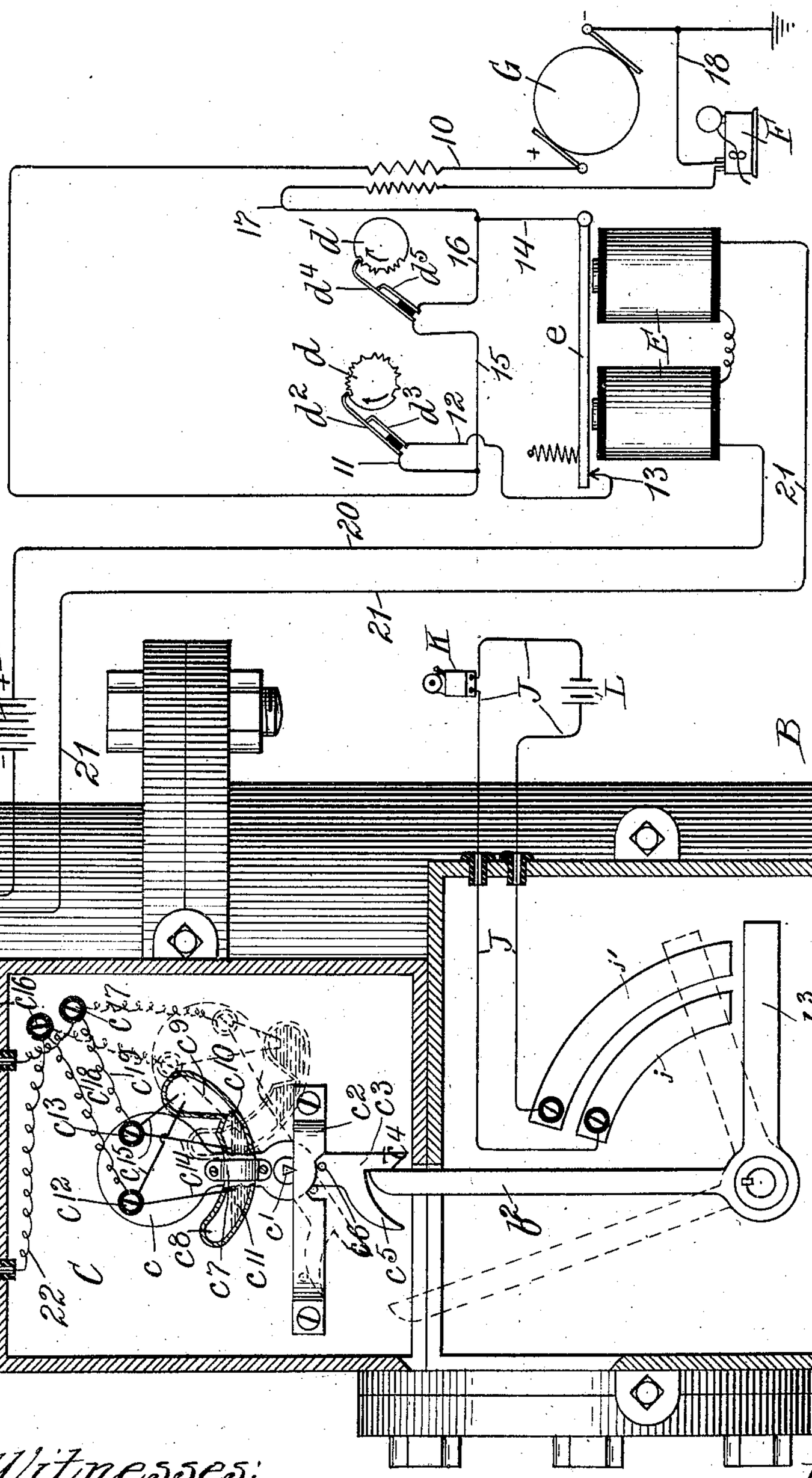
No. 828,045. PATENTED AUG. 7, 1906.

J. G. NOLEN.

FIRE PROTECTION SYSTEM.

APPLICATION FILED SEPT. 17, 1904.

3 SHEETS—SHEET 1.



Witnesses:
Ray White.
Harry P. L. White

Inventor:
James G. Nolen.
By José Dain Atty.

No. 828,045. PATENTED AUG. 7, 1906.

J. G. NOLEN.

FIRE PROTECTION SYSTEM.

APPLICATION FILED SEPT. 17, 1904.

3 SHEETS—SHEET 2.

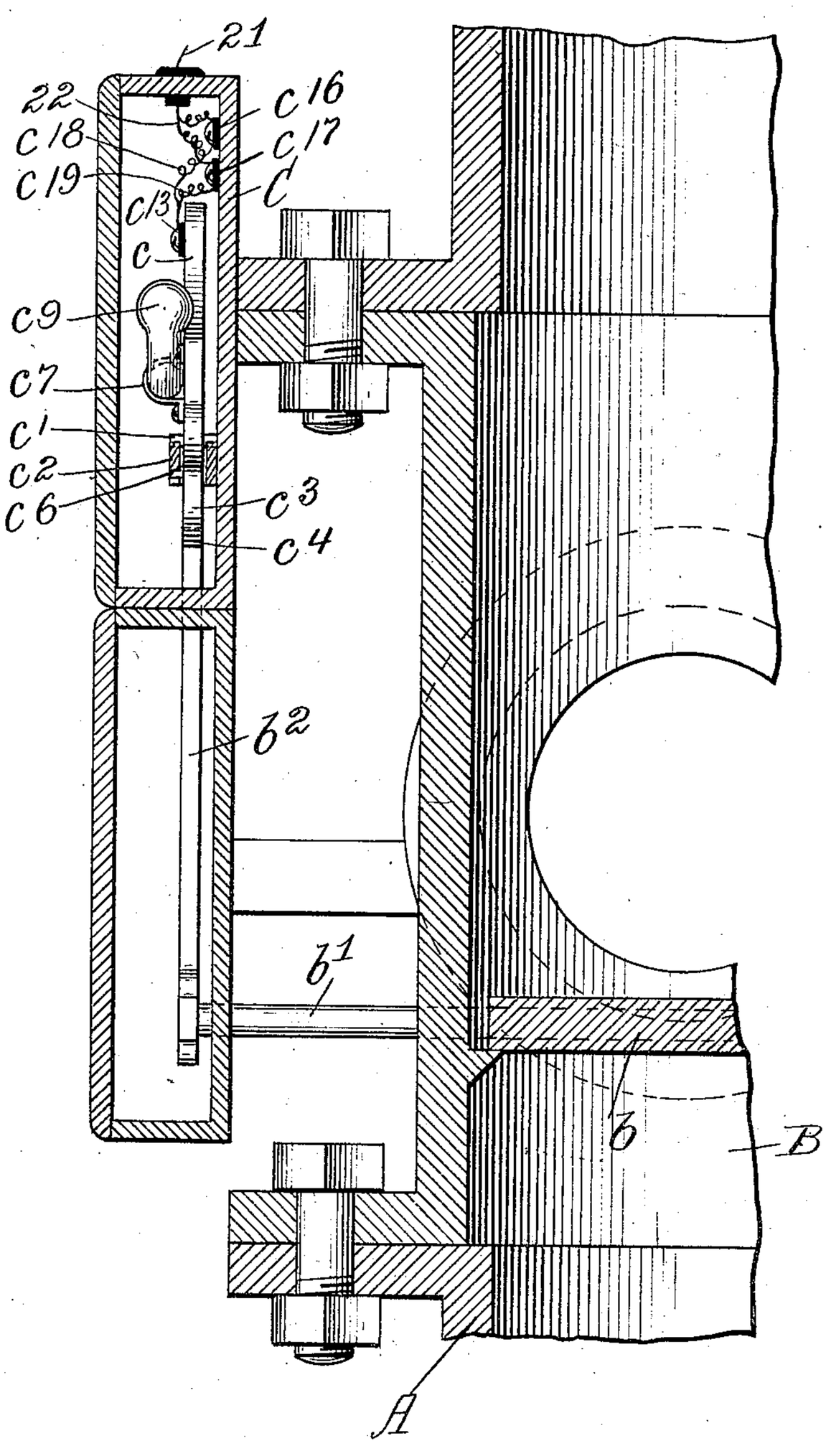


Fig. 2

Witnesses:
Ray White.
Harry R. Lubite

Inventor:
James G. Nolen.
By Jones Dain Atty.

No. 828,045. PATENTED AUG. 7, 1906.

J. G. NOLEN.

FIRE PROTECTION SYSTEM.

APPLICATION FILED SEPT. 17, 1904.

3 SHEETS—SHEET 3.

Fig. 3

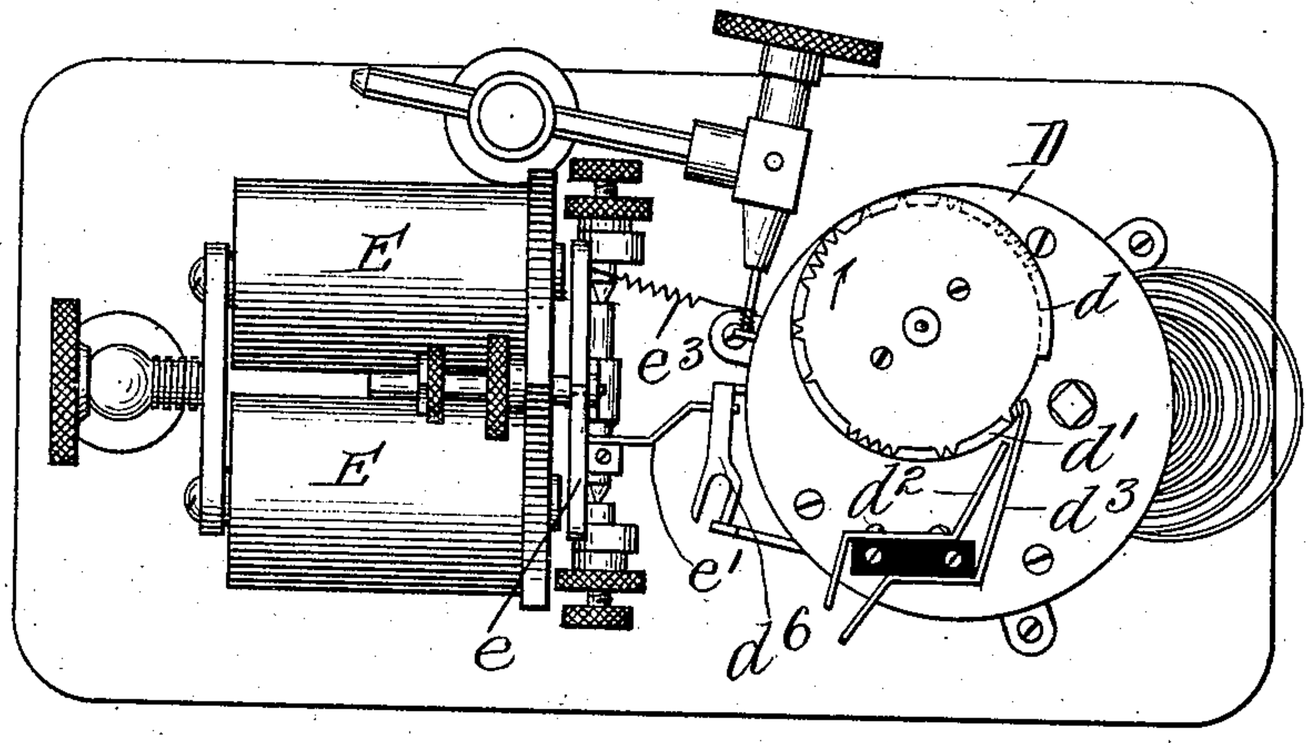


Fig. 4.

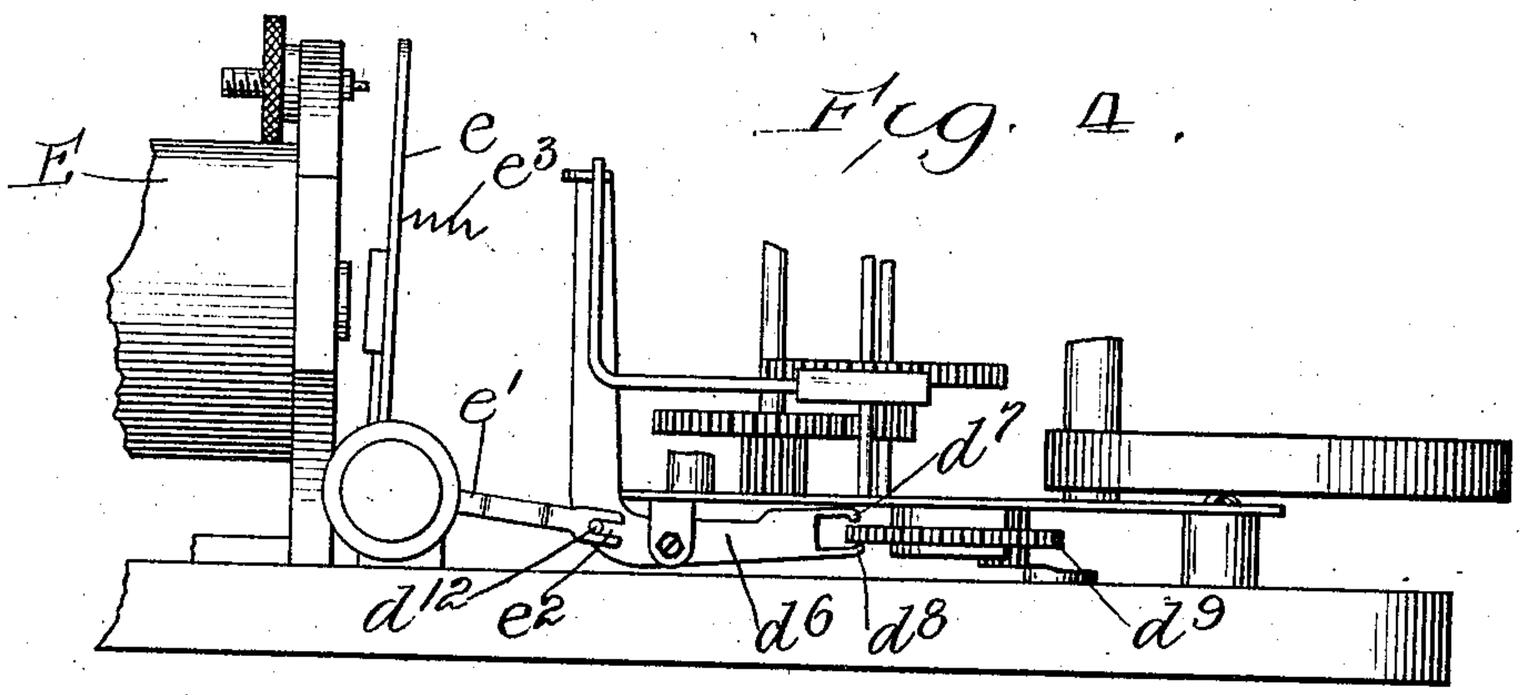


Fig. 5.

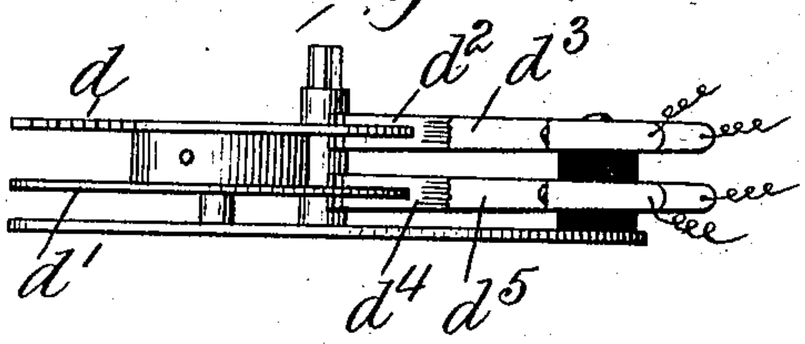


Fig. 6.

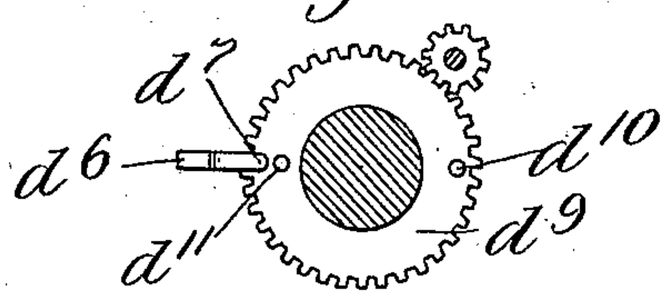
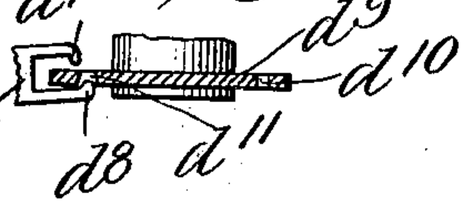


Fig. 7.



Witnesses:
Ray White.
Harry R. Lubke.

Inventor
James G. Nolen,
By Jones Bain Atty.

UNITED STATES PATENT OFFICE.

JAMES G. NOLEN, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, TO AUTOMATIC FIRE PROTECTION COMPANY, A CORPORATION OF MAINE.

FIRE-PROTECTION SYSTEM.

No. 828,045. Specification of Letters Patent. Patented Aug. 7, 1906.

Application filed September 17, 1904. Serial No. 224,925.

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.

My invention relates to fire-protection systems, and has for its general object to provide for use in conjunction with a movable part of a fire-protection system—such, for instance, as an automatic valve of an extinguisher system—an alarm system which will indicate by predetermined signal when the actuating part is so moved from its normal position that it is desirable to direct the attention of these having supervision of the protected area to the action of the movable part which has taken place. For example, it is important that the authorities having supervision over the safety of a building equipped with an automatic sprinkler system should be informed when the water is in flow through the system and I therefore herein show my system as applied to the supervision of an automatic check-valve adapted to be moved to open position whenever the water-flow commences.

In the drawings, wherein I have illustrated such application of my invention, Figure 1 is a front view of a timing element thereof in its association with the valve and showing diagrammatically the circuit connections of the parts. Fig. 2 is a vertical cross-section on line 2 2 of Fig. 1. Fig. 3 is a top plan view of a signal-box such as may be employed in the embodiment of my invention. Fig. 4 is a side elevation of the same, and Figs. 5, 6, and 7 are details of construction of said box.

Throughout the drawings like numerals of reference refer always to like parts.

Referring now to the specific embodiment of my invention shown in the drawings, A indicates a riser or a pipe of an automatic fire-extinguisher system, B a valve-casing, and b a check-valve therein constituting in the system a signal-initiating device, said valve having a stem b' projecting beyond the casing and carrying at its extremity an actuating-arm b^2 and a switch-arm b^3. Associated with the arm b^2 for actuation thereby is a timing device, herein shown as an electric time-switch of novel construction which serves as a means for producing different predetermined conditions in proper succession and timed relation in a circuit to be hereinafter traced.

The time-switch consists in general of a device comprising two chambers connected by a restricted passage, a body of mobile material in one of said chambers adapted under predetermined conditions to flow through the restricted passage into 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 as 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^2, so that it tends constantly to overbalance in one direction.

c^3 indicates a foot provided upon the lower end of the carrier and having a heel c^4, which constantly lies in the path of movement of arm b^2 and normally engages with the extremity of the said arm b^2 to maintain the carrier in substantially upright position against its tendency to overbalance. The foot c^3 is further preferably provided with an extension c^5, lying in the path of oscillation of the arm b^2, so that if struck by said arm it positively throws the carrier in the direction of its operative movement. A stop-pin c^6, playing in a slot in the support c^2, is provided for limiting the motion of the carrier in both directions. Supported in the carrier c, as by a clip c^7, is a device comprising two chambers c^8 and c^9, connected by a restricting-passage c^{10}. The device described is preferably a glass bulb, and in it is placed a body of mobile material c^{11}, preferably 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^8.

Mounted upon the upper portion of the carrier are two binding-posts c^{12} and c^{13}, from which lead two pairs of electric conductors, one pair c^{14} extending into the chamber c^8 so as to be normally immersed in the mercury and the other pair c^{15} extending into the chamber c^9 so as to be normally out of the

mercury. The construction of the device is such that if the arm b^2 be removed from its position restraining the tendency of the carrier to overbalance and the parts assume a position shown in dotted lines in Fig. 1 the mercury will commence to slowly flow through the restricted passage c^{10} into the then lower chamber c^9. Accordingly after a predetermined interval the circuit between the pair of conductors c^{14} will be broken, and after a further predetermined time contact is completed between the normally separated conductors c^{15}.

Binding-posts c^{16} and c^{17} 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 pigtail c^{18} and the binding-post c^{17} being similarly connected by a wire c^{19} to the binding-post c^{13} upon the carrier. Thus the slight natural spring of the pigtails is made to exert its force to throw the carrier to active or abnormal position as soon as the arm b^2 is removed from contact with the shoulders c^4.

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 the switch which I have herein described is particularly adapted in its connections and arrangement for operation in conjunction with a signal-transmitting device, which I will now describe.

D represents a normally wound signal box or transmitter adapted to transmit a plural-impulse signal, by which I mean a signal of interrupted character, the impulses or divisions whereof are grouped to enable the signal to be read, so as to determine the particular box transmitting a signal. The transmitter D comprises, preferably, a spring-motor of any suitable type arranged to drive synchronously a pair of make-and-break wheels d and d', each having 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.

Associated in the usual manner with the wheel d are the pen and contact d^2 d^3, constituting make-and-break devices, and cooperating with wheel d' are the like pen and contact d^4 d^5, the two contact devices being insulated from each other.

Associated with the motor is a suitable controlling mechanism, herein shown as comprising a pivoted lever d^6, having at one end a pair of fingers d^7 d^8 confronting each other, but at different distances from the pivotal point, and arranged, respectively, to over and under lie a rotating member d^9, adapted to be driven by the motor-train at one-half the speed of rotation of the number-wheels d d'. The rotating member d^9 is provided at diametrically opposite points with two apertures d^{10} and d^{11}; arranged at such distances from the center as to be capable of registering with the respective fingers d^7 and d^8. The construction is such that assuming the finger d^8 to be in engagement with the aperture d^{11}, as illustrated in Fig. 7, elevation of the forward end of the lever d^6 throws the finger d^8 out of such engagement with its aperture and forces the finger d^7 down upon the top of the rotating part d^9. The rotating part being now free, the wound box operates until the number-wheels d d' have made one revolution, at which time the finger d^7 drops into its aperture d^{10} and further movement of the mechanism is stopped. If, however, the lever d^6 be moved back toward its initial position, the rotating part d^9 is again released for a half-revolution, so that it will be apparent that if either finger be moved from engaging position with its corresponding aperture out of engagement therewith and then be immediately moved back toward engaging position (but after the aperture has escaped from therebeneath) the member d^9 will make a complete revolution and the number-wheels d d' two complete revolutions before the mechanism is again stopped. For actuating this controlling mechanism I provide an electromagnet E, having an armature e, from which extends an arm e', mounted at its forward end, as at e^2, for engagement with a stud d^{12}, carried by the forward end of the lever d^6 of the controlling device.

e^3 indicates a spring tending to normally hold the armature e in forward or unattracted position. It will be apparent now that as the armature is attracted by its magnet or returned by its spring the lever-arm d^6 will be correspondingly vibrated to operate, as described, upon the motor mechanism controlled thereby.

While I prefer to employ the box herein described, I do not desire to be understood as limiting myself to the construction employed, as it will be apparent that other devices might be employed which would serve the same end as the box herein referred to—that is to say, provide a suitable signal-transmitting device.

Referring now to the devices diagrammatically shown in Fig. 1, F indicates a signal-responsive device of well-known type, and G indicates any 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 the 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 con-

tacts when the 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 a 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 brush of the generator. The electromagnet 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 electromagnet E, from the opposite terminal whereof extends wire 21 to the binding-post c^{17} of the time-switch, and from the opposite binding-post c^{16} of said switch extends wire 22 to the negative terminal of the battery H. It will be apparent now that under normal conditions with the parts as shown in full lines in Fig. 1 the magnet-circuit is closed and the armature e of the magnet E held in attracted position against the tension of its spring. It will be understood that in this position the finger d^7 of the controlling device engages with its corresponding aperture in the rotating part of the motor. If now the magnet-circuit be broken, so that the magnet is deënergized and its armature retracted by its spring, d^7 is withdrawn from its aperture and the finger d^8 pressed against the rotating member d^9 of the motor. The number-wheel of the motor now makes one complete revolution before the motor is stopped by the engagement of said finger d^8 with its aperture, as heretofore described. It will be noted that during this operation of the signaling device the branch of the circuit including the pens d^2 and d^3 is broken by the separation of the armature of the magnet from its contact 13, and therefore current flows only through the pen d^4 and contact d^5. In consequence the signal transmitted to the central station is simply the number represented by the teeth on the wheel d', followed by a long dash caused by the separation of the corresponding pen and contact by the raised peripheral portion of the wheel. If now the magnet-circuit be held closed and the magnet-armature attracted, the motor mechanism is again freed for operation until the aperture d^{10} is engaged by the finger d^7 of the controlling mechanism, the wheels d and d' again making one revolution. It will be noted, however, that during this action of the signaling device both branches of the circuit containing both pairs of contact making and breaking parts are energized, so that the signal transmitted to the central station will be the series of numbers represented by the teeth of both wheels, as will be well understood by those skilled in the art. I also preferably provide a local circuit and alarm devices for actuation by the valve-opening, such circuit being shown in Fig. 1, where J indicates the circuit, including two contact-segments j and j', associated with the switch-arm b^3, to be closed thereby when the valve is opened, a bell K, and a battery L. It will be apparent now that if the check-valve b is raised by the commencement of the flow of water through the riser or other pipe the arm b^3 closes the circuit J to sound the local alarm K and the arm b^2 is removed from contact with the heel c^4 of the time-switch device. The frame of the timing device now oscillates to the dotted-line position and the mercury commences to flow into chamber c^9, so that in a definite time the mercury connection between conductors c^{14} is broken, as heretofore described. These parts being included in the electromagnet-circuit deënergize the electromagnet E, which actuates the signaling device to transmit its signal, as first described. The mercury continues to slowly flow through the restricted passage c^{10} into the chamber c^9 and after a lapse of time preferably sufficient to enable the motor mechanism to complete its first operation fills the chamber c^9 to such an extent as to complete contact between the conductors c^{15}, thereby again completing the electromagnet-circuit and causing the latter to again actuate the transmitting mechanism to transmit to the central station the signal last described. When the check-valve again closes, the arm b^2 engages heel c^4 and moves the frame c back to initial position ready for another operation, the circuit J being simultaneously broken.

While I have herein described with some particularity one form of normally set box and its actuating mechanism which I may conveniently employ, I do not desire to be understood as limiting myself to the construction described, nor do I desire to be understood as limiting myself to the specific circuit arrangement shown and described (although I find the latter convenient) further than as specified in the claims.

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

1. In a fire-protection signal system, a suitable circuit, a signal-transmitter adapted to be twice actuated upon the successive occurrence of two conditions in its circuit, and means for producing said conditions in said circuit in proper succession and in definite timed relation.

2. In a fire-protection signal system, a suitable circuit, a signal-transmitter adapted to be twice actuated upon the occurrence of certain conditions in its circuit, a time-switch in said circuit, adapted when actuated to produce said conditions in the circuit, and means for actuating said time-switch.

3. In a fire-protection signal system, a suit-

able circuit, a signal-transmitter adapted to be twice actuated upon the occurrence of two different conditions in its circuit, a time-switch in said circuit adapted when actuated to produce said conditions in the circuit, and means for actuating said time-switch.

4. In a fire-protection signal system, a suitable circuit, a signal-transmitter adapted to be twice actuated upon the successive occurrence of two predetermined conditions in said circuit, a time-switch in said circuit adapted when actuated to produce said conditions in proper succession, and a definite timed relation, and means for actuating said timed switch.

5. In a fire-protection signal system, the combination with a movable element of a fire-protection system, of a signal system comprising a suitable circuit, a signal-transmitter, and a signal-responsive device, and a time-switch, operatively associated with the movable element of a fire-protection system for control thereby and operatively associated with the signal-transmitter to control said transmitter.

6. In a fire-protection signal system, the combination with a receptacle containing fluid under pressure, of a signal system comprising a suitable circuit, a signal-transmitter, and a signal-responsive device, and a time-switch, controlled by the pressure in the receptacle, and operatively associated with the signal-transmitter to control said transmitter.

7. In a fire-protection signal system, the combination with a receptacle containing fluid under pressure, of a signal system comprising a suitable circuit, a signal-transmitter and a signal-responsive device, and electroresponsive means for conditioning the signaling transmitter for operation, a circuit for said electroresponsive means, and a time-switch controlling the last said circuit arranged for control by the pressure in the fluid-receptacle.

8. In a fire-protection signal system the combination with a receptacle containing fluid under pressure, of a signal system comprising a suitable circuit, a signal-transmitter, and a signal-responsive device, and electroresponsive means for conditioning the signal-transmitter for operation arranged for a functional operation upon the rupture of the circuit containing it, circuit connections for said electroresponsive means, and a time-switch controlled by the pressure in the receptacle, arranged to control the said circuit connection of the signal-responsive means, and, under normal conditions of pressure in the fluid-receptacle to maintain said circuit connection of the electroresponsive means closed.

9. In a fire-protection signal system, the combination with a movable element of a fire-protection system, of a signal system comprising a suitable circuit, a signal-transmitter, and a signal-responsive device, an electroresponsive means for conditioning the signal-transmitter for operation, circuit connection for said electroresponsive means, and a time-switch operatively associated with the movable element of the fire-protection system for control thereby, arranged to control the circuit connections of the electroresponsive device.

10. In a fire-protection signal system, the combination with a movable element of a fire-protection system, a signal system comprising a suitable circuit, a signal-transmitter, a signal-responsive device, an electroresponsive means for conditioning the signal-transmitter for operation, circuit connections for said electroresponsive means, and a time-switch associated with the movable element of the fire-protection system for control thereby, and arranged to control the circuit connections of the electroresponsive means, said time-switch being arranged to normally maintain said circuit connections closed.

11. In a fire-protection signal system, the combination with a receptacle containing fluid under pressure, of a signal system comprising a suitable circuit, a make-and-break device therein, a source of current-supply, and a signal-responsive device; and means controlled by certain variations in pressure in the receptacle, for actuating the make-and-break device to transmit a plural-impulse signal, said means being timed in operation to functionally operate only upon the maintenance of the pressure conditions in the receptacle to which it responds for a predetermined length of time.

12. In a fire-protection signal system, the combination with a movable element of a fire-extinguisher system, of a signal system comprising a circuit, a source of current-supply therefor, and make-and-break devices and a signal-responsive device therein; and means operatively associated with the valve for control thereby, for actuating the make-and-break devices to transmit a plural-impulse signal, timed to functionally operate only upon the maintenance of the operation-initiating condition of the valve for a predetermined time.

13. In a fire-protection signal system, the combination with a movable element of a fire-extinguisher system, of a signal system comprising a circuit, a source of current-supply therefor, a signal-responsive device, and a plural-impulse-signal transmitter involving a circuit-controlling switch, a switch-actuating part and a motor for moving the switch-actuating part, and means controlled by the valve, and timed in operation, for conditioning the motor to move the switch-actuating

part upon the maintenance of the valve in certain position for a predetermined interval of time.

14. In a fire-protection signal system, the combination with a receptacle of a fire-extinguisher system wherein predetermined conditions should be maintained, of a part associated with said receptacle movable in response to variations from normal conditions, a signal system comprising a circuit, means of electric-current supply therefor, a signal-responsive device, and a plural-impulse-signal transmitter involving a circuit-controlling switch, a switch-actuating member movable to actuate the switch to transmit a plural-impulse signal, and means for actuating said switch-actuating member, associated with the part responsive to conditions in the receptacle for control thereby and timed to functionally operate only upon the maintenance of the operation-initiating conditions in the receptacle for a predetermined time.

15. In combination, a signal-transmitter, a movable signal-initiator to be supervised, a timing device operatively associated with the transmitter and signal-initiator, and arranged when maintained in functionally operative condition by the initiator for a predetermined time to condition the transmitter for operation, and when maintained in such condition for less than the predetermined time to restore itself to normal condition without affecting the transmitter.

16. In combination, a valve, a signal-transmitter, and a timing device, responsive to an abnormal condition of the valve for a definite time to trip the transmitter and self-restoring after maintenance of such abnormal condition for less than such definite time.

17. In combination with a valve, a normally wound signal device, and means for tripping the signal device comprising a movable part associated with the valve for movement thereby, and a timing device arranged to be moved from normal position by said movable part and, when maintained in abnormal position for a predetermined time, to trip the signal device, said timing device being self-restoring to normal condition after maintenance in abnormal condition for less than the predetermined time.

18. In combination with a device to be supervised, a normally wound signal device, a timing device controlling the signal device and controlled by the device to be supervised, said timing device being adapted to condition the signal device for operation only after its maintenance in condition for operation by the device to be supervised for a predetermined time, and to restore itself to initial condition after maintenance in timing condition for less than the predetermined time.

19. In combination with a device to be supervised, a normally wound signal device, an electrical timing device controlling the signal device and controlled by the device to be supervised, said timing device being adapted to condition the signal device for operation only after its maintenance in condition for operation by the device supervised for a predetermined time, and to restore itself to initial condition after maintenance in timing condition for less than the predetermined time.

20. In combination, a valve, an electrical signal-transmitter, and means for controlling the operation of said transmitter comprising an electrical timing device responsive to abnormal conditions of the valve for a definite time to trip the transmitter, and self-restoring after maintenance of such abnormal conditions for less than such definite time.

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.