Dec. 11, 1934. W. A. KENNEDY 1,984,067

ALARM ACTUATING APPARATUS FOR SPRINKLER SYSTEMS AND THE LIKE

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Fig. 1

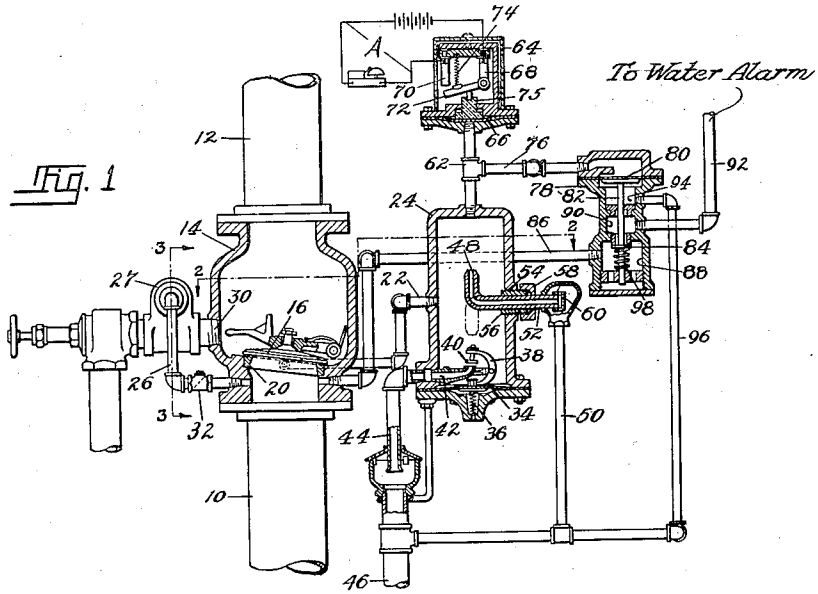
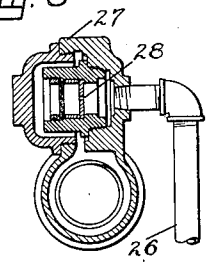


Fig. 3



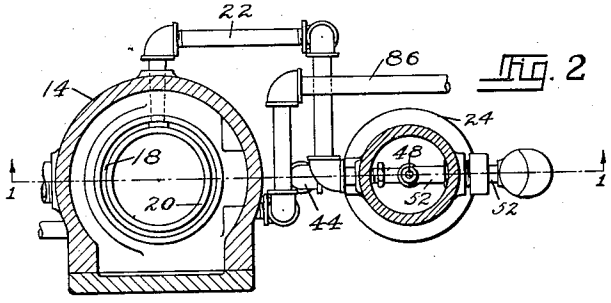


Fig. 2

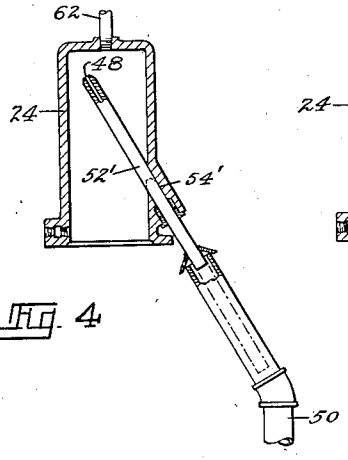


Fig. 4

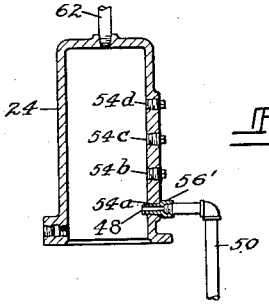


Fig. 5

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ALARM ACTUATING APPARATUS FOR SPRINKLER SYSTEMS AND THE LIKE

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Application January 3, 1933, Serial No. 649,825

5 Claims. (Cl. 169—23)

This invention relates to improvements in alarm actuating apparatus for sprinkler systems and the like. More especially it relates to improved means for adjusting the "tie-over" period of apparatus such as is disclosed in Letters Patent 1,589,858 granted to me June 22, 1926.

Whenever fire extinguishing discharge from a sprinkler system takes place, it is desirable that an alarm be given indicating that the system is in active operation. It is equally desirable that the cessation of such alarm truly indicate that discharge from the sprinkler system has ceased. In the case of wet pipe systems, to which this invention is particularly directed, the actuation of the alarm is effected by flow of water to the alarm actuating mechanism and theoretically this flow should occur only when discharge flow through the main system takes place, for there is a so-called alarm valve in the main distributing or feed pipe which opens and closes in accordance with the system flow and which also controls the passage to the alarm actuating mechanism. In practice, however, it not infrequently happens that this alarm valve is opened by surge into the main system even though the sprinklers are all closed, and such opening of the valve admits water to the alarm actuating mechanism and may result in a false alarm indicating that the system is actually discharging. On the other hand, when a system is in operation and an alarm is being given indicating that fact, it also happens that, due to a back-surge or temporary stoppage of flow in the main line, the alarm valve will close and thus cut off the flow to the alarm actuating apparatus. In consequence the alarm may cease thus again falsely indicating by its silence that the sprinkler system is not operating, whereas in fact the sprinklers are still discharging.

In the apparatus disclosed in my aforesaid Letters Patent, I provided means for minimizing the false opening of the alarm valve clapper, means for avoiding a false alarm when this clapper temporarily opens, and means for maintaining the alarm during a re-closing of this clapper after it had been opened by discharge flow past it. In the apparatus of the patent, however, no means were provided whereby the alarm actuating apparatus could be adjusted to suit the operative conditions of the sprinkler system with which it might be associated. These conditions are affected by the character and size of the sprinkler system, the normal water pressure of the supply and the characteristics of this supply as regards variation in pressure, water hammer conditions, volume, etc. Since all of these factors or influences are encountered in every installation and make it necessary to have a different "tie-over" period for each alarm apparatus, the present invention is directed primarily to means for adjusting the actuating apparatus to the end that a standard assembly may be readily adapted to the particular system to which it is applied.

More especially the principal object of the invention is to provide an adjustable open-drain from an accumulation chamber so that when this drain is sealed by the water accumulating in the chamber a suitable volume of air will be entrapped therein to meet the requirements of the system. It is also a feature to provide for the adjustment of the rate of flow through this open drain and to otherwise simplify the construction of the apparatus.

It is intended that the patent shall cover by suitable expression in the appended claims, whatever features of patentable novelty exist in the invention disclosed.

In the accompanying drawing:

Figure 1 is an elevation, largely in section, showing apparatus embodying the present improvements;

Figure 2 is a plan in section on line 2—2 of Figure 1 but with the alarm valve clapper removed;

Figure 3 is an elevation of a detail in section on line 3—3 of Figure 1;

Figure 4 is an elevation in section of the accumulation chamber showing a modified form of adjustable open drain; and

Figure 5 is another elevation like Figure 4 showing a different arrangement for adjusting the location of the open drain.

Referring to the drawing, the supply pipe 10 and distributing pipe 12 of a wet pipe sprinkler system are connected by a valve casing 14 housing an alarm valve 16. This is preferably of the differential type whose intermediate chamber is an annular groove 18 provided in its seat 20. Whenever the alarm valve is seated this intermediate chamber is cut off from the main system, but is open to atmosphere through a pipe 22 and casing 24 constituting an accumulation chamber. This chamber, as will more particularly hereinafter appear, is vented to atmosphere.

Although the alarm valve is of the differential type, the areas of its two faces are so nearly equal that the distribution side has but slight advantage over the supply side. Consequently, when the pressures on the alarm valve are nearly equal,

surges in the water supply may cause temporary lifting of the valve 16, with resulting flow to the accumulation chamber 24. Such flows are somewhat eliminated by a restricted by-pass from the supply side to the distribution side of the alarm valve through a small pipe 26, a fitting 27 with restricted opening 28, and a connection 30. When the pressure of the supply rises slowly so as to exceed the pressure on the distribution side but not enough to overcome the differential, this by-pass transmits this slow increase of pressure to the water beyond the alarm valve and thus mantains the differential substantially constant. This prevents lifting of the alarm valve due to further slow rise, or to minor surges, and reduces the frequency of intermittent flow of water through pipe 22 into the accumulation chamber 24. A check valve 32 in the by-pass pipe 26 prevents any flow backward past the alarm valve and thus maintains the pressure above the valve with corresponding further protection against its opening by surge consequent upon the reestablishment of the supply pressure after it has dropped. However, upon a very sudden or substantial increase of pressure on the supply side, the alarm valve will be lifted from its seat, because the restricted opening 28 is only large enough to handle flow caused by a small or gradual increase. When the alarm valve is thus lifted flow occurs into the accumulation chamber 24.

The bottom of this chamber is formed by a diaphragm 34 which is secured at its edge and has its center supported by a compression spring 36. On and attached to the diaphragm is one end of a lever 38 whose other end carries a valve 40 for closing an outlet 42 leading to pipe 44 which connects with the covered drain 46. This lever is pivoted on a fixed support and is so arranged that depression of the diaphragm swings it and seats its valve 40 over the outlet 42. The size of this drain outlet and the strength of the spring supporting the diaphragm can be so proportioned that all flow entering the accumulation chamber during intermittent or casual openings of the alarm valve, followed reasonably soon by its closure, will be discharged before sufficient accumulation occurs to depress the diaphragm and close valve 40. But upon a sustained opening of the alarm valve, as when discharge through the main system occurs, the inflow to the accumulation chamber being greater than the outflow through outlet 42, will in a short time rise rapidly in the accumulation chamber, compress the air above it and cause the diaphragm to flex and seat the valve 40.

The water thus accumulating will effect the sealing of another outlet 48 which is provided in the wall of the accumulation chamber and is connected by pipe 50 to the drain 46. This outlet may be closed either before or after the flexing of the diaphragm 34, depending upon whether or not the stored up pressure in the accumulation chamber is to continue the alarm for a comparatively long or short time. If a long period is required, this outlet 48 will be relatively near the bottom of the chamber and will accordingly be sealed by the water before the outlet 42 is closed. On the other hand, if only a short period of sustained alarm is required outlet 48 will be located higher up in the wall of the accumulation chamber.

As shown in Figure 1 this open drain outlet comprises a tube 52 extending through a suitable opening 54 in the wall of the accumulation chamber, having its inner end turned from the axis of the opening so that upon rotation of the tube its inner open end 43 will assume different positions vertically in the chamber. Thus if a long "tie-over" period is desired, the tube will be turned with its inner end downward, as shown dotted in Figure 1, whereas if a short tie-over period is preferred, the tube is turned upward as shown in full lines. The tube is rotatable in a bushing 56 screwed into the opening 54 and a packing nut 58 can be tightened to hold the tube in adjusted position and to prevent leakage.

The positioning of the tube, or more particularly its inner open end 43, will determine the quantity of air to be entrapped in the chamber when the accumulating water covers the open end. The period of time required to compress this air to a point where the alarm apparatus will operate may be further controlled by using tubes with different bores or by using tips 60 at the discharge end of the tube having different size outlets. Ordinarily the proper positioning of the inner end of the tube will provide sufficient adjustment and it is not generally necessary to vary the discharge flow through the tube.

Besides the drain outlets 42 and 48, there is another outlet at the top of the accumulation chamber from which pipe 62 leads to alarm actuating devices. One of these is represented as a switchbox 64 having a diaphragm 66 whose flexings are controlled by the pressure in the accumulation chamber. As illustrated this device comprises two binding posts 68 and 70 which form part of an alarm circuit A shown somewhat diagrammatically. This circuit may be completed by a blade switch 72 pivoted to one post and adapted to engage the other. This blade is urged by a spring 74 against an insulating block 75 resting on the diaphragm 66. When this diaphragm is flexed upward, due to rise of pressure in the accumulation chamber, the force of spring 74 is overcome, the blade switch closed, and the alarm initiated. This will continue until the pressure in the accomulation chamber again falls whereupon the spring 74 will swing the blade switch out of contact with post 70 and thus terminate the alarm.

From the pipe 62 between the accumulation chamber and the switchbox 64 is a connection 76 leading to a casing 78 in which is a diaphragm 80 attached to the stem 82 of a relay valve 84. This valve controls a separate passage for water leading from any source of constantly available pressure, such as the supply pipe 10. As shown, this separate passage comprises a pipe 86, a chamber 88 to which it leads and in which is the relay valve 84, a chamber 90 on the other side of the relay valve and a pipe 92 leading to suitable alarm apparatus such as a water motor alarm (not shown). A chamber 94 under the diaphragm 80 is vented to atmosphere by pipe 96 through which may drain any water that may leak past the valve stem 82 when the relay valve is open. Under the latter valve is a spring 98 by which the valve will be closed upon the pressure above the diaphragm being reduced to a predetermined degree.

Upon cessation of discharge from the main system and consequent stoppage of flow, the alarm valve will reseat and shut off the flow to the accumulation chamber. Flow from the chamber continues however through the restricted outlet 48 due to the expansion of the air which has been entrapped in the upper portion of 24, the space below diaphragm 66 in switch box 64, the space

above diaphragm 30 in relay valve 78 and connecting lines as represented by 62 and 76. The fall in pressure which takes place as a result of the continued flow from outlet 48, resulting from the expansion of the entrapped air, proceeds to the point where spring 74 can force the switch blade 72 to an open position and the spring 98 can seat the relay valve 84, thus effecting a silencing of the alarms. Further flow through the outlet 48 reduces the pressure upon the diaphragm 34 to a point where the spring 36 can flex the diaphragm upward and thus lift the valve 40 from the outlet 42. When this occurs the remaining water in the accumulation chamber rapidly escapes and leaves the system in its initial condition.

In Figure 4 a modified arrangement is disclosed in which the open drain 48 is a tube 52' arranged at an angle in the accumulation chamber. This tube can be moved in or out of the opening 54' so as to position its open end 48 at any desired level.

In Figure 5, the accumulation chamber 24 is shown as having several openings 54*a*, 54*b*, 54*c* and 54*d* in its wall at different levels. The proper opening is selected and an outlet connection 56' is inserted therein and connected to the waste pipe 50. The other openings are closed with removable plugs.

The invention thus provides for the giving of an alarm that is truly indicative of the conditions existing in the main system and eliminates the false soundings of alarms, or the false silencing of an alarm due to temporary changes of conditions within that system. The arrangement of two separate drains in the accumulation chamber, each serving its own particular function and each designed according to its own special use, enables the apparatus to be adjusted for any conditions. The large drain outlet 42 for leakage or intermittent flow can be closed at any predetermined setting, leaving the inflow then free to compress the air trapped in the accumulation chamber. The drain outlet 48 is made small relative to outlet 42 but within restricted limits may be varied in size in order to control the rate of discharge of water which rises above it during the accumulation period. And by suitably locating this outlet 48 the volume of air entrapped in the chamber may be predetermined, thus providing for the correct timing of the operating cycle which is involved in building up and releasing the pressure in actuating the alarm.

The spring 36 can be designed to hold the drain outlet 42 open until a predetermined pressure is exerted upon the diaphragm 34. When inflow has ceased and the pressure on the diaphragm has been reduced by discharge through the open drain 48 to the said predetermined pressure, the spring 36 will force the diaphragm 34 upward thus opening the valve 40 and allowing the water to run off more rapidly. The added advantage, of causing the escape of water from the accumulation chamber to be as slow as desired, enables the alarm to be prolonged while the chamber 24 is being emptied and also enables the stored energy in the trapped air to be utilized to carry on the function of the alarm valve when the latter is inopportunely closed.

The different methods shown in Figures 1, 4 and 5, by means of which the level of discharge outlet 48 may be varied, serve to show how varying amounts of air may be entrapped in an accumulation chamber to accomplish the results desired in a particular instance. It is to be understood, however, that the principle involved is that of having an adjustable orifice in an accumulation chamber and is not to be limited to the specific means illustrated.

I claim:

1. Alarm actuating apparatus adapted to be connected to a water supply system having a valve operable in accordance with the flow therethrough comprising, in combination, a passage controlled by said valve; an accumulation chamber in said passage having a drain outlet restricted relative to said passage; pressure actuated means for closing said outlet upon the occurrence of a predetermined pressure; another drain outlet from said chamber which is constantly open and of restricted capacity with respect to said first mentioned drain outlet; pressure responsive means adapted, upon rise of pressure in the accumulation chamber above said predetermined pressure, to actuate the alarm; and an outlet from said chamber having connection with said pressure responsive means; the said open drain outlet being adjustable so as to be located in the wall of said chamber at such a level that upon its being sealed by the accumulation of water in the chamber, a suitable volume of air will be entrapped therein to store up sufficient pressure to actuate said pressure responsive means and maintain said actuation during a temporary closing of the alarm valve.

2. Alarm actuating apparatus comprising a casing and a passage thereto from a liquid supply system; an outlet from said casing restricted relative to said passage; a valve for said outlet; means responsive to a predetermined pressure developed in the casing for closing said valve; other means adapted to be attached to the wall of said casing providing a continuously open drain of restricted capacity with respect to said first mentioned outlet; and pressure responsive means connected with said casing and adapted upon rise of pressure therein beyond said predetermined pressure to actuate an alarm; the said other means being adjustable to permit locating the entrance to said open drain at a level whereat upon the sealing thereof by water accumulating in the casing, a volume of air is entrapped in the casing corresponding to the period during which said alarm is to be continued after cessation of flow into the casing.

3. Alarm actuating apparatus comprising a casing and a passage thereto from a liquid supply system; an outlet from said casing restricted relative to said passage; a valve for said outlet; means responsive to a predetermined pressure developed in the casing for closing said valve; other means adapted to be attached to the wall of said casing providing a continuously open drain of restricted capacity with respect to said first mentioned outlet; and pressure responsive means connected with said casing and adapted upon rise of pressure therein beyond said predetermined pressure to actuate an alarm; the said other means being adjustable to permit locating the entrance to said open drain at different levels in said casing.

4. Alarm actuating apparatus for a sprinkler system adapted to sound an alarm upon sprinkler discharge and to stop said alarm upon cessation of said discharge comprising, in combination, a passage leading from said system; a valve controlling flow in said passage in accordance with flow in the main system; a casing receiving the flow through said passage; a closable drain from said casing restricted relative to said pas-

sage; means responsive to a predetermined pressure developed in said casing for closing said drain; a second drain from said chamber of restricted capacity with respect to the first mentioned drain; said second drain being constantly open and adjustably located at a level whereat its sealing by the flow accumulating in said casing entraps a volume of air which is compressed by further flow through said passage; pressure responsive means connected to said casing and adapted upon rise of pressure above said predetermined pressure due to the compression of said air to actuate an alarm; the location of said open drain being selected to determine the volume of air entrapped in accordance with the period in which said alarm is to be actuated after stoppage of flow in said passage.

5. Alarm actuating apparatus comprising a casing and a passage thereto from a liquid supply system; an outlet from said casing restricted relative to said passage; a valve for said outlet; means responsive to a predetermined pressure developed in the casing for closing said valve; pressure responsive means connected with said casing and adapted, upon rise of pressure therein above said predetermined pressure, to actuate an alarm; a continuously open drain from said casing of restricted capacity with respect to said first mentioned outlet; and means for selectively positioning said open drain at such a level in said casing as to determine the volume of air entrapped in said casing in accordance with the period in which said alarm is to be actuated after stoppage of flow in said passage.

WILLIAM A. KENNEDY.