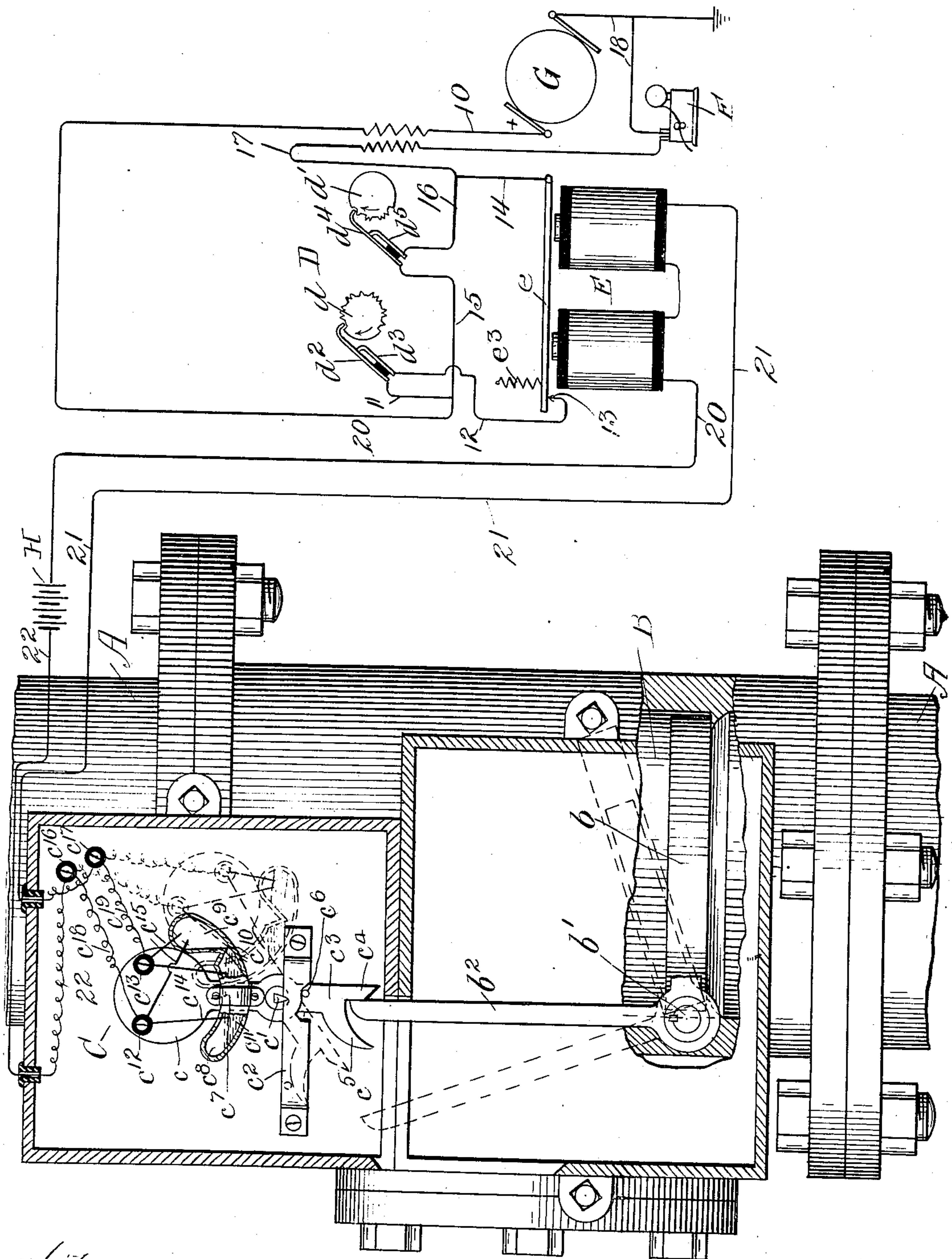


No. 860,605.

PATENTED JULY 16, 1907.

J. G. NOLEN.  
FIRE PROTECTION SYSTEM.  
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# UNITED STATES PATENT OFFICE.

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## FIRE-PROTECTION SYSTEM.

No. 860,605.

Specification of Letters Patent.

Patented July 16, 1907.

Original application filed September 17, 1904, Serial No. 224,925. Divided and this application filed December 8, 1904.  
Serial No. 236,069.

*To all whom it may concern:*

Be it known that I, JAMES G. NOLEN, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Fire-Protection Systems; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This application is a division of application for patent for improvements in fire protection system, Serial No. 224,925, filed September 17th. 1904.

My present invention relates to fire protection systems, and has for one of its salient objects to provide in conjunction with a fluid receptacle or fluid piping system, wherein different conditions of pressure exist under different circumstances, means controlled by the pressure for giving or transmitting alarms or signals, upon the establishment of certain pressure conditions in the receptacle or system.

More specifically an object of my invention is to provide in conjunction with a fluid receptacle, or piping system, an electric alarm or signal device, an electric switch arranged and adapted to operate upon the establishment of certain pressure conditions in the receptacle or piping system, to condition the alarm or signal device for operation.

Further, an object of my invention is to provide such a switch adapted to so condition the alarm or signal device for operation only after maintenance of the predetermined pressure conditions in the receptacle or piping system for a certain interval of time, so as to avoid conditioning the alarm or signaling device for operation upon a mere momentary establishment in the associated receptacle or system of the said predetermined pressure conditions.

A further object of my invention is to provide a time switch of novel and advantageous construction well adapted for use in such connection.

And a yet further object of my invention is to provide a switch so constructed and in such electrical association as to be under constant test.

Other and further objects of my invention will become apparent to those skilled in the art from the following description taken in conjunction with the drawings, wherein I have shown in a single view, partly in elevation and partly in section, and partly diagrammatic, the operative association of a time switch with a fluid pressure piping system, and electric signaling apparatus, all in accordance with my invention.

Referring now to the specific embodiment of my invention shown in the drawing, A indicates a riser or pipe of an automatic fire extinguisher system; B a valve casing and b a check valve therein, having a stem b' projecting beyond the casing and carrying at its ex-

trinity an actuating arm b<sup>2</sup>. Associated with the arm b<sup>2</sup> for actuation thereby is an electric time switch of novel construction, which I will now describe.

The time switch consists in general of a device comprising two chambers connected by a restricted passage, a shiftable body of mobile material in one of said chambers adapted under predetermined conditions to shift or flow through the restricted passage to the other chamber, and circuit parts associated with the device controlled by the movement of the mobile material.

In the specific construction illustrated C indicates a whole the time switch, which preferably comprises a carrier c of suitable shape, pivoted as at c', preferably at some point below its center of gravity, in suitable supports c<sup>2</sup> so that it tends constantly to overbalance in one direction.

c<sup>3</sup> indicates a foot provided upon the lower end of the carrier and having a heel c<sup>4</sup> which constantly lies in the path of movement of arm b<sup>2</sup> and normally engages with the extremity of said arm b<sup>2</sup> to maintain the carrier in substantially upright position against its tendency to overbalance. The foot c<sup>3</sup> is further preferably provided with an extension c<sup>5</sup> lying in the path of oscillation of said arm b<sup>2</sup> so that if struck by said arm it positively throws the carrier in the direction of its operative movement. A stop pin c<sup>6</sup> playing in a slot in the support c<sup>2</sup> is provided for limiting the motion of the carrier in both directions.

Supported in the carrier c as by a clip c<sup>7</sup> is a device comprising two chambers c<sup>8</sup> and c<sup>9</sup> connected by a restricted passage c<sup>10</sup>. The device described is preferably a glass bulb and in it is held a shiftable body of mobile material c<sup>11</sup> preferably of mercury or other electrically conductive liquid, the device being so disposed when in normal position that said mercury body lies wholly, or for the most part, within the chamber c<sup>8</sup>.

Mounted upon the upper portion of the carrier are two binding posts c<sup>12</sup> and c<sup>13</sup>, from which lead two pairs of electric conductors, one pair, c<sup>14</sup>, extending into the chamber c<sup>8</sup> so as to be normally immersed in the mercury, and the other pair, c<sup>15</sup>, extending into the chamber c<sup>9</sup> so as to be normally out of the mercury. The construction of the device is such that if the arm b<sup>2</sup> be removed from its position restraining the tendency of the carrier to overbalance, and the parts assume the position shown in dotted lines in Fig. 3, the mercury will commence to slowly flow through the restricted passage c<sup>10</sup> into the then-lower chamber c<sup>9</sup>. Accordingly, after a predetermined interval, the circuit between the pair of conductors, c<sup>14</sup>, will be broken, and after a further predetermined lapse of time electrical connection will be established between the normally separated conductors c<sup>15</sup>.

Binding posts c<sup>16</sup> and c<sup>17</sup> are preferably provided



within the casing conveniently containing the switch, upon the side of the carrier toward which its top tends to fall, the binding post  $c^{16}$  being connected with the carrier binding post  $c^{12}$  by a pig-tail  $c^{18}$  and binding post  $c^{17}$  being similarly connected to the binding post  $c^{13}$  upon the carrier, as shown at  $c^{19}$ .

The time switch which I have described is capable of wide application and the principles embodied in my switch are susceptible of embodiment in diverse forms, but for purposes of a full showing I have diagrammatically illustrated its association with devices of an electrical signaling system, the parts whereof are particularly shown and described in my pending application, Serial No. 224,925, filed September 17th, 1904, of which this application is a division.

In general D represents the electrical equipment of a normally wound signal box comprising two make and break wheels  $d$  and  $d'$ , arranged to be driven synchronously by a suitable spring motor, or other device (not shown) and contact parts associated with said wheels. As herein shown each of the wheels  $d$   $d'$  has an elevated peripheral portion and a toothed portion, the toothed portions of the two wheels being preferably dissimilar and the toothed portion of each being arranged to correspond in position to the raised peripheral portion of the other. The pen and contact  $d^2$  and  $d^3$  are associated in the usual manner with the wheel  $d$  while pen and contact  $d^4$ ,  $d^5$  cooperate with the wheel  $d'$ , the two contact devices being insulated from each other.

The operation of the wheels  $d$ ,  $d'$  is controlled (through any suitable mechanism such as that described in my co-pending application heretofore mentioned,) by the operation of an electro-magnet E having an armature  $e$  provided with the usual spring  $e^3$  tending to hold said armature in forward or unattracted position. The association of devices is preferably such that with each movement of the armature  $e$  away from or toward its magnet, the wheels  $d$   $d'$  are conditioned for synchronous rotation throughout a single complete revolution and are then brought to a stop ready for subsequent operation.

Referring now to the signal devices diagrammatically shown F indicates a signal responsive device of a well known type, and G indicates a suitable generator. The devices described may be connected in circuit as follows; from the positive brush of generator G a signal circuit extends through wire 10 which connects with two parallel branches, one extending through wire 11 to pen  $d^2$  and contact  $d^3$  of the signal box, thence by wire 12 to a contact point 13 with which the armature  $e$  of the magnet E contacts when said armature is in attracted position, and from the pivotal point of said armature by wire 14 back to the main circuit; the other branch extending through wire 15 to the pen  $d^4$  and contact  $d^5$  and thence by wire 16 to connection with wire 14, whence extends wire 17 back to the central signal responsive device F, the opposite terminal of which is connected by wire 18 with the negative branch of the generator.

The electro-magnet E is associated with the time switch for control thereby in a circuit as follows; from a battery or other source of current supply H extends a wire 20 direct to one terminal of the electro-magnet E, from the opposite terminal whereof extends a wire 21 to the binding post  $c^{17}$  of the time switch. From

the opposite binding post  $c^{16}$  of said switch, extends a wire 22 to the negative terminal of battery H.

It will now be apparent that under normal conditions, with the parts as shown in full lines in Fig. 1, the magnet circuit is closed and the armature E is held in attracted position against the tension of its spring, the circuit being traceable from battery H through wire 20, magnet E, wire 21 binding post  $c^{17}$  wire  $c^{19}$  conductor pair  $c^{14}$  and the mercury  $c^{11}$  back to the binding post 12, through wire  $c^{18}$ , post  $c^{16}$  and wire 22 back to the battery.

It will be understood that when the electro-magnet is in this position the circuits of the signaling device are as shown in full lines in Fig. 1, that is to say, the circuit may be traced from generator G by wire 10 through the parallel branches, on the one hand by wire 11, pen  $d^2$ , contact  $d^3$ , wire 12, point 13, armature  $e$ , and wire 14, and on the other hand by wire 15, pen and contact  $d^4$ ,  $d^5$ , and wire 16, to juncture with wire 14 and thence by wire 17 to the current responsive device F and by wire 18 to the negative terminal of the generator.

In a fire extinguisher system such as that with which the mechanism is shown associated, it will be understood that certain pressure conditions exist in the piping system and receptacles when the system is passive, and other pressure conditions exist when the system becomes active, and upon the occurrence of fire. Therefore, it will be apparent that it is highly advantageous that authorities having supervision over the safety of a building equipped with an automatic fire extinguisher system should be informed when the pressure conditions in the system are such as are present in the event of fire, the transmission of such information being tantamount to transmission of a fire alarm.

It is well known that in fire extinguisher systems the receptacles and piping of the system usually contain fluid under pressure, some times air, or gas, as in the dry pipe system, and sometimes water, as in a wet pipe system. It is further well known that it is customary to provide in such systems movable parts, such as check valves, or other automatic valves, the movements of which are responsive to variations in pressure conditions of the elements of the system with which they are associated due to the unbalancing of pressure as a result of the blowing or fusing of the sprinkler heads under the influence of undue heat, and the consequent reduction of pressure on one side of the valve. Under such conditions water flow in the system begins. It will, therefore, be apparent that a typical way of employing this variation in pressure as a means of actuating alarm mechanism is to employ the valve or other device, which operates within the pipe or other receptacle, consistently with the variation in pressure, or the flow of water as a pressure responsive device susceptible of mechanical connection with parts of the signaling system, so as to place the signaling devices under the control of the pressure conditions of the piping system. Thus in the present embodiment of my invention, it will be apparent when the check valve  $b$  is raised by the commencement of flow of water through the riser or other pipe or receptacle, or by the rush of escaping air preceding the commencement of flow of water in a dry pipe system, the arm  $b^2$  is removed from contact with the heel  $c^4$  of the time switch device, so that the frame of the timing device oscillates to dotted line posi-



tion and the mercury commences to flow from chamber  $c^8$  into chamber  $c^9$ . After a definite time the mercury connection between the conductors  $c^{14}$  is broken, as heretofore described, and (it will be remembered that 5 said parts are connected in the electro-magnet circuit) it will be seen that the electro-magnet E is deenergized, so that its armature  $e$  is released and flies back under the influence of spring  $e^3$ . This movement of the armature, as heretofore specified, conditions the wheels 10  $d$  and  $d'$  to make synchronously each a revolution and come to a stop. It is to be noted, however, that the movement of the armature E, as before described, breaks the signaling path through the pen and contact  $d^2$ ,  $d^3$ , as the branch of the circuit including said pen and contact was closed through the armature  $e$ . Therefore, the signal transmitted by the responsive instruments F is simply characteristic of the peripheral surface of the wheel  $d'$ , that is to say, in the present showing, the number 123 followed by a long dash or "run-down". 20

In the switch the mercury continues to flow into chamber  $c^9$  so that after a definite time a mercury connection is established between the conductors  $c^{15}$ , which it will be apparent, establish connection between the 25 wires  $c^{18}$  and  $c^{19}$  of the electro-magnet circuit, thereby completing said electro-magnet circuit and reenergizing the said magnet. Now the armature  $e$  is attracted, closing the branch circuit containing the pen and contact  $d^2$ ,  $d^3$ , and again conditioning the wheels  $d^2$  and  $d'$  30 to effect synchronously a revolution. In consequence the signal transmitted to the central station will be the entire series of numbers represented by the teeth of both wheels, as will be well understood by those skilled in the art.

35 When the check valve again closes the arm  $d^2$  engages the heel  $c^4$ , and moves the frame  $c$  back to initial position ready for another operation.

While I have herein described in some detail a specific construction and embodiment of my invention, and its 40 association with specific devices of fire protection systems, I do not desire to be understood as limiting my invention to the specific construction shown and described further than as specified in the claims.

I do not claim to be the inventor of the combination 45 below expressed, viz., The combination with a valve and alarm mechanism of a shifting body for conditioning the alarm mechanism to operate, means through which the valve in opening conditions said body to shift, and means for retarding its movement, nor a similar arrangement wherein the valve, by suitable means 50 in opening conditions the body to move in one direction, and thereby conditions the alarm mechanism to operate, and on its return movement through suitable

means conditions the body for movement in the opposite direction. Neither do I claim the conceptions 55 above expressed wherein the shiftable body is carried on a movable support, whether the shifting of the body is retarded through suitable means or not, nor do I claim in combination either chambered supports broadly, or a chambered support comprising enlarged 60 portions and a contracted duct through which the body may shift from one enlarged portion to the other. Further I disclaim such combinations where the alarm is an electric alarm, and the shifting body is an electrically conductive material controlling contact parts in 65 the circuit whereby the operation of the alarm or signal device is controlled.

Having thus described my invention, what I claim and desire to secure by Letters Patent, of the United States, is:— 70

1. In combination with a movable element of a fire protection system, a time switch associated with said movable part for actuation thereby, and two pairs of circuit connections associated with said time switch, said time switch being arranged when actuated to break the connection of one 75 pair of circuit connections and thereafter, after the lapse of a definite time, to make connection between the other pair of circuit connections.

2. In a system of the character described, the combination with a receptacle containing fluid under pressure, of a 80 time switch comprising a device having two chambers, connected by a restricted passage, a body of mobile electrically conductive material in one of said chambers, adapted and arranged to be conditioned under predetermined conditions of pressure in said receptacle to flow through the restricted 85 passage into the other chamber, and circuit parts in the first said chamber normally connected by the electrically conductive material, arranged to have connection broken therebetween a predetermined time after the commencement of its flow from chamber to chamber. 90

3. In a system of the class described, in combination with a valve, a time switch associated with said valve for actuation thereby and comprising a device having two chambers connected by a restricted passage, mounted to be 95 rocked when actuated by the valve, a body of mobile electrically-conductive material in one of said chambers while the device is in normal position, adapted when the device is rocked to flow through the passage into the other chamber, circuit parts in each chamber adapted to be affected by the flow of material and circuit connections for said 100 parts operatively associated with signaling devices.

4. The combination of a water pipe; an electric alarm circuit; a rocking contact retarding switch; a spindle journaled on the pipe; means for rocking said spindle by a 105 flow of water in the pipe; and an arm on the spindle adapted to rock the switch, and free to pass on after closing the switch, substantially as described.

In testimony that I claim the foregoing as my own, I affix my signature in presence of two witnesses.

JAMES G. NOLEN.

In presence of—

GEO. T. MAY, Jr.,  
MARY F. ALLEN.