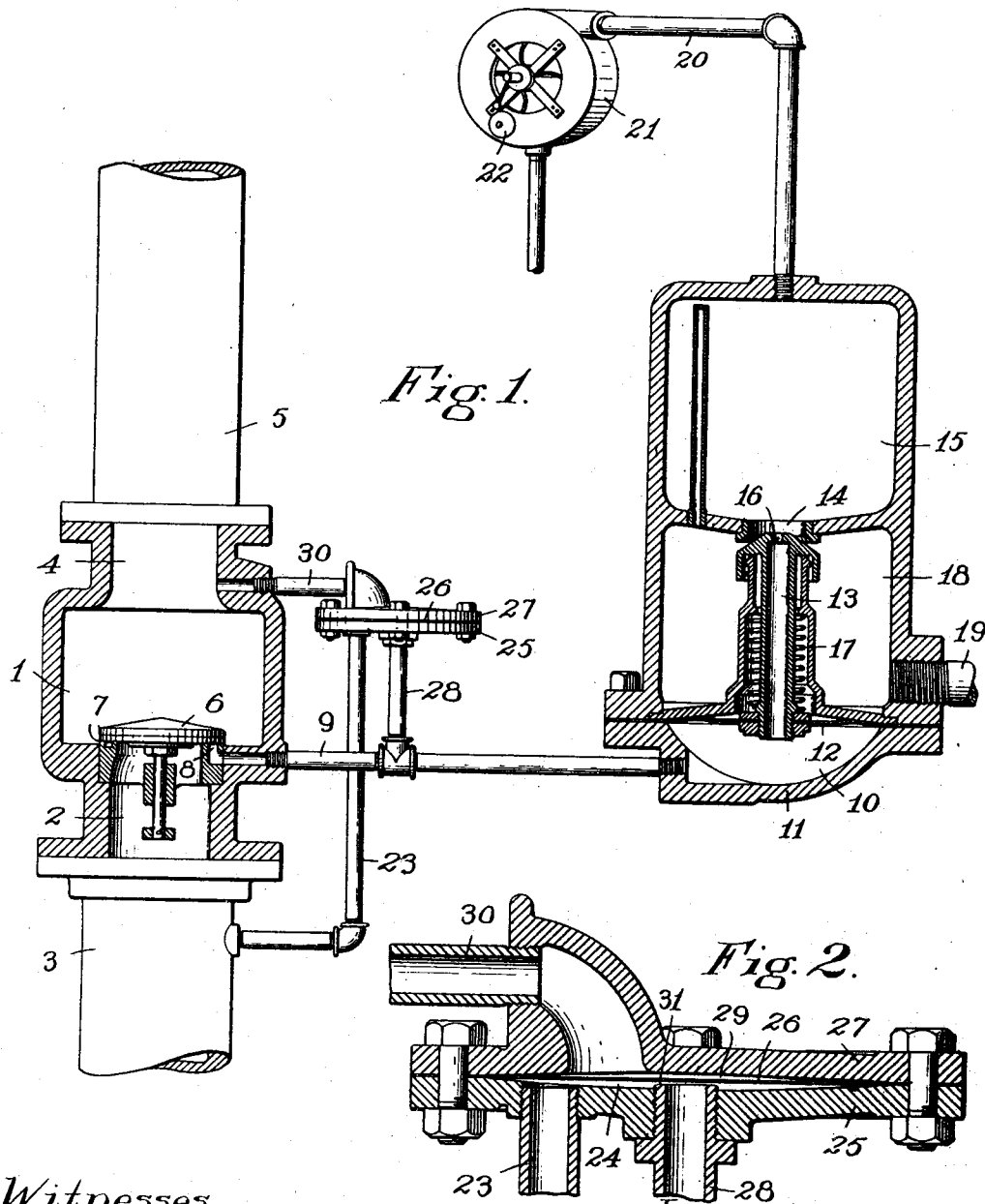


G. I. ROCKWOOD.
 APPARATUS FOR OPERATING ALARMS OR OTHER DEVICES.
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1,033,472.

Patented July 23, 1912.



Witnesses

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GEORGE I. ROCKWOOD, OF WORCESTER, MASSACHUSETTS
APPARATUS FOR OPERATING ALARMS OR OTHER DEVICE

1,033,472.

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To all whom it may concern:

Be it known that I, GEORGE I. ROCKWOOD, a citizen of the United States, residing at Worcester, in the county of Worcester and Commonwealth of Massachusetts, have invented a new and useful Improvement in Apparatus for Operating Alarms or other Devices of which the following, with the accompanying drawings, is a specification.

My present invention relates to an alarm operating device which is especially adapted for initiating the operation of an alarm employed in connection with an automatic fire sprinkler, in which the alarm is arranged to be operated by a continuous passage through a pipe of liquid under pressure, but is ineffectual during short intermittent passages of liquid.

The apparatus in which my invention is embodied causes the alarm to be sounded whenever one or more sprinkler heads have been released, causing a continuous flow of water through the supply pipe, but remaining ineffectual to operate the alarm during intermittent passages of water through the supply pipe, such as are caused by what are known as water hammers.

It is the object of my present invention to insure the certain and positive operation of the alarm whenever relief is given to the pressure in the supply pipe, such as would occur by the release of a single sprinkler head. This object is accomplished by the construction and arrangement of parts as described in the following specification and illustrated in the accompanying drawings forming a part of the same, in which—

Figure 1 is a side elevation of my improved alarm controlling mechanism, the principal parts being shown in vertical central sectional view, and Fig. 2 is a vertical central sectional view on an enlarged scale of the differential diaphragm.

Similar reference characters refer to similar parts in the different figures.

Referring to the accompanying drawings, 1 denotes a chamber having an inlet passage 2 communicating with a pipe 3 leading to a water supply under pressure. The chamber 1 is provided with an outlet passage 4 communicating with a pipe 5 forming the supply pipe of a fire sprinkler system. When the sprinkler heads are closed, as in the normal condition of the system, the flow of water from the water supply through the pipes 3 and 5 and the chamber 1 is checked,

but whenever one or more sprinkler heads are released, water under pressure will pass through the pipes 3 and 5 and the chamber 1 in an uninterrupted flow and, under this condition, it is desirable to sound an alarm, which I accomplish by means of an alarm sounding mechanism, comprising a check valve 6 supported upon an annular valve seat 7, said valve being normally held upon its seat and against the pressure of water in the pipe 3 by means of the water pressure above the check valve 6 and between it and the sprinkler heads. As the area of the check valve 6 exposed to water pressure from above is greater than the area exposed to water pressure from below, a pressure of water above the valve somewhat less than the pressure of water below will be sufficient to hold the check valve 6 upon its seat. Whenever one or more sprinkler heads are released, however, the pressure above the check valve becomes relieved, allowing the valve to be lifted and an uninterrupted flow of water to pass to the sprinkler heads.

The valve seat 7 is provided with an annular groove or recess 8, communicating with a pipe 9 which communicates with a chamber 10 inclosed between a cap 11 and a flexible diaphragm 12. During the temporary lifting of the check valve 6 by what is known as a water hammer, a quantity of water will be forced into the chamber 10 and, as the latter becomes filled, the flexible diaphragm 12 is raised, thereby lifting the attached tube 13 until its beveled end fills the opening 14 leading to the upper chamber 15. If water continues to be admitted by successive water hammers into the chamber 10, it will be forced upward through the tube 13 and restricted opening 16 into the chamber 15, and this upward movement of the water into the chamber 15 will continue until the pressure beneath the diaphragm 12 is relieved sufficiently to allow a spiral spring 17 to force the diaphragm 12 and tube 13 downward, allowing the water which has accumulated in the chamber 15 to flow through the opening 14 into the lower chamber 18 and escape through a pipe 19. Temporary accumulations of water in the chamber, due to a water hammer, will, therefore, escape through the pipe 19. An uninterrupted flow of water to the sprinkler system, such as would occur whenever one or more sprinkler heads had been released, will maintain a sufficient water

pressure in the chamber 10 to hold the diaphragm 12 and tube 13 in their elevated positions, thereby permanently closing the opening 14 until the water has filled the chamber 15 and risen through a pipe 20 to rotate a wheel within a case 21 and carry a series of hammers attached to the rotating shaft of the wheel against a bell or gong 22, thereby sounding an alarm to indicate that one or more sprinkler heads had been released and that water was flowing through the supply pipe 5.

The above described alarm apparatus, comprising the chamber 1 with its check valve 6 and the chambers 15 and 18 with the mechanism for controlling the accumulation of water, forms no part of my present invention, the same having been fully described and claimed in a copending application filed by me on December 3, 1909, Serial No. 531,253.

To render the apparatus more sensitive to slight differences in water pressure upon opposite sides of the check valve 6 is the object of my present invention, which consists in forming a by-pass between the water supply pipe 3 and the chamber 10, consisting of a pipe 23 communicating at one end with the water pipe 3 below the check valve 6, and communicating at its other end with a chamber 24 between the lower half 25 of the casing and a flexible diaphragm 26, having its edges clamped between the lower half 25 and the upper half 27 of the casing.

Communicating with the chamber 24 is a pipe 28 leading into the pipe 9 which communicates with the chamber 10. A chamber 29, above the diaphragm 26, communicates with the chamber 1 through a short pipe 30. The upper end of the pipe 28 extends slightly into the chamber 24 and forms a valve seat 31 with which the diaphragm 26 is arranged to contact when the latter is depressed. During the operation of the apparatus, when the water pressure above the check valve 6 is substantially equal to or greater than the water pressure below the check valve 6 the flexible diaphragm 26 will be forced downward into contact with the valve seat 31, thereby closing the pipe 28 and preventing the flow of water through the by-pass connecting the chamber 10 with the water supply pipe 3. The diameter of the flexible diaphragm 26 is several times greater than the diameter of the valve seat 31, so that the differences in the effective pressures upon the upper and lower sides of the diaphragm 26, when the water pressure above and below the check valve 6 is the same, is very small. In order to lift the diaphragm 26 off its valve seat and open the by-pass, it is only necessary that the water pressure above the check valve 6 shall be slightly less than the pressure below the check valve, or in an inverse ratio to the

water contacting surface above and below the flexible diaphragm.

Whenever a slight decrease in the water pressure above the check valve 6 over the pressure below the check valve takes place, even by the release of a single sprinkler head, the difference in water pressure upon opposite sides of the diaphragm 26 will be effective in raising the diaphragm from its valve seat 31 and opening the by-pass, allowing water to flow freely through the pipes 23, 28 and 9 into the chamber 10, filling the latter and closing the opening 14, causing an accumulation of water in the chamber 15 sufficient to overflow through the pipe 20 and sound the alarm. This will occur even if the valve 6 should have become stuck upon its valve seat, or should fail to open sufficiently to afford a supply of water through the recess 8 and pipe 9. The operation of the alarm, therefore, does not depend upon the lifting of the valve 6, but occurs whenever the diaphragm 26 has been raised from its valve seat 31, and this lifting of the diaphragm will occur with a much less difference in water pressure upon its opposite sides than is required to raise the check valve 6, for the reason that, in the case of the check valve 6, the difference in areas of effective water pressures upon opposite sides of the valve is comparatively large, while in the case of the flexible diaphragm, the difference in areas of effective water pressures when the diaphragm contacts with the valve seat 31 is proportionately small.

By my present improvement the operation of the alarm is rendered both certain and extremely sensitive to slight variations in water pressure upon opposite sides of the check valve 6 and, as soon as the by-pass is once open by slight variations in water pressure, the flow of water therethrough is sufficient to rapidly fill the chamber 15 to produce an immediate alarm.

When a single sprinkler head alone is released, only a minute lifting of the check valve 6 is necessary to supply sufficient water for the operation of the open sprinkler, and frequently a continued rising and falling, or pulsating movement, of the check valve 6 will occur. In neither case is there sufficient water admitted through the pipe 9 to operate the alarm, and the action of the diaphragm 12 under this pulsating movement is similar to that which occurs in the case of a water hammer, above described. By my present improvement, however, the opening of even a single sprinkler head will cause the sounding of the alarm, which would not take place at all if the check valve 6 were alone depended upon.

I claim,

1. In an apparatus of the class described, comprising a water supply pipe, a casing

having a check valve inclosing three chambers one above the other, a diaphragm in the lowermost chamber, an opening between the middle and upper chambers, a valve for closing said opening controlled by the movement of said diaphragm, a water passage connecting said lower chamber with the water supply pipe below said check valve, a diaphragm arranged to close said water passage, means for maintaining a water pressure on one side of said diaphragm corresponding with the pressure in the water supply pipe below the check valve, and means for maintaining on the opposite side of said diaphragm a water pressure corresponding with the pressure above the check valve.

2. In an apparatus of the class described, comprising a water supply pipe provided

with a check valve, the combination of a casing inclosing a pressure chamber, a diaphragm inclosed in said chamber, means for operating an alarm controlled by the movement of said diaphragm, a water passage between said pressure chamber and the water supply pipe, a diaphragm arranged to close said passage, means for maintaining a water pressure on one side of said diaphragm corresponding with the pressure in the water supply pipe below the check valve, and means for maintaining a water pressure on the opposite side of said diaphragm corresponding to the pressure in said water supply pipe above the check valve.

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