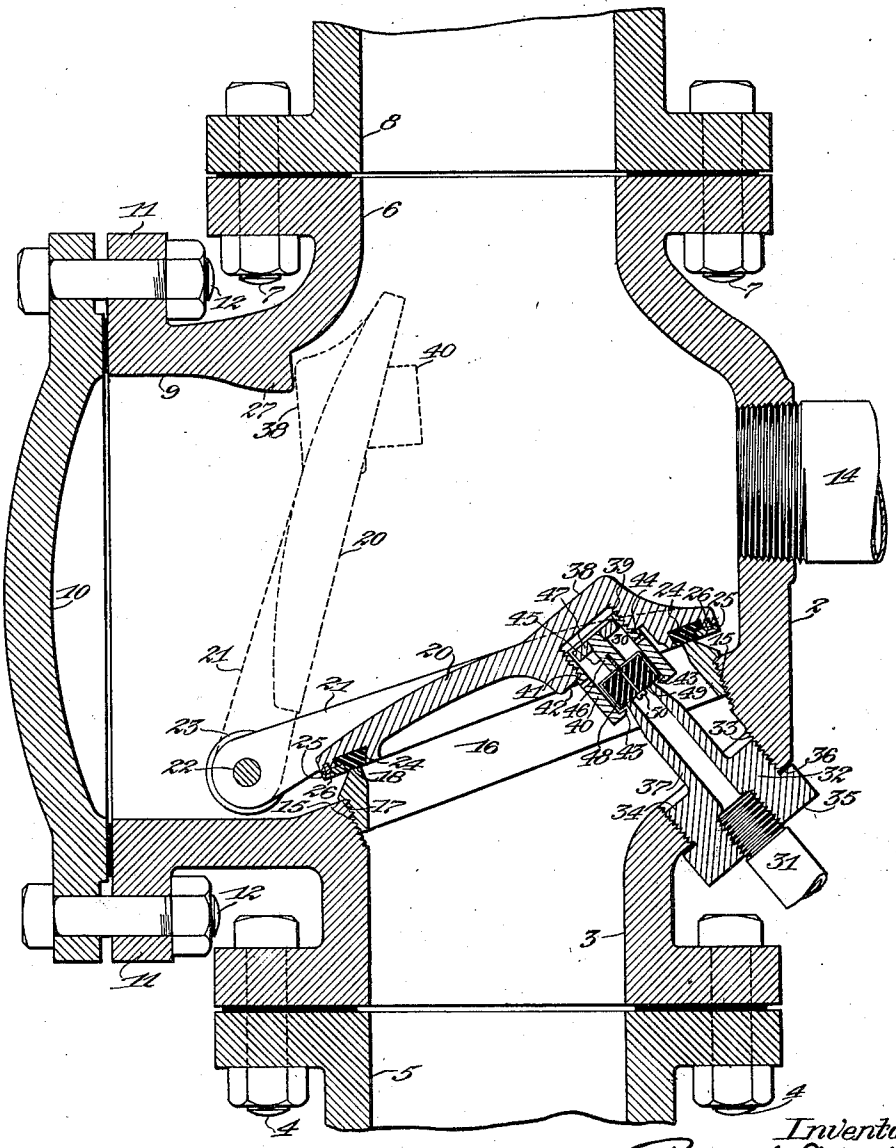
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P. L. DRAKE

ALARM VALVE

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# UNITED STATES PATENT OFFICE.

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## ALARM VALVE.

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*To all whom it may concern:*

Be it known that I, PERCY L. DRAKE, a citizen of the United States, residing at Providence, in the county of Providence, State of Rhode Island, have invented certain new and useful Improvements in Alarm Valves, of which the following is a specification.

My invention relates to improvements in alarm-valves for automatic fire-extinguishing systems. The object of my improvement is to provide a device of this type for use with sprinkler-systems to sound an alarm when a sprinkler-head is opened, or should a leak occur in the piping-system; and particularly to render the device extremely sensitive to detect any slight escape of water while being proof against causing a false alarm under the action of variations in pressure or "water-hammer" in the supply pipe.

A further and most important object of the improvement is to provide a device in which the valve seats and closures may be inspected from the outside, without taking the valve apart or draining off the water from the system, whereby adjustments may be made and the parts renewed or replaced should they become inoperative from wear or derangement.

The manner and means for carrying out these improvements are fully described in the following specifications, illustrated by the accompanying drawing, in which like reference characters designate like parts.

In the drawing the single figure shows my improved alarm-valve in cross-section, taken on its vertical axis, and illustrates the parts of the valve-mechanism in operative relation.

Referring to the drawing, 2 designates the valve-casing which is here shown as of the flanged type having openings at top and bottom and on one side. The bottom opening 3 serves as the inlet to the valve and its flange is connected by bolts 4 to the flanged end of a supply-pipe 5. At the top is the outlet 6 which is also flanged and connected by bolts 7 to a vertical pipe 8 leading to the branch pipes of the sprinkler-system which carry the sprinkler-heads. At the side of the casing 2 is a larger opening or hand-hole 9 which is closed by a cover-plate 10 held against the flange 11 by means of bolts 12. The hand-hole 9 provides an extended opening for inserting the parts of the valve-mechanism to apply them to position in the process of assembling the complete valve. On the opposite side from the hand-hole 9 a waste- or drain-pipe 14 is tapped through the wall of the casing 2 to adapt it to serve as a means for draining off the water from the system, a suitable drain-valve, not here shown, being provided for this purpose.

The inlet 3 is enlarged at one side where it opens into the central chamber of the casing 2 and is provided with an interiorly-threaded, circular seat 15. Screwed into the seat 15 is a ring or washer 16 provided with a shoulder 17 which abuts the upper end of the opening. The ring 16 is preferably constructed of brass, bronze or some easily worked metal which will take a smooth finish and is beveled around its upper edge to provide a relatively narrow seat 18 for a valve-clapper 20 which sets thereagainst. The seat-ring 16 is arranged at a slight angle to the horizontal and the valve-clapper or circular closure-plate 20 is provided with an arm 21 pivoted on a hinge-pin 22 held in suitable hubs or bosses 23 on the sides of the casing 2. Set into the under side of the clapper-plate 20 is a flat ring or washer 24, constructed of hard rubber or similar material and arranged to seat against the rim 18 of the valve-ring 16. The washer 24 is beveled on its inside to fit a beveled under-cut in the plate 20, being held in place therein by a flat, metal ring 25 let into its edge and secured to the plate 20 by screws or pins 26. The clapper or closure 20 is adapted to swing upwardly on its pivot or hinge-pin 22 to the position shown in the drawing by dotted lines where its end strikes against a lug 27 on the inside of the casing 2. In this way the clapper 20 may be forced upwardly from the inlet-opening 3 by the flow therethrough to provide a free passage to the outlet 6, the lug 27 serving as a stop to limit its movement and provide for the return of the valve to its seat under the action of gravity when the pressure against it is removed.

At its outer end the clapper 20 carries an auxiliary pilot-valve 30 which controls the escape of water through a small duct or pipe 31 leading to the alarm apparatus, the pressure of this stream causing the operation of the alarm in the manner familiar to those versed in the art. As shown in the drawing, the pipe 31 is screwed into a plug 32

which is fitted to an opening 33 in an offset on the side of the casing 2, arranged beneath the side of the main valve seat or ring 16. The plug 32 is provided with a cylindrical portion 34 which is externally threaded to screw into the opening 33, and at its outer end is an enlarged head 35 which may be formed as a nut to receive a wrench for applying it to place or removing it therefrom. The head 35 forms a shoulder which is adapted to set against a washer or gasket 36 fitted around the plug to seal the joint where it screws into the opening 33. On its inner end the plug 32 is provided with a quill-like extension or nozzle 37 reaching upward toward the under side of the clapper 20.

At the outer end of the clapper 20 is a hub or boss 38 having a bore or socket 39 on its under side arranged with its axis in line with that of the plug 32. The bore 39 is threaded to receive a thimble 40 which is formed with a shoulder 41 screwed against a seat 42. At its lower end the thimble 40 is provided with an inturned flange 43 which surrounds the reduced end of the nozzle 37 of the plug 32 with a slight clearance therebetween. Arranged to slide in the thimble 40 is a valve or closure 45 which seats against the end of the nozzle 37. The valve 45 is constructed with a stem 46 carrying a disk 47 at its upper end which slides in the bore of the thimble 40. At its lower end is a cylindrical cup 48 of thin sheet-metal, also slidable in the bore of the thimble 40 and forming a sheath for a plug or disk 49 of hard rubber which is secured to the stem 46 by means of a pin or screw 50. On the sides of the thimble 40 are radial openings 44 for receiving the points of a spanner-wrench which may be employed for screwing the thimble into place or removing it from its seat.

It will be noted from the drawing that when the main valve-clapper 20 is seated against the ring 16 the pilot-valve 45 will also be seated against the end of the nozzle 37 on the plug 32 with a slight clearance between the bottom of its disk 49 and the surrounding flange 43 which retains it in place. This arrangement allows the clapper-valve 20 to be lifted slightly off from its seat 18 under variations in pressure of the water column in the supply-pipe 5, but when the clapper 20 is raised beyond this slight extent upon the opening of a sprinkler-head, or if abnormal leakage occurs in the piping system, then the pilot-valve 45 will be lifted with it to allow the water to flow through the plug 32 and pipe 31 to furnish pressure for operating the alarm-apparatus. The method of operation of the complete device is as follows:

My improved alarm-valve is usually installed in the basement of the building in the supply-pipe or water-main leading to the sprinkler-system on the floors above. Beneath it in the pipe 5 is a hand-valve or gate, not herein shown, for admitting pressure to the system. When the hand-gate is opened the water will flow through the inlet 3, the pressure lifting the clapper 20 to the position shown by the dotted lines in the drawing, and issuing through the outlet 6 will be distributed to the various branches of the sprinkler-pipes. After the piping-system has been filled the pressure will be equalized on the clapper 20 and under the action of gravity it will drop back against its seat 18 on the rim of the ring 16. As the clapper 20 returns to this position the pilot-valve 45 carried at its end will seat itself against the end of the nozzle 37 to close the egress to the pipe 31 leading to the alarm-apparatus. Under normal conditions the pilot-valve 45 remains seated in this manner and the pressure on its under side is equalized by that on its upper end by the flow through the openings 44 in the thimble 40. It is well known that the water-pressure or head from city mains or other supply systems varies under different conditions, the pressure usually increasing at night and decreasing under greater use in the daytime. This causes what is termed a "water-hammer" in the supply-pipe 5, tending to produce a fluctuation of pressure against the clapper-valve 20 in the casing 2. To compensate for this increase in pressure the clapper 20 is adapted to lift slightly off from its seat 18, as before explained, but the slight play of the pilot-valve 45 in the thimble 40 prevents the disk 49 from being raised away from its seat on the end of the nozzle 37. That is to say, the valve 45 floats or slides in the thimble 40 to provide for maintaining it constantly against its seat under a slight lifting action of the clapper 20. When, however, the valve-clapper 20 is raised beyond the extent allowed by the clearance between the bottom of the disk 49 and the flange 43, the valve 45 will be lifted off from its seat and the water will flow through the plug 32 and pipe 31 to furnish pressure to operate the alarm-apparatus. This latter may be of any usual arrangement for ringing a bell or sounding a whistle, the mechanism employed not being herein shown as it forms no part of the present invention.

It will be understood, of course, that the raising of the valve-clapper 20 to the extent required to open the pilot-valve 45 is caused by the flow through the casing 2 induced by escape of water when one or more sprinkler-heads is opened or from excessive leakage. The extent of this lifting-motion of the clapper 20 required to open the pilot-valve may be regulated by adjusting the plug 32 longitudinally through its opening 33 in the casing 2. Usually the plug 32 is

made of the exact length required to give the proper adjustment when its shoulder seats against the gasket 36 surrounding the opening 33. This provides that when the parts are once properly assembled the adjustment cannot be changed or tampered with by unauthorized persons. Should wear of the valve-seats or derangement of the parts necessitate a new adjustment this may be made by inserting a new plug, or in some cases by changing the dimensions of the one in use. By substituting a plug having a longer nozzle a greater clearance may be provided between the bottom of the disk 49 and the flange 43, when the valve 45 is seated, so that the clapper 20 may be raised to a greater extent without lifting the plug off from its seat. If less clearance is required, to provide for quicker or more sensitive action of the pilot-valve, then a plug with a shorter nozzle is substituted. In some instances, where different sizes of plugs are not at hand, the one in place may be altered by filing off the end of the nozzle 37 to make it shorter; or by facing off the shoulder under its head 35 to allow the nozzle to project farther into the casing 2. Gaskets 33 of different thicknesses might also be employed to alter the adjustment of the plug 32, or they could be used in multiple as required to give the proper setting: although, as before stated, the preferable method of adjustment is to provide plugs of graded lengths to insure accurate setting in accordance with varying requirements. Through this means the pilot-valve may be adjusted to allow the proper extent of lift of the clapper 20 to take care of water-hammer or variations in pressure in the supply without lifting the pilot-valve off from its seat.

Heretofore, in all alarm-valve constructions now in use the adjustment of the pilot-valve must be made from the inside of the casing in which it is contained. That is to say, the plunger, diaphragm or other closure carried by the main valve constitutes the adjustable element of the pilot-valve mechanism, and access to this part can only be had by removing the cover of the hand-hole and reaching into the interior of the valve-casing. It will be obvious that to effect an adjustment in this manner the pressure must be shut off at the main gate and all of the water drained off from the piping-system above the valve. Not only does it require considerable time for draining the system and refilling the pipes again, but the building is left unprotected while the adjustment is being made. As the adjustment must be very accurate it is sometimes necessary to alter the position of the pilot-valve several times before the proper setting is arrived at, and a test must be made for each adjustment after the sprinkler system has been refilled. This makes it a very laborious and time-consuming operation and renders the adjustment of the valve a very costly matter.

Readjustment of the pilot-valve is often made necessary by its seat becoming marred or damaged from contact with foreign substances such as pebbles and scale, or from wear or derangement of the parts of the device due to abnormal conditions. For this reason it is highly important that the adjustment of the valve-mechanism may be made easily and expeditiously and without the loss of fire-protection to the building for even a short period. With my improved apparatus the pilot-valve may be adjusted from the exterior of the main valve-casing and without draining the sprinkler system. When it is required to set the valve it is only necessary to close the main gate in the supply-pipe 5 to shut off the pressure. Now when the plug 32 is removed a very small amount of water will be drained off from the inlet 3 through the opening 33, but the clapper 20 acts as a check-valve to hold the pressure in the piping-system above it. That is to say, the water cannot flow back through the main valve-opening so that the sprinkler system will not be drained, but will retain the water therein to provide a measure of fire-protection at all times. When this is in place a test can be made immediately by simply turning on the pressure at the main gate, without delay for refilling the system. That is to say, the sprinkler-system remains filled or under pressure while the adjustment is being made and is ready for a test immediately the plug 32 is replaced and the supply-gate opened. It will thus be seen that the adjustment may be altered several times within a very brief period and a test taken each time until the proper setting is secured.

My improved arrangement also provides for convenient inspection of the pilot-valve at frequent intervals so that its seat may be cleaned and the essential parts kept in order by repair or replacement should they become worn or deranged. After the plug 32 has been removed the thimble 40 may be unscrewed from its bore or socket 39 and the valve 46 renewed or replaced should occasion require. It is also to be noted that the opening or socket for the pilot-valve 45 is open from the bottom only and is therefore much less liable to collect sediment or scale from the piping-system so that it is practically proof against becoming clogged or impeded in its action. For these reasons my improved device is much more sensitive and positive in its action, besides being easier and more convenient of adjustment and more efficient for the purpose required.

Various modifications might be made in the structure and arrangement of the parts

of the apparatus without departing from the spirit or scope of the invention, therefore, without limiting myself to the exact embodiment herein shown and described, what I claim is:

1. In an alarm-valve for automatic fire-extinguishing systems, the combination with a casing having inlet and outlet ports, of a check-valve for closing the inlet-port against back-pressure, a pilot-valve movably mounted on the under side of the check-valve within the inlet port, and a plug inserted through an opening in the side of the casing below the check-valve and provided with an outlet-port arranged opposite the pilot-valve to adapt the latter to seat thereagainst, the opening for the plug being of such dimension as to allow removal of the pilot-valve therethrough for repair or replacement, without draining off the water from the system.

2. In an alarm-valve for automatic fire-extinguishing systems, the combination with a casing having inlet and outlet ports, of a check-valve for closing the inlet-port against back-pressure, a pilot-valve movably mounted on the underside of the check-valve within the inlet port, and a plug screwed through an opening in the side of the casing below the check-valve and carrying a nozzle against the end of which the pilot-valve is adapted to seat, said plug being adapted to be withdrawn from its opening to allow the pilot-valve to be removed therethrough for repair or replacement without draining off the water from the system.

3. In an alarm-valve for automatic fire-extinguishing systems, the combination with a casing having inlet and outlet ports, of a check-valve for closing the inlet-port against back-pressure, a plug inserted through an opening on the side of the casing below the check-valve, said plug having an outlet leading to the alarm apparatus to supply pressure thereto, and a pilot-valve on the under side of the check-valve within the inlet-port, said pilot valve movable independently of the check-valve to seat against the plug to close the pressure outlet therethrough and to be raised from its seat by the lifting of the check-valve to a predetermined extent, said pilot-valve being removable through the side opening in the casing to allow its repair and replacement without draining off the water from the system.

4. In an alarm-valve for automatic fire-extinguishing systems, the combination with a casing having inlet and outlet ports, of a check-valve for closing the inlet-port against back-pressure, a socket attached to the under side of the check-valve, a pilot-valve slidable in said socket, and a plug inserted through an opening on the side of the casing and having a duct leading to the alarm apparatus to supply pressure thereto, said plug arranged with the pilot-valve normally seated against its inner end and being adapted to be withdrawn to allow the pilot-valve and its socket to be removed through the opening in the casing.

5. In an alarm-valve for automatic fire-extinguishing systems, the combination with a casing having inlet and outlet ports, of a check-valve for closing the inlet-port against back-pressure, a pilot-valve movably mounted on the under side of the check-valve within the inlet port, and a plug inserted through the side of the casing below the check-valve and provided with an outlet adapted to be closed by the pilot-valve, said plug provided with means adapted to seat against the side of the casing to regulate the position of the inner end of the plug with relation to the pilot-valve which seats thereagainst, and also adapted to be withdrawn from the casing to allow the removal of the pilot-valve without draining off the water in the system.

6. In an alarm-valve for sprinkler-systems, the combination with the valve-casing having inlet and outlet openings, of a gravity-operated clapper for closing the inlet against back-pressure, a socket on the under side of the clapper, a pilot-valve slidable in said socket, means to limit the sliding-movement of the pilot-valve to retain it in the socket, a plug inserted through an opening on the side of the casing and provided with a nozzle projecting into position to adapt the pilot-valve to seat against its end, and a duct leading from the plug to supply pressure to operate the alarm-apparatus when the clapper is raised to a predetermined extent by release of pressure from the sprinkler-system.

7. In an alarm-valve for automatic fire-extinguishing systems, the combination with the valve-casing having inlet and outlet openings. of a movable clapper for closing the inlet-opening against back-pressure, a socket on the under side of the clapper having an inturned flange on its lower end, a pilot-valve slidable in the socket and retained in place by the flange, a plug inserted through an opening in the side of the casing and provided with a nozzle projecting into position for the pilot-valve to seat against its end, and a duct leading from the plug to supply pressure for operating the alarm-apparatus.

8. In an alarm-valve for sprinkler-systems, the combination with the valve-casing having inlet and outlet openings, of a seat-ring fitted to the inlet-opening, a clapper hinged to seat against the seat-ring to close the inlet against back-pressure, a thimble screwed into a socket on the under side of the clapper and provided with an inturned flange on its lower end, a pilot-valve slidable in said thimble and retained in position

by the flange, a plug inserted through an opening on the side of the casing and having a nozzle-extension projecting into position for the pilot-valve to close its end, and a duct leading from the plug to supply pressure to operate the alarm-apparatus when the clapper is lifted to a predetermined extent by the escape of pressure from the sprinkler-system.

9. In an alarm-valve for sprinkler-systems, the combination with the valve-casing having inlet and outlet openings, of a check-valve for closing the inlet-opening against back-pressure, a thimble screwed into the under side of the check-valve, a pilot-valve slidable in the thimble, means to retain the pilot-valve in place in the thimble while allowing it to play up and down, a plug screwed through an opening in the side of the casing and provided with a nozzle projecting into position for the pilot-valve to close its end, said plug also formed with a head adapted to seat against the side of the valve-casing to regulate the position of adjustment of the nozzle in relation to the pilot-valve, and a duct leading from the plug to supply pressure to the alarm-apparatus.

In testimony whereof I affix my signature.

PERCY L. DRAKE.