(No Model.)

4 Sheets—Sheet 1.

W. F. SINGER.

FIRE ALARM SIGNAL BOX.

No. 448,684. Patented Mar. 24, 1891.

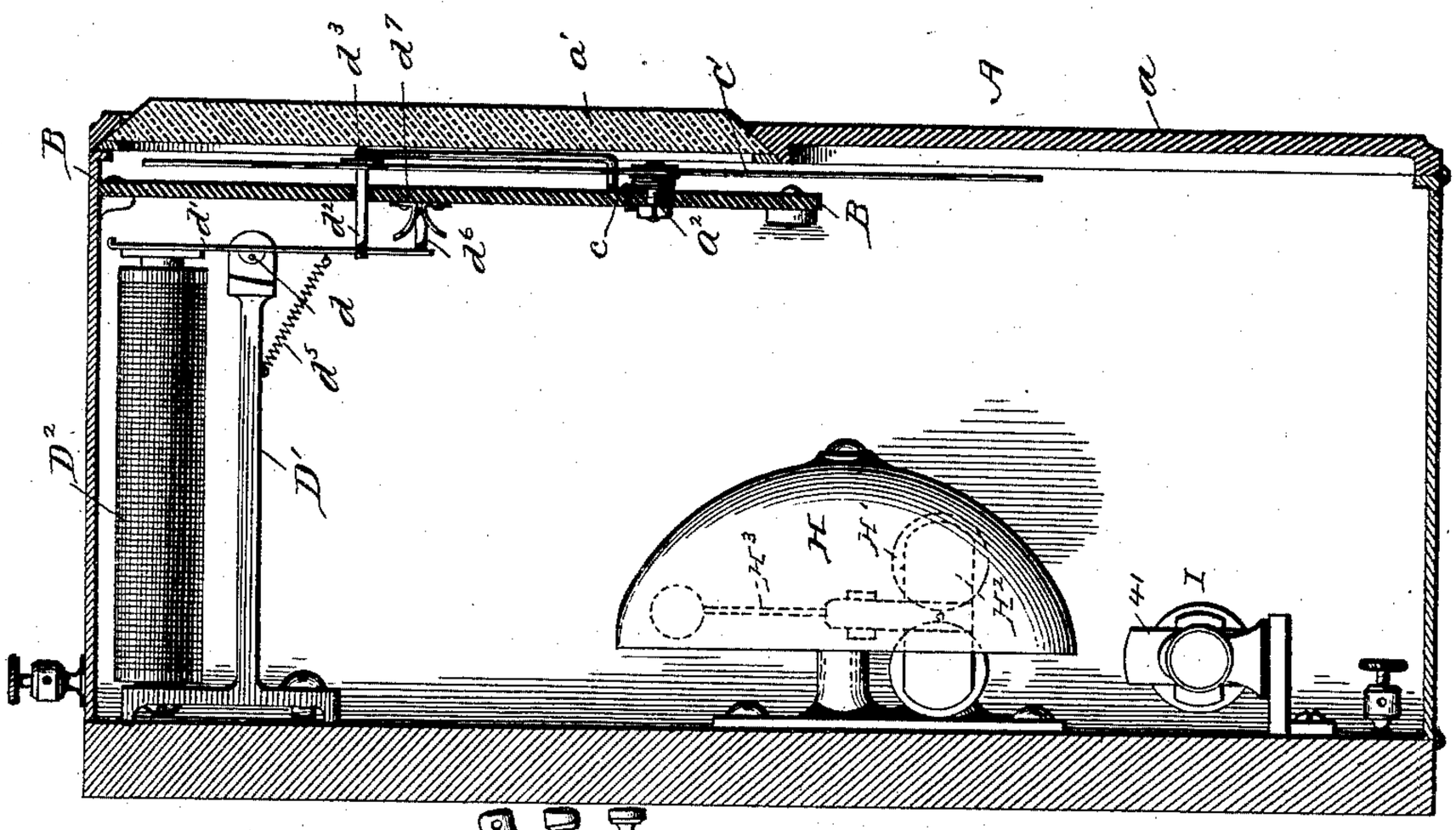

Fig. 3.

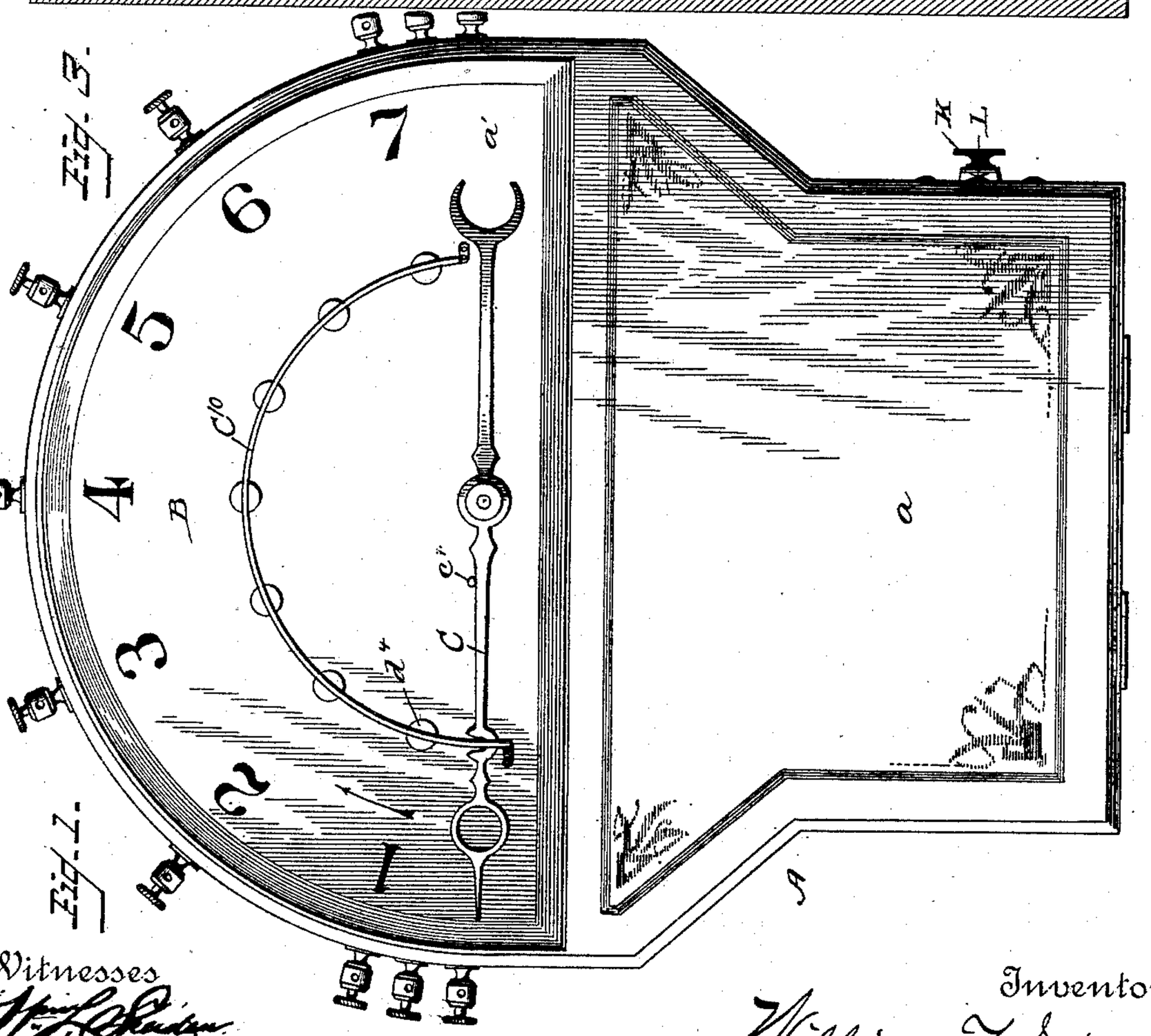

Fig. 1.

Witnesses
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E. H. Bond.

Inventor
William F. Singer
By his Attorney
Franklin H. Hough

(No Model.)

4 Sheets—Sheet 2.

W. F. SINGER.

FIRE ALARM SIGNAL BOX.

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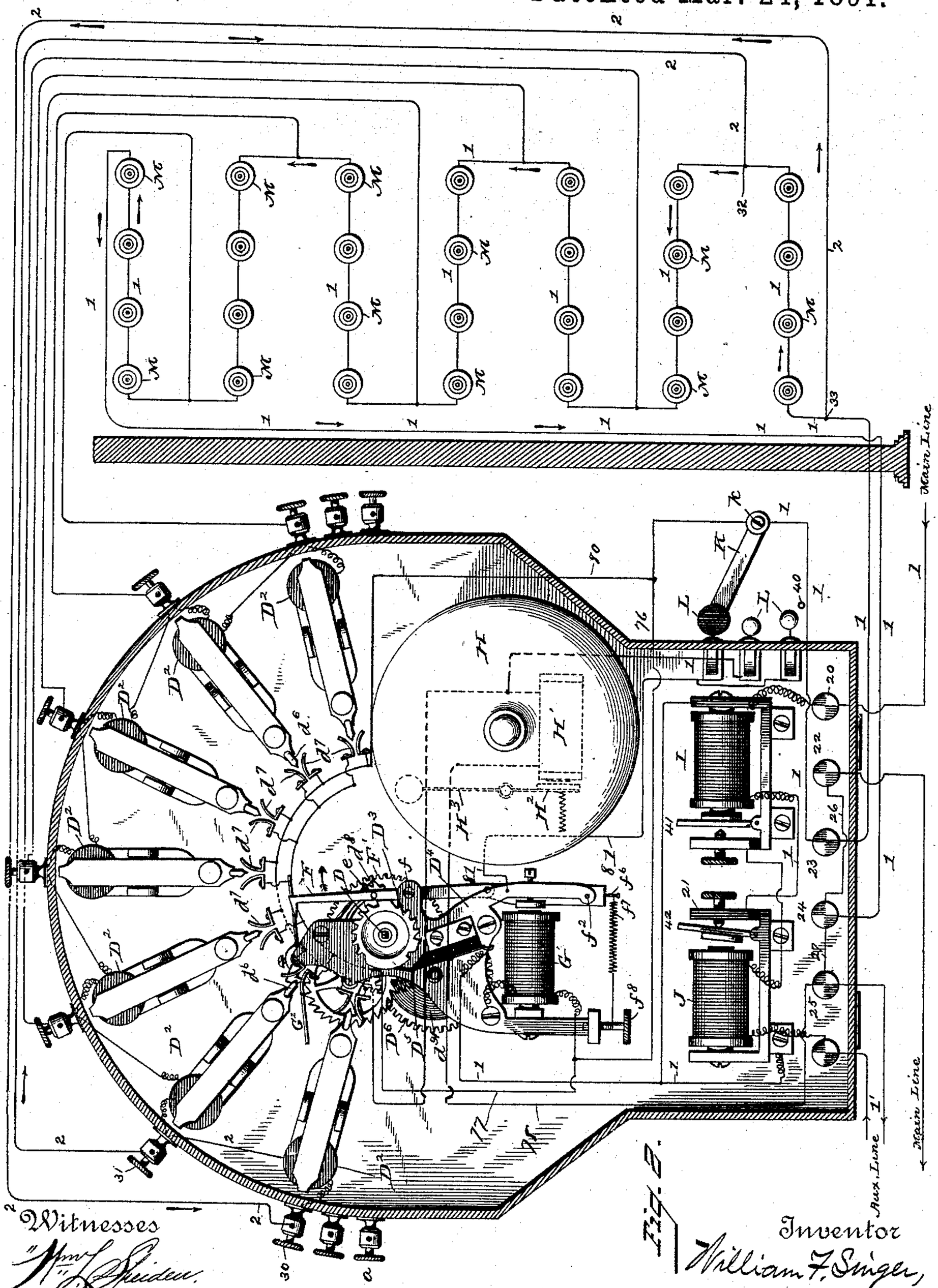


(No Model.) 4 Sheets—Sheet 3.

W. F. SINGER.

FIRE ALARM SIGNAL BOX.

No. 448,684. Patented Mar. 24, 1891.

Fig. 4.

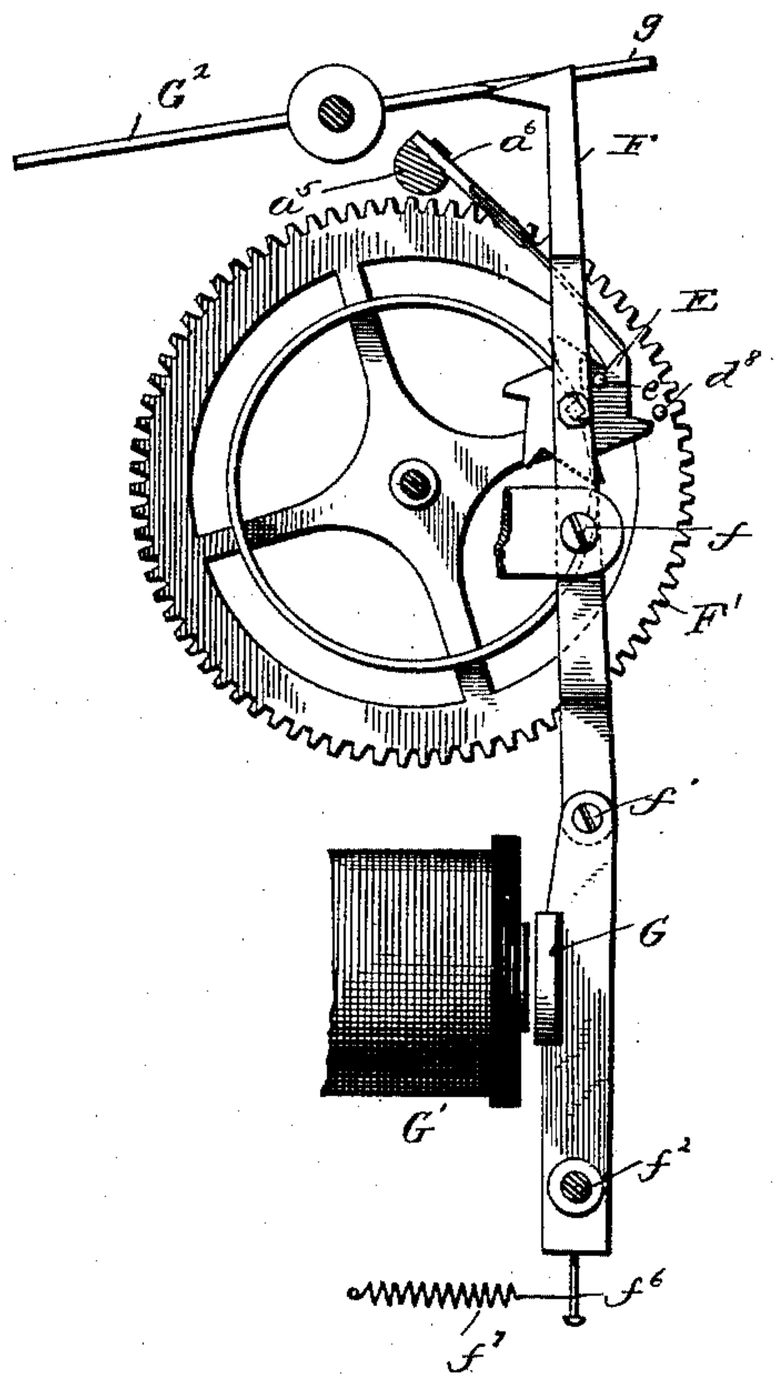


Fig. 5.

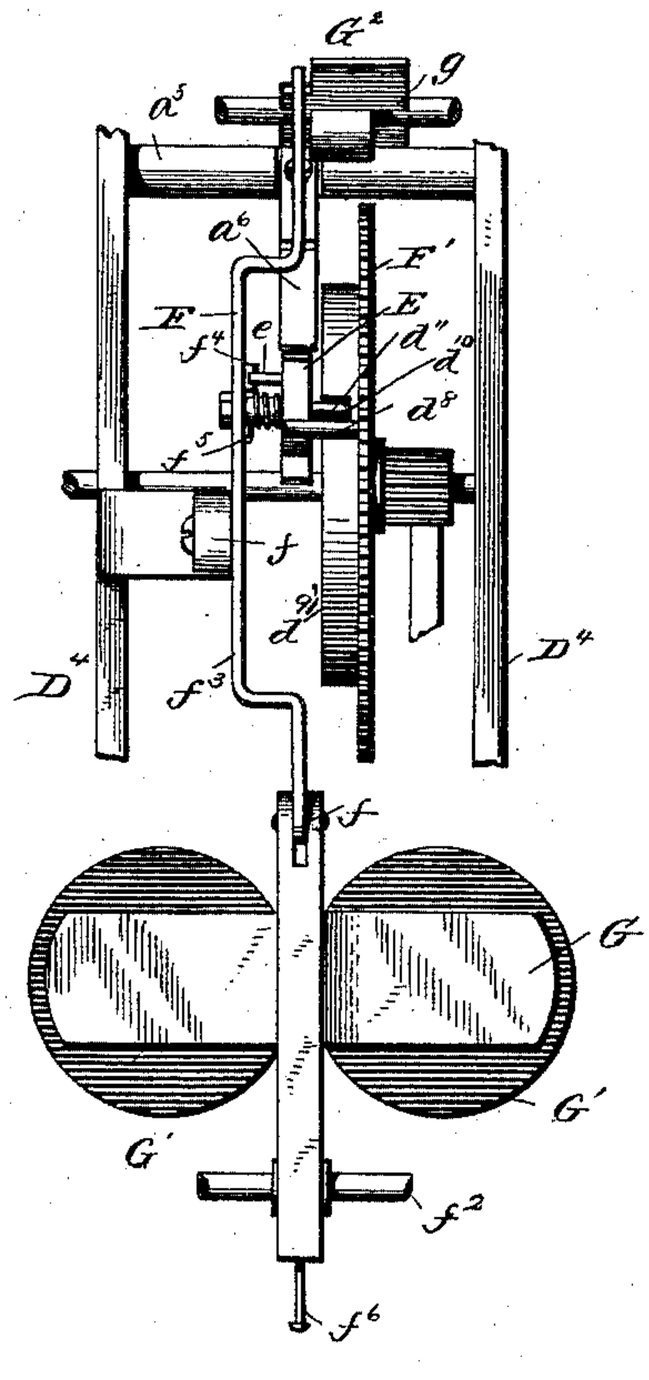


Fig. 6.

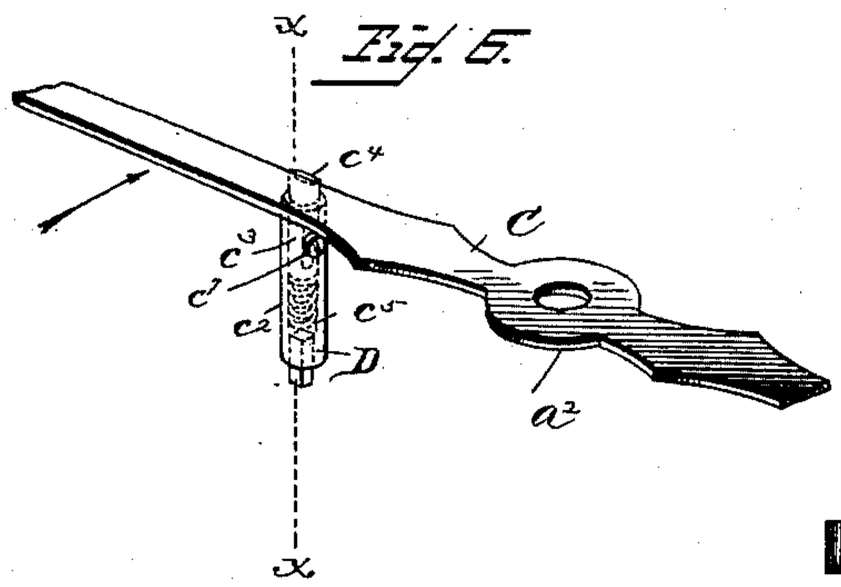
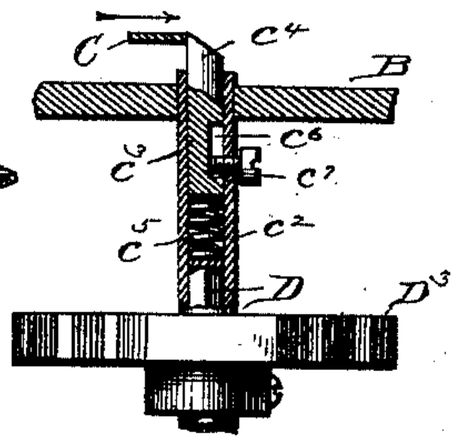


Fig. 7.



Witnesses
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(No Model.)

4 Sheets—Sheet 4

W. F. SINGER.

FIRE ALARM SIGNAL BOX.

No. 448,684. Patented Mar. 24, 1891.

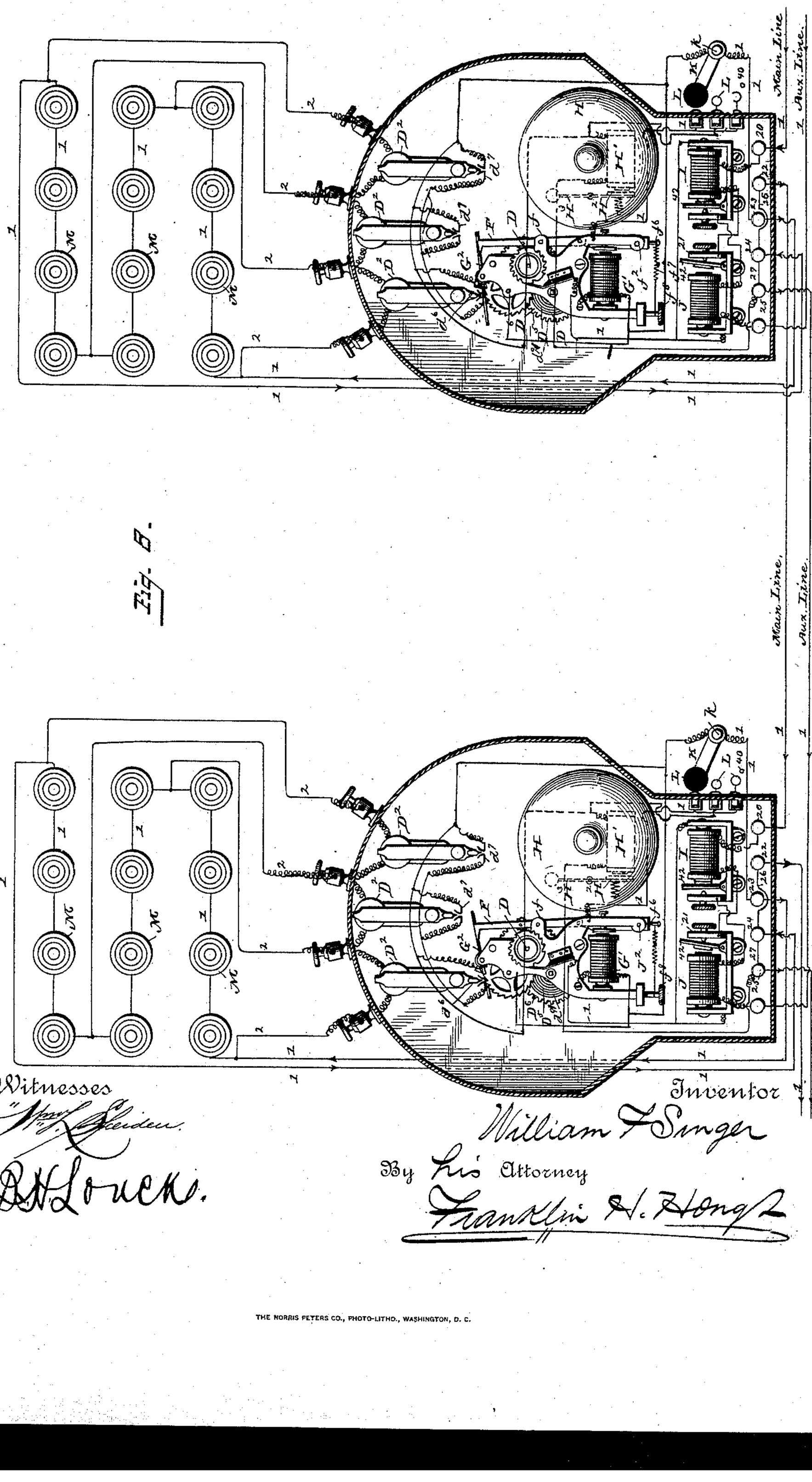

Fig. 8.

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D. W. Loucks.

Inventor
William F. Singer
By his Attorney
Franklin H. Hough

UNITED STATES PATENT OFFICE.

WILLIAM F. SINGER, OF CARTHAGE, ASSIGNOR TO THE SINGER FIRE-ALARM COMPANY, OF BUFFALO, LIMITED, OF BUFFALO, NEW YORK.

FIRE-ALARM SIGNAL-BOX.

SPECIFICATION forming part of Letters Patent No. 448,684, dated March 24, 1891.

Application filed March 11, 1889. Serial No. 302,875. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. SINGER, a citizen of the United States, residing at Carthage, in the county of Jefferson and State of New York, have invented certain new and useful Improvements in Fire-Alarm Signal-Boxes; and I do declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters and figures of reference marked thereon, which form a part of this specification.

This invention relates to certain new and useful improvements in automatic fire-alarm systems and apparatus therefor; and it has for its object to improve upon previous devices of this character, to provide for the visual and audible indication of the location of the fire, and the providing of means for conveying the current around a break created either by a broken wire or by the thermostat from heat.

To these ends and to such others as the invention may pertain the same consists in the peculiarities of construction and in the novel arrangement, combination, and adaptation of parts, all as more fully hereinafter described, shown in the drawings, and then specifically defined in the appended claims.

In another application filed by me, No. 302,876, I have described a complete system embodying the boxes described in detail in this application. In the present case the claims are restricted for the most part to the mechanism at the outlying stations, a few claims being addressed to the intercommunication of the boxes at the several stations, a feature of my system which might be operative with other central-office apparatus than that described in my other application.

This invention is clearly illustrated in the accompanying drawings, in which—

Figure 1 is a front view of the box employed in my system. Fig. 2 is a similar view with the face and dial removed, and also showing in diagram the building equipment of which the box is a part and the connections between the same. Fig. 3 is a central vertical section through Fig. 1. Fig. 4 is a detached front view of the movement with its frame and other portions removed, and showing also the escapement, all upon an enlarged scale. Fig. 5 is a view of the movement, taken at right angles to Fig. 4. Fig. 6 is a perspective detail of the indicator and its detent or holder. Fig. 7 is a vertical section through the line $x\,x$ of Fig. 6. Fig. 8 is a sectional view on an enlarged scale, showing inside elevations, the interior mechanism of the boxes, and their connections with the thermostats and with each other.

Like letters and figures refer to like parts throughout the several views.

Reference being had to the details of the drawings by letter, A designates the box, provided with a hinged front a, the upper portion a' of which is provided with a transparent portion, preferably of beveled glass. Beneath this glass portion is the dial B, of any suitable material, preferably hard rubber, and provided upon its face with a plurality of indicating-marks—such, for instance, as the numerals 1, 2, 3, 4, &c—the number corresponding to the number of stories in the building, in the present instance seven. Pivoted on a suitable pivot a^2 on this dial B is the pointer C, a spiral spring c being provided around said pivot and connected with the dial and pointer in a manner well known to cause the said pointer to oscillate when free to do so. This pointer is normally held in the position in which it is indicated in Fig. 1 by means of the detent or stop c', the construction of which and its connection with the other parts is more clearly illustrated in Figs. 6 and 7, in which c^2 is a sleeve fitted onto the end of the shaft D of the circuit-breaker, and sliding within this sleeve is the detent or bolt c^3, having a beveled end c^4, as shown in Fig. 7.

c^5 is a spring within the sleeve, having one point of resistance against the end of the shaft D and its other against the bolt, said bolt being provided with a longitudinal slot c^6, which is engaged by the set-screw c^7 to limit the motion thereof. As soon as the circuit-breaker is started the rotation of its shaft brings the beveled portion c^4 of the detent into a position where the pointer, by reason of the force of its spring, will act thereon and depress the detent or bolt, thus permitting the pointer to

be rotated by reason of its spring until stopped by coming in contact with a story-indicating pin, the construction and operation of which will be hereinafter described.

Within the box are located a plurality of magnets, one for each story of the building; but as these magnets, their accessories, and their operation are similar in each instance a description of one will suffice for all. I will therefore confine my description to that illustrated in Fig. 3, in which D′ is a pole-piece secured to the back of the box and supporting the magnet D^2 of ordinary construction. Upon the horizontal arm of this pole-piece is pivoted at d the armature d' of said magnet, said armature carrying a pin d^2, projecting at right angles therefrom, and provided with a head d^3, designed when the armature is attracted by its magnet to be projected through an opening d^4 in the dial, for a purpose hereinafter explained, a spring d^5 being provided to retract the armature, as will be readily understood.

C^{10} is a guide or guard, beneath which the pointer works.

Projecting from the tail-piece of the armature is a contact-pin d^6, which when the armature is attracted by its magnet is forced between the contact-springs d^7, secured to the rear face of the dial, each one of which is properly connected with opposite poles of a battery.

On the shaft D is the circuit-breaker D^3, and on the frame D^4 is the brush D^5, insulated as shown. On the opposite side of the frame is a train of gear-wheels D^6, on the periphery of one of which F′ is the laterally-projecting pin d^8, which at each revolution of the gear-wheel engages the star gear-wheel E, journaled on the lever F, pivoted at f, and jointed at f', and pivoted again at f^2, its lower end to the frame D^4. This lever is attached to and carried by the armature G of the magnets G′, supported by the downward extension of said frame. On the shaft of the first mover of the train of gearing is a spring d^{91}. The upper end of this lever F is hooked, said hook being beveled upon both sides, as best shown in Fig. 4, and is designed to lock the movement when the armature G is away from its magnet, the said hook then engaging the fan or regulator G^2, which is provided with a notch g, which when the armature is attracted by its magnet and the lever thrown back is disengaged from the hook and admits of a free action of the fan.

The lever F is provided with an offset f^3, and to the rear side of the lever in this offset is a projection f^4, and on the face of the star-wheel E is a pin e, and around the shaft of said star-wheel and connected therewith and with the lever in a well-known manner is a spiral spring f^5.

Projecting from the lower end of the lever F is a pin f^6, to which is attached one end of a spring f^7, the opposite end of which is attached to a regulating-screw f^8 on the extension of the frame D^4, as shown best in Fig. 2.

On the face of the wheel F′ is a guard flange or rail d^9, provided with a notch d^{10}, with which engages at stated intervals a rearward extension d^{11} of the shaft d^{12} of the star-wheel E, the object of which will be explained farther on. Secured at one end to the upper cross-bar a^5 of the frame is a flat spring-bar a^6, the free end of which is adapted to engage the periphery of the star-wheel to prevent retrograde movement thereof. (See Fig. 5.)

H is a bell of ordinary construction, H′ its magnet, H^2 the armature thereof, and H^3 the hammer operated by the making and breaking of the current by the circuit-breaker.

I is a special relay located within the box below the mechanism above described, and J is an auxiliary relay, also located within the box in proximity to the relay I.

K is a switch pivoted at k, and L L are connecting-points connected as shown in Fig. 2 of the drawings.

M M are thermostats located upon the ceiling of the different stories, a sufficient number being placed in each story, (four being shown in the drawings,) all of the thermostats being connected with the main line.

The main line 1 enters the binding-post 20, to which is connected one end of the relay-coil I, the other end of which coil is connected to an insulated section 21 of the frame of the auxiliary J, passing thence through the adjusting-screw to the armature of the auxiliary relay, thence onto the frame thereof, thence to the brush of the circuit-breaker, thence onto the frame of the movement, thence to one of the switch-points L, thence through the switch K to its base, from thence to the binding-post 23, out from thence to building-circuit and through all the thermostats therein, returning to binding-post 24. The binding-post 24 is connected by wire 26 with the binding-post 22, and also by means of wire 27 with the binding-post 25 of the auxiliary line, each offering a path out for the current, as will be readily understood.

In order to maintain a current in the event of a break, I provide in each story a tap or path around each story, which normally is not operative. The magnets D^2 are of large resistance compared with the portions of the thermostatic circuits which they shunt. As the arrangement is the same upon each story, a description of one will suffice for all.

Referring to Fig. 2, the numeral 2 indicates the path of the current in the event of a break to the shunt-magnet, whose office it is to shunt the current from the top, while the main line is in a normal condition. This line 2 enters the binding-post 30 and through the shunt-magnet, passing out at the binding-post 31, thence, as indicated in the drawings, enters the main line at the point 32, which is beyond the thermostats in that story, thus completing the circuit around the thermostats in the event

of a break at any place between the points 32 and 33.

In operation, in the event of a break in the main line—for instance, between the points 32 and 33—the current then leaves the main line at 33 and goes to binding-post 30 and enters shunt-magnet at 30, passes out at binding-post at 31, and returns to main line at 32. In passing through the shunt-magnet D^2 it causes said magnet to attract its armature, and as its armature is attracted the contact-point d^6 enters between the springs d^7 and closes the circuit at that point, and at the same time projects the pin d^2 through the opening in the dial opposite the indicating-mark of the story in which the break occurred. When the pin d^6 enters between the springs d^7 and closes the circuit at that point, giving it a path through the starting-magnet of the movement, thus starting the movement, the armature G of the magnet is attracted, and this releases the hook of the lever from its engagement with the fan, allowing the latter to vibrate, starting the movement. The starting of the movement causes the circuit-breaker to revolve. The number of revolutions of the circuit-breaker is indicated at the central office on receiving-instruments (not shown) in a manner well known in the art, and each time the brush drops into a notch of the circuit-breaker a single stroke is rung upon the bell H, the said bell being connected in the common path of the main and auxiliary line. The attraction of the armature G throws the upper end of the lever F outward in the direction of the arrow in Fig. 2, thus releasing the hooked end thereof from the regulator or fan G^2, allowing the same to revolve until interrupted by the releasing of the armature from the magnet, allowing the spring f^7 to again throw the hook into engagement with the fan. The star-wheel E, journaled on the lever, as shown, is held against the stop or projection f^4 by means of the spring f^5 and pin e until moved by the engagement therewith of the pin d^8 on the wheel F′, the rotation of said wheel F′ while the magnet is closed, and consequently the lever thrown out, causes the said star-wheel to turn one notch, and provided the armature is not released by its magnet said star-wheel is held against retrograde movement by means of its spring a^6. The said wheel continues to move forward one notch at each revolution of the wheel F′ until five revolutions have been completed, at which point the pin e engages with the projection f^4 on the lever, thus locking the movement against further revolution, which remains firmly locked until the broken circuit between the points 32 and 33 has been again restored, the effect of which is to take current from the starting-magnet G′, thus allowing the spring f^7 to throw the hook in again, engaging the vibrating fan, freeing the star E from its engagement with the pin d^8 and allowing it to fly back to its former position, as shown in Fig. 4. Should the circuit be restored between the points 32 and 33 before a complete revolution of the circuit-breaker, the effect would be to shunt current from the starting-magnet, leaving the spring f^7 free to throw the top of the lever F toward its engagement point with the regulating-fan, which act is prevented by the guard-rail d^9, upon whose periphery the pin d^{11} travels, and thus prevents the moving in of the lever F toward the notch in the fan G^2 until the notch d^{10} in the guard-rail is coincident with said pin, when the said pin enters the notch and allows the lever F to be thrown inward into engagement with the fan, thus stopping the movement. The movement is capable of being started by the opening of the building-circuit and is stopped at the end of one or more revolutions by the circuit being restored again, but always completing a full revolution should circuit be closed before it is finished. Of course, if a break should occur at any other thermostat than that specified the same result will be produced, but through the other lines, the path of the current being through the tap or shunt circuit nearest the break.

The switch K enables the occupant of a building provided with this system to call the fire department should a fire occur in adjoining buildings not equipped with this system. In this event the switch K is pulled down against the stopping-pin 40, leaving it at rest upon the lowest connecting-point L. While on said point the condition of the point is the same as before being moved; but on its passage it passes the intermediate connecting-point L, throwing the current temporarily through the starting-magnet G′ over the following path: main line 1, post 20, magnet I, 21, 42, brush, frame, magnet G′, switch K, point L, wire 80, bell-magnet H′, wire 78, posts 25 22, and out to main line. As the bell-magnet is of low resistance, this energizes G′ and releases the clock-train, the bell H giving the strokes of the signal and apprising the operator that the signal is going in, releasing the movement and enabling it to make a complete revolution, thus indicating at the central office the location of a box that has been pulled.

The office of the relays I and J is to divide the current as it enters the box, for be it understood that two lines—a main and an auxiliary 1 and 1′—are used to convey the current to all buildings upon the circuit, the main line only being in use when the circuit is in complete working order; but should the main line be from any cause disabled the current will automatically shift to the auxiliary line by the falling back of the armature 41 of the main-line relay and the closing of the armature 42 of the auxiliary-line relay, as will be readily understood from the description heretofore given in tracing the course of the current through the box.

It will be seen that either the main or auxiliary circuit may have a path through any

box, accordingly as the main or auxiliary relay I or J is active. In the condition illustrated in Fig. 2 current enters on main wire 1 and passes thence over a course previously traced to the frame of the wheel-train and out on the main circuit. If, however, the main circuit should be broken at any point, the relay I will automatically drop its armature, thus completing the auxiliary circuit through wire 1, (see Fig. 2,) magnet J, armature 41 (then against its back-stop) to the brush and wheel-train. If a thermostat be opened, current will be shunted through a story-magnet over path (supposing a thermostat on the first story to be actuated) of wire 1, magnet I, back-stop 21, armature 42, brush, break-wheel, frame, wire 81, switch K, wire 1, post 23, wire 33, story-magnet D^2, post 24, post 22, and main line, and the armature of the story-magnet will close a low-resistance path around the thermostatic circuit as follows: wire 1, post 20, magnet I, back-stop 21, armature 42, brush, magnet G′, wire 77, contacts d^6 d^7, (now bridged by the armature of D,) bell-magnet H′, wire 78, posts 25 and 22, and out on line. Thus any one of the story-magnets which may be actuated by the operation of a thermostat will close a normally-open short circuit around the thermostatic or building circuit, and will for that reason increase the strength of current flowing through magnet G′ and cause it to release the clock-train. The magnet G′ is normally weakened by reason of the path offered the current by wire 81, connecting clock-frame and the upper and lower switch-points.

What I claim as new is—

1. A fire-alarm system provided with a main and an auxiliary circuit, signal-boxes connected by both circuits, and a relay in each signal-box to automatically cut in the auxiliary circuit upon rupture of the main circuit.

2. In a fire-alarm system, the combination of a thermostatic circuit through an equipped building normally connected through its signal-box in the main circuit, a high-resistance magnet in a shunt around the thermostatic circuit, a normally-open short circuit, including the box-releasing magnet around the thermostatic circuit, and a circuit-closer controlled by the high-resistance magnet to close the short circuit when a thermostat operates.

3. In a fire-alarm system, the combination of a normally-closed thermostatic circuit through an equipped building, a high-resistance shunt around each story, a circuit-closer controlled by a story-magnet in each shunt, and a normally-open short circuit around the entire thermostatic circuit of the building, adapted to be closed upon the operation of any story-magnet.

4. In an automatic fire-alarm system, the combination, with a plurality of thermostats and a call-box, of the main line through all of said thermostats, a branch line, as described, the auxiliary line, a visual and audible indicator, and the relays I and J, one in each circuit, the armature of one being closed while the other is open and the armature of one governing the main line and that of the other the auxiliary, all substantially as and for the purpose specified.

5. The combination, with the dial, the magnet D^2, the circuit-wires, the pointer, a shunt-magnet, its armature, and the pin d^2, carried by the tail-piece of the armature and provided with a head d^3, adapted to project through an opening in the dial, of the contact-springs on the rear of the dial, and the pin d^6 on the end of the armature and adapted to engage said springs when the armature is attracted by said magnet, substantially as described.

6. The combination, with the apertured dial, its pointer, and the stop thereof adapted to project through a hole in the dial, of the shunt-magnet, its armature, a pin carried by the tail-piece of said armature, and a releaser for said stop, substantially as described.

7. The combination, with the apertured dial, the oscillating pointer, a shunt-magnet, its armature, and the pin d^2, carried by the tail-piece of the armature and adapted to project through an opening in the dial, of a circuit-breaker and a stop for said pointer actuated by the shaft carrying the said circuit-breaker, substantially as described.

8. The combination, with the apertured dial, the oscillating pointer, its stop, the shunt-magnet, and its armature, of the pin d^2, carried by the armature, the releasing-magnet, the circuit-wires, a circuit-breaker the shaft of which actuates said stop, the contact-springs d^7, and the pin d^6, carried by said armature, substantially as described.

9. The combination, with the vibrating pointer and the rotary circuit-breaker, of a stop for said pointer, having a beveled end and actuated by a shaft of the wheel-train driving said circuit-breaker, substantially as described.

10. The combination, with the spring-actuated vibrating pointer, of the rotating circuit-breaker and the spring-actuated stop moving with said circuit-breaker and having a beveled end actuated by the circuit-breaker shaft, substantially as and for the purpose specified.

11. The combination, with the dial, the pointer, and the circuit-breaker, of the sleeve on the shaft of said breaker and the pin sliding in said sleeve and having a beveled end, substantially as described.

12. The combination, with the dial, the pointer, and the circuit-breaker, of the sleeve on the shaft of the circuit-breaker, the bolt sliding within said sleeve and having a beveled end, the said bolt having a longitudinal slot, the set-screw c^7, and the spring in said sleeve beneath the bolt, substantially as shown and described.

13. The combination, with the dial having apertures, as shown, the armature, and stop-pins carried by said armature, of the guard

over said apertures and the pointer vibrating beneath said guard, substantially as shown and described.

14. The combination, with the circuit-breaker and the frame D^4, of a train of gear-wheels, the lever F, and the star-wheel E on said lever and adapted to make a complete revolution and actuated by one of the train of gear-wheels, substantially as described.

15. The combination, with the circuit-breaker and the frame D^4, of a train of gear-wheels, a pin d^8, projecting laterally from one of said wheels, the pivoted lever F, and the star-wheel E, journaled on said lever, substantially as described.

16. The combination, with the circuit-breaker and the frame D^4, of a train of gear-wheels, a pin d^8, projecting laterally from one of said wheels, the magnets G′ and their armature, the lever carried by said armature, and the star-wheel journaled on said lever, substantially as described.

17. The combination, with the circuit-breaker and the frame D^4, of a train of gear-wheels, a pin d^8, projecting laterally from one of said wheels, the coil-spring on the shaft of the first mover of said train of gear-wheels, the vibrating fan, pivoted lever, and the star-wheel journaled on said lever, substantially as and for the purpose specified.

18. The combination, with the lever, the projection f^4 thereon, the train of gear-wheels, and the pin d^8, projecting laterally from one of said wheels, of the star-wheel journaled on said lever and provided with the pin e, projecting therefrom parallel with the axis of the star-wheel, substantially as and for the purpose specified.

19. The combination, with the train of gear-wheels, one of which is provided with a guard-flange having notch d^{10}, of the pivoted lever, the projection f^4, and the star-wheel journaled on said lever and formed with pin e, a rear extension d'', and a laterally-projecting pin d^8, substantially as and for the purpose specified.

20. The combination, with the lever F, provided with the offset f^3 and a projection f^4 on the rear side of the lever in said offset, of the star-wheel journaled on said lever, the spring f^5 around the shaft of said star-wheel, and the pin e on said star-wheel parallel with the axis of said wheel and engaging said projection, substantially as and for the purpose specified.

21. In a fire-alarm system, the combination, with outlying signal-boxes and a central office, of two independent circuits extending throughout all exposed parts of the system, a single thermostatic circuit through a protected building, and an electro-magnetic circuit-changer at the outlying stations for connecting the thermostatic with the auxiliary circuit when the main circuit breaks or becomes inoperative.

22. The combination of two independent circuits, transmitting-instrument, connections therefrom to one of said circuits, a relay in said circuit, a contact constituting the terminal of the other of said circuits, another contact, and connections independent of said circuits from said last-named contact to said transmitting-instrument, said contacts being controlled by said relay, substantially as described.

23. The combination of a closed circuit, including a circuit-controller, a shunt around said circuit-controller, including a magnet, contact-points controlled by said magnet, a motor, a controlling-magnet therefor, a branch from one leg of said circuit to said controlling-magnet and to one of said contact-points, and a second branch from the other contact-point to the other leg of said circuit, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM F. SINGER.

Witnesses:
FRANKLIN H. HOUGH,
VICTOR L. MASON.