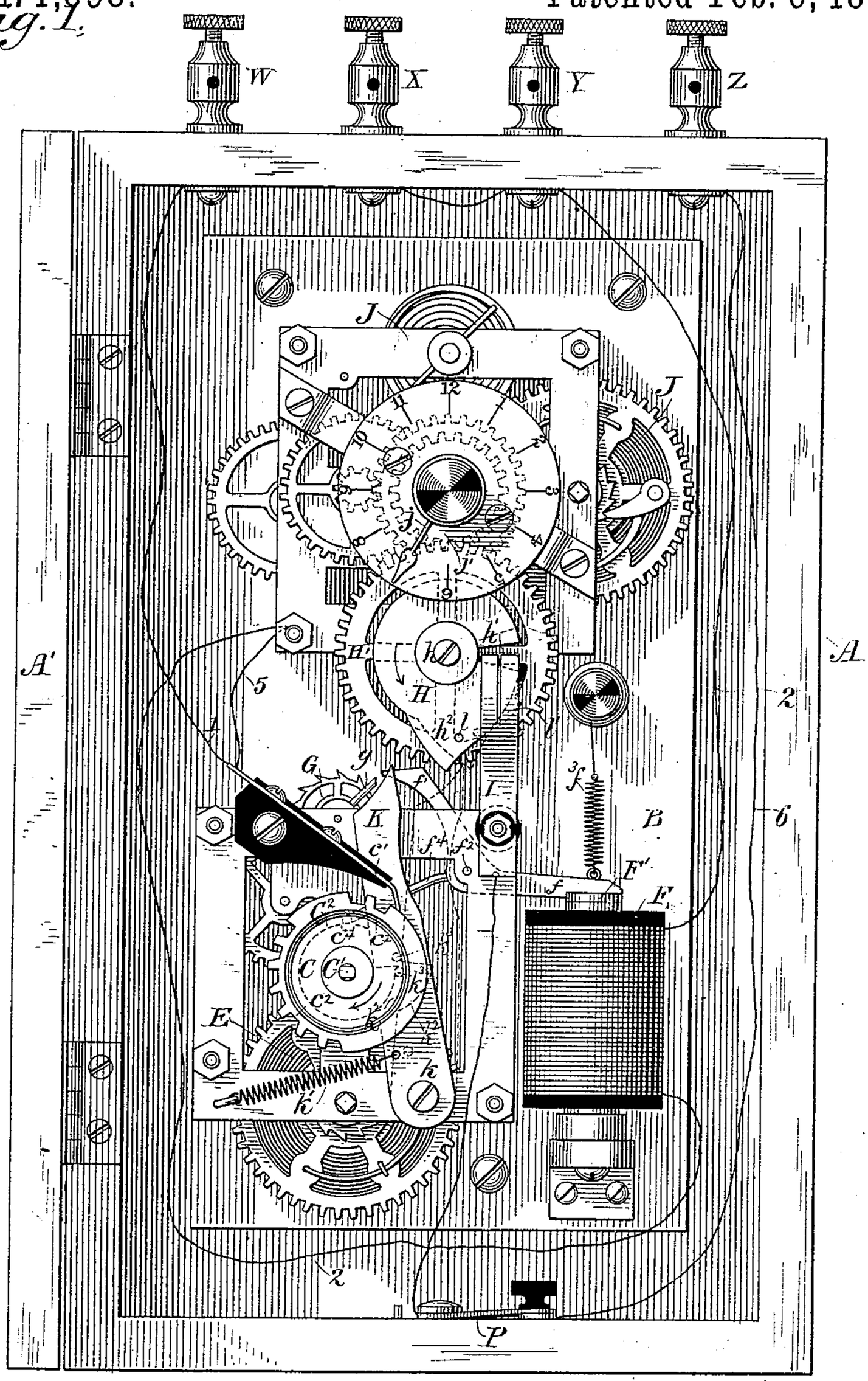
(No Model.) 2 Sheets—Sheet 1.

G. F. BULEN.

AUTOMATIC TESTING APPARATUS FOR TELEGRAPHIC FIRE ALARM STATIONS

No. 271,598. Patented Feb. 6, 1883.

Fig. 1.



Witnesses:

Wm. A. Skinkle.

Geo. W. Breck.

Inventor:

George F. Bulen.

by his Attorneys,

Cope Edgecomb & Butler.

(No Model.) 2 Sheets—Sheet 2.

G. F. BULEN

AUTOMATIC TESTING APPARATUS FOR TELEGRAPHIC FIRE ALARM STATIONS.

No. 271,598. Patented Feb. 6, 1883.

Fig. 2.

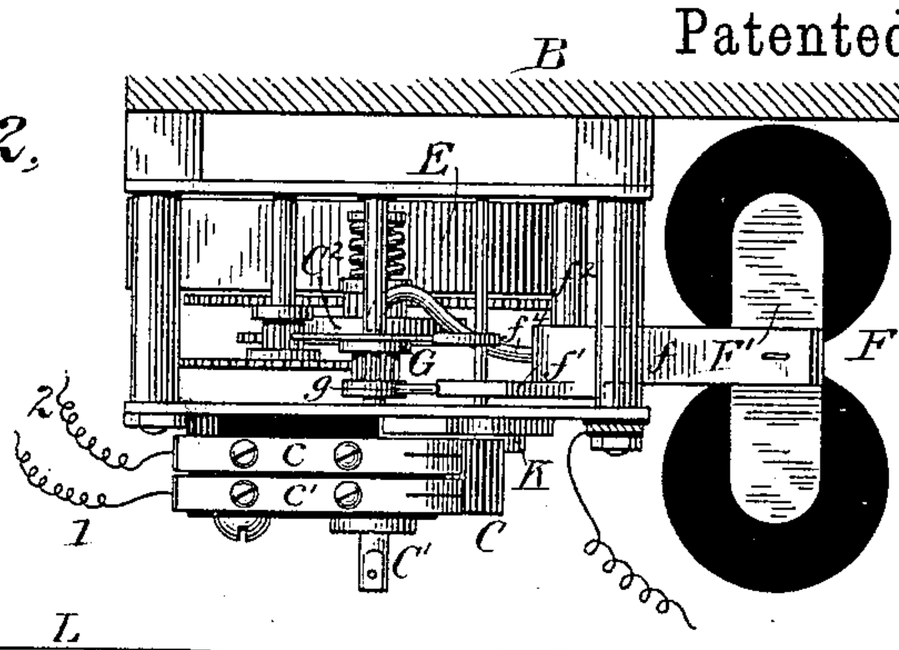
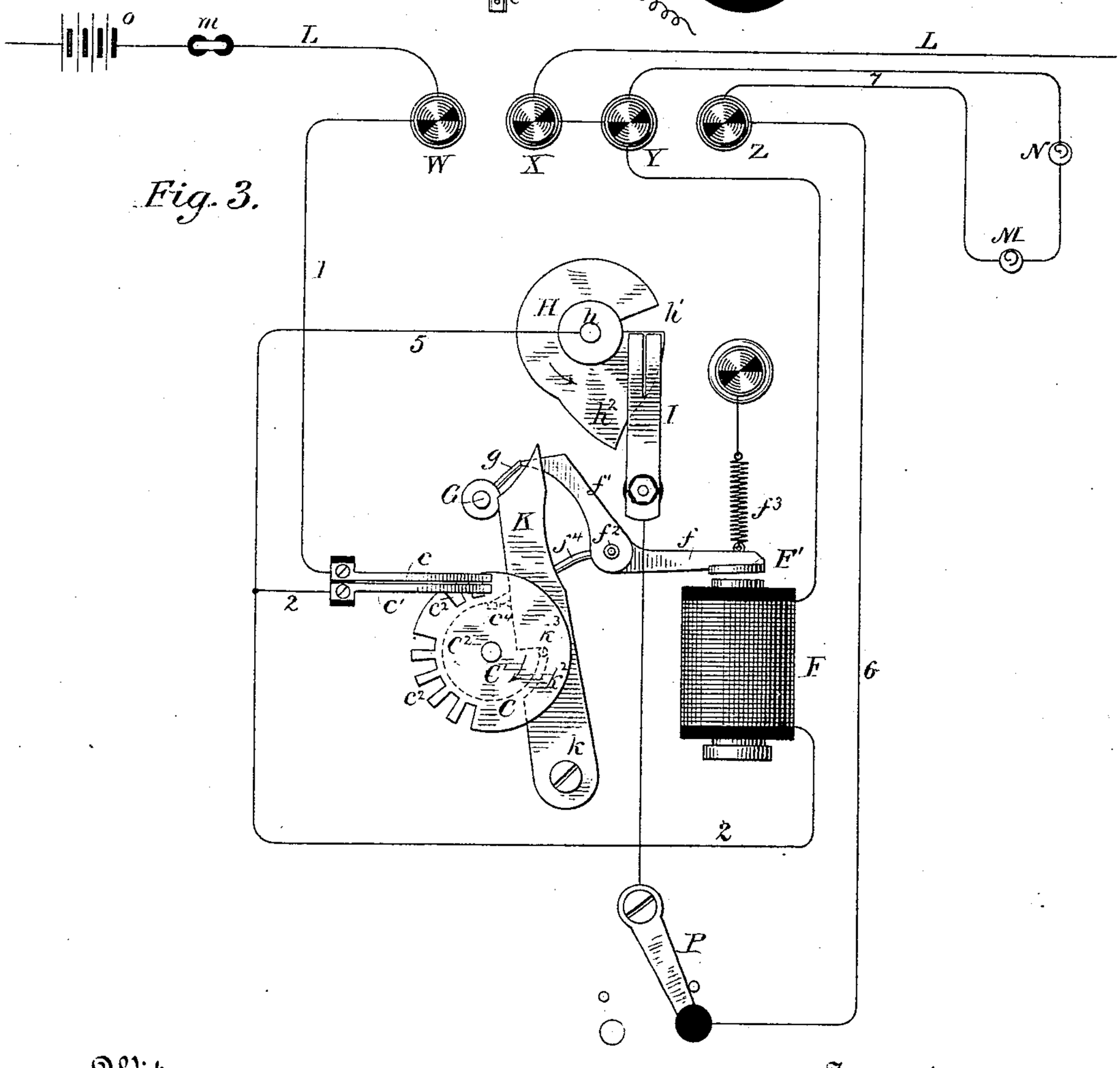


Fig. 3.



Witnesses:

Wm A. Skinkle

Geo W Breck

Inventor:

George F. Bulen,

by his Attorneys

Pope Edgecomb & Butler

UNITED STATES PATENT OFFICE.

GEORGE F. BULEN, OF JERSEY CITY, NEW JERSEY, ASSIGNOR TO THE WATKINS AUTOMATIC SIGNAL TELEGRAPH COMPANY, (LIMITED,) OF NEW YORK, N. Y.

AUTOMATIC TESTING APPARATUS FOR TELEGRAPHIC FIRE-ALARM STATIONS.

SPECIFICATION forming part of Letters Patent No. 271,598, dated February 6, 1883.

Application filed August 1, 1882. (No model.)

To all whom it may concern:

Be it known that I, GEORGE F. BULEN, a citizen of the United States, residing in Jersey City, in the county of Hudson and State of New Jersey, have invented certain new and useful Improvements in Automatic Testing Apparatus for Telegraphic Fire-Alarm Stations, of which the following is a specification.

My invention relates to the application of certain automatic testing devices to signal-boxes of the type commonly employed in district fire-alarm telegraph systems for automatically transmitting predetermined signals to a central station in the event of the occurrence of a fire or other emergency requiring assistance in the building in which the particular signal-box is situated. The efficiency of the protection furnished by systems of this class depends upon each of the signal-boxes being at all times in perfect working order, and to render it certain that such will be the case it has heretofore been necessary to employ inspectors whose duty it is to examine at frequent intervals the signal-boxes and apparatus at each station.

The object of my invention is to provide mechanism which is preferably employed in connection with the signal-box at each sub-station for automatically transmitting the designating-signal of that station to the central office at stated times, provided the apparatus and circuits are in their normal or operative condition. Should, however, any part of the apparatus at a sub-station become for any reason inoperative, the testing-signal will fail to be transmitted at the proper time, and the attendant at the central office will thus be notified that the apparatus at that particular station is out of order and requires attention. In this manner the services of a regular inspector may be dispensed with, and it is only necessary to visit the individual signal-boxes when it is known by means of the automatic apparatus that they are not in working order.

To this end my invention consists in mechanism so organized as to automatically transmit a predetermined designating-signal to a central station whenever required for protective or other purposes, in combination with a circuit-breaking device actuated by a time-train or chronometer-movement and arranged to automatically set in operation at stated intervals the said signal-transmitting device, thereby causing the predetermined designating-signal to be transmitted to the central station.

In the accompanying drawings, illustrating my invention, Figure 1 is a front elevation of a signal-box with its automatic signal-transmitting mechanism. Fig. 2 is a plan view of the signal-transmitting mechanism, together with a portion of the mechanism for controlling the same; and Fig. 3 is a theoretical diagram, showing the arrangement of electric circuits as well as certain details of construction.

Referring to the drawings, A represents a suitable case for inclosing and protecting the apparatus, which is preferably provided with a hinged or removable door, A′.

Secured within the case A is a metallic frame, B, for supporting the various parts of the signal-transmitting and time-train mechanism. The signal-transmitting mechanism consists of a rotating circuit-breaking wheel, C, of the usual well-known construction, against the periphery of which rest two metallic contact-springs, *c c′*, which are brought into electrical connection with each other when thus in contact with the wheel. Suitable recesses or notches, c^2, are formed in the periphery of the wheel C, which, during the revolution of the latter in the direction indicated by the arrow, are made to pass successively beneath the tips of the springs *c* and *c′*, and thus interrupt the electrical connection between them. The recesses c^2 are arranged in successive groups, in a manner well understood, for transmitting any required numerical signal by thus interrupting the circuit a greater or less number of times. A suitable train of clock-work, E, driven by a spring or other like motive power, is provided for impelling the circuit-breaking wheel, when the same is released from the detaining mechanism, hereinafter described. One of the contact-springs, *c*, is electrically united by a wire, 1, with the binding-post W, while the remaining contact-spring, *c′*, is connected by a wire, 2, through the coils of an electro-

magnet, F, with the binding-post X. The main line L, proceeding from the battery *o* at the central office, is attached to the binding-post W, and, through the circuit-connections of the instrument, as described, with the binding-post X, from which it extends to the succeeding stations of the system in order, and thence returns to the opposite pole of the battery.

It will be evident from the preceding description that whenever the circuit-breaking or transmitting wheel C is caused to revolve the normally-closed circuit of the main line L and battery *o* will be interrupted each time a recess c^2 passes beneath the contact-springs *c* and *c'*, and these interruptions are utilized at the central office to actuate any suitable receiving or recording instrument, *m*, or to sound an alarm.

For the purpose of protecting the building at which the signal-box is located against fire or burglary, I provide an auxiliary conductor, 5 6 7, which traverses the building and includes in its circuit suitable thermostats and other forms of circuit-breakers, as indicated at M N, and which normally short-circuits and demagnetizes the electro-magnet F, thus allowing its armature to fall away from the poles of the magnet, and thereby bringing a detent into the path of the signal-transmitting mechanism, which causes the latter to remain inactive so long as the auxiliary circuit is complete. The mechanism which I employ for thus locking the signaling device consists of a detent-arm, *f'*, attached to the armature-lever *f* of the electro-magnet F, and moving therewith. This arm *f'* is pivoted, together with the armature-lever *f*, at f^2, and when the armature F' is drawn upward by means of a retractile spring, f^3, which is the case when the electro-magnet F is demagnetized, the arm *f'* projects into the path of a pin, *g*, extending from the axis of the escapement-wheel G of the mechanism which actuates the signal-transmitting wheel C, thereby arresting the movement of the mechanism.

Mounted upon the same axis, C', with the circuit-breaking wheel C is a drum, C^2, against the periphery of which presses an L-shaped arm, f^4, extending from the axis f^2 of the armature-lever *f*, and, during the time a signal is being transmitted, serving to retain the arm *f'* out of the path of the detent *g*. A notch or recess, c^4, however, is formed in the periphery of the drum C^2 at the point where the arm f^4 rests when the circuit-breaking wheel has completed one revolution. The arm f^4, by falling into this recess, allows the arm *f'* to be carried into the path of the detent *g*, thus locking the mechanism, in case the armature F' is in its backward position, away from its electro-magnet F, as when the signal-transmitting mechanism has been released by a single short electric impulse transmitted through the electro-magnet; but if, on the other hand, the armature F' remains attracted to the magnet F, the arm *f'* will be held away from the detent *g* and the circuit-breaking wheel will continue to revolve, repeating its signal at each revolution.

The auxiliary conductor 5 and 6, for short-circuiting the electro-magnet F and normally allowing the arm *f'* to be drawn away from the poles of the magnet, extends from the contact-spring *c'* to a binding-post, Z, and thence through the building to be protected, including in its course the several circuit-breakers within the building, as indicated at N and M, thence to the binding-post Y, which is electrically united with the binding-post X. Thus it will be understood that so long as the circuit closers or detectors M N, &c., are in their normal condition the electro-magnet F (which is preferably so constructed as to offer a considerable resistance to the current) is shunted, and is therefore not sufficiently magnetized to cause its armature F' to overcome the tension of the retractile spring f^3. If, however, the shunt-circuit 5 6 be broken at any point, the main-line current from the battery *o* will pass through the magnet F, causing its armature to be attracted, thereby removing the arm *f'* from the path of the detent *g*, releasing the mechanism, and causing the signal-transmitting wheel to rotate. So long as the armature F' remains attracted to the poles of the magnet F the signal-transmitting wheel will continue to revolve, and the designating-signal of that box will be repeated to the central station once during each revolution. When from any cause the auxiliary circuit 5 6 is again closed, the armature F' will be drawn away from the magnet F by the retractile spring, and the arm f^4 will press against the periphery of the drum C^2. The arm *f'* will, however, be held out of the path of the detent *g* until the signal has been completed by the arrival of the wheel C at its starting-point, when the arm f^4 will again fall into the notch c^4, thus allowing the arm *f'* to come into the path of the detent *g* and arrest the signal-transmitting mechanism.

For the purpose of transmitting a test-signal to the central station at regular intervals, thereby assuring the attendant that the apparatus is in working order, I provide a clock-work or chronometer mechanism, the function of which is to operate at stated intervals a circuit-breaking device interposed in the path of the auxiliary or shunt circuit which spans the electro-magnet F. It is evident that such a device will cause the signal-transmitting wheel to be actuated whenever said device is in a position to break the auxiliary or shunt circuit. The circuit-breaking device which I prefer to employ for this purpose consists of a metallic sector-wheel, H, against the side of which rests a contact-spring, I. The wheel H is placed in electrical connection with the conductor 5, leading from one contact-spring, *c'*, of the signal-transmitting wheel C, and the contact-spring I is placed in connection with the conductor leading to the binding-post Z. The wheel H is normally in the position to close the circuit

with the contact-spring I; but it is caused to revolve in the direction indicated by the arrow through the instrumentality of a suitable clock-work mechanism, J, driven by a coiled spring in the manner of an ordinary time-piece. The wheel H is mounted upon an axis, *h*, and connected with that shaft of the time-train carrying the index-hands *j* by means of a toothed wheel, H′, and a pinion, *j*′, which causes the wheel H to complete a revolution once during every twelve hours or during any other required time. A section of the wheel H is cut away, as shown at *h*′, from the periphery toward the axis *h*, and the slot thus formed passes beneath the end of the contact-brush I once in each revolution, thereby disconnecting or interrupting the auxiliary or shunt circuit 5 6. In this manner it is evident that the signaling-wheel will be released at a particular moment once in each twelve hours, or other stated interval, the electro-magnet F magnetized, and a test-signal transmitted to the central office.

For the purpose of preventing the signal from being repeated a number of times when the mechanism is actuated by means of the testing device, as would be the case were the shunt-circuit 5 6 to continue broken by the slot *h*′ remaining beneath the contact-spring I until carried beyond it by the slow revolution of the time-train mechanism, I provide an arm, K, for moving the disk H upon its axis independently of the clock mechanism, thereby causing the shunt-circuit to be again closed at the moment the operation of transmitting the signal has been completed. The arm K is pivoted at a point, *k*, beneath the transmitting-wheel C, and is normally held back toward the circuit-breaking wheel C by means of a spring, *k*′. A pin, k^3, extends from the transmitting-wheel C behind the arm K, and when in the position of rest allows the arm K to be drawn into its backward position by falling into a recess, k^2, formed in the back of the arm K. The lower side of the notch k^2 is in the form of an arc of a circle preferably concentric with that described by the revolution of the pin k^3, thus allowing the pin k^3 to be carried with the wheel C through the first portion of its revolution without affecting the arm K. The upper edge of the notch k^2, however, is rectangular, and when the wheel C has nearly completed its revolution the pin k^3 comes into contact with the back of the arm K, moving it forward until the pin has reached the recess k^2, when the arm is again drawn backward by means of the spring *k*′.

Upon one side of the wheel H is provided an extension, h^2, which, while the slot *h*′ is in a position to break the auxiliary circuit, projects into the path of the arm K. When the arm K is thrown forward by the revolution of the signal-transmitting wheel C it strikes against the projection h^2 and carries the wheel H forward a sufficient distance to cause the slot or recess *h*′ to pass completely under the contact-spring I and bring the wheel again into contact therewith, thus closing the circuit immediately and before the signal-transmitting wheel has completed its revolution. The armature F′ is thereupon released from the poles of its magnet F, and the arm *f*′ locks the path of the signal-transmitting mechanism, in the manner already described.

For the purpose of allowing the wheel H to be moved forward by means of the arm K independently of the clock mechanism, I mount the former loosely upon the shaft *h* and provide a coupling-pin, *l*, which projects from beneath the disk H through a slot, *l*′, in the rim of the toothed wheel H′, which conveys the movement of the time-train to the shaft *h*. The pin *l* is normally engaged by the wheel H′ at one extremity of the slot, and the disk H is caused to revolve therewith. The slot, however, is of sufficient length to allow the disk H to be at any time moved forward a sufficient distance to cause the notch *h*′ to pass completely across any given point. It will be seen, thus, that when the contact-spring I has reached the notch *h*′ the wheel H may be moved forward a sufficient distance to bring the spring again into contact with the wheel without interfering with the movement of the clock mechanism. When the wheel has thus been moved forward by the arm K it will remain stationary until the wheel H′ has been caused by the time-train to pass through a distance equal to that through which the wheel H was carried by the arm K. It will then be engaged by the coupling-pin *l* and carried forward in the same manner as before.

For convenience in testing the apparatus at other than the normal stated intervals, I insert in the conductor, connecting the contact-spring I with the binding-post Z, a switch, P, for breaking the shunt-circuit by hand when desired.

By adjusting the hand *j* of the time-piece in any required position with reference to the notch formed in the circuit-breaking wheel H, it is evident that the circuit may be caused to be broken at any required time by causing the notch to pass beneath the contact-brush I at that moment.

It is evident that the automatically-operating device for actuating the circuit-breaking wheel at regularly-recurring intervals may be applied without modification to signal-boxes other than those of fire and burglar alarm systems—as, for example, to those of the ordinary district messenger systems in use in large cities.

I claim as my invention—

1. The combination, substantially as hereinbefore set forth, of a main line, a series of signal-boxes each containing automatic mechanism for transmitting a designating station-signal over said line, and means, substantially such as described, for automatically setting in action each of said transmitting mechanisms at independent and regularly-recurring intervals.

2. The combination, substantially as here-

inbefore set forth, of a main line, automatic mechanism for transmitting determinate signals through said main line, an electro-magnet included in the electric circuit of said main line for controlling said automatic mechanism, a normally-closed shunt-conductor spanning said electro-magnet, and a circuit-breaker automatically brought into action by continuously-operating mechanism for actuating said electro-magnet by interrupting the shunt-conductor.

3. The combination, substantially as hereinbefore set forth, of a main line, automatic mechanism for transmitting determinate signals through said main line, an electro-magnet included in the electric circuit of said main line for controlling said automatic mechanism, a normally-closed shunt-conductor spanning said electro-magnet, a circuit-breaker for actuating said electro-magnet by interrupting the shunt-conductor, and chronometric apparatus for automatically actuating the last-named circuit-breaker at determinate times.

4. The combination, substantially as hereinbefore set forth, of the continuously-revolving disk having an extension at one side, circuit-connections, substantially such as described, the circuit-breaking wheel, and the arm operated by said wheel at determinate intervals, to engage said extension and turn said disk through a portion of a revolution.

In testimony whereof I have hereunto subscribed my name this 28th day of July, A. D. 1882.

GEORGE F. BULEN.

Witnesses:

DANIEL W. EDGECOMB,

CHARLES A. TERRY.