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FIRE EXTINGUISHING SPRINKLER VALVE

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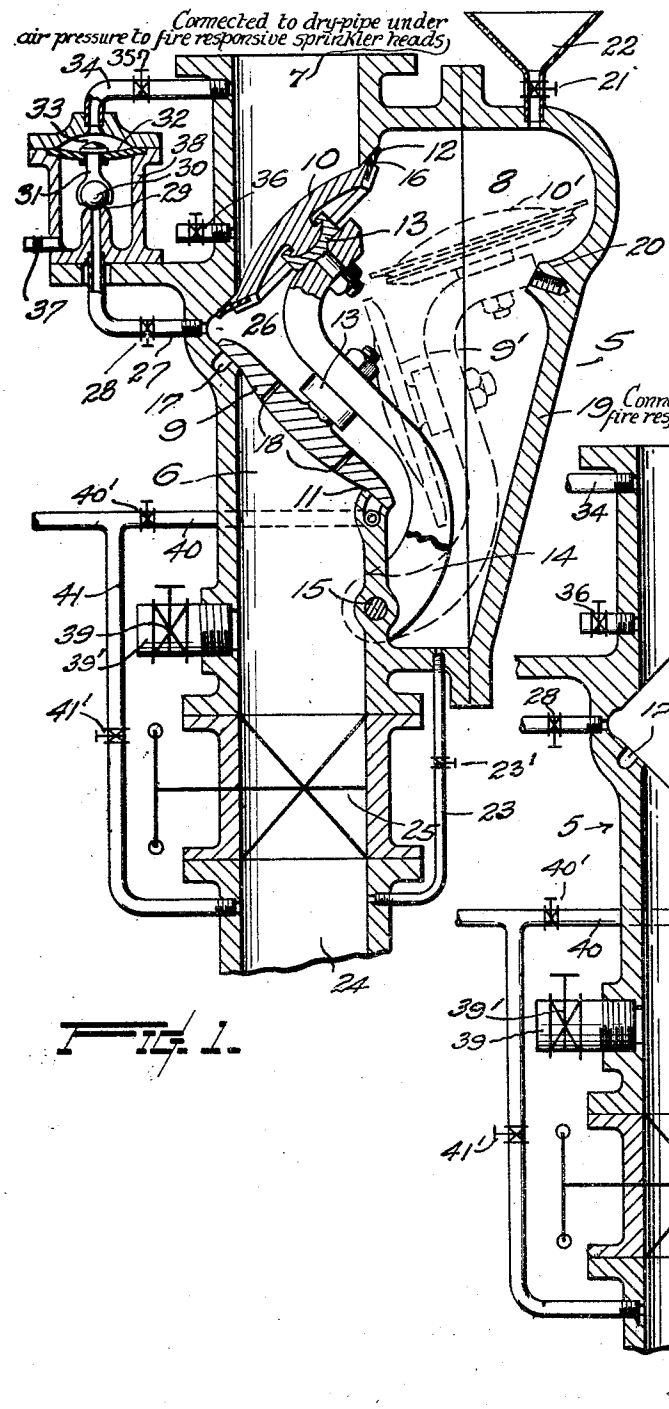


FIG. 1.

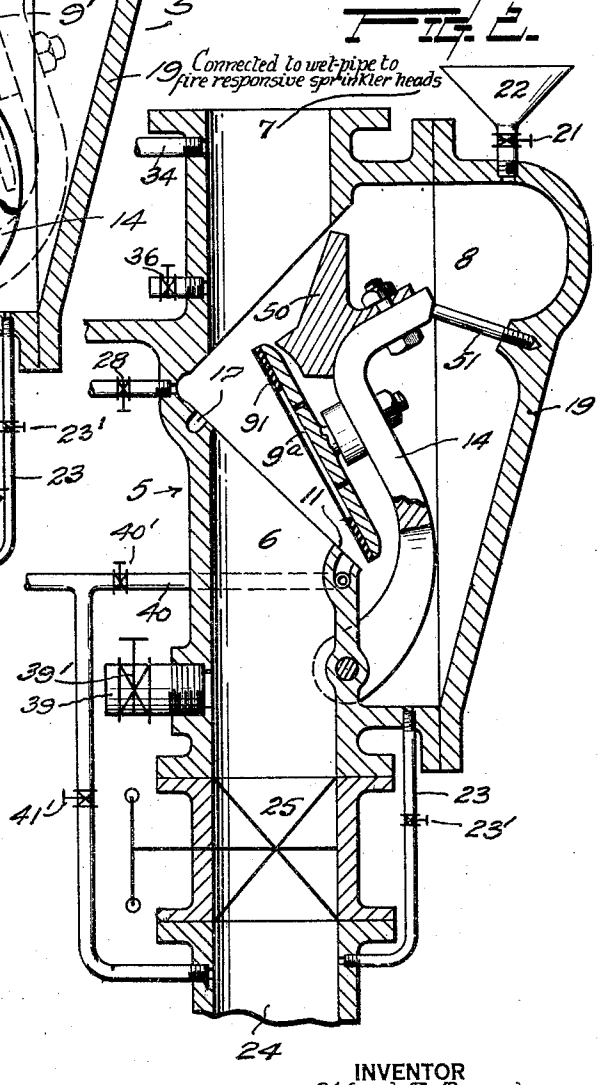


FIG. 2.

INVENTOR
Alfred E. Boardman
BY
Pierce Barnes
ATTORNEY

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ALFRED E. BOARDMAN, OF SEATTLE, WASHINGTON

FIRE EXTINGUISHING SPRINKLER VALVE

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This invention relates to water flow controlling devices for fire protection sprinkler systems.

The object of my invention, generally stated, is the improvement of apparatus of this character to render the same more efficient and extend its usefulness.

Another object is to provide fire protection apparatus which is adapted to be regulated for operating, interchangeably, either as an automatic dry pipe valve at a low air pressure, or as a variable pressure alarm valve.

For operating the present invention as an automatic dry pipe valve, I utilize, in a pressure chamber, the primary water pressure existing in the supply main to keep the valve closed against the delivery of water into the sprinkler piping, instead of utilizing the medium of a differential valve wherein the system air pressure directly holds the water pressure in check.

In association with such pressure chamber is an actuating, or releasing, device whereby a low pressure of air in the pipe system is employed in opposition to a pressure-regulated diaphragm, or an equivalent, to releasably maintain a small actuating valve closed in opposition to the effective pressure of water confined within the pressure chamber, the release of such trapped pressure occurring with a reduction in the system air pressure due to the opening of a sprinkler head or otherwise; such release of the trapped pressure permitting the primary water pressure to open the valve and pass into the sprinkler pipes. Water being practically incompressible, the sudden release of a small quantity of the water under pressure in the pressure chamber, will relieve the pressure trapped therein and permit the direct pressure from the main to open the valve.

For operating the invention as a dry pipe system, two spaced-apart valves of the clapper type are used to provide a pressure chamber therebetween, and the apparatus is changed to operate as a wet alarm system, by rendering the actuating and releasing valves inoperable, and removing one of the clapper valves.

It is believed that the principle involved in this invention of trapping main water pressure in regulating devices to hold main water pressure in check and the means for automatically releasing the water pressure thus trapped as well as the accomplishment of these results by the utilization of extremely low air pressure, are new in fire protection sprinkler practice, as is also the means for adapting a dry pipe valve to serve as a wet alarm valve, and vice versa.

In my invention the admission of water to the pipe system is prevented solely by the trapping of the primary or supply-main pressure in a pressure chamber thus producing a balance of pressure which holds the primary pressure in check. The only need or function of air pressure in the pipe system is to operate an actuating or releasing device, the function of which is to destroy the balance of water pressure in the pressure chamber or trap and thus permit the main water supply to open the valve. The amount of air pressure required for this function is very small.

The invention consists in the novel construction, adaptation and combination of devices, hereinafter described and claimed.

In the accompanying drawing,—

Figure 1 is a vertical transverse sectional view of a sprinkler pipe and valve assembly embodying my invention, as adapted for use as a dry-pipe alarm valve system; and Fig. 2 is a similar view with the parts arranged to serve as a variable pressure or wet alarm valve.

Referring now to the dry-pipe system, shown in Fig. 1, the numeral 5 represents a casing constituting a part of a pipe line, or main, having aligned passages, 6 and 7, communicating with an intermediary positioned water-containing pressure chamber, or trap 8 which, as shown, is disposed in laterally offset relation with respect to said passages 9 and 10 represent valves, preferably of the clapper type, arranged substantially as shown, to close against seats 11 and 12 provided therefor about the ends of said passages.

Said valves are adjustably connected by means of couplings 13 to a bifurcated arm 14

which is pivotally connected, as by a pin 15, to the pipe line structure, permitting the valves to be swung, as indicated by dotted lines 9^1 and 10^1, away from their seats to afford an unobstructed direct flow of water through the chamber 8 and both of said passages 6 and 7.

As shown, the clapper valve 10 carries a gasket, or sealing ring 16, for making a water-tight closure about its periphery when the valve is in the closed position in which it is represented by full lines in Fig. 1. The seat for the valve 9 includes a groove 17 providing a gutter to carry away leakage at the seat, and to which a water motor alarm gong and circuit closer (of known construction, but not shown) connections may be made.

18 represents small perforations provided in the valve 9 for equalizing the pressure of water at opposite sides thereof—that is to say, with respect to the water supply passage 6 and the trap 8.

For convenience in manufacture, and for the purposes of cleaning, adjusting and resetting, the apparatus, the outer wall 19 of the trap 8 is removable and is advantageously provided with a protuberance 20 which is engageable by the valve-carrying arm 14 to limit the opening movement of the valves. 21 represents a priming valve for releasing air from the passage 6 and from the trap 8 and admitting water thereinto as from a charging funnel 22 when regulating the apparatus for operation.

Water may also be supplied to fill said passage and the trap through a valved by-passage 23 extending from the trap 8 to the pipe line 24 at the opposite side of the main or shut-off valve 25.

The space 26 between the clapper valves 9 and 10 is connected to an end of a pipe 27 provided with a shut-off valve 28, the other end of the pipe 27 terminating in an orifice 29 constituting the seat for a relief valve 30, preferably of the ball type, carried by a stem 31 which is connected to a diaphragm 32 adapted to normally retain the relief valve in position to close said orifice.

The space 33 above the diaphragm 32 is connected by means of a pipe 34 with the passage 7. 35 represents a valve for regulating and shutting-off the connection between said diaphragm and the passage 7.

36 is a test and drain valve to remove condensation or leakage which may accumulate in passage 7. 37 is a ball-check valve to carry away leakage past ball valve 30 and permit atmospheric pressure inside casing 38 until valve 30 opens when water flowing under pressure will close ball-check 37.

39^1 represents a drain pipe provided with a shut-off valve 39 whereby the water may be withdrawn from the system above the valve 25. 40 is a pipe connecting groove 17 to an alarm gong and circuit closer (of known construction, but not shown).

40^1 is a valve which may be closed to permit inspection test of said alarm devices by opening valve 41^1 in pipe 41, which is connected to main water supply below valve 25.

23^1 represents a valve provided for the pipe 23 to regulate the action of the latter.

While not shown, the present construction is interconnected in any suitable manner to have the passage 7 communicatively arranged, as by coupling the flange extremity, to the main or supply pipe of a conventional sprinkler system, by-pass outlets from which are normally sealed through any suitable medium, such as temperature controlled fusible-link sprinklers.

The above described dry pipe valve system, illustrated in Fig. 1, is set as follows:

First close valves 25 and 23^1, open valve 39 to drain the pipe system above the valve 25, then close the valves 39, 28 and 35.

The back wall 19 of the pressure chamber 8 is then removed for cleaning and seating the clapper valves 9 and 10, and the wall 19 returned and secured in place so that when pressure is applied in chamber 8 the clapper 10 will be firmly held against its seat 12 and cause the clapper 9 to be held against the seat 11 through the instrumentality of the arm 14.

The valve 21 is now opened and the spaces within the chambers 6 and 8 filled with water either through the funnel 22 or by opening the valve 23^1. When the air has escaped from said chambers and the same are filled with water, the valve 21 is closed and the main water pressure is supplied to said chambers by opening the valve 23^1. The valve 36 is now opened to test for leakage beyond the clapper 10 and to withdraw any water which may have remained thereabove in the pipe system. After closing the valve 36, air to a pressure of approximately ten pounds above that of the atmosphere is pumped into the system above the clapper 10, whereupon the valve 35 is opened for admitting air at such pressure against the diaphragm 32 to close the ball valve 30. After which, the valve 28 is opened to admit water pressure to the ball valve 30, the valve 25 opened and the valve 23^1 closed.

With the parts thus regulated, pressure is equalized between passage 6 and chamber 8 by communication provided through the perforations 18 of the clapper 9.

The valve system as a whole is thus set ready to operate upon release of air pressure with respect to the diaphragm 32 responsive to the opening of a sprinkler head.

More particularly, the opening of a sprinkler head, normally arranged to act responsive to temperature rise serves to reduce air pressure in the passage 7 and that acting against the diaphragm 32, whereupon the pressure in

chamber 8 acting through space 26 and pipe 27 causes the ball valve 30 to raise and thereby release main water pressure within the chamber 8.

The main water pressure in the passage 6 thereupon acts against the clapper 9 to swing clappers 9 and 10 into their open positions and thus provide a straight unobstructed water outlet through passages 6 and 7. When the clapper valves are brought to their open positions, the arm 14 engages against the casing wall, the clappers remaining in their dotted line positions 9^1 and 10^1 until the valve is reset.

The above described apparatus is readily converted from a dry system (Fig. 1) to a wet alarm valve system which is represented in Fig. 2.

To which end, one of the clappers, as 10, is omitted and the remaining clapper, denoted by 9^a in Fig. 2, is desirably provided with a rubber seating ring 91. The modified form desirably includes a weight 50 attached to the arm 14 to counter balance the weight of the arm, and coact with a stop pin 51 to yieldably retain the arm 14 and the clapper 9^a in positions approximately as represented in Fig. 2 while water is flowing. When the flow ceases clapper 9^a falls into closed position.

The apparatus is regulated to be used as a wet alarm valve as follows:

First, drain the system through the valve 39^1, while valves 25, 23^1, 28, 41^1 and 35 are closed. Water is now admitted into the system through the main valve 25 until the system is full, when valve 9^a will fall into closed position. Then open valve 40^1 to water motor alarm (not shown) and the apparatus is ready for operation.

The operation of a sprinkler head permits a flow of water to actuate the valve mechanism, causing the clapper 9^a to be unseated, whereupon a flow of water occurs through channel 17 and pipe 40 to operate the alarm gong.

In practice, a ball-check valve (not shown) is attached to pipe 40 to carry away possible leakage past valve seat 11 while clapper 9^a is in closed position and atmospheric pressure exists in groove 17.

Flow of water under pressure through pipe 40 closes said ball drip valve (not shown) and passes on to operate said alarm devices (not shown).

From the foregoing description, it is obvious that the present invention provides devices which afford both "wet" and "dry" types of sprinkler systems and may be used selectively as either—as a wet pipe system under moderate temperatures and as a dry pipe system for use, more especially, with sprinkler piping which is exposed to freezing weather, in refrigerating installations, and the like.

While I have illustrated and explained the embodiment of the invention now preferred by me I do not wish to limit myself specifically thereto, as changes may be made in the details of its construction and operation without departing from the spirit of the invention and sacrificing its advantages.

What I claim, is,—

1. In an automatic valve for a dry-pipe fire extinguishing system, a valve casing providing a water containing chamber therein and a pair of aligned passages leading to and from said chamber, the passage to said chamber being adapted for connection with the pressure pipe from a water main, the passage from said chamber being adapted for connection with a dry-pipe under air pressure to sprinkler heads acting responsive to fire conditions, an arm pivotally supported in said chamber, a pair of clapper valves carried by said arm for simultaneous seating engagement over the openings between the chamber and the respective passages, said valves seating against the pressure in the water main and the dry-pipe, respectively, means to normally maintain an equalization of the water pressure in said chamber and the water main for maintaining said valves in seated dispositions, and means acting responsive to a drop of pressure in the dry-pipe by reason of the opening of a sprinkler head for reducing the pressure in said chamber to allow the pressure in the water main to unseat both of said valves.

2. The apparatus as defined in claim 1, said last named means comprising a diaphragm under pressure of the air in the dry pipe, an outlet from the chamber, and a ball valve supported by said diaphragm for normally closing said outlet.

3. In an automatic valve for a dry-pipe fire extinguishing system, a valve casing providing a chamber adapted to contain water and passages leading to and from said chamber, the passage to said chamber being adapted for connection with the pressure pipe from a water main, the passage from said chamber being adapted for connection with a dry-pipe, said dry-pipe being under air pressure and of a character serving to supply sprinkler heads acting responsive to fire conditions, a pair of valves collectively swingable about a common axis, said valves seating over the inlet from said water main and the outlet to the dry-pipe, respectively, and against the pressure in the respective instances, means for maintaining a normal pressure equalization between the water in said chamber and that of the supply main to maintain said valves in seated dispositions and means responsive to a drop in the air pressure of the dry-pipe for relieving the water pressure in the chamber, the resulting assertion of the relatively greater pressure of the water in the supply pipe serving to open said valves.

4. In an automatic valve for a dry-pipe fire extinguishing system, a valve casing providing a chamber adapted to contain water,

said casing having an inlet to and an outlet from the chamber with the inlet being adapted for connection with the pressure pipe from a water main for supplying said water to the chamber and the outlet being adapted for connection with the supply pipe of a dry-pipe system, said supply pipe being of a character containing air under pressure and carrying sprinkler heads adapted to open responsive to fire conditions, valves of a swing-check character normally maintained in seating engagement by the water in said chamber over said inlet and outlet openings, means for maintaining a normal pressure equalization between the water in said chamber and that of the supply pipe to maintain said valves in seated dispositions, and means acting as a result of a drop in the air pressure of said dry-pipe for releasing the water in said chamber to allow said valves to open under the pressure of the water from the main on said inlet valve.

5. An automatic valve for fire extinguishing apparatus comprising two passages adapted for connection with the pressure main of a water supply and a dry-pipe containing air under pressure and leading to the sprinkler-heads of a sprinkler system, respectively, a pressure-chamber adapted to contain water under pressure located between and in communication with said passages, a valve arranged for seating engagement over the communicating entry from the water supply passage to the chamber, a valve arranged for seating engagement over the communicating outlet from said chamber to the dry-pipe of the system, said valves seating against the pressure of the water main and the dry-pipe, respectively, means for maintaining a normal pressure equalization between the water in said chamber and that of the supply pipe to maintain said valves in seated dispositions, and means acting as a result of a drop in the air pressure of the dry-pipe affording a dislodgment of both of said valves from their seats, said first named valve being dislodged directively of the course of the water passing through said passages.

6. The combination of a valve device for use in either a dry-pipe or a wet-pipe sprinkler system characterized by the provision of a chamber adapted to contain water under pressure, said chamber having aligned passages leading to and from the same, and an arm pivotally mounted in said chamber provided with a valve having ports therethrough and arranged for seating engagement with the inlet to the chamber, said arm further provided with means by which another valve may be so attached to said arm that it will be engaged with the outlet from said chamber when the first mentioned valve is seated and the device is used in a dry-pipe system or to which a weight may be attached to aid in holding the first mentioned valve on its seat when the device is used on a wet-pipe system.

7. The combination of a valve device for use in either a dry-pipe or a wet-pipe sprinkler system characterized by the provision of a chamber having passages leading to and from the same, said passages being adapted to connect said chamber with the pressure supply of a water main and the discharge pipe of the system, respectively, and a member in said chamber provided with a valve of the swing-check character arranged for seating engagement with the inlet to the chamber, said device having means for normally equalizing the pressure in said chamber and the supply main for both of said systems, said member further provided with means by which another valve also of the swing-check character may be so attached thereto that it will be engaged with the outlet from said chamber when the first mentioned valve is seated and the device is used in a dry-pipe system, said latter valve being removable in adapting said device with the first mentioned valve only to a wet-pipe system.

8. The combination of a valve device for use in either a dry-pipe or a wet-pipe sprinkler system characterized by the provision of a chamber adapted to contain water under pressure and having passages leading to and from the same, and an arm supported in said chamber provided with a valve arranged for seating engagement with the inlet to the chamber for either a dry-pipe or a wet-pipe system, said arm further provided with means by which another valve may be so attached to said arm that it will be engaged with the outlet from said chamber when the first mentioned valve is seated and the device is used in a dry-pipe system.

9. The combination of a valve device for use in either a dry-pipe or a wet-pipe sprinkler system characterized by the provision of a chamber adapted to contain water under pressure and having a passage leading to the same adapted for connection with the pressure supply of a water main and a passage from the same adapted for connection with the discharge pipe of the system, said pressure in the chamber being normally equalized with respect to the pressure of the water main, and a member supported in said chamber providing a valve arranged for seating engagement with the port opening between said chamber and but one of said passages, said member further provided with means by which another valve may be so attached thereto that it will be engaged with the port opening between said chamber and the other of said passages when the first mentioned valve is seated and the device is used in a dry-pipe system.

10. An automatic valve for fire extinguishing apparatus comprising a casing having a chamber adapted to contain water under pressure and inlet and outlet openings to and

from the same, said inlet being adapted for connection with a water supply under pressure, said outlet being adapted for connection with a sprinkler system, valves normally seating over both of said openings, said inlet valve being of a swing-check character supported to open directively of the course of the water, means to normally maintain an equalization of the pressures in said water supply and chamber, and means serving to afford a reduction in the pressure of said chamber below that of the water supply responsive to fire conditions in the vicinity of the sprinkler system, the resulting assertion of the relatively greater pressure in the water supply opening both of said valves for supplying water to the system.

11. In an automatic valve for a fire extinquishing system, said system including a pressure pipe from a water main and a dry-pipe under air pressure to sprinkler heads, said heads opening responsive to fire conditions, a valve casing providing a chamber adapted to contain water under pressure, passages in said casing respectively adapted to supply water to said chamber from the water main pressure pipe and from said chamber to the dry-pipe, means for maintaining a normal pressure equalization between the water in said chamber and that of the pressure pipe from the water main, a valve seat between said chamber and the dry-pipe, a pivotally mounted arm, a valve pivotally supported on said arm for seating engagement to said valve seat and normally serving through the pressure thereon from the water in said chamber to seal said dry-pipe with respect to the water in said chamber, means operative responsive to a drop in the air pressure of the dry-pipe as a result of the opening of a sprinkler head to effect a drop in the water pressure of the chamber below that of the pressure pipe from the water main, and means acting under the influence of the greater water pressure in said pressure pipe as a result of said drop in the chamber water pressure for unseating said valve to allow a flow of the water to said dry-pipe.

Signed at Seattle, Washington, this 10th day of April 1929.

ALFRED E. BOARDMAN.