

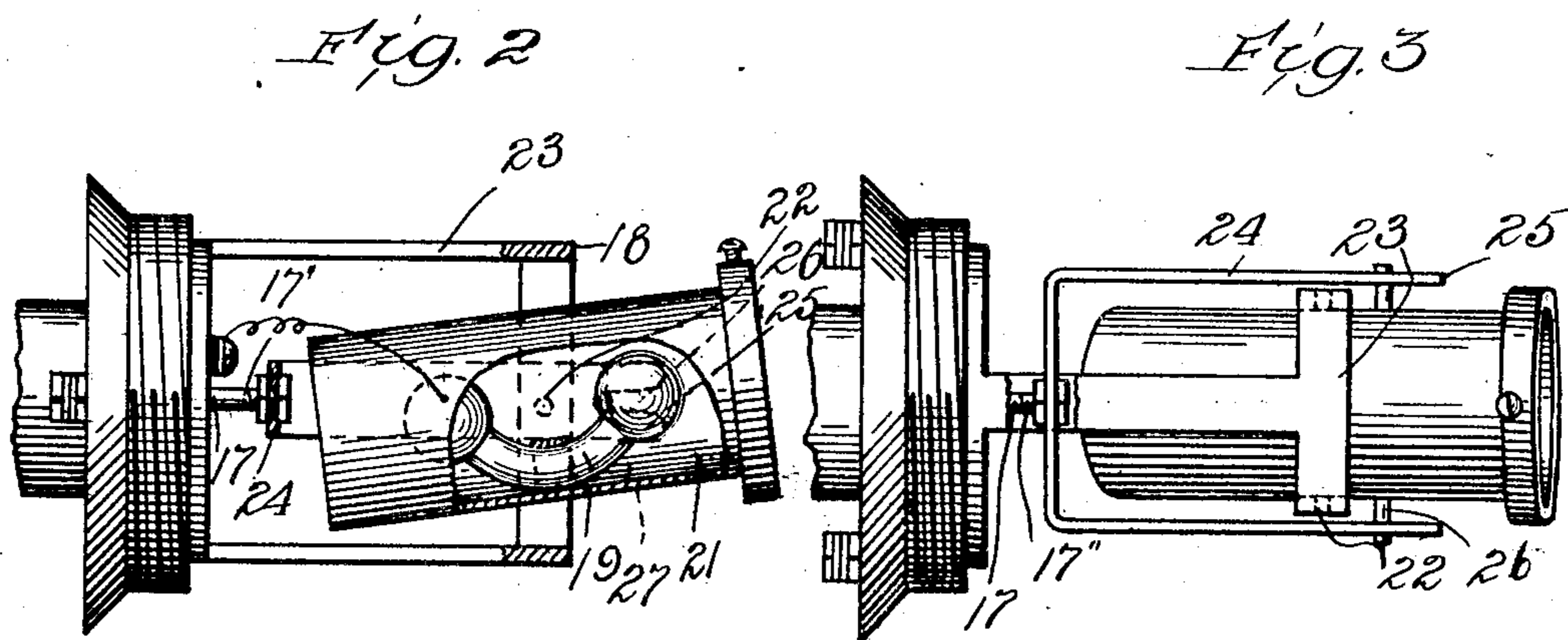
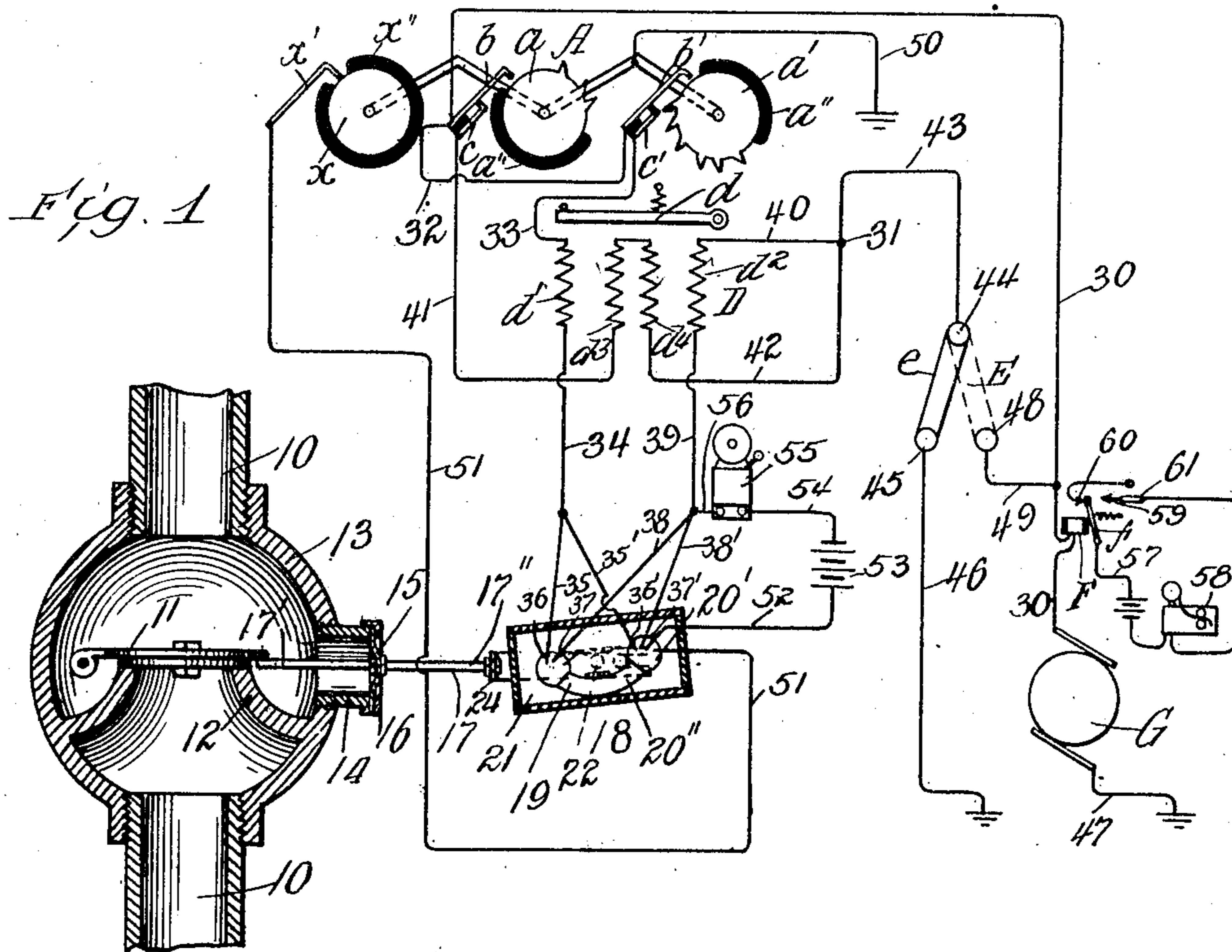
9-136

J. G. NOLEN & J. E. SHEPHERD.
FIRE PROTECTION SIGNAL SYSTEM.
APPLICATION FILED MAR. 20, 1905.

913,041.

Patented Feb. 23, 1909.

2 SHEETS—SHEET 1.



Witnesses:
Ray White
Harry R. L. White

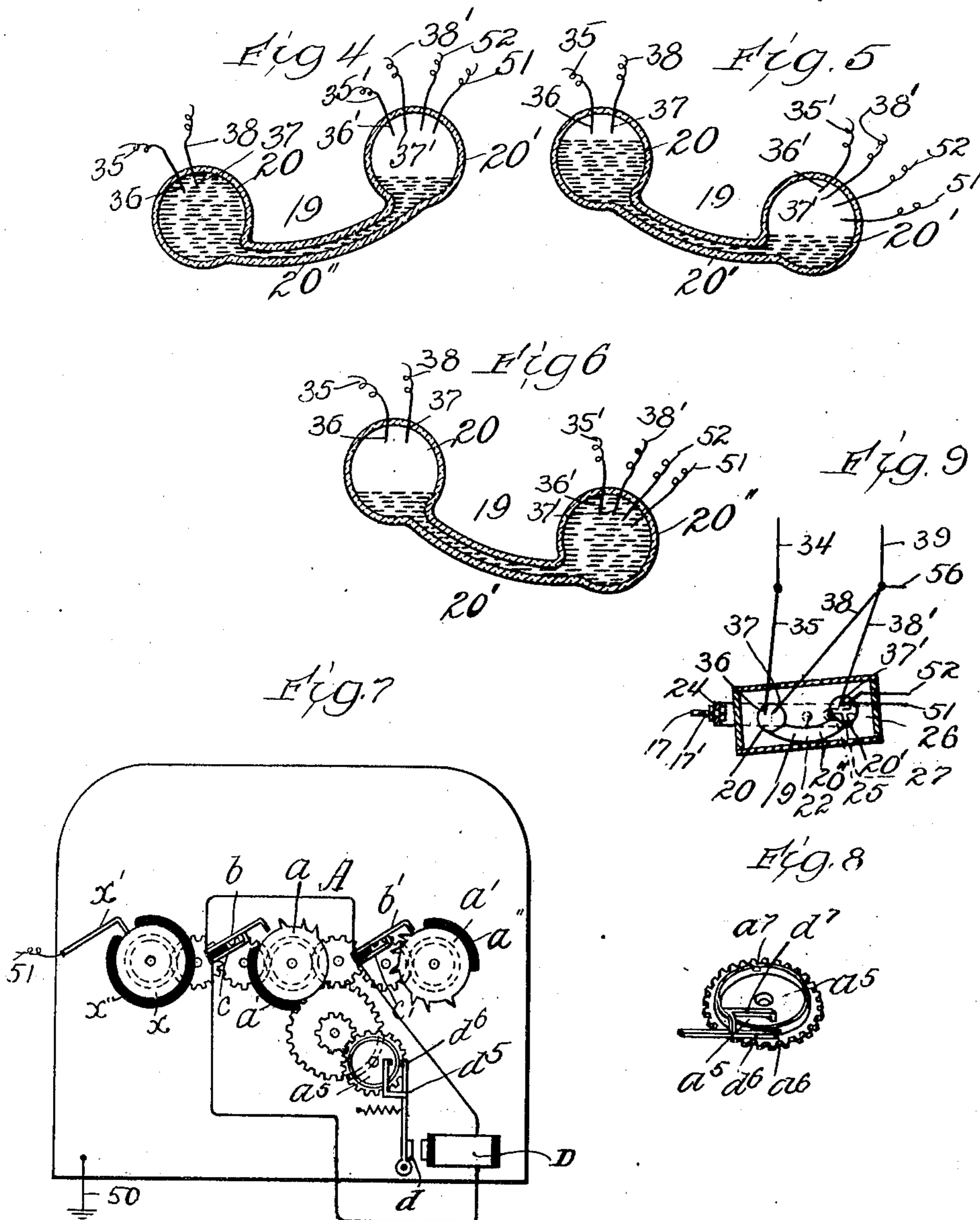
Inventors:
James G. Nolen
John E. Shepherd.
By J. J. Rain Atty.

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UNITED STATES PATENT OFFICE.

JAMES G. NOLEN AND JOHN E. SHEPHERD, OF CHICAGO, ILLINOIS; SAID NOLEN ASSIGNOR
TO SAID SHEPHERD.

FIRE-PROTECTION-SIGNAL SYSTEM.

No. 913,041.

Specification of Letters Patent.

Patented Feb. 23, 1909.

Application filed March 20, 1905. Serial No. 250,956.

To all whom it may concern:

Be it known that we, JAMES G. NOLEN and JOHN E. SHEPHERD, of Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Fire-Protection-Signal Systems; and we 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.

Our invention relates to improvements in fire protection signal systems, and is designed to provide an electric signaling system, operating in conjunction with devices of an automatic sprinkler system, in such manner that the continued presence for a definite time of a predetermined condition, such as water flow in the sprinkler system, will occasion the transmission to a central or other supervisory station of an alarm, while a momentary existence of said condition, such as not to require attention of the supervisory authorities, does not transmit an alarm.

A further object of our invention is to provide between devices interiorly located in a receptacle of a fire extinguisher system, and devices of the system exteriorly located relative to said receptacle, such connection as will secure the proper correlation of action of the sprinkler and signal system without subjecting the sprinkler system to the danger of leakage, the connection maintaining permanently the hermetic closure of the extinguisher receptacle.

A further object of our invention is to provide improved appliances for sprinkler supervisory systems, and improved circuit connections for such appliances, whereby advantages are attained which may best be understood from the following description taken in conjunction with the accompanying drawings, wherein:

Figure 1 is a diagrammatic representation of portions of a fire protection system equipped in accordance with our invention. Fig. 2 is a side elevation of a portion of the apparatus, and, Fig. 3 is a top plan view of the instrumentality shown in Fig. 2. Figs. 4, 5, and 6 are diagrams showing the action of the time switch. Figs. 7 and 8 represent conventionally the transmitter. Fig. 9 is a modification of a portion of Fig. 1.

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

Referring now to the diagrammatic view, Fig. 1, 10 indicates a riser of a fire-extinguisher system, as typifying an element wherein fluid flows when the system is active, and containing a movable part such as a valve 11, normally occupying a given position when the system is passive or out of operation, and occupying another position when the system is active or in operation.

In the specific embodiment illustrated, 11 indicates a valve, located in the pipe or riser 10, and arranged under normal condition to rest upon its seat 12 within the valve casing 13. From the valve 11 connection is established with devices forming part of the alarm or signal system, arranged exteriorly to the casing 13, such connection being preferably established through the instrumentalities herein shown, whereby hermetic closing of the receptacle at all times is insured. As to some features of our invention, however, such connection is not essential.

Specifically 14 indicates a tubular bushing threaded into a suitable opening in the valve casing 13, and having secured across it a tight diaphragm 15, held in place by suitable means such as the annular cap 16. Associated with said diaphragm 15 to fulcrum therein is a lever 17, preferably in the form of a rod or stem, suitably secured with a hermetic joint to the diaphragm 15 centrally thereof, and extending within and without the valve casing through said diaphragm. The inner end, 17', of said stem, is associated with the valve 11 for control by said valve, the arrangement of parts being such that when the valve is in closed position the stem occupies one position, and when the valve is moved to open position the stem 17 is moved to or conditioned for movement to another position.

Specifically, we have shown and preferred to arrange the lever 17 so that its inner end 17' is overlaid by the valve 11, the lever end 17' being held depressed while the valve is closed and freed to rise by the opening of the valve 11.

Exteriorly of the casing we associate the end 17'' of the stem or lever 17, with a switch or other circuit-varying device forming part of an electric signal or alarm system, and so arrange the devices that when the end 17'' of the lever is lowered the switch is actuated to vary the conditions of

its circuit, in such manner as to cause the giving of a signal through the agency of the alarm or signaling devices.

We prefer that the switch, arranged for actuation with the lever 17, be a time-switch adapted to condition the devices of the electric circuit, wherein it is associated, for operation only upon the maintenance of the movable element of the fire extinguisher system in condition showing activity of said system during a predetermined time, thereby avoiding the transmission of signals or the sounding of alarms at every momentary occurrence of movement of said movable members of said fire extinguisher system to position, indicative of activity in the system.

Specifically, 18 indicates in general an electric time switch suitable for carrying out our invention, and preferably comprising essentially a movable receptacle 19 having two enlarged portions or chambers 20, 20', connected by a restricted passage or duct 20'', said receptacle including a movable body, preferably of mobile, electrically conductive liquid, such as mercury, adapted, when the chamber is moved, to shift from one enlargement thereof to the other, the movement of said mobile liquid being adapted to influence a circuit, or circuits, having terminals in the receptacle.

We prefer that the receptacle 19 be mounted in a containing carrier 21, pivotally supported as at 22 in a suitable frame 23 in such manner that one end of the carrier 21 constantly tends to swing downward. The stem 17 is provided with a yoke 24 straddling the carrier 21, and having slots 25 for engagement with the studs 26 secured on said pivoted carrier in front of its pivots. The connections are made in such manner that when the stem is in normal position with its end 17', weighted down by the valve 11, the front end of carrier 21 is tilted upward against its constant tendency to drop, to such position that the body of mercury is substantially all contained in the chamber 20, as shown in Fig. 4, while, when the valve 11 rides the front end of the unbalanced pivoted frame 21 tilts downward so that the chamber 20' is brought below the level of chamber 20, and the mercury is conditioned to flow from the chamber 20 which it normally occupies into the chamber 20', which is normally empty. Such movement of the unbalanced frame 21, depresses the outer end of lever 17 and raises its inner end, the diaphragm 15 serving as a fulcrum for the movement of said lever. The return of the valve 11, to closed position, restores the parts to normal positions.

It will be understood, of course, that the time switch, herein shown, is illustrative merely, and that other forms of time switch,

mechanical or electrical, might be substituted therefor in the combinations.

Associated with the time switch for control thereby, we preferably provide a normally wound, plural-impulse signal-transmitting box adapted, when conditioned for operation, to transmit a readable or predetermined plural-impulse signal to a supervisory station, such transmitter or box being herein diagrammatically illustrated as indicated by the character A. Said box A is provided, preferably with two spring motor-driven number wheels *a* and *a'* each adapted to transmit a predetermined signal, distinguishable from the other. The teeth of the two wheels *a* and *a'* are preferably oppositely disposed, that is to say, the wheels *a* and *a'* operate in succession in conjunction with their respective contact pens, and each wheel is provided with a body of insulation *a''* adapted and arranged to raise its pen out of contact with the coacting contact point during the interval of time when the teeth of the opposite wheel are acting upon its pen. Associated with said wheel *a* are the pen *b* and contact *c* and with the wheel *a'* the pen *b'* and contact *c'*. Both pairs of contact parts being normally closed and being adapted to be broken by the passage beneath said pens of the teeth of their respective wheels. The teeth are preferably of such contour as to release the pens for sharp, free return after the passage of the tooth point thereby, so that the pen during each reciprocation caused by the passage of a tooth is momentarily out of contact with both the wheel and its coacting contact part.

A third wheel, *x*, may be conveniently arranged to constitute part of the box A, and is timed for simultaneous rotation with the wheels *a a'*, the wheel *x* being provided with a pen *x'* which makes electrical contact with the wheel while the wheels *a a'* are inactive or in normal position, and which is maintained out of such electrical contact with wheel *x* during the operation of wheels *a a'*, by a body of insulating material *x''* almost inclosing wheel *x*.

The purpose of the features of construction described will hereafter become apparent.

D indicates in general an electro-responsive device controlling the operation of the number wheels, said device comprising a magnet, the armature *d* whereof is suitably connected with the clock work of the transmitting box A to control its condition, said magnet being preferably so wound that when all of the normally charged circuits are energized by current flowing in the normal direction its condition is so nearly neutral that its armature is unattracted.

The transmitter and magnet arrangement is preferably such that the wheels are conditioned to make one revolution when the

magnet armature is moved in either direction, and for a second round, upon the return movement of the armature. This may be accomplished in any suitable way, Figs. 7 and 8 illustrating a simple mechanism wherein the clockwork is provided with the crown wheel a^5 having two notches a^6, a^7 at different elevations in the flange of the wheel, and at opposite sides thereof, each notch being adapted for coaction with a corresponding finger d^6 or d^7 of a yoke d^5 carried by the armature d of magnet D. The crown wheel is geared to make one half revolution for each full revolution of the wheels a a' and x . In operation, the notch a^6 is engaged by finger d^6 when the armature is unattracted, movement of the armature to attracted position releases wheel a^5 for a brief revolution until finger d^7 falls into notch a^7 , the number of wheels making a full revolution, and restoration of the armature to unattracted position releasing the wheel a^5 for another half revolution until notch a^6 is again engaged by finger d^6 .

E indicates in general a central station switch for varying the circuit conditions, F a relay at central station, and G the generator whereby energy is supplied from the central station to the signaling system. The wiring connections of said parts are preferably as follows: The positive pole of generator G is connected with wire 30, which I will term a main line wire, including at the central station the wiring of relay F and terminating at pen b of box A. From said pen extend two parallel circuit branches to a point 31, one branch, which for brevity I will hereafter term the "supervisory branch", extending from said pen b by wire 32 to the pen b' , from its contact c' by wire 33 to a coil d' of the magnet D, thence by wire 34, and parallel connections 35, 35', to the two contacts 36, 36' respectively located in chambers 20 and 20' of the time switch receptacle. Corresponding contacts 37, 37' are arranged in pairs with the contacts 36, 36' and from them extend parallel wires 38, 38' connected to wire 39 extending to the magnet coil d^2 , whose opposite terminal is connected by wire 40 to the point 31. The other branch of the circuit, which I will arbitrarily call the "main branch" extends from said pen b by its contact c and wire 41 through the coils d^3 and d^4 of the magnet D, (which are preferably wound to substantially neutralize the effect of coils d' , d^2 under normal conditions) and thence by wire 42 to the juncture point 31, whence the main circuit continues by wire 43 to the pole 44 of the single-pole, double-throw switch E, the blade e whereof normally contacts with a point 45, connected by wire 46 with ground at the central station. A wire 47, also connected with ground, extends to the negative pole of the generator G normally completes the circuit through

which current normally flows. The remaining contact 48 of the switch E is connected by wire 49 with the main wire 30.

The frame work of the transmitter box A, and consequently all of its wheels a a' and x , are preferably grounded through a suitable ground connection 50. We also preferably provide, in the normally empty chamber 20' of the time switch, a contact, connected by wire 51 with the pen x' of the wheel x , and also a contact connected by wire 52 with a local battery 53, the other terminal whereof is connected by wire 54 with a local alarm 55, whence extends a wire 56 establishing connection with another contact in said chamber, preferably by connection with the wire 39.

The armature f , of the relay F at central station, is normally maintained in attracted position, by the magnet of the relay, and is included in the normally open circuit 57 containing the recording instrument, or register, 58, preferably of the ordinary district telegraph messenger-call type, the circuit 57 being closable by movement of the armature f into contact with its back contact 59. The front contact 60 is normally disconnected from circuit 57, but a switch 61 is preferably provided, adapted to disconnect contact 59 from, and connect contact 60 in the circuit 57.

It will now be understood that under normal conditions in the fire extinguisher system, valve 11, being closed and the time switch being tilted to such position that the mercury fills the chamber 20 and leaves the chamber 20' substantially empty, the condition of the signaling system will be as follows: Electric current from the generator G traverses line wire 30 and relay F, (thereby maintaining the armature f in an attracted position) to the pen b , where the circuit divides, current flowing through both the "main" and "supervisory" branches, to the grounded main line wire 43, whence connection is made to the negative terminal of the generator by wire 47. The supervisory circuit, it will be observed, is closed at the time-switch through the contact of the mercury in chamber 20 with contact points 36 and 37. When the normal condition in this circuit prevails, it will be understood that the magnet D is balanced and its armature held retracted from the magnet by its spring.

Should now a variation in the conditions in the sprinkler system occur, such as to cause the raising of the valve 11, the unbalanced carrier 21 tilts, lowering the chamber 20' of the time switch, below the chamber 20, thereby conditioning the mercury to flow through the restricted passage 20'' into the chamber 20'. If the opening of the valve 11 be momentary only the flow of mercury through the restricted passage is not sufficient to break the circuit between contact points 36, 37, and upon the return of the valve 11 to normal position and the restora-

tion of the carrier 21 to position to raise the chamber 20' above the chamber 20 the mercury flows back into said chamber 20 and no variation in the circuit conditions takes place. If, however, the valve 11 remains in abnormal or open position for a period of time sufficient to enable enough mercury to flow through the restricted passage to break contact between the terminals 36 and 37, as shown in Fig. 5, and thereby make contact between the terminals 36' and 37', as shown in Fig. 6, the following action takes place: The break in the circuit at the contacts 36, 37, breaks the "supervisory" branch of the circuit from the pen *b* to point 32, throwing all of the current through the main branch and its connected coils d^3 , d^4 , so that the magnet becomes unbalanced and attracts its armature, thereby tripping the box for a single cycle, or round of operation, of the number wheels. The subsequent closing of the circuit through contacts 36', 37', however, preferably occurring about the time the insulation a'' of wheel a' is raising pen b' , restores the circuit connections, as originally described, and conditions the magnet armature to return to unattracted position under the influence of its retracting spring, thereby conditioning the box for another round of operation of the number wheels. As a result the box transmits two "rounds", each number wheel sending its characteristic number to be received at central station during each revolution. This operation will be well understood by those skilled in the art, as it will be apparent that the two pens and contacts are respectively in the opposite branches of the circuit, and that when the teeth of one number wheel are passing below its corresponding pen the parallel circuit connection through the pens of the opposite wheel are broken by the elevation of the pen of said opposite wheel by the insulated peripheral portion of the wheel coextensive with the toothed portion of the then-sending wheel. It will be apparent further that when the wheels are in operation upon the passage of a tooth of either wheel beneath its pen the main circuit is broken through both its parallel branches at the pens, momentarily grounded through one branch by wire 50 and then broken completely as the sending pen drops from the wheel teeth, so that register 58 records on the grounding action of each tooth by a break in its dash or "run-down", when the wheel a' is transmitting, and on the breaking action of each tooth, by a dot on the tape, when wheel a is transmitting.

Obviously when the valve 11 reseats itself, restoring the parts to initial position, the operation described will be repeated, circuit being first broken between contact points 36', 37', and then made between contacts 36 and 37. In this way the central

office is notified both of the maintenance of the valve 11 in open position, for a definite length of time, and of its subsequent closing for a similar length of time.

We also prefer that the local circuit, including the gong 55, be provided, it being obvious that when the valve is allowed to remain open for a short time the contact is made between the terminals of the local circuit in the chamber 20' and the gong started in operation to sound until the circuit is broken by the restoration of the time switch to normal condition.

We prefer also that the ground connections of the time switch and the transmitting box be provided to guard against failure of the system through the breaking of one of the line wires between the central station and the protected area. The central station connections shown are well known to those skilled in the art, and it is customary in systems having such central equipment as soon as prolonged operation of the relay 58 indicates a break in an outside wire, to throw the switchblade e into contact with the point 48, so that both sides 30 and 43, of the main line are connected with the positive pole of the generator, the negative pole whereof remains grounded through wire 47, and to throw switch 61 of the local recorder circuit so that said circuit is open when the relay armature contacts with its back contact. Under such conditions our improved signaling device is capable of perfectly operating and transmitting to central station its indications of activity in the fire extinguisher system. Assuming for example that the main wire 30 be broken, upon the rocking of the time switch attendant upon the opening of the valve 11, and the consequent shifting of the movable body of mercury, the following action takes place: The opening of the "supervisory" branch of the main line circuit at contacts 36, 37, produces no effect, as, obviously, under the conditions adverted to no current is normally in flow through the system. The closing of the contacts of the chamber 20' of the time switch, however, establishes a circuit for the generator, by wires 30, 49, switch blade e and wire 43 to point 31, and through parallel paths on one hand comprising coil d^2 , wire 39 and wire 38' to the mercury, and on the other hand including wire 42, coils d^4 , d^3 , wire 41, contact and pen c , b , wire 32, pen and contact b' c' , wire 33, magnet coil d' and wires 34, 35' to the mercury. Here the parallel paths join and circuit is completed through wire 51, pen x' , wheel x , the box frame and grounded wires 50 and 47 to the negative terminal of the generator.

It will be seen that while current flows through all of the coils of the balanced magnet D the direction of current flow through each coil except d' is opposite to that in

which it flows under normal conditions of the circuit when the magnet is balanced. An unbalanced condition, therefore, prevails in the magnet so that its armature is attracted
 5 and the transmitting instrumentalities conditioned for operation to transmit a single round.

Now as the wheels a a' and x start in revolution the insulated portion x'' of the wheel x
 10 breaks the ground connection of the time switch by raising the pen x' from contact with the metallic portion of the grounded wheel x . By this operation the main line circuit is again opened so that no current
 15 flows therethrough. Now as the teeth of a number wheel a or a' pass beneath the corresponding pen, a ground circuit connection is made by the wires 30, 49, 43, the appropriate
 20 transmitting pen through the teeth of the wheel and the grounded wire 50 and back to the generator by grounded wire 47. Thus it will be seen that the passage of each tooth beneath a pen causes an impulse to traverse the
 25 relay F, at central station, causing the recorder 58 to register a character in the usual manner. Should the line wires 43 and 46 be broken the action of the system is substantially the same as just described, the
 30 pens b b' getting their connection with the generator through the line wire 30, and the ground connection through the grounded frame as before.

In the modification shown in Fig. 9, if the
 35 valve 11 be raised, as a result of a disturbance of the normal conditions within the chamber 10, for a time sufficient for the mercury to flow from the chamber 20 of the time switch, and thus open or break the circuit between
 40 the wires 35 and 38, the relay D will thus become unbalanced, the wheels a , b and x will be revolved. The pen b and wheel a will send in a signal over the wires 30, 41, coils d^3 and d^4 , wires 42, 44 and 46 through
 45 ground to generator G. Closing of the valve 11 will restore the circuit between the points 35 and 38, thus balancing the relay D and again tripping the box causing a repetition of the signal over the circuit just described.

It will be apparent now that our system provides a means for transmitting signals from a movable member within a hermetically closed, fluid containing receptacle of a fire extinguisher system without rendering
 55 said receptacle liable to leakage; provides means for the prevention of the transmission of a signal by momentary changes of condition in the receptacle of the extinguisher system; provides means for controlling both
 60 local and central station alarm and signal devices by a common instrumentality; provides a complete central energy system wherein the main line and parallel branch wires are under constant test; and further provides a
 65 system which will not be incapacitated for

proper operation by the rupture of one of the main wires.

Other and further advantages of our system will be apparent to those skilled in the art, but it will be understood that we do not
 70 desire to limit ourselves to the use of the specific apparatus and connections herein shown and described further than as specified in the claims.

Having thus described our invention, what
 75 we claim and desire to secure by Letters Patent of the United States, is:

1. In combination with a fluid-containing receptacle of a fire extinguisher system, a diaphragm closing an opening in said receptacle, a movable part within the receptacle, a signal transmitting box without the receptacle provided with a tripping device, and connections whereby the movable part within the receptacle controls the signal box including a lever fulcrumed in the diaphragm and means for retarding the operation of the tripping device after functional movement of the part within the receptacle.

2. In combination, a receptacle of a fire
 90 extinguisher system, a part in said receptacle movable by variations of conditions therein, a diaphragm closing an opening in said receptacle, an electric signal transmitting box, a controlling or supervisory circuit
 95 therefor, a time switch operatively associated with said circuit, and connections whereby said switch is controlled by the movable part within the receptacle including a lever fulcrumed in the diaphragm.

3. In combination, a receptacle of a fire
 100 extinguisher system having an opening therein, a diaphragm closing said opening, a movable part within the receptacle, a signal transmitting box, electrical connections
 105 therefor including a box controlling time-switch, and mechanical connections between said switch and the movable part within the receptacle including a lever controlling the movement of the switch, and itself controlled by the movable part within the receptacle, said lever being fulcrumed in the diaphragm.

4. In combination, a receptacle of a fire
 115 extinguisher system, a movable part within said receptacle, a diaphragm constituting part of the receptacle, an electric signaling device, a circuit therefor, a time switch arranged to control said circuit, and operative connections between said time switch and
 120 the part within the receptacle whereby the movements of said time switch are controlled by the part within the receptacle, said connections comprising a lever fulcrumed within the diaphragm.

5. In combination, a fluid receptacle of a
 125 fire extinguisher system, a movable part in said receptacle, arranged to be actuated by movement of the fluid, a diaphragm constituting part of said receptacle, a signal trans- 130

- mitter without the receptacle, a signal responsive device, circuit connections therefor, a time switch controlling the operation of the signal transmitter, and connections whereby the movements of the switch are controlled by said movable part, within the receptacle, said connections comprising a lever fulcrumed in the diaphragm and operatively associated with the movable part.
6. In combination, a receptacle of a fire extinguisher system, a movable part of said receptacle, a diaphragm constituting a part of said receptacle, an electric time switch arranged without the receptacle, a local alarm circuit controlled by said switch and operative connections between said switch and the moving part within the receptacle, whereby the movable part controls the operation of the switch, said connections comprising a lever fulcrumed in the diaphragm.
7. In combination, a receptacle of a fire extinguisher system, a movable part in said receptacle, a diaphragm constituting part of said receptacle, a time switch without the receptacle, a local alarm circuit controlled by said switch, a signal transmitting device controlled by said switch, a signal responsive device, circuit connections between said signal transmitter and signal responsive device, and mechanical connections between said switch and the moving part within the receptacle whereby said switch is controlled by the part within the receptacle, said connections comprising a lever fulcrumed in the diaphragm.
8. In combination, a receptacle of a fire extinguisher system, a diaphragm closing a portion of said receptacle, a movable part in said receptacle, a plural impulse electric signaling device without the receptacle, and connections between said part within the receptacle and said signaling device, whereby the actuation of said device is controlled by movements of said part, comprising a lever fulcrumed in the diaphragm, extending within and without the receptacle, and a timing means for retarding the commencement of operation of the signaling device after functional movement of the part within the receptacle.
9. In combination, a receptacle of a fire extinguisher system, a valve within said receptacle, a diaphragm constituting part of said receptacle, an electric time switch without the receptacle, an electric signaling device, circuit connections for said device controlled by said switch, and means for operatively connecting said switch with the valve within the receptacle for control by said valve, said means comprising a lever fulcrumed within the diaphragm, and extending within and without the receptacle.
10. In combination, a receptacle of a fire extinguisher system, a valve in said receptacle, a diaphragm constituting part of the receptacle, an electric time switch arranged without the receptacle, an electric signaling device, circuit connections for said signaling device controlled by said time switch, and means connecting said time switch with the valve for control by the valve, said means comprising a lever fulcrumed in the diaphragm and extending within and without the receptacle.
11. In combination, a receptacle of a fire extinguisher system, a valve in said receptacle, a diaphragm constituting part of said receptacle, a signal transmitter, a signal responsive device, circuit connections between said transmitter and said responsive device, a time switch controlling the operation of said transmitter, and means connecting said time switch with the valve for control thereby, said means comprising a lever fulcrumed in the diaphragm.
12. In combination, a receptacle of a fire extinguisher system, a movable part in said receptacle, a signal transmitter, a signal responsive device at a supervisory station, circuit connections between said signal transmitter and supervisory device, including a ground connection at the supervisory station, an electro-responsive means for conditioning said signaling device for operation, a normally open ground connection for said electro responsive device adapted when closed to condition said electro responsive device to condition the transmitter for operation, a switch for closing said ground connection and means connecting said switch with the part within the receptacle for control by said part.
13. In combination, a receptacle of a fire extinguisher system, a movable part in said receptacle, a diaphragm constituting part of said receptacle, a signal transmitter, a signal responsive device at a supervisory station, circuit connections between said signal transmitter and supervisory device, including a ground connection at the supervisory station, an electro-responsive means for conditioning said signaling device for operation, a normally open ground connection for said electro responsive device adapted when closed to condition said electro responsive device to condition the transmitter for operation, a switch for closing said ground connection, arranged without the fire extinguisher receptacle, means connecting said switch with the part within the receptacle for control by said part.
14. In combination, a receptacle for a fire extinguisher system, a movable part in said receptacle, a diaphragm constituting part of said receptacle, a signal transmitter, a signal responsive device at a supervisory station, circuit connections between said signal transmitter and supervisory device, including a ground connection at the supervisory station, an electro-responsive means for con-

conditioning said signaling device for operation, a normally open ground connection for said electro responsive device adapted when closed to condition said electro responsive device to condition the transmitter for operation, a switch for closing said ground connection, arranged without the fire extinguisher receptacle, means connecting said switch with the part within the receptacle for control by said part, said means comprising a lever fulcrumed in the diaphragm.

15. In combination, a signal transmitter, having ground connections adapted to be made and broken in transmission of signals, a signal responsive device at a supervisory station, a source of current supply, and circuit connections grounded at the central station, an electro responsive device adapted to condition said signal transmitter for operation, said electro-responsive device being connected to receive current from the said central source of supply, a normally open ground connection for said electro-responsive device adapted when made to condition the responsive device to condition the transmitter for operation, and means for successively

making and breaking said ground connections, whereby said responsive device is grounded to condition the transmitter for operation and the ground then broken to condition the circuit for the transmission of signals from said transmitter.

16. In combination, a signal transmitting device having two make and break wheels, a normally contacting pen and contact for each wheel, each wheel having break devices insulated therefrom and grounded break devices, the grounded break devices of one wheel being timed to operate simultaneously with the insulated break device of the other, and a suitable circuit including the two pens in parallel, and including a signal receiving device and a grounded source of current supply.

In testimony that we claim the foregoing as our own, we affix our signatures in presence of two witnesses.

JAMES G. NOLEN,
JOHN E. SHEPHERD.

In presence of—

FORÉE BAIN,
MARY F. ALLEN.