

Feb. 5, 1935.

E. M. BENSON

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SPRINKLER ALARM MECHANISM

Filed April 10, 1931

4 Sheets-Sheet 1

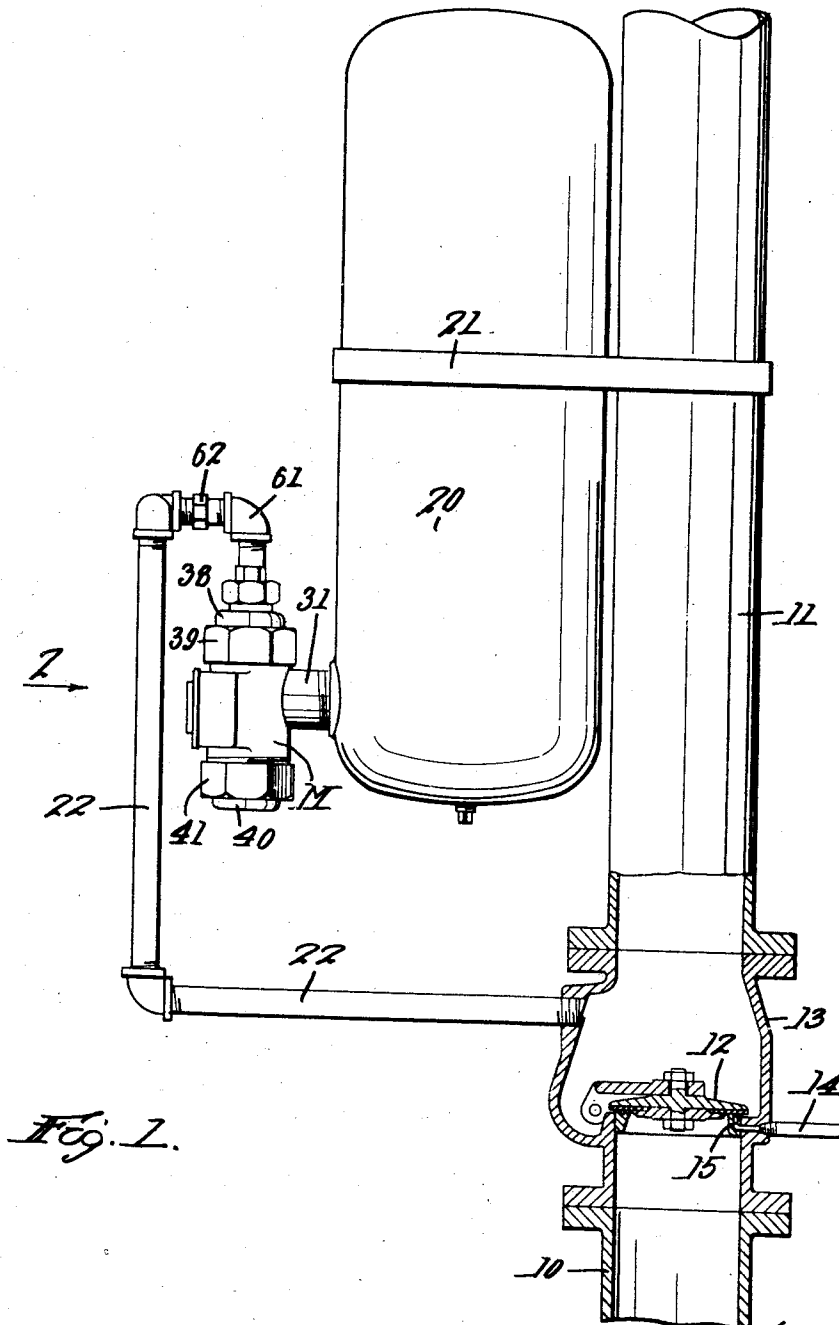


Fig. 1.

Inventor
Emil M. Benson
By Attorneys
Vought & Hay + Hawley

Feb. 5, 1935.

E. M. BENSON.

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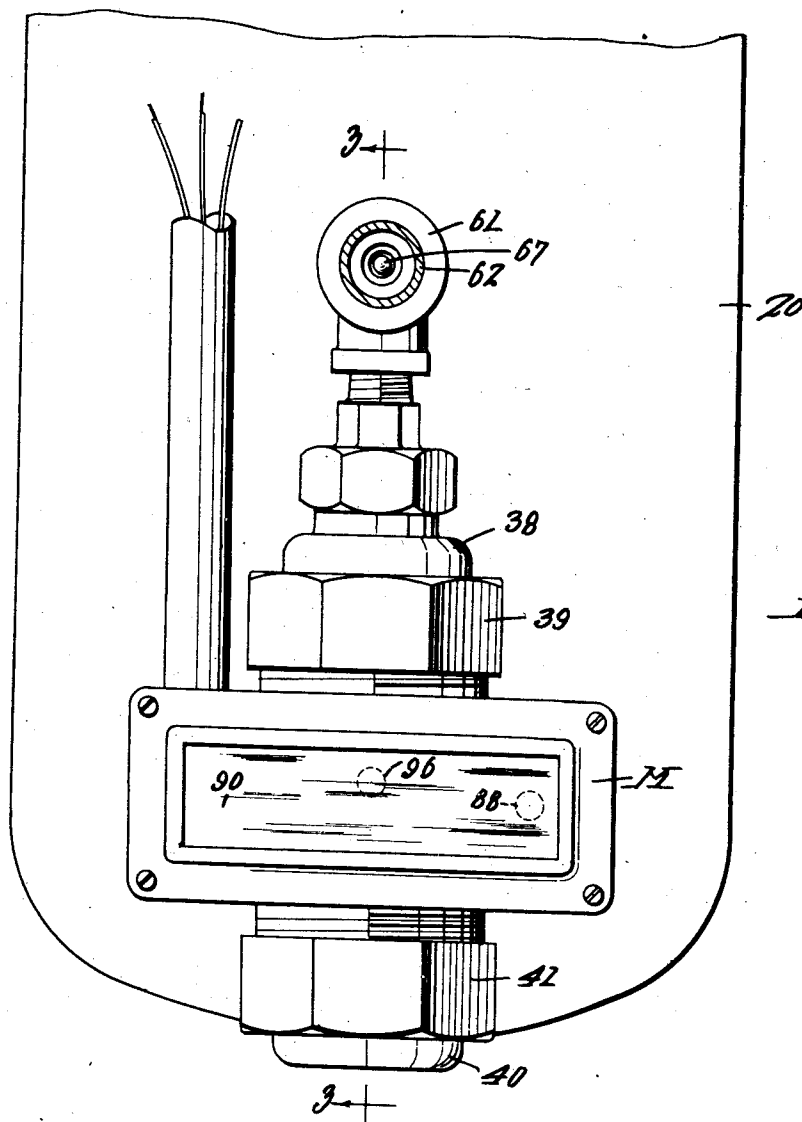


Fig. 2.

Inventor
Emil M. Benson
By Attorneys
Santhorne Hay & Hawley

Feb. 5, 1935.

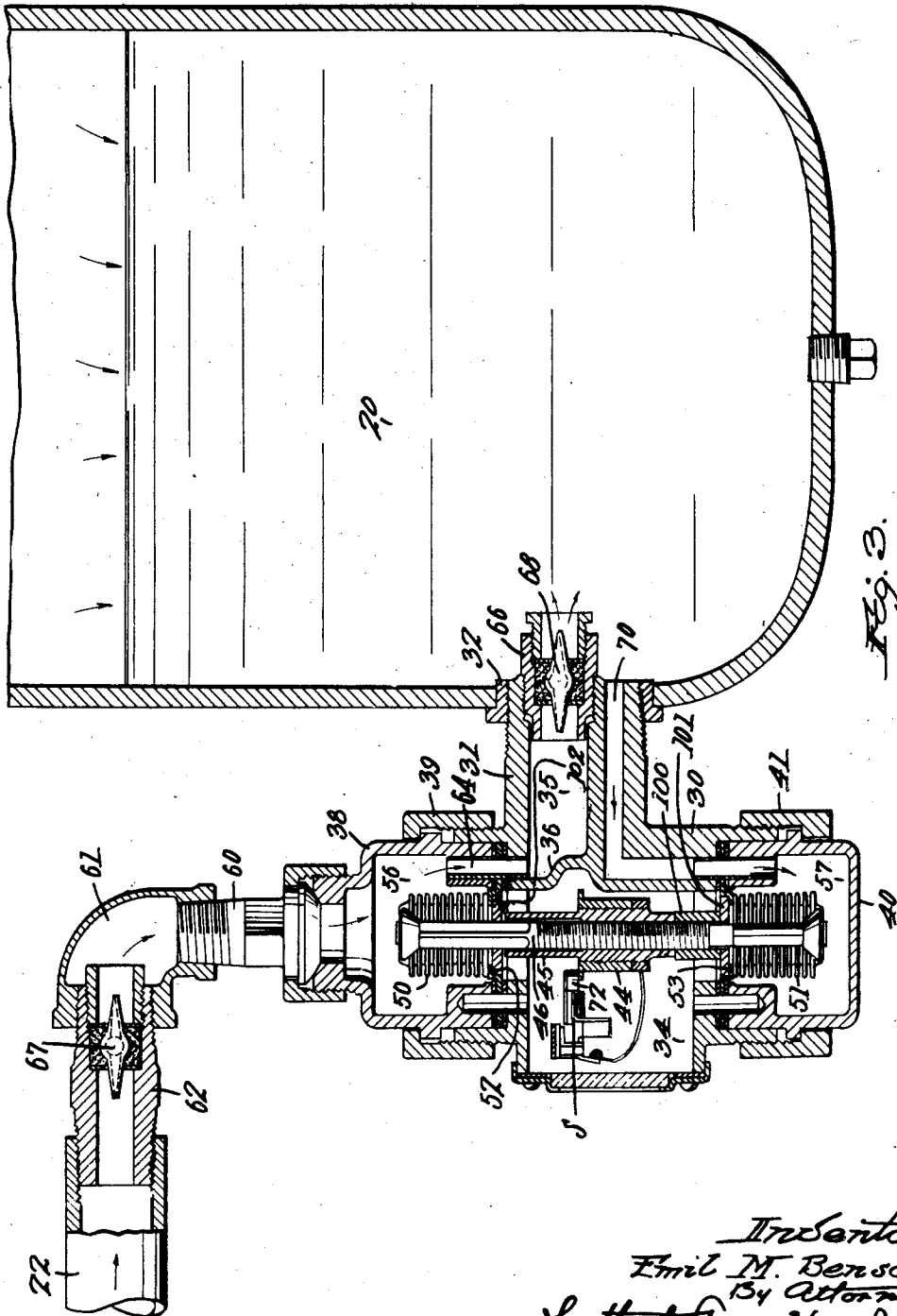
E. M. BENSON

1,990,264

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Inventor
Emil M. Benson
By Attorneys
Southgate Gray & Hawley

Feb. 5, 1935.

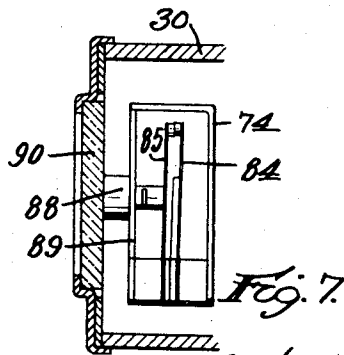
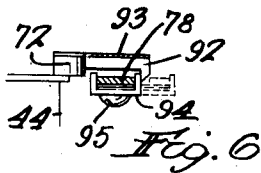
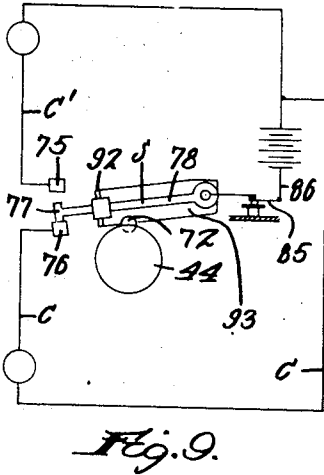
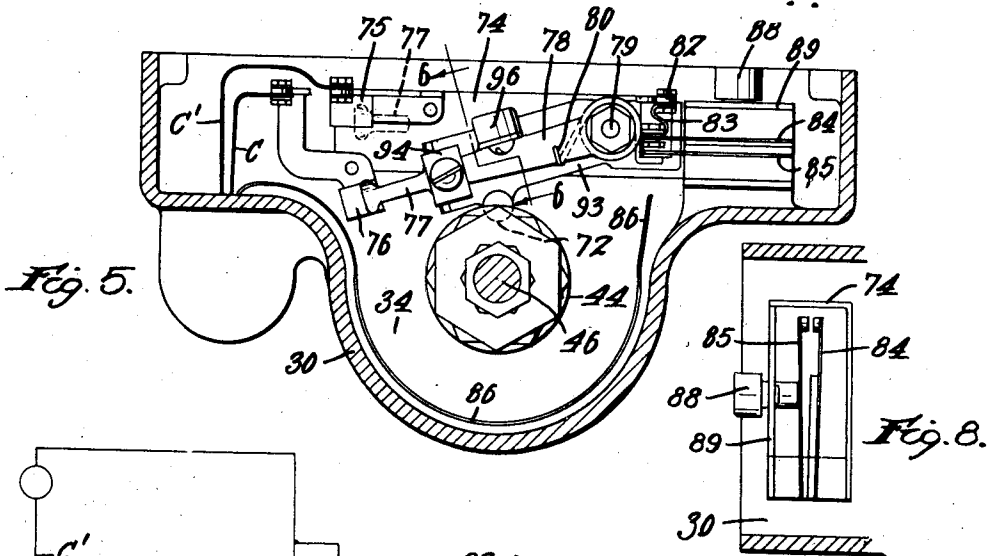
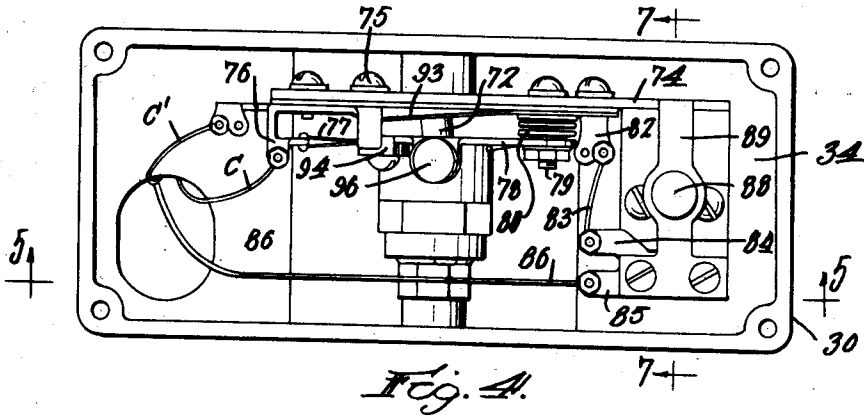
E. M. BENSON

1,990,264

SPRINKLER ALARM MECHANISM

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4 Sheets-Sheet 4



Inventor
Emil M. Benson
By Attorneys
Sutherland, Fay & Hawley

UNITED STATES PATENT OFFICE

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SPRINKLER ALARM MECHANISM

Emil M. Benson, Worcester, Mass., assignor to
Rockwood Sprinkler Company of Massachusetts,
Worcester, Mass., a corporation of Massachusetts

Application April 10, 1931, Serial No. 529,163

2 Claims. (Cl. 200—83)

This invention relates to alarm mechanism used in connection with sprinkler apparatus operating on the wet system, that is—with the sprinkler pipes and connections at all times full of water under pressure.

It is the general object of my invention to provide improved control mechanism for an alarm device by which the operation of the alarm will be rendered much more certain and dependable.

A further object is to provide such control mechanism operable at a predetermined drop in pressure in the sprinkler pipes, independent of the actual pressure and also independent of the difference in pressure between the sprinkler pipes and the water-main.

I also provide an improved form of switch to be used in my alarm mechanism and I make provision for eliminating the effect of water hammer.

My invention further relates to arrangements and combinations of parts which will be hereinafter described and more particularly pointed out in the appended claims.

A preferred form of the invention is shown in the drawings, in which

Fig. 1 is a front elevation, partly in section, of a portion of a sprinkler system having my improvements applied thereto;

Fig. 2 is a side elevation of my improved control mechanism, looking in the direction of the arrow 2 in Fig. 1;

Fig. 3 is a sectional front elevation, taken along the line 3—3 in Fig. 2;

Fig. 4 is a side elevation of the control switch;

Fig. 5 is a sectional bottom view, taken along the line 5—5 in Fig. 4;

Fig. 6 is a detail sectional view, taken along the line 6—6 in Fig. 5;

Fig. 7 is a sectional end elevation, taken along the line 7—7 in Fig. 4;

Fig. 8 is a view similar to Fig. 7 but showing the parts in a different position, and

Fig. 9 is a diagrammatic view showing the circuits controlled by my improved switch mechanism.

Referring to Fig. 1, I have shown a portion of a main water pipe 10, a sprinkler supply pipe 11 and a check valve 12 mounted in a casing 13 interposed between the pipes 10 and 11. An ordinary type of water-operated alarm mechanism may be connected by a pipe 14 to a passage 15 in the seat of the check valve 12. When a sprinkler opens and the water pressure falls in the sprinkler supply pipe 11, the check valve 12 will eventually be overcome by the pressure in

the water-main 10 and will open to admit water under main pressure to the supply pipe 11 and also to the water alarm connection 14, these parts being of the usual commercial construction.

My improved control mechanism M is mounted on the side of a pressure tank 20, which may be secured to the supply pipe 11 by a strap or binder 21. The control mechanism M is connected by a pipe 22 to the check valve casing 13 at a point above the check valve 12.

Alarm mechanism

The details of the alarm mechanism are best shown in Fig. 3. The alarm mechanism M comprises a casing 30 having a hub or sleeve 31 projecting from one side thereof and threaded into a bushing 32 in the side of the tank 20 and near the lower end thereof. Two separate chambers 34 and 35 are formed in the casing 30 and are entirely separated by a partition 36. A hollow cap 38 is secured to the upper end of the casing 30 by a clamping nut 39 and a similar cap 40 is secured to the lower end of the casing 30 by a clamping nut 41.

A circuit-closing member is movably mounted in the control mechanism M and comprises a contact collar 44 (Fig. 3) threaded on a sleeve 45, which sleeve in turn is threaded on a rod 46, the ends of which extend into the hollow interiors of the caps 38 and 40. Corrugated imperforate expansion members 50 and 51 are mounted at the ends of the rod 46 and are seated against offset rings 52 and 53, securely clamped against annular shoulders in the casing 30. The rings 52 and 53 and the expansion members 50 and 51 cooperate to entirely close the passages between the chamber 34 in the member 30 and the chambers 56 and 57 in the caps 38 and 40.

The upper chamber 56 is connected to a pipe 60, elbow 61 and nipple 62 to the pipe 22 previously described. The chamber 56 is also connected through a passage 64 to the chamber 35, which in turn is connected through a nipple 66 to the tank 20.

Restrictive devices 67 and 68 are preferably provided in the nipples 62 and 66 for controlling the rate of flow between the pipe 22 and the chamber 56 and between the chamber 35 and the tank 20, for reasons hereinafter stated. Preferably also the opening through the device 67 is slightly larger than the opening through the device 68. For illustration, the opening in the device 67 may have a diameter of .015" and the opening in the device 68 may have a diameter of .010". A passage 70 in the hub or projection

31 connects the tank 20 to the chamber 57 in the lower cap 40.

If the rod 46 and collar 44 are moved upward, the collar 44 engages a button 72 in a switch device S to be described, and causes movement of a switch member to alter the condition of one or more alarm circuits. Such circuits are shown for illustration in Fig. 9, in which the switch device S is normally in position to maintain a circuit C closed and a second circuit C' open.

The circuit C would ordinarily be associated with a central station alarm, while the circuit C' would be associated with a local alarm. When the collar 44 is moved to release the switch device S, the circuit C is opened, causing the alarm at the central station to sound, and the circuit C' is closed, causing the alarm in the local circuit to sound. Any other desired circuit connections may be substituted for those shown by way of illustration in Fig. 9.

Switch device

My improved form of switch device is shown in Figs. 4 to 7, inclusive, this device being mounted in the chamber 34 of the control mechanism M.

The switch device comprises a supporting plate or bracket 74, secured in fixed position and having terminals 75 and 76 mounted thereon but insulated therefrom. A contact member 77 is mounted on an arm 78 pivoted on a screw 79 supported by the plate 74. A spring 80 mounted concentric with the screw 79 tends to swing the arm 78 so that the contact member 77 when released will be disengaged from the terminal 76 in the circuit C and will engage the terminal 75 in the circuit C'.

The arm 78, pivot screw 79 and spring 80 are all insulated from the supporting plate 74 but are connected with a terminal 82, connected by a wire 83 to a contact member 84 (Fig. 8). A second contact member 85 is connected to the common return wire 86 (Fig. 9) of the alarm circuit. The contact members 84 and 85 are resilient and will move to the disengaged position indicated in Fig. 8 when not positively held in contact with each other.

A stud 88 is slidably mounted in a support 39 adjacent the contact member 85 and the head of the stud 88 is normally engaged by a glass plate 90 (Fig. 2) which closes the front of the control mechanism M. If this glass plate is broken or removed, the circuit will be opened by separation of the contact members 84 and 85, thus breaking the central station circuit C and causing the central station alarm to be sounded.

A latch 92 is mounted on a spring-plate 93 (Fig. 4) which also carries the button 72 previously described. The spring 93 is insulated from the supporting plate 74 and the latch 92 thereon normally engages a member 94 (Fig. 6) secured by a screw 95 to an end portion of the arm 78. So long as the latch 92 engages the member 94, the arm 78 and contact member 77 are held in the normal position shown in Fig. 5, closing the circuit C.

When the button 72 is engaged by the collar 44 and the latch 92 is thereby raised, the member 94 is released and the contact member 77 moves to the dotted line position indicated in Fig. 5, thus opening the circuit C and closing the circuit C'. Subsequent downward movement of the button 72 will merely release the latch 92 but will not reset the switch, which must be reset manually after the sprinkler system has been restored

to normal operating condition. A rubber button 96 is mounted on the switch arm 78 in convenient position for use in resetting the switch.

It will also be noted the switch mechanism S, while contained within the casing 30, is entirely separated from all chambers and passages to which water has access.

Operation

I will now describe the general operation of the control mechanism M. The sleeve 45 (Fig. 3) is adjusted on the threaded rod 46 and is secured in adjusted position by a lock nut or sleeve 100. The parts are so adjusted that when the pressures in the upper and lower chambers 56 and 57 are substantially equal, the nut 100 engages a disc or washer 101 seated in the offset ring 53, while the upper end of the sleeve 45 is spaced slightly from a second washer 102 similarly seated in the upper offset ring 52. The collar 44 is then adjusted on the sleeve 45 so as to clear the button 72 under the described conditions.

If water under pressure is admitted into the sprinkler system after the parts are thus adjusted, the water will flow into the chamber 56 through the connection 22 from the check valve casing 13 and will thereafter flow through the passage 64, chamber 35 and restrictive device 68 to the pressure tank 20, which tank is usually full of air or vapor but which has no outlets except through the chamber 35 or the passage 70. The water will flow slowly into the tank 20 through the restrictive device 68 and will also flow from the tank 20 through the passage 70 to fill the lower chamber 57.

This flow will continue, compressing the air into the upper part of the tank 20 and gradually raising the water level in the tank until the air pressure in the tank equals the water pressure in the sprinkler supply pipe 11 and in the check valve casing 13, at which time the pressures in the chambers 56 and 57 of the control mechanism M will also be equalized, with the nut 100 on the sliding rod 46 seated against the fixed washer or disc 101.

The parts remain in this condition until a sprinkler opens, causing a drop in pressure in the sprinkler supply pipe 11, the check valve casing 13 and the pipe connection 22. The pressure in the chambers 56 and 35 will be correspondingly lowered, but the subsequent drop in pressure in the tank 20 and in the lower chamber 57 will take place much more slowly, due to the fact that the water can flow from the tank 20 to the chamber 35 only through the very small opening in the restrictive device 68.

Furthermore, due to the relatively great change in volume of the air in the tank 20 for a given change in pressure and the negligible change in volume of the water for a similar change in pressure, the out-flow of a very small amount of water from the chamber 56 will cause a substantial reduction in pressure therein, whereas a relatively large amount of water must be removed from the tank 20 to cause a similar reduction in the air and water pressure in the tank 20. Consequently, the pressure in the lower compartment 57 (directly connected to the tank 20) will overbalance the pressure in the upper compartment 56, when a drop in pressure in the sprinkler system occurs, moving the rod 46 upward and lifting the latch 92 to release the switch device S and reverse the alarm circuits.

The sleeve 45 is preferably so adjusted on the rod 46 that the expansion member 51 will over-

come the expansion member 50 and raise the collar 44 yieldingly to release the switch-device S whenever the pressure in the chamber 57 exceeds the pressure in the chamber 56 by a predetermined small amount, usually about two pounds.

It should be particularly noted that this difference in pressure is the difference between the pressure in the supply pipe 11 and the pressure in the tank 20, and that this difference in pressure is quite independent of the relative pressures in the water-main 10 and supply pipe 11. This is an important advantage, as conditions frequently arise under which the pressure in the supply pipe 11 may be many pounds greater than in the water-main 10.

This may easily occur in wet sprinkler systems where there is a substantial variation in water-main pressure during a twenty-four hour period. It is not uncommon for the pressure to be substantially higher during the night, when only a small amount of water is being used, than during the day when heavy demands may cause the water pressure in the main to drop very substantially. The higher pressure may be maintained in the sprinkler system by the check valve 12 after the pressure drops in the water-main, and any alarm device depending upon the opening of the check valve 12 must remain inoperative until the pressure in the sprinkler system is definitely less than the pressure in the water-main at that particular time. This may necessitate a drop of fifteen or twenty pounds in the sprinkler system before the alarm operates.

Such a drop and delay is most undesirable and is entirely avoided by the use of my improved control mechanism, which operates on a predetermined drop in pressure in the sprinkler system, regardless of the pressure in the water-main below the check valve.

Furthermore, a gradual increase or decrease of pressure in the sprinkler system causes no operation of my improved alarm mechanism, as the pressure in the chambers 56 and 57 will be constantly equalized during such gradual pressure changes. A sudden increase in pressure due to water hammer is also ineffective to sound the alarm, as this merely increases the pressure in the upper chamber 56, more firmly seating the check nut 100 against the lower disc or washer 101.

The restrictive device 67 in the nipple 62 is provided mainly for reducing the possibility of sounding the alarm upon a sudden reduction in pressure in the pipe 22 following a water hammer, when the rebound action of the water might otherwise possibly reduce the pressure in the chamber 56 sufficiently to release the alarm switch. The restrictive device 67, however, retards the flow in both directions, so that this result cannot occur.

Having thus described my invention and the advantages thereof, I do not wish to be limited to the details herein disclosed, otherwise than as set forth in the claims, but what I claim is:—

1. Alarm control mechanism for a sprinkler system comprising two hydraulic compartments connected in series to said sprinkler system and having a flow-restrictive device interposed between said compartments, a separate pressure-responsive device associated with each compartment, a member mounted for movement to initiate an alarm on the occurrence of a predetermined preponderance in pressure in the compartment more remote from the sprinkler system, a hydraulic pressure storage device connected to said latter compartment and normally maintained at sprinkler system pressure, and additional flow-restrictive means to prevent rebound of the water in the compartment nearer the sprinkler system after occurrence of water hammer in the system.

2. Alarm control mechanism for a sprinkler system comprising a hydraulic compartment, a hydraulic pressure storage device, separate connections from said compartment to said storage device and to said sprinkler system, a flow restrictive device in the connection between said compartment and said storage device, a second flow restrictive device in the connection between said compartment and said sprinkler system, and pressure responsive means associated with said compartment and movable to initiate an alarm on a substantial and fairly rapid drop in pressure in said sprinkler system below the pressure in said storage device, said first restrictive device rendering said pressure responsive means effective to initiate an alarm on drop in pressure in said compartment and said second restrictive device preventing initiation of an alarm on the occurrence of rebound in the sprinkler system after the occurrence of water hammer therein.

EMIL M. BENSON. 50