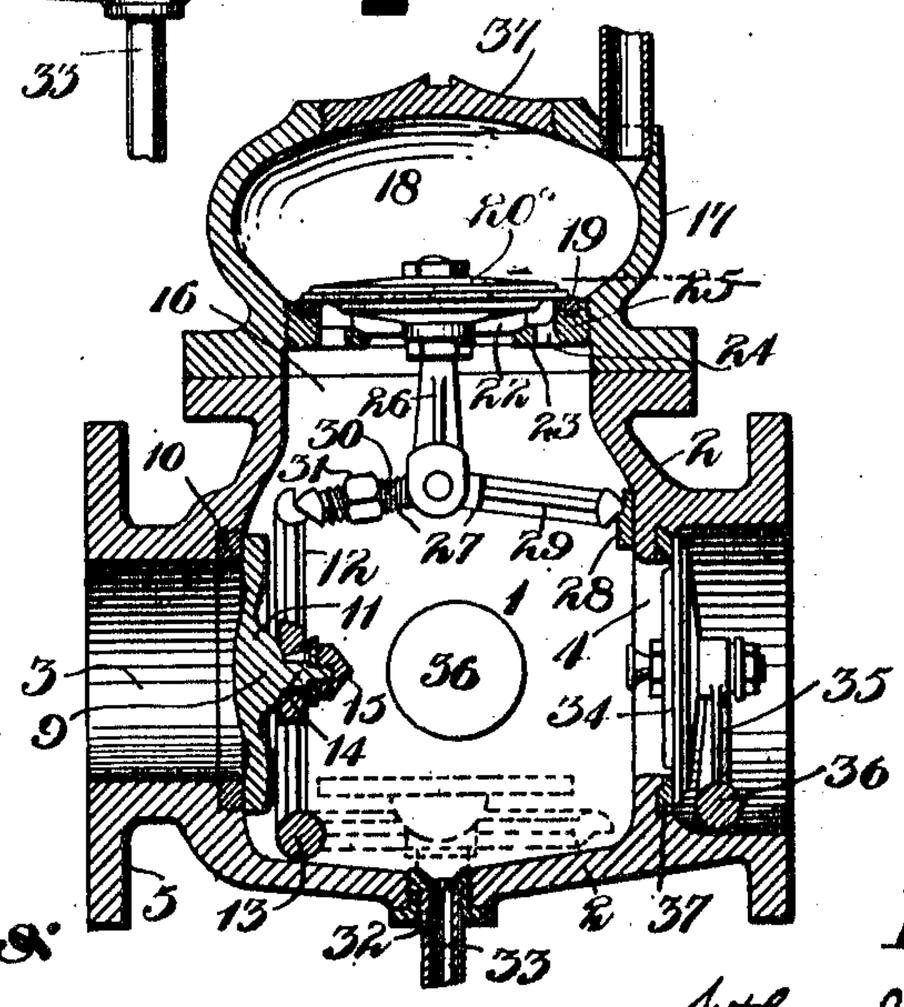


Fig. 2.



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VALVE MECHANISM.

993,621. Specification of Letters Patent. Patented May 30, 1911.

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To all whom it may concern:

Be it known that I, ARTHUR J. RICHMOND, residing in Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Valve Mechanisms; and I do hereby declare the following specification, taken in connection with the accompanying drawings, forming a part of the same, to be a full, clear, and exact description thereof.

The present invention relates to a valve mechanism in which a comparatively low pressure in a system of piping is utilized to hold in check a comparatively high pressure fluid in the supply pipe, said mechanism being so constructed that upon the reduction of the pressure in the system below a predetermined point the fluid in the supply pipe will be automatically released and will flow into said system.

It is the object of the invention to provide a valve mechanism of the class referred to in which there shall be upon the release of the high pressure fluid a substantially free and unobstructed passage from said supply pipe to the system of the full capacity of the supply pipe so that the flow of the fluid to the system shall not be retarded.

A further object of the invention is to so connect the valve mechanism with the system of piping that said mechanism cannot be rendered inoperative by the formation of a water column in said system.

A further object of the invention is to so construct the mechanism that the resistance against which the high pressure fluid acts shall decrease as the main valve opens.

A further object of the invention is to provide a valve mechanism in which the operating parts shall be entirely inclosed so that all liability to derangement from external causes, or clogging from accumulation of dust or dirt will be prevented.

It is a further object of the invention to provide an unobstructed drain for any fluid which may leak from the supply pipe, which drain will be automatically closed when the higher pressure fluid is released.

To these ends, the invention consists in the features and combinations hereinafter described and claimed.

Valves of the class above referred to are especially useful in connection with automatic sprinkler systems known as "dry pipe systems", in which a light air pressure in the system is made to hold back the water in the supply pipe, and in the accompanying drawings the present improvements are illustrated embodied in a valve mechanism applied to such a system.

The valve mechanism illustrated as embodying the present improvements in their preferred forms consists of a casing in which is formed a chamber provided with an inlet for communication with the water supply pipe and an outlet for communicating with the riser of the sprinkler system, said inlet and outlet being of the size of the supply pipe and being located substantially in line with each other. The inlet and outlet are provided with valves which are held closed by the air pressure in the sprinkler system and are released when the pressure in said system is reduced, and when so released move to one side of the path of the water thus leaving an unobstructed passage from the supply pipe to the sprinkler system. The inlet valve is held to its seat against the water pressure by means of a toggle which is held in position by a device, preferably a valve, acted on by the pressure in the sprinkler system. The valve is located in a chamber from which a pipe is preferably led to the top of the riser of the sprinkler system so that the valve mechanism cannot be rendered inoperative by the formation of a water column in the riser. The chamber in which the main water valve is located is provided with an opening which communicates with the atmosphere when said valve is closed, but which is closed by a valve formed on the back of said main valve when said main valve is open.

Referring to the drawings, Figure 1 is an elevation showing the valve mechanism applied to a sprinkler system and Fig. 2 is a vertical sectional view of the valve mechanism.

The chamber 1 formed by the walls of the casting 2 is provided with an inlet 3 and an outlet 4. The inlet is connected with the supply pipe 6 by means of the flange 5 formed on the casting 2, and the outlet 4 communicates with the riser 7 of the sprinkler system through an elbow 8 secured to the casting 2 and said riser. The water in the supply pipe 6 is held back by a valve 9 which is held against the valve seat 10 by the ac-

tion of the light air pressure with which the sprinkler system is charged as will be more fully described. A spherical boss 11 on the back of valve 9 fits within a recess in an arm 12 pivoted at 13 in the casting 2. A stud 14 projects from the boss 11 through the arm 12 and a nut 15 on said stud serves to hold the valve to the arm while allowing the boss to move freely in the recess so that the valve 9 may firmly seat itself.

Secured to the top of the casting 2 and communicating therewith through the opening 16 is a casting 17 forming the chamber 18 which is provided with a valve seat 19 upon which is seated a valve 20. The valve 20 is held to its seat by the pressure of the air in the sprinkler system with which the chamber is connected through a pipe 21 leading from the top of the riser 7 to the chamber 18. The valve 20 is provided with ribs 22 which fit within a conical recess formed in a ring 23 and serve to center the valve. The ring 23 is supported by the arms 24 which extend from a ring 25 screwed into the casting 17. An arm or rod 26 depends from valve 20 and serves to prevent the breaking of the toggle 27 interposed between the end of arm 12 and an abutment 28 on the wall of the casting 2. By reason of the leverage exerted through the toggle 27 a light air pressure in the sprinkler system will hold the valve 9 firmly to its seat against the high pressure of the water in the supply pipe. By varying the angle of the arms of the toggle to the line of thrust exerted thereon by the valve, the pressure in the sprinkler system necessary to overcome the pressure in the supply pipe may be varied. With the arms of the toggle at about an angle of 7° to the line of thrust as shown, one pound pressure on the valve 20 will overcome substantially nine pounds pressure on valve 9. It is preferred to form the toggle 27 by pivoting the arms 29 and 30 to the end of arm 26 and to make one of said arms adjustable. As shown, the arms 30 is formed of two parts provided with right and left hand threads respectively and said parts are adjusted toward or away from each other by turning the nut 31 which engages said threads.

The chamber 1 is provided with an opening 32 which connects with the atmosphere through a pipe 33 and forms a drain for any water which may leak past the valve 9. The inner end of the opening 32 is conical and forms a seat for the conical end of nut 15 when valve 9 is open. A valve 34 is carried by an arm 35 pivoted at 36 and said valve is held against the valve seat 37 secured in the outlet by the air pressure in the sprinkler system.

The operation is as follows:—The parts stand normally in the position shown in Fig. 2 with the valve 9 held firmly in position by the action of the pressure in the sprinkler system acting through the valve 20 and the toggle 27, the valve 34 being also held closed by the light air pressure, and the chamber 1 being open to the atmosphere through the drain opening 32. When the pressure in the sprinkler system is relieved by the opening of one or more sprinklers, the pressure on the valve 20 is reduced and the pressure of the water on valve 9 breaks the toggle 27, the resistance of said toggle to the movement of the valve 9 decreasing as the arms of said toggle approach each other. The valve 9 in opening moves to one side of the path of the water as shown in dotted lines, and the conical end of nut 15 enters the opening 32 and closes the same. The action of the water also opens the valve 34 which in opening also moves to one side of the path of the water so that there is a free and unobstructed passage from the supply pipe to the riser of the sprinkler system. When it is desired to reset the valves 9 and 34, the plug 36 is removed from the hand hole in the side of casting 2 and the plug 37 from the hand hole in the top of casting 17, so that ready access to the parts may be had.

A pipe 40 is provided near the base of the riser through which any water which may collect in the riser may be drawn off, and a test cock 41 may be inserted in pipe 21.

It will be noted that since the pipe 21 which connects the chamber with the sprinkler system leads from the riser near or at its top, the formation of a water column in the riser will not prevent or interfere in any way with the opening of the valve 9 when the air pressure in the system is reduced. It will be further noted that all the operating parts are inclosed in the castings 2 and 17 and are thus protected from any accidental displacement, and will not become clogged by the accumulation of dust or dirt.

What I claim as my invention and desire to obtain by Letters Patent is:

1. The combination of a chamber, an inlet for communication with a high pressure supply, an outlet for communication with a low pressure system, a valve for said outlet, a valve for said inlet, said valves being in line with each other and when open being arranged at one side of the passage from the supply to the system, and means at one side of said passage for holding the inlet valve closed by the pressure in the system, substantially as described.

2. The combination of a chamber, an inlet for communication with a high pressure supply, an outlet for communication with a low pressure system, a valve pivoted at one side of said inlet, a valve pivoted at one side of said outlet, said valves being in line with each other, and means at one side of the passage from said inlet to said outlet for

holding the inlet valve closed by the pressure in the low pressure system, substantially as described.

3. The combination of chamber 1 having inlet 3, outlet 4, and drain 32 for chamber 1, valves 9 and 34 closing said inlet and outlet, toggle 27, for holding valve 9 to its seat, chamber 18 and valve 20 between chambers 1 and 18 for holding toggle 27, substantially as described.

4. The combination of a chamber provided with an inlet and an outlet, valves for closing said inlet and outlet, a toggle for holding said inlet valve to its seat having its arms at angles to the line of the thrust exerted thereon by the valve, an auxiliary chamber, a valve between said chambers, a connection for transmitting the pressure on said valve to said toggle and through it to said inlet valve, substantially as described.

5. The combination of a chamber provided with an inlet and an outlet, valves for closing said inlet and outlet, a toggle for holding said inlet valve to its seat having its arms at angles to the line of the thrust exerted thereon by said valve an auxiliary chamber, a valve therein held to its seat by the pressure in said chamber, a connection for transmitting the pressure of said valve to said toggle and through it to said inlet valve, substantially as described.

6. The combination of a chamber, an inlet for communication with a high pressure supply, an outlet for communication with a low pressure system and in line with said inlet, a valve pivoted below said inlet, a valve pivoted below said outlet, and means out of line with said inlet and outlet for holding the inlet valve closed by the pressure in said system, substantially as described.

7. A device of the class specified, having a straight water-way and also having a pressure chamber arranged at one side of the water-way in combination with a valve controlling the inlet to the water-way, a valve controlling a port opening into the pressure chamber and the water-way, and means for actuating said valves, substantially as described.

8. In a device of the class described, the combination with a casing having a water way including a low pressure chamber having an inlet opening thereinto and an outlet opening therefrom, of a cut-off for controlling said inlet, a cut-off for controlling said outlet, a toggle engaging the inlet cut-off at one end and at its other end engaging the casing, said toggle consisting of two members operatively related to each other, a pressure chamber at the side of the low pressure chamber having communication with the system, a cut off for controlling communication between the chamber last aforesaid and the low pressure chamber, and means interposed between said cut-off and the toggle for controlling the latter, substantially as described.

9. In a device of the class described, the combination with a casing having a low pressure chamber, an inlet opening thereinto and outlet opening therefrom, of a cut-off for controlling said inlet, a toggle for holding said cut-off seated, a pressure chamber communicating with said low pressure chamber laterally and also with the system, a second cut-off for controlling communication between said chambers, and means interposed between said second cut-off and toggle for holding the latter in place, substantially as described.

10. A device of the class described having a substantially straight water-way and having also a pressure chamber arranged at one side of the water-way and a low pressure chamber with which said pressure chamber communicates, of a valve controlling communication between said pressure chamber and low pressure chamber, a valve for controlling communication between the water supply and the low pressure chamber, a valve for controlling communication between the distributing system and the low pressure chamber and means controlled by the valve first aforesaid for controlling the valve from the water supply into the low pressure chamber, substantially as described.

11. In a device of the class described the combination of a casing having a low pressure chamber, a chamber communicating with the distributing system, a check valve for controlling communication between said chambers, a valve for controlling the inlet to the low pressure chamber, a pressure chamber disposed at the side of the low pressure chamber and having normal communication with the system, a cut-off for controlling communication between the chamber last aforesaid and the low pressure chamber, a toggle, at one end engaging the inlet valve and at the other end engaging a fixed abutment, and means interposed between the said cut-off and the toggle for holding the latter in place, substantially as described.

12. In a device of the class described, the combination of a casing having a water way, a valve for controlling the inlet to the water way, a valve for controlling the outlet from said water way to the system, a pressure chamber communicating directly with the water way and also with the system, a toggle engaging the valve first aforesaid, and a stem carried by the valve last aforesaid and engaging the toggle, said valves being differential, substantially as described.

13. In a device of the class described, the combination of a casing having a water way, a valve for controlling the inlet to the water way, a valve for controlling the outlet from

said water way to the system, a pressure chamber located at the side of the water way and communicating directly therewith and also with the system, a valve controlling communication between the two chambers, and means interposed between the valve first aforesaid and the valve last aforesaid for holding the valve first aforesaid seated, substantially as described.

14. In a device of the class described, the combination of a casing having a water way, a valve for controlling the inlet to the water way, a valve for controlling the outlet from said water way to the system, a pressure chamber located at one side of the water way and communicating therewith and also with the system, a valve for controlling communication between the two chambers, said valves being differential, and means interposed between the valve first aforesaid and the valve last aforesaid for holding the valve first aforesaid seated, substantially as described.

15. In a device of the class described, the combination of a casing having a low pressure chamber, a valve for controlling the admission of water thereto, a valve for controlling the outlet from said water way to the system, a pressure chamber located at the side of the low pressure chamber and communicating therewith and with the distributing pipes of the system, a valve for controlling communication between the chambers, said valves being differential, and means interposed between the valve first aforesaid and the valve last aforesaid for holding the valve first aforesaid seated, substantially as described.

16. The combination of a casing having a water inlet and a water outlet, a valve governing said inlet, a valve governing said outlet, a toggle comprising two members, one bearing against the casing and the other against the valve first aforesaid, one of said members being adjustable in length, and means independent of the outlet valve and under the control of the pressure in the system for actuating said toggle, substantially as described.

17. Automatic valve mechanism for sprinkler systems comprising a valve casing having communication with a water supply and with the sprinkler system, an inlet valve within the casing for governing said supply, a valve governing the communication with the system, a toggle arranged within the casing and independent of the valve to the system and adapted when the toggle members are in alinement to hold said inlet valve closed, and an air trip valve independent of the aforesaid valves and controlled by the pressure of the system and operatively connected to the toggle, substantially as described.

18. The combination of a casing having a water inlet and a water outlet, a valve governing said inlet, a valve governing said outlet, a toggle independent of the valve last aforesaid and comprising two members, one of said members bearing against the casing and the other against the valve first aforesaid, and means under the control of the pressure of the system for actuating the toggle, substantially as described.

19. A valve for a sprinkler system comprising a casing having a water inlet and a water outlet substantially in line with each other, valves for closing said inlet and outlet respectively, said valves being arranged to swing out of the water-way when open, and mechanism acted upon by the air-pressure in the system for holding said inlet valve closed, said valve-holding mechanism being also out of the water-way when the valves are open and so as to leave an unobstructed passage for the water through said casing, substantially as described.

20. A valve for a sprinkler system comprising a casing having ports communicating respectively with the water supply and the sprinkler system, said ports being substantially in line with each other, valves arranged to close said ports, the one for the sprinkler system port being normally closed by the pressure in the distributing pipes, and mechanism acted upon by the air-pressure in the sprinkler system and arranged to hold said inlet port valve in its closed position until the air-pressure is relieved, said valves and mechanism assuming when the ports are open a position out of line with said ports to form an unobstructed passage between them, substantially as described.

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