F. H. RICE.

MAIN VALVE FOR DRY PIPE AUTOMATIC FIRE EXTINGUISHING SYSTEMS.

APPLICATION FILED JAN. 14, 1911.

1,026,882. Patented May 21, 1912.

Fig. 1.

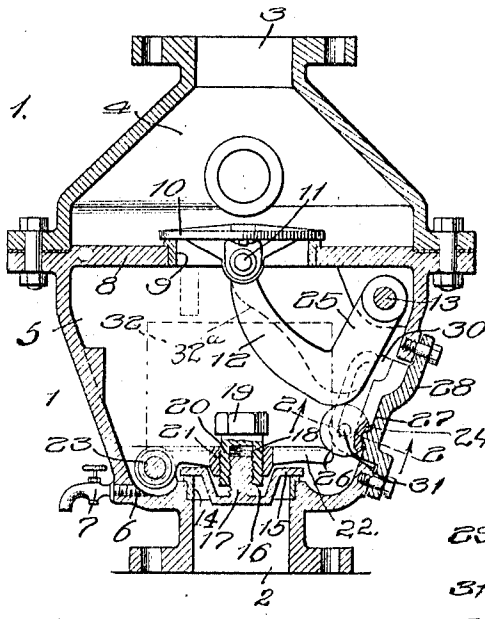


Fig. 2.

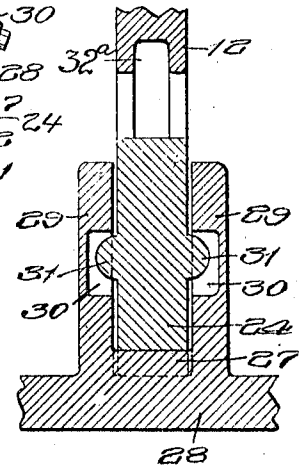
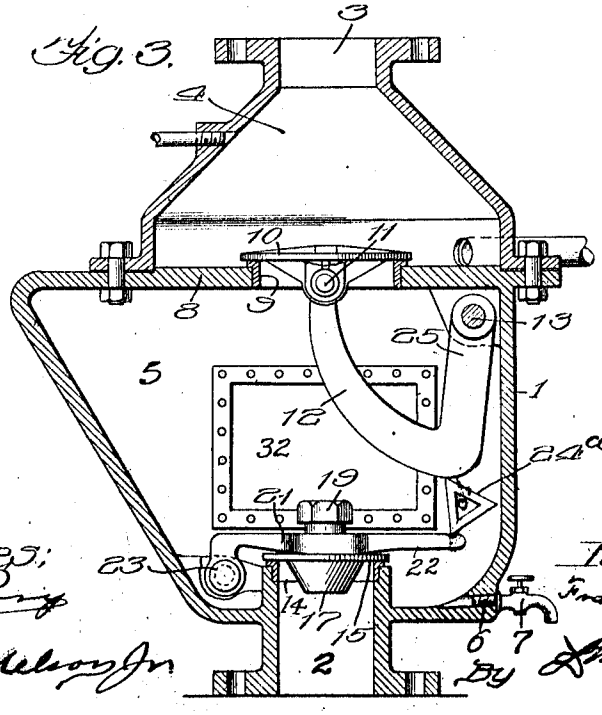


Fig. 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

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MAIN VALVE FOR DRY-PIPE AUTOMATIC FIRE-EXTINGUISHING SYSTEMS.

1,026,882. Specification of Letters Patent. Patented May 21, 1912.

Application filed January 14, 1911. Serial No. 602,727.

To all whom it may concern:

Be it known that I, FRANK H. RICE, a citizen of the United States, residing at Oak Park, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Main Valves for Dry-Pipe Automatic Fire-Extinguishing Systems, of which the following is a specification.

The offices, or general purposes, which dry pipe valves are intended to fill or supply, as well as the general construction and mode of operation of their essential or fundamental features being well known and understood by those skilled in the art, and the present invention being concerned only with the construction and arrangement of some of their minor elements, a rudimentary description of such valves is unnecessary at this point.

The object of the invention is to provide a valve of this class which shall be improved in its construction in the respect that the number of necessary parts is minimized, its construction and operation simplified, its efficiency assured and its operative parts made easy of access for the purposes of setting and resetting, inspecting, cleaning and other purposes.

To this end the invention consists in the features of novelty that are hereinafter described with reference to the accompanying drawing, which is made part of this specification and in which:

Figure 1 is a vertical axial section of a main valve embodying the invention in its preferred form. Fig. 2 is a section showing a detail thereof on the line 2—2, Fig. 1. Fig. 3 is a vertical longitudinal section of the valve embodying some features of the invention under a slight modification.

The casing, 1, of the valve is provided at bottom with an opening, 2, communicating with any suitable source of water supply and having at top an outlet opening, 3, communicating with the riser of the system. The interior of the casing is divided into a chamber, 4, herein called the outlet chamber which is in constant open communication with the distributing system and a chamber, 5, which is called the low pressure chamber in that its interior is maintained at atmospheric pressure through a leak opening, 6, that may be provided with a petcock, 7, for preventing the accumulation of water in the low pressure chamber to an objectionable level. The formation of the two chambers, 4 and 5, is the result of a web or diaphragm, 8, having through it an opening in which is arranged a valve seat, 9, and a check valve, 10, of customary or any suitable construction adapted to said seat, whereby the port through said seat may be opened or closed as may be desired. The valve, 10, is located in the outlet chamber 4 and seats downward against the seat, 9, through which the port connecting the chambers, 4 and 5, is formed, but while this valve is located in the outlet chamber, 4, it is jointed at 11 to the free end of an elbow lever, 12, which extends downward from the valve and into the low pressure chamber, 5, in which its upper end is pivoted, as at 13, to the body of the casing or suitable parts carried thereby.

In the inlet opening, 2, of the valve casing is arranged a valve seat, 14, through which is formed the port for the admission of water into the inlet or low pressure chamber, 5, and to this seat is adapted a valve of somewhat novel construction for controlling this port. This valve consists primarily of a disk, 15, the top side of which has an annular depression, 16, and a central portion, 17, surrounded by this depression, which portion takes the form of a stud or pin integral with the disk, 15, and rising centrally therefrom. It is screw-threaded on its exterior in order to engage corresponding threads, 18, formed on the interior of a hollow bolt, 19, the exterior of which also is provided with screw threads, 20, which engage corresponding internal threads of a nut, 21, which is attached to or formed with and as a part of a lever, 22, arranged diametrically with respect to the valve disk, 15. One end of this lever is pivoted to the valve casing or a part carried thereby at 23, whence it crosses the inlet valve diametrically and terminates at its free end in contact with the lower side of a part, 24, which may be of any one of a large variety of shapes, but the active part and functional characteristic of which reduce it to nothing more nor less than a floating or unattached member of a two-part strut, the other member of which consists of the inner arm, 25, of the elbow lever, 12. For example, as shown in Fig. 1, the lever, 22, contacts at 26 with the strut member, 24, which in this form of the invention is nothing more nor less than a cylindrical block

or roller and the pressure of the water against the under side of the inlet valve, acting through the lever, 22, tends to force the strut member, 24, upward. By reason of its contact with the flat surface, 27, of a removable cover plate, 28, the member, 24, will be confined to movement directly toward the pivotal center of the member, 25, and this surface also forms a stop for preventing the strut members from passing or even reaching the dead center. That is to say, when acting as a stop, the surface 27 will prevent the point of contact between the members 24 and 25 of the strut from reaching a straight line drawn from the pivotal center of the movement, 13, of the member 25 to the point of contact, 26, between the member 24 and the lever 22, the result being that the strut is prevented from becoming locked while it is permitted to "buckle" in one direction only, after the manner of a toggle. Thus, it will be seen there is a constant tendency on the part of the water pressure on the under side of the inlet valve to unseat said valve and that there is a constant tendency upon the part of the air pressure in the system to prevent this unseating of the inlet valve, notwithstanding the water pressure. And with the parts constructed and arranged as shown in the drawings the low air pressure in the system aided by the differentials of the valves and the levers and the powerful toggle-like action of the two-part strut, will hold the inlet valve seated in opposition to the greater water pressure acting against it. The toggle action of the strut is particularly advantageous in holding the inlet valve seated, since it is more positive and effective in resisting water hammer than the yielding pressure of the air confined in the system is. The possible variations in these differentials in order that the described results may be accomplished are practically innumerable and therefore no attempt has been made to illustrate them *in extenso*, this being a mechanical detail which may be left to the builder. It will, of course, be understood by those skilled in the art that if the preponderance in favor of, say, the air in the system is to be increased to meet an abnormal or unusually high pressure in the water supply, this may be done by increasing the diameter of the valve, 10, or decreasing the diameter of the valve, 15, or both, or changing the relative lengths of the arms of any one or more of the levers.

As before stated, the parts, 24 and 25, constitute in effect a two-part strut having a toggle-like action interposed between the inlet valve (or the lever, 22, carrying it) and the ultimate fixed abutment or resistance and as shown in Fig. 1 the three cardinal points of this strut are only slightly off center. Like a toggle joint its holding power or resistance against bending or buckling is greatly against the force tending to buckle it, and to a corresponding degree in favor of the force tending to prevent its buckling.

For the purpose of adjusting the parts which intervene or are interposed between the two valves, 10 and 15, so that the valves will both firmly seat at the same time, the connections between the two valves are so made that they may be adjusted and thus lengthened or shortened, as it were. For instance, the threads, 18, and 20, on the interior and exterior, respectively, of the hollow bolt, 19, are right and left. Thus, assuming the parts to be in the positions shown in Fig. 1, if both valves, 10 and 15, are not firmly seated, by turning the bolt, 19, in the proper direction, the valve disk, 15 and lever, 22, will be forced apart or drawn together, and the connection between the two valves thereby lengthened or shortened, as the case may be.

The member, 24, floats freely, and is not connected to any of the other parts excepting that it is confined to contact with the flat surface, 27, on the inner face of the cap, 28, by means of certain parts which are formed integrally with the cap, 28, and may be termed a cage. This cage may consist of two parallel webs or flanges, 29, which are just sufficiently far apart to permit the member, 24, to move freely between them, without contact, and the inner faces of these webs or flanges are provided with grooves, 30, respectively, which are occupied loosely by gudgeons, 31, projecting from opposite faces of the cylindrical member, 24, so that the gudgeons can not escape from said grooves, and consequently the cylindrical member, 24, can not escape from its cage, so long as the cage remains in place shown in Figs. 1 and 2. When the cap plate, 28, is removed, carrying the cage with it, the cylindrical member, 24, may, if desired, be removed.

It will be understood that each time the valve operates, *i. e.*, each time the valve disks, 10 and 15, unseat and open the water way, the cylindrical member, 24, will be moved upward by the lever, 22, and will again fall back, by gravity, to the position shown in Fig. 1 as soon as the end of the lever has escaped upward from it. The resetting of the valve is then accomplished by hand in customary manner, a suitable hand hole for this purpose being shown at 32.

The form of the invention shown in Fig. 3 differs from that shown in Figs. 1 and 2 principally in the construction of the floating strut member. In Fig. 3 this strut member, 24ª, takes the form of an open triangle interposed between the angle of the elbow lever, 12, and the lever, 22, of the inlet valve

in substantially the same manner as has already been described with reference to the cylindrical strut member, 24. In both forms of the invention the valve casing has a straight water way and the valves are swung oppositely, *i. e.*, so as to move in opposite directions in unseating, so that when they do unseat, they move entirely out of the water way so as to leave it unobstructed.

In order to provide clearance between the levers, 12 and 22, whatever their positions, the former is slotted as shown at 32ª.

When the valve 15 is once unseated it is prevented from again automatically seating itself by the floating member, 24.

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

1. A main valve for automatic fire extinguishers having a casing, said casing having a chamber, a port opening thereinto for the inlet of water, a second chamber communicating with the system, and a port through which said chambers communicate, in combination with valves adapted to said ports, respectively, and means interposed between said valves for transmitting pressure from one to the other, said transmitting means having a strut comprising two members contacting with each other and operating after the manner of a toggle, a fixed abutment on which the outer end of one of said members is fulcrumed, and means interposed between one of said members and one of said valves, whereby the air pressure normally prevents the buckling of the strut.

2. A main valve for automatic fire extinguishers having a casing, said casing having a chamber, a port opening thereinto for the inlet of water, a second chamber communicating with the system, and a port through which said chambers communicate, in combination with valves adapted to said ports, respectively, and means interposed between said valves for transmitting pressure from one to the other, said transmitting means having a strut comprising two members contacting with each other and operating after the manner of a toggle, and means interposed between one of said members and the valve for controlling the port through which the chambers communicate, whereby the air pressure normally prevents the buckling of the strut.

3. A main valve for automatic fire extinguishers having a casing, said casing having a chamber, a port opening thereinto for the inlet of water, a second chamber communicating with the system, and a port through which said chambers communicate, in combination with valves adapted to said ports, respectively, and means interposed between said valves for transmitting pressure from one to the other, said transmitting means having a strut comprising two members contacting with each other and operating after the manner of a toggle and means interposed between one of said strut members, adjacent to its point of contact with the other strut member, and the valve for controlling the port through which the chambers communicate.

4. A main valve for automatic fire extinguishers having a casing, said casing having a chamber, a port opening thereinto for the inlet of water, a second chamber communicating with the system, and a port through which said chambers communicate, in combination with valves adapted to said ports respectively and means interposed between said valves for transmitting pressure from one to the other, said transmitting means having a strut comprising two members contacting with each other and operating after the manner of a toggle, and a stop for preventing the strut members from reaching the dead center.

5. A main valve for automatic fire extinguishers having a casing, said casing having a chamber, a port opening thereinto for the inlet of water, a second chamber communicating with the system, and a port through which said chambers communicate, in combination with valves adapted to said ports, respectively, means interposed between said valves for transmitting pressure from one to the other, said transmitting means having a lever fulcrumed at one end in the chamber first aforesaid, means interposed between the free end of said lever and one of the valves, and a strut member contacting with the lever at an intermediate point, that portion of the lever which is between its fulcrum and its point of contact with said strut member forming the other of two strut members operating after the manner of a toggle, whereby the air pressure normally prevents the buckling of the strut.

6. A main valve for automatic fire extinguishers having a casing, said casing having a chamber, a port opening thereinto for the inlet of water, a second chamber communicating with the system, and a port through which said chambers communicate, in combination with valves adapted to said ports, respectively, a lever fulcrumed at one end in the chamber first aforesaid and at its free end engaged by the valve controlling the port through which the chambers communicate, a strut member one point of which contacts with the lever at an intermediate point and means for transmitting pressure from the other end of said strut member to the inlet valve.

7. A main valve for automatic fire extinguishers having a casing, said casing having a chamber, a port opening thereinto for the inlet of water, a second chamber communicating with the system, and a port through which said chambers communicate, in com-

bination with valves adapted to said ports, respectively, and means interposed between the valves for transmitting pressure from one to the other, said transmitting means having a bent lever fulcrumed at one end in the chamber first aforesaid and at its free end engaged by the valve for controlling the port through which the chambers communicate, and one member of a two-part strut engaging the lever at an intermediate point, that part of the lever which lies between its fulcrum and its point of contact with the strut member aforesaid forming the other member of said two-part strut, said strut operating after the manner of a toggle.

8. A main valve for automatic fire extinguishers having a casing, said casing having a chamber, a port opening thereinto for the inlet of water, a second chamber communicating with the system, and a port through which said chambers communicate, in combination with valves adapted to said ports, respectively, and means interposed between said valves for transmitting pressure from one to the other, said transmitting means having a bent lever, one end of which is fulcrumed in the chamber first aforesaid and the free end of which is engaged by the valve for controlling the port through which the chambers communicate, a floating member of a two-part strut contacting with the lever at an intermediate point, the other member of said strut being formed by that portion of the lever itself which lies between its fulcrum and its point of contact with the member first aforesaid, and a stop for limiting the movement of the point of contact between the strut members toward the dead center.

9. A main valve for automatic fire extinguishers having a casing, said casing having a chamber, a port opening thereinto for the inlet of water, a second chamber communicating with the system, and a port through which said chambers communicate, in combination with valves adapted to said ports, respectively, and means interposed between said valves for transmitting pressure from one to the other, said transmitting means having a lever engaging the inlet valve, a bent lever fulcrumed at one end in the chamber first aforesaid and at its free end engaged by the valve which controls the port through which the chambers communicate, and a member of a two-part strut, one end of which member engages the lever first aforesaid, while its other end contacts with the bent lever at an intermediate point, that portion of the bent lever which lies between said point of contact and its pivotal point forming the other member of the strut, which operates after the manner of a toggle.

10. A main valve for automatic fire extinguishers having a casing, said casing having a chamber, a port opening thereinto for the inlet of water, a second chamber communicating with the system, and a port through which said chambers communicate, in combination with valves adapted to said ports, respectively, and means interposed between said valves for transmitting pressure from one to the other, said transmitting means having a two-part strut operating after the manner of a toggle, one member of said strut being floating, and the other member being in the form of a lever fulcrumed in the chamber first aforesaid and engaged at an intermediate point by the strut member first aforesaid, the free end of said lever being held in operative position by the pressure of the air in the system, whereby the strut is prevented from buckling.

11. A main valve for automatic fire extinguishers having a casing, said casing having a chamber, a port opening thereinto for the inlet of water, a second chamber communicating with the system, and a port through which said chambers communicate, in combination with valves adapted to said ports, respectively, and means interposed between said valves for transmitting pressure from one valve to the other, said transmitting means having a two-part strut operating after the manner of a toggle, one member of said strut being in the form of a floating cylinder, and means for guiding said floating cylinder in its movements and confining it to operative positions.

12. A main valve for automatic fire extinguishers having a casing, said casing having a chamber, a port opening thereinto for the inlet of water, a second chamber communicating with the system, and a port through which said chambers communicate, in combination with valves adapted to said ports, respectively, means interposed between said valves for transmitting pressure from one to the other, and means for preventing the reseating of the inlet valve, said transmitting means having a strut comprising two members contacting with each other and operating after the manner of a toggle, one of said members being floating and adapted to recede as the inlet valve opens and fall back to its normal position for preventing the reseating of the inlet valve.

13. A main valve for automatic fire extinguishers having a valve disk provided with an externally screw threaded pin or stud, a hollow screw having on its interior threads corresponding to the threads on the pin and having on its exterior threads pitched in the opposite direction, a nut having threads complementary to the threads last aforesaid, a lever fulcrumed at one end and carrying said nut and means engaging said lever for forcing the valve to its seat.

14. A main valve for automatic fire extinguishers having a valve disk provided

with a screw thread, a lever provided with a screw thread pitched in the opposite direction and a third part interposed between the valve disk and lever and having right and left threads, complementary to the threads of the valve disk and lever, respectively.

15. A main valve for automatic fire extinguishers having a casing provided with a chamber communicating with the system, a second chamber having a port for the inlet of water, and a port through which said chambers communicate, of a valve located in the chamber first aforesaid for controlling the port through which the chambers communicate, a bent lever to the free end of which said valve is connected, whence said lever extends through said port and into the chamber second aforesaid where it is pivoted, a valve for controlling the inlet port, and means interposed between the two valves for transmitting pressure from one to the other.

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Witnesses:
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