A. C. JOHNSON.

ALARM DEVICE FOR AUTOMATIC SPRINKLER SYSTEMS.

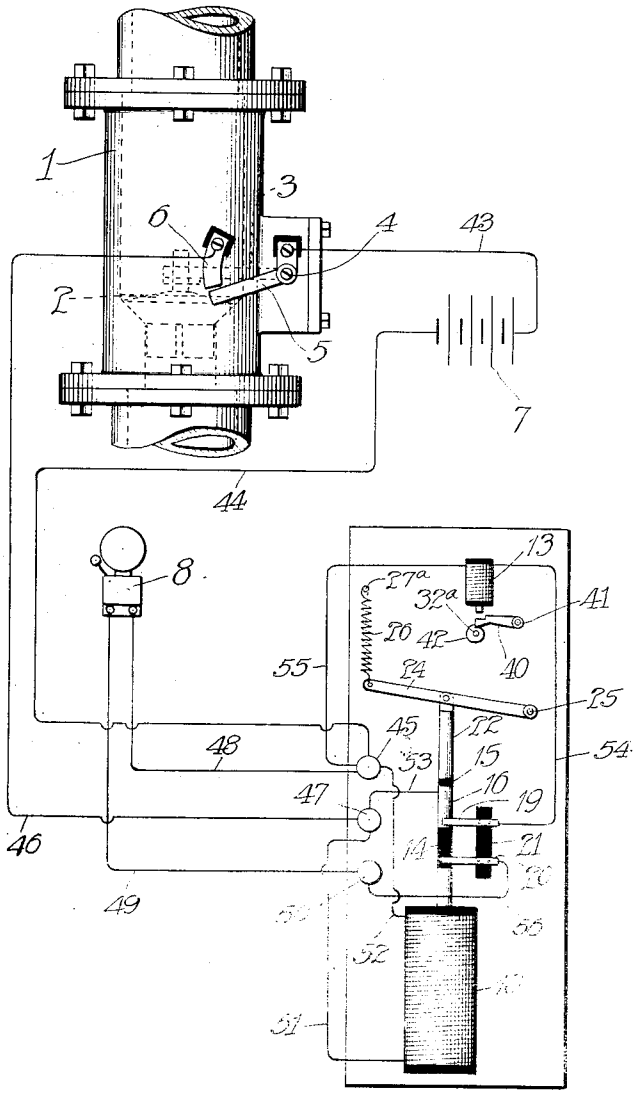
APPLICATION FILED APR. 25, 1912.

1,088,024.

Patented Feb. 24, 1914.

2 SHEETS—SHEET 1.

Fig. 1.



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2 SHEETS—SHEET 2.

Fig. 2.

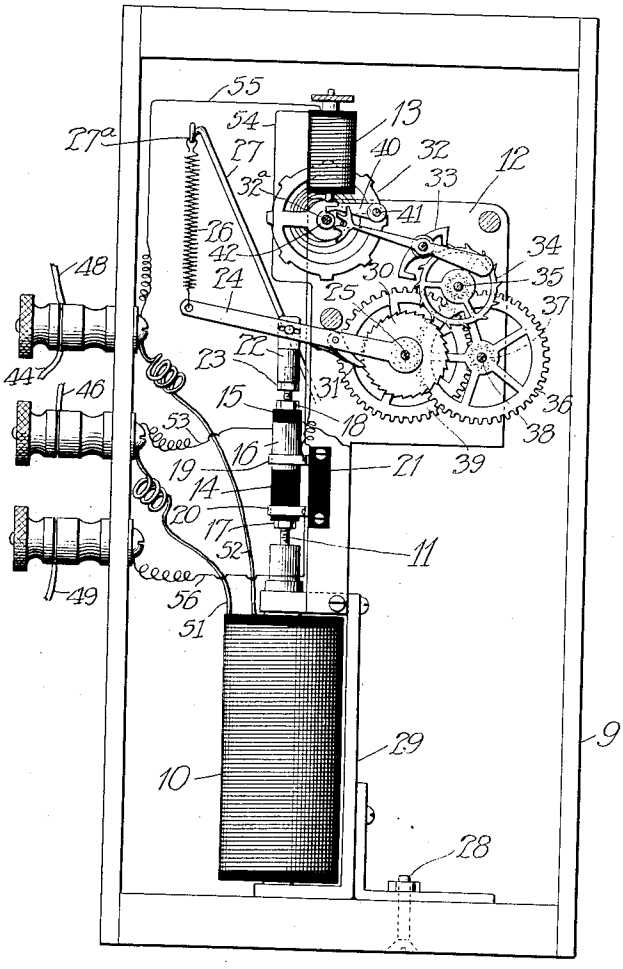
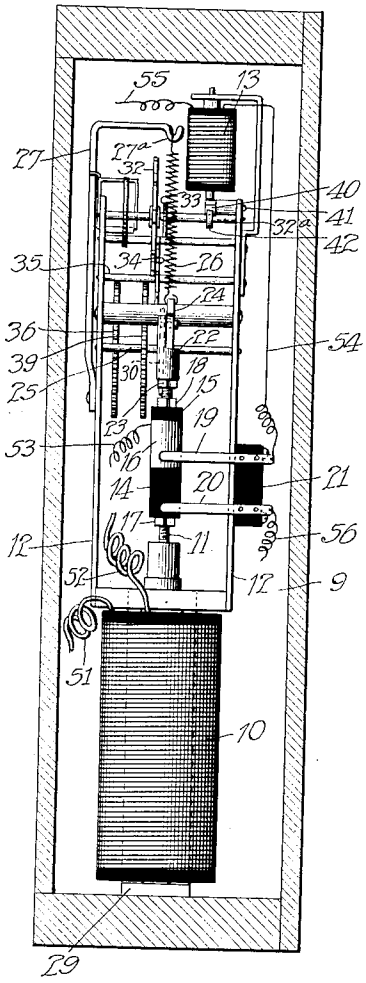


Fig. 3.



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UNITED STATES PATENT OFFICE.

AUSTIN C. JOHNSON, OF CHICAGO, ILLINOIS, ASSIGNOR OF ONE-HALF TO ALLEN A. CARPENTER AND ONE-HALF TO RALPH H. BURDICK, BOTH OF CHICAGO, ILLINOIS.

ALARM DEVICE FOR AUTOMATIC SPRINKLER SYSTEMS.

1,088,024. Specification of Letters Patent. Patented Feb. 24, 1914.

Application filed April 25, 1912. Serial No. 693,105.

To all whom it may concern:

Be it known that I, AUSTIN C. JOHNSON, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Alarm Devices for Automatic Sprinkler Systems, of which the following is a specification.

My invention relates to an alarm device of an automatic sprinkler system and the object thereof is to provide a device of this character which shall be capable of compensating for or being unaffected by the usual water hammer of such systems with the result that by the use of my invention the water hammer is incapable of sounding an alarm. Speaking in general terms, I accomplish this result by placing in an electrical alarm circuit a retard device under the control of a clock or time movement whereby a predetermined period of time is compelled to elapse before the alarm is sounded which period of time is greater than that occupied by the water hammer. The construction and arrangement of the retard device is such that at each water hammer the mechanism returns to initial position so that the entire predetermined period of time is applied to each water hammer.

In the drawings, Figure 1 is a view more or less diagrammatic showing my alarm device and circuits and an automatic valve of a sprinkler system; Fig. 2 a front elevation of the retard device or mechanism and Fig. 3 an end view thereof.

It will be understood that my device is adapted to operate in connection with any automatic sprinkler valve whose movement can be transmitted to cause the same to close an electric switch and in the present instance I have shown in Fig. 1 a representative automatic valve including the casing 1, valve 2 connected to an oscillating arm 3 which is secured to the rock shaft or axis 4, the latter extending extraneous of the valve casing. At its outer end this shaft is provided with a rock arm 5 forming one of the contacts of a switch the other contact 6 being secured in any suitable manner preferably on the valve casing. This switch is preferably of the knife type. This switch is connected with an electrical circuit in which is included a battery 7 and a suitable alarm device such as the electric bell 8 but between this bell and the switch described there is interposed the retard device or mechanism which will now be explained.

Within or on a suitable support such as the box 9 is arranged the retard mechanism which includes essentially a solenoid 10, its plunger 11, the clock or time movement indicated generally at 12 and an electromagnet 13 which controls the balance wheel of such movement. The solenoid plunger 11 is provided along its length with insulating and conducting portions or sections, the main insulating portion being a collar 14 on the plunger and the other insulating portion being a smaller collar 15 also surrounding the plunger. Between these two insulating portions 14 and 15 is arranged a section 16 of conducting material. All of these sections are adjustable together vertically and relative to the solenoid plunger 11 and to this end this plunger is screw-threaded as shown and provided at opposite ends of said sections with adjusting nuts 17 and 18 screwing on said plunger with the result that these sections may be moved or adjusted up or down, as occasion requires for reasons hereinafter given, and may be held in such adjusted position. These sections on the solenoid plunger are adapted to coöperate with the two parallel contacts 19 and 20 which are arranged in the electrical circuit hereinafter explained, these contacts being secured to an insulating block 21 on the frame of the time movement.

The top of the solenoid plunger is provided with a bearing head 22 which is screw-threaded upon such plunger and held in adjusted position by the lock nut 23. Upon this head is pivoted an arm or lever 24, the lever being fulcrumed at one end upon the arbor 25 of the clock movement and being held upwardly at its other end by yielding pressure by means of the spring 26 whose lower end is secured to the lever 24 and whose upper end is connected to a fixed point such as the hook 27ª of a rod or wire 27 which is in turn secured to the frame of the clock movement. I prefer to adopt this particular means for attaching or anchoring the upper end of the coiled spring in order that the mechanism may be self-contained and removable by simply removing the bolt 28 which secures the main frame 29 of such mechanism to the bottom of the box 9.

To the arbor 25 is secured a ratchet wheel

30 whose ratchet teeth coöperate with a spring-pressed pawl 31 which is pivoted upon the lever 24. The clock movement may be of any suitable character and that herein shown is of the conventional construction including the balance wheel 32, escapement 33, escapement wheel 34 and the train including pinion 35, wheel 36, pinion 37 secured to the same arbor 38 as the wheel 36, wheel 39 secured to arbor 25. The operation of this clock movement actuates the arbor and its ratchet wheel 30 in a counter clockwise direction thereby through the medium of the pawl 31 and lever 24 retarding the downward movement or pull of the solenoid plunger 11 when such solenoid is energized in the manner and with the result hereinafter explained. The clock movement is under the control of the electromagnet 13 which coöperates with an armature 40 pivoted at one end on a fixed point or axis 41 on the clock movement frame and tending to fall by gravity at its free end into a marginal notch in a collar 42 secured to the arbor 32^a of the balance wheel. The construction and arrangement is such that when this armature engages the collar 42 the balance wheel is in such position as to be under tension so that when the armature is disengaged by the energizing of the electromagnet the balance wheel will be instantly started and the clock movement thereby operated. In other words, the balance wheel is stopped and engaged by the armature in a position other than that of rest.

The running of the circuits is indicated in Fig. 1 wherein it is seen that the switch contact 5 is connected by the wire 43 with the battery 7 and that such battery is connected by means of the wire 44 to the binding post 45 in immediate proximity to the retard mechanism. The other switch contact 6 is connected by means of the wire 46 with a second binding post 47. From the binding post 45 there leads a conducting wire 48 to the electric bell 8 and from this bell a conducting wire 49 leads to a third binding post 50. From the post 47 a wire 51 leads to the winding of the solenoid 10 and from this winding there leads a wire 52 to the first-mentioned binding post 45 thereby completing the circuit with the result that the solenoid 10 is energized when the two contacts 5 and 6 are brought into contact. From the two binding posts 45 and 47 there leads a shunt circuit in which the electromagnet 13 is interposed, such circuit having in practice light wires as compared with the others heretofore mentioned. Following this shunt circuit and beginning with the binding post 47 a wire 53 leads therefrom to the conducting section 16 on the solenoid plunger 11. From this section the current will pass through the contact strip 19, through a conducting wire 54 to the winding of the electromagnet 13 and through another conducting wire 55 from such latter winding to the post 45. Consequently when the contacts 5 and 6 are closed, the solenoid 10 and electromagnet 13 will be energized with the results first that the armature detent 40 will be released thereby permitting the clock movement to start and second that the solenoid plunger will have a tendency to be pulled downwardly but such tendency is opposed by the clock movement which will permit the plunger to descend according as timed by it, owing to the interposed connections including the ratchet wheel 30, pawl 31 and the lever 24. There is therefore a downward pull upon the lever 24 as soon as the solenoid is energized and such pull is also transmitted through the pawl to the clock movement which of course has no main spring or the like. The ratchet wheel can therefore rotate only at such speed as is determined by the clock movement including the balance wheel with the result that the plunger will move downwardly very slowly and as determined by the clock movement. In thus moving downwardly from the initial position shown in the drawings the conducting section 16 is brought in a position to contact with the contact strip 20 with the result that an electric circuit is established through the alarm bell 8 through the following connections: from battery through wires 43 and 46, binding post 47, wire 53, section 16, contact 20, conducting wire 56, binding post 50, wire 49, through alarm bell 8, wire 48, binding post 45, wire 44 back to battery. As a result, the alarm bell will ring just as soon as the section 16 comes into contact with the contact strip 20.

It will be understood that the solenoid plunger moves downwardly synchronously, of course, with the clock movement because it is governed thereby and that it therefore takes an appreciable length of time to move to such a position as to establish the alarm bell circuit. It therefore follows that the mere closing of the switch at the automatic valve by the action of water hammer for instance, which is more or less momentary in point of time, would merely start the retard mechanism into operation, but such water hammer would not last a sufficient length of time to permit of the plunger being moved downwardly far enough to establish the alarm bell circuit. As a matter of fact, the retard mechanism is so timed that it takes a longer period than the period of duration of a water hammer for the solenoid plunger or core to move downwardly to establish said circuit, in practice such period or time consumed by the plunger being about fifteen seconds. Just as soon as the water hammer ceases, the circuit is, of course, broken in the contacts 5 and 6 with the result that the circuits through the solenoid 10 and electro-

magnet 13 will be broken, thereby permitting the spring 26 to restore the plunger and associated parts to their normal or initial starting position, in which movement the pawl 31 will ride loosely over the ratchet teeth on the ratchet wheel 30. At the same time the gravity pawl 40 will engage the collar 32 and stop the balance wheel in such a position as to start, that is, in a position of tension.

It will be observed that at the close of each water hammer the retard mechanism will be restored to initial position so that it is impossible for a series of water hammers to have accumulative effect upon such mechanism. In case, however, of an opening of the valve in event of fire and a consequent establishing of the circuit at the main switch composed of the contacts 5 and 6, the retard mechanism will operate as before and after the predetermined duration of time has elapsed, for example fifteen seconds, then the alarm bell will be sounded. From the time that the contacts 5 and 6 were closed and while the alarm bell circuit was thus established the electromagnet 13 was energized thereby holding the pawl 40 to inoperative position. However, the construction and arrangement is such that continued movement of the solenoid plunger will carry the section 16 off from the contact strip 19 and bring the insulating section 15 underneath the contact strip 19 with the result that the circuit through the electromagnet will be broken and such magnet deënergized. The armature or pawl 40 will thereupon drop to operative position and stop the clock movement. I prefer to so arrange the insulating and conducting sections that the contact strip 20 shall make contact with the conducting section 16 before the clock movement is thus stopped. It will be understood however that the alarm continues to sound after the clock movement has been stopped.

It will be understood that by adjusting the different sections up or down upon the solenoid plunger in the manner hereinbefore described the duration of the retard may be varied or adjusted. For instance, by raising these sections the duration may be increased and by lowering them such duration may be decreased. The duration is dependent upon the time that it takes the conducting section 16 to reach the contact strip 20.

By the use of my invention I am enabled to overcome the sounding of an alarm in case of water hammer and this without affecting the efficiency and reliability of the alarm system, in case of the opening of the valve in event of fire, the short delay in sending in the alarm being practically negligible so far as results are concerned.

I claim:

1. The combination, with a sprinkler valve, of a normally open electrical circuit, a switch therein controlled by the valve, an electric signal adapted to be cut into said circuit, and a retard device normally in the circuit and arranged to control the cutting in of the signal.

2. The combination, with a sprinkler valve, of a normally open electrical circuit, a switch therein controlled by the valve, an electric signal adapted to be cut into said circuit, said device having means for varying the duration of the retard.

3. The combination, with a sprinkler valve, of a normally open electrical circuit, a switch therein controlled by the valve, an electric signal adapted to be cut into said circuit, and a retard device including a circuit closer in said circuit for cutting the signal into such circuit and an electrically controlled time movement for controlling the closer.

4. The combination, with a sprinkler valve, of a normally open electrical circuit, a switch therein controlled by the valve, an electric signal adapted to be cut into said circuit, and a retard device including a circuit closer in said circuit for cutting the signal into such circuit and an electrically controlled time movement for controlling the closer and means for varying the duration of the retard.

5. The combination, with an alarm system of a sprinkler valve including an electric signal arranged in an electrical circuit, and also including a switch operated by said valve, of a retard device for controlling the time of the closing of said circuit, said device comprising a circuit closer in such circuit, a time movement controlling the closer and an electro-magnet controlling the starting of the movement, said magnet and switch being in the same electrical circuit.

6. The combination, with an alarm system of a sprinkler valve including an electric signal arranged in an electrical circuit, and also including a switch operated by said valve, of a retard device for controlling the time of the closing of said circuit, said device comprising a circuit closer in such circuit, a time movement controlling the closer and including its balance wheel and the arbor thereof, a collar on said arbor, an electro-magnet in the same electrical circuit as the switch and an armature for said magnet to coöperate with said collar to stop the movement.

7. The combination, with an alarm system of a sprinkler valve including an electric signal arranged in an electrical circuit and also including a switch in said circuit operated by said valve, of a retard device for controlling the time of the closing of such circuit comprising a time movement having electrical controlling means in the same circuit as the switch and a solenoid also

in said circuit and having a plunger acting as a circuit closer for the alarm circuit, said plunger being operatively connected with the time movement and controlled thereby.

8. The combination, with an alarm system of a sprinkler valve including an electric signal arranged in an electrical circuit and also including a switch in said circuit operated by said valve, of a retard device for controlling the time of the closing of such circuit comprising a time movement having electrical controlling means in the same circuit as the switch and a solenoid also in said circuit and having a plunger provided with conducting and insulating sections, a contact strip coöperating with the conducting section and together with such latter section forming a part of the electric signal circuit, said plunger being operatively connected with the time movement and controlled thereby.

9. The combination, with an alarm system of a sprinkler valve including an electric signal arranged in an electrical circuit and also including a switch in said circuit operated by said valve, of a retard device for controlling the time of the closing of such circuit comprising a time movement having electrical controlling means in the same circuit as the switch and a solenoid also in said circuit and having a plunger provided with conducting and insulating sections, a contact strip coöperating with the conducting section and together with such latter section forming a part of the electric signal circuit, said plunger being operatively connected with the time movement and controlled thereby, and a second contact strip arranged in the same circuit as the said controlling means, said plunger being adapted to break the last mentioned circuit when one of its insulating sections reaches the second contact strip.

10. The combination, with an alarm system of a sprinkler valve including an electric signal arranged in an electrical circuit and also including a switch in said circuit operated by said valve, of a retard device for controlling the time of the closing of such circuit comprising a time movement having an electrical controlling means in the same circuit as the switch and a solenoid also in said circuit and having a plunger provided with conducting and insulating sections, a contact strip coöperating with the conducting section and together with such latter section forming a part of the electric signal circuit, and operating connections between the plunger time movement comprising a lever pivoted to the plunger and having a pawl, and a ratchet wheel coöperating with the pawl and adapted to be driven thereby when the solenoid is energized.

11. The combination, with an alarm system of a sprinkler valve including an electric signal arranged in an electrical circuit and also including a switch in said circuit operated by said valve, of a retard device for controlling the time of the closing of such circuit comprising a time movement having an electrical controlling means in the same circuit as the switch and a solenoid also in said circuit and having a plunger provided with conducting and insulating sections, a contact strip coöperating with the conducting section and together with such latter section forming a part of the electric signal circuit, and operating connections between the plunger and having a pawl, and a ratchet wheel coöperating with the pawl and adapted to be driven thereby when the solenoid is energized, and a spring for returning the plunger to normal or retracted position.

AUSTIN C. JOHNSON.

Witnesses:
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