(No Model.)

G. F. MILLIKEN & H. B. LYTLE.

ELECTRICAL AUXILIARY SIGNALING SYSTEM.

No. 377,083. Patented Jan. 31, 1888.

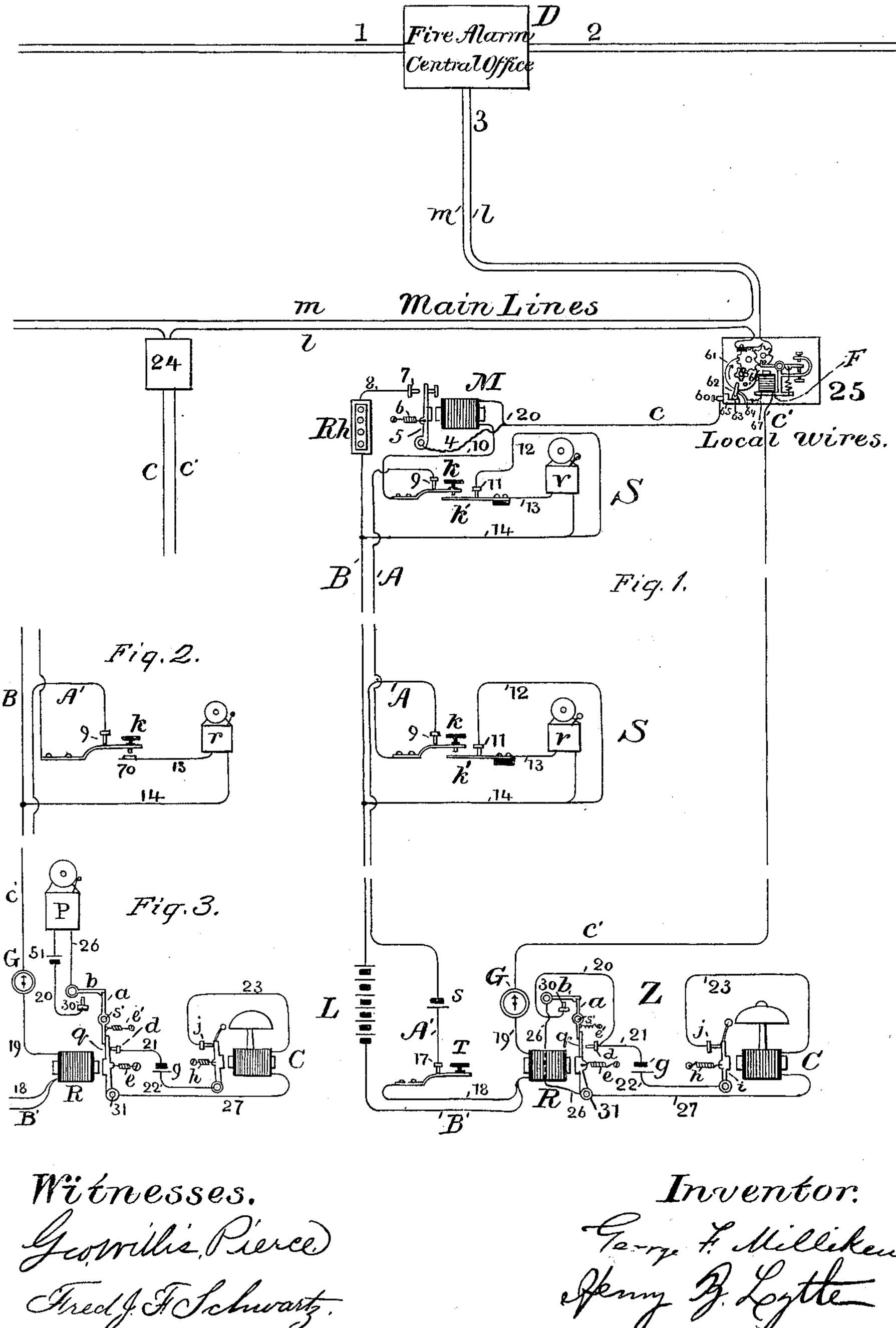

Fig. 1.

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ELECTRICAL AUXILIARY SIGNALING SYSTEM.

SPECIFICATION forming part of Letters Patent No. 377,083, dated January 31, 1888.

Application filed September 10, 1887. Serial No. 249,326. (No model.)

To all whom it may concern:

Be it known that we, GEORGE F. MILLIKEN, of Boston, in the county of Suffolk and State of Massachusetts, and HENRY B. LYTLE, of Providence, in the county of Providence and State of Rhode Island, have invented certain Improvements in Electrical Auxiliary Signaling Systems, of which the following is a specification.

This invention relates to systems of electrical signaling in which fire, messenger, police, and other predetermined and arbitrary signals are sent from each or any of a series of call-boxes to a central or district signal-receiving station.

It specially relates to organizations wherein the call-boxes, each inclosing a suitable clock-train and a signal device, instead of or in addition to being adapted to be operated manually, can be operated through the instrumentality of an electro-magnet and local circuit from any number of out stations connected with the said call-box by the said local circuit. Any number of private establishments may thus, for example, be connected by a local circuit with a public alarm-box, and the inconvenience of a special visit to the said box is thus avoided by all persons having access to the said sub-stations. These may be called "auxiliary signaling systems." An ordinary plan of operating the electro-magnetic apparatus of the main-circuit call-box is to use a normally-open metallic local circuit, which is closed by effectuating, at any desired point, a contact between the two wires leading from the battery and instruments to be operated. A well-known alternative plan is to normally connect the two wires, introducing at the end of the circuit thus formed a sufficiently-high resistance. A constant current is thereby caused to flow in the circuit, which is useful in making periodic continuity tests, (this being not practicable in the use of open circuits,) but which is insufficient to operate the instruments. Moreover, the contact-keys have, prior to our invention, been so arranged that after making the contact by which the working-current is directed through the instruments the circuit is broken before being restored through the normal resistance, for the purpose of more effectually discharging the electro-magnets of the circuit. The circuits so arranged are, however, liable to be accidentally crossed or grounded, so as to short-circuit the battery and instruments or to include them between two grounds, thus operating the instruments unduly and causing the battery to be uselessly overworked.

This invention is intended to obviate the said practical defect, and also to provide means whereby any circuit trouble is automatically announced by suitable signals, and, while it may be employed in various systems, has special reference to the operating of fire or other alarm mechanism, acting to prevent the occurrence of false alarms and other mishaps arising from the undesired operation of the instruments.

It comprises an improved arrangement of circuits between the batteries, circuit-closers, artificial resistances, and instruments to be operated, and also certain peculiar and novel mechanical and electrical dispositions of circuit-closing relays, keys, and alarms for announcing circuit faults and for testing purposes.

In the drawings which form a part of this specification, Figure 1 is a diagram of the electrical connections and appliances employed in our system. Fig. 2 is a modified sub-station detail, showing the sub-station bell included in a normally-open branch circuit adapted to be introduced into the line when the signal is sent; and Fig. 3 is a modified local-circuit arrangement whereby the alarm-signal and the disarrangement-signal may be received upon different instruments, which may, if desired, be differently located.

In the improved system which forms the subject of this specification there may be any number of sub-stations, S, and for testing and fault signal receiving purposes a testing-station, Z. To each sub-station two wires, A and B, are led, while a third wire, *c*, which serves as the return for both, may be led back by any preferred route.

D is a main central alarm or call receiving station, to which any number of main alarm-circuits, 1 2 3, may converge. These main circuits may each pass through one or more alarm or signal sending boxes, as shown with

respect to circuit 3, of which *m* and *l* are the incoming and outgoing wires, and which pass through the call-boxes 24 25 and others, as may be desired. In the said signal-boxes are placed electro-magnets F, which, when energized, act to release the train operating the signal-sending mechanism. The main line thus enters the boxes and is adapted to be acted upon by the signal-sending mechanism therein, while the two wires of some local circuit *c* and *c'* also enter the said boxes and connect with the electro-magnets F for the purpose of controlling the mechanism.

I have shown the box 25 of the main circuit as being connected by a metallic local circuit with a group of sub-stations, from each of which it may be actuated, and with the testing-station Z. At the station upon the said local circuit which is most distant from the batteries, (but always between the last sub-station and the alarm-box,) or, if preferred, at a station specially arranged for the purpose, is placed an artificial resistance or rheostat, R*h*, and a circuit-changing magnet, M, for a purpose which will hereinafter appear. A similar but independent local circuit may in like manner be connected with box 24 and others throughout the main system.

L is a powerful battery for furnishing a strong electrical current, which, when directed under proper conditions through the electro-magnet F in the alarm-box, its circuit being closed for that purpose, energizes the said magnet and releases the train which sends the alarm-signals. The relay R has one of its terminals connected with one pole of the battery L and may be energized thereby for the purpose of sounding at an electro-magnetic alarm-instrument, C, such alarm being located at any convenient part of the premises, but preferably at the testing-station Z, and controlled through a special circuit by the relay R, as also described hereinafter. The same terminal of the relay R is united electrically through wire 18 and through the testing-key T to one pole of a small battery, *s*. Thus both batteries have one pole connected with the same terminal of said relay; but it is to be observed that the poles of the two batteries connected are not like poles.

It will be seen that the battery *s* furnishes a continuous current upon the circuit passing through all the sub-stations of the auxiliary system and through the call-magnet F of sufficient strength to test the continuity of said circuit, but not sufficiently strong to actuate the said magnet and operate the alarm.

G is a galvanometer suitably mounted at the testing station at a point between the other terminal of the relay R and the alarm-magnet F on the wire *c'*. The circuit through which this current flows is through wire A', back-stop 17, test-key T, wire 18, relay R, wire 19, galvanometer G, wire *c'*, magnet F, wire *c*, magnet M, wire 10, and then by main wire A and the signal-sending keys *k* back to the other pole of battery *s*, (the keys *k* being at rest.)

R*h* is an artificial resistance or rheostat in connection with the principal battery L by means of wire B or an extension thereof, and controlled by the armature-lever 5 of the circuit-changing magnet M, so that it is introduced into the circuit which includes said battery, the relay R, the alarm-magnet F, and the galvanometer G whenever the said armature-lever is freed from the attraction of its magnet and falls against its back-stop 7, and when such an event occurs the current of the battery L is thereby so weakened, that while remaining sufficiently strong to deflect the galvanometer-needle, it is too feeble to actuate the magnets in circuit.

Signal-sending keys *k* or other suitable circuit-changers are provided at each sub-station and rest normally against their upper contact-stops 9, both keys and stops being consecutively included in the circuit of wire A. Each main key *k* controls a supplementary spring-key, *k'*, which also normally rests against its upper contact-stop, 11, and these respectively connect by branch wires 12 and 14 with the main wire B. Connected by wires 13 between the supplementary keys *k'* and the wire B are electro-magnetic bells *r*, either of the single stroke or vibratory variety, as may be desired, and these bells are normally shunted by the wires 12. Their function is to be introduced into the circuit of the battery L, when the keys *k* are depressed to send signals, for the purpose of affording to the subscriber an audible notification that the circuits are continuous, for if the circuits are in order a ring will be received, whereas if they are not the bells will remain silent.

The relay R has an armature-lever, *q*, which at its free end engages with a lever, *a*, pivoted at its center *s'* and normally caused to bear against the end of said the armature-lever by a counter-spring, *e'*. The pivoted lever *a* supports in its normal position, in which it is maintained by the spiral spring *e'*, a third and circuit-closing lever *b*, and by such support the latter is held away from its front stop.

The relay R is partially energized by the current from battery *s* when the circuit is closed, but sufficiently to attract its armature against the pull of its spring *e* until the lever *q* strikes the lever *a*; but it is not sufficiently energized by such current to move the lever *a* against the force of spring *e'*.

When the apparatus is quiescent or in its normal state, the closed circuit of battery *s* may be traced, as already indicated, and the current flowing therein effects the attraction of the armature 5 of the magnet M and the partial attraction of the armature *q* of the relay R, and, furthermore, showing a deflection of the galvanometer G in a certain direction. The alarm-magnet F, though in circuit, is so adjusted as to be totally irresponsive to this current, and the box-train thus remains inert.

The circuit of the battery L is normally open, as shown at the back stop 7 of the armature-lever 5 of the magnet M, to which it is

extended through the resistance R*h* and wire 8, and it may legitimately be closed there and also at each sub-station by its branches 14 and the keys *k*. The difference between these points of closure is that when closed at 7 the resistance R*h* is included, but when closed by the sub-station keys the resistance is cut out. A branch wire, 4, is connected from the point 20 on wire *c* to the armature-lever 5 of magnet M, and in conjunction with this for testing purposes a spring circuit-breaking key, T, is provided between battery *s* and relay R, the wire 18 being united to the key and the said relay.

At the testing-station Z the alarm-instrument may consist of a vibratory bell, C. This is operated by the current of a battery, *g*, by means of the relay R, the armature of which is adapted to close the circuit of said battery through said bell when in its extreme forward or extreme backward position. The circuit of this battery *g* extends through the bell C and is normally open. One of its poles connects by wire 22 with the bell C, and the circuit extends, by wire 27, from said bell to the armature-lever *q* of relay R, with which it makes contact at 31, and also to the circuit-closing lever *b*. The other pole of said battery connects with the back-stops of both of the said levers; but we prefer to form another and separate local bell-circuit and place therein an additional vibratory bell which shall respond only in case of an alarm of fire, or when the electro-magnet F is energized to release the clock-train, and to use the vibratory bell C for test purposes and to give notice of any disarrangement of the circuit-wires. To effect this we arrange the wires as shown in Fig. 3. The local bell C is connected to the back-stop *d* and to the armature-lever *q*, as before described, the action thereof being the same; but the wire 26 is detached from the armature *q* and extended to one side of the vibratory bell P, including therein the battery 51, and the wire 20 is detached from the back-stop *d* and extended to the other side of bell P. This division into two bell-circuits is desirable in many places. For instance, in a factory the alarm-bell C would be located where the watchman would be notified of any disarrangement of the wires, and the bell P would be located in the main office to give immediate notice of a fire, it being understood from previous description that the lever *b* can close the local circuit of bell P only when an alarm is sent in.

Having now described the invention with reference to the drawings, it remains to indicate its operation in various circumstances.

It is known that the wires A and *c'* are continuous, because the galvanometer-needle is constantly deflected, and the relay R being closed, as shown. Let it be desired to test the continuity of that part of the alarm-circuit which is normally open—namely, the wire B. This is done by pressing the test-key T, which opens the circuit of battery *s*. This causes the armature 5 of magnet M to fall away under the influence of its counter-spring against its back-stop 7, forming a circuit for battery L, which includes the resistance R*h*, this circuit passing through battery L, wire B, resistance R*h*, wire 8, contact-stop 7, lever 5, wire 4, wire *c*, alarm-magnet F, wire *c'*, galvanometer G, wire 19, relay-magnet R, and wire B', back to the other pole of battery L; but the current is weakened by the interposition of the resistance R*h*, so that the electro-magnets in circuit will not be affected. If the wire B be intact, this fact is learned from the position of the galvanometer-needle, which will show a small deflection distinctive in two respects from that shown on the normally-closed circuit—namely, the deflection will be smaller and also of opposite direction—the two batteries L and *s* presenting poles of opposite sign to the galvanometer. If the wire B be broken, there will be no deflection. Should the normal circuit be broken at any point on wires A, *c*, or *c'*, the current of battery *s* will of course cease to flow, and the relay R becoming demagnetized, its armature-lever will be drawn back by the spring *e* against the back-stop *d*, closing the circuit of battery *g* through the bell C, and giving a continuous ring or warning-alarm until attention is attracted to the disarrangement; or, if a cross or an accidental contact should occur between the main wires A and B, the batteries L and *s* will simply be short-circuited (their polarity being arranged under such conditions to coincide) through the wires B and A and A', 18, and B', the result being that the entire current is cut off from the relay R, and the alarm denoting that the circuit is out of order is given upon the bell C exactly as in case of a break. In either case the galvanometer-needle also will indicate the disarrangement by the absence of deflection. We have seen that in the event of a break or a cross between A and B the trouble is manifested by means of the bell C, the circuit of which is closed by the back contact of the relay.

It is clear that the signal-sending magnet F may, by proper adjustments, be made irresponsive to all conditions except the intentional sending of signals by means of the keys at the sub stations by proper adjustments, and prevented from operating, even though any two or all of the wires connecting the various parts of the apparatus be crossed or accidently brought into contact. As an additional example, it may be stated that in case of such a contact between wires B and *c*, while a portion of the current from the battery L will pass through relay R, galvanometer G, and the signal-sending magnet F, such portion will not be enough to operate the magnet F, as a much larger proportion of the current will pass from battery L through battery *s* and wire A, magnet M, and the cross back to the other pole of the battery L, (provided the line-resistance is unimportant or equal in either case,) by the reason of the lesser elec-

tro-magnet resistance occurring in the latter route; but if it be desired to operate the siggal-sending magnet F by means of any one of the keys *k* at the several sub-stations, the desired key is depressed. This action first opens the circuit of battery *s* by breaking wire A, and then, coming into contact with key *k'*, closes the circuit of battery L, including the supplementary key *k'*, the branch wires 12 and 14, wire B, battery L, relay R, galvanometer G, signal-sending magnet F, wires *c* and *c'*, circuit-changing magnet M, wire A, and key *k*. The whole of the current of the large battery is thus sent through the magnet F, which thereupon releases the train of the signal-box and sends the signal. The resistance R*h* is not included in the circuit, and the current is thus maintained at its full strength. The alarm-bell controlled by the relay R likewise gives notice that an alarm or signal has been sent. The further pressure of keys *k k'* breaks the contact of the latter with its stop 11, opening the shunt-circuit 12, and the current will then pass also through the sub-station bell-magnet *r* to wire B. The hammer of bell *r* will then respond by a single tap or a vibratory series, as arranged, thus giving evidence of the transmission of the signals, as intended.

Several features in the construction and operation of the fire-alarm box not heretofore alluded to will now be described. It is desirable for the perfect working of an alarm apparatus of this character that there shall be no interference with an alarm being sent in by any other sub-station in the same circuit sending in an alarm; and, secondly, it is also desirable that the sub-station sending in an alarm shall be notified by means of a return-signal that the alarm has been received at the fire-alarm box; and, thirdly, it is important that the sub-station sending in the alarm shall not have the means for repeating the alarm, for after an alarm has been once sounded the future proceedings form a part of the duties of the fire-alarm department. To these ends the fire-alarm box is constructed as shown in diagram in box 25. Wire *c*, entering the box, is secured to screw-post 60, connected to the metal block 65. Pivoted to block 65 at 63 is a bar, 62, normally resting against and making electrical contact with the projecting stop 64, which is united by wire 67 to the electro-magnet F. We arrange in connection with the clock-train of the box a slow-moving wheel, 61, which has on its face a projecting pin, 66, in the path of which reaches the upper end of the bar 62. The pin 66 is at a little distance from the bar 62 when the mechanism is at rest.

When a key, *k*, is depressed at any sub-station and a current sent into the box 25 from the battery L, as hereinbefore described, the clock-train is released by the attraction of the armature of the electro-magnet F and the fire-alarm signal commences to sound, the slow-moving wheel 61 moves in the direction of the arrow; at the same time the vibratory bell in the sub-station is ringing, thus notifying the operator there that the circuits are intact, the operator still keeping the key depressed; the pin 66 reaches the free end of bar 62 and breaks the circuit between it and the projecting stop 64. When this takes place, three things have been effected: First, the vibratory bell in the sub-station has ceased to ring, thus notifying the operator that the alarm has reached the box and the clock-train started in motion; second, the circuit being broken, a second signal cannot be sent and sound a second alarm; and, third, for the same cause no alarm can be sent in from the other sub-stations on the line to cause confusion.

The one alarm sent to the fire-alarm box is sufficient for the fire-alarm department, who, in the nature of things, will soon reach the box and locate the fire, and, if it becomes necessary to call a second alarm, it will be done at the box by the engineer in charge of the fire apparatus, and to make the auxiliary alarm-circuit again operative it is necessary that the circuit be closed manually by turning the bar 62 back again to rest upon the projecting stop 64, the wheel 61, after opening the circuit, having pushed the bar 62 over onto the base of the screw-post 60, and coming at rest again into operative position when the fire-alarm has been sounded the predetermined number of times. We do not confine ourselves to the specific devices shown and described for effecting these results at the box 25, as we may use any other to obtain the same result.

In Fig. 2 we show a modification of the circuits at the sub-stations, in which the shunt-wire 12 is left out, as is also the auxiliary key *k'*. The key *k* makes a solid contact with the anvil 70, the current always passing through the bell.

We claim—

1. In a system for the transmission of arbitrary electric signals, the combination, substantially as hereinbefore described, of a main alarm-circuit connecting signal-transmitting boxes with a central signal-receiving station, local or auxiliary alarm-sending circuits extending through a series of private sub-stations, and connecting the said sub-stations with the alarm boxes of the main circuit, an electro-magnetic releasing device controlling the signal-sending mechanism of the said alarm-boxes, the actuating-magnet therefor being included in the auxiliary circuit, two batteries of different strengths, the weaker being constantly included in the local alarm-circuit when the said circuit is at rest for testing purposes, and the stronger being included in a normally-open derived circuit having a normally-open branch extending into each sub-station, and a compound signaling-key at each sub-station connected with the wire leading to the alarm-box-actuating magnet and normally maintaining the continuity of the weaker battery-circuit through its back contact, but having its front stop united to the branches of the larger battery derived circuit, whereby the said key,

when operated, is adapted first to break the circuit of the testing-battery and thereafter to connect the remaining fragment of the local alarm-circuit, including the magnet of the signal-transmitting box, with the stronger battery for the purpose of sending an alarm-signal.

2. The combination, with an alarm-transmitting or arbitrary signal-box, of a normally-closed local alarm-circuit extending from sub-stations to said signal-box, two batteries of unequal strength, the weaker of which is included in said circuit and the stronger being included in a normally-open branch thereof, extending also into the sub-stations, a releasing or tripping device for the said signal-box controlled by an electro-magnet in the local alarm-circuit, the said magnet being responsive to the current of the stronger battery only, a relay-magnet, also included therein and adapted to be partly energized and actuated by the current of the smaller battery, but fully energized by that of the larger battery, and a compound circuit-changing key at each sub-station connected permanently with the main wire of the local alarm-circuit and maintaining the connection thereof with the weaker battery when at rest through its resting-contact, but having its front contact connected with the stronger battery and adapted thereby, when operated, to disconnect the weaker battery from the circuit and to substitute the stronger, whereby the releasing-device magnet may be actuated to send a signal, the relay-magnet being simultaneously caused to exert a fuller attraction upon its armature, thereby changing its position, substantially as described herein.

3. The combination, with an alarm-transmitting or arbitrary signal-box, of a normally-closed local alarm-circuit extending from sub-stations to said signal-box, two batteries of unequal strength, the weaker of which is normally closed upon said circuit, completing the same, and the stronger being included in a normally-open derived circuit thereof, said derived circuit being permanently in contact with the local alarm-circuit at one end and extending by normally-open branches into the sub-stations, a releasing or tripping device for the said signal-box controlled by an electro-magnet in the local alarm-circuit, the said magnet being responsive to the full force of the stronger battery only, a relay-magnet, also included therein and adapted to partially respond to the current of the weaker battery, but to be fully responsive to the current of the stronger battery, a compound signal-sending key at each sub-station, comprising the main key *k* and the supplementary key *k'*, the latter being adapted to be actuated by the former, and each having an independent resting contact stop, that of the former having a circuit-connection with the weaker battery and that of the latter with the normally-open circuit of the stronger battery, the keys *k* of the several sub-stations being in series on the weaker battery-wire, and an electric bell connected in the circuit-connection of the supplementary key between the said key and its back contact-stop, and thereby normally shunted, whereby when the said keys at any sub-station are actuated the weaker battery is disconnected, the stronger battery connected, and the subscriber's bell introduced into the circuit of the latter to receive an automatic answering-signal, as described.

4. The combination, substantially as hereinbefore described, with a clock-train or signal-box mechanism and an electro-magnetic releasing device therefor, of two batteries of different strengths, the stronger only being of sufficient strength to actuate the electro-magnetic releasing device, a metallic circuit normally completed through the weaker of the said batteries and including permanently the magnet of the releasing device, a circuit-connection including the stronger battery connected permanently on one side of said battery with the said metallic circuit, but normally open on the other side thereof, and having normally-disconnected branches extending into one or more sub-stations, a compound circuit-changing key, *k*, at each sub-station, having its back contact connected with the leading wire from the weaker battery, and being itself connected with the continuation of said wire to the releasing-device magnet, (the said keys at the several sub-stations being in series with one another,) a supplementary key, *k'*, at each sub-station connected permanently with the normally-open branch extending thereinto from the stronger battery and serving as the front contact of the main key, a responsive signal electric bell included in said branch circuit between the key *k'* and the main wire, and a shunt-circuit around the said bell from the back contact of said key *k'* to the said open branch circuit, the operation of key *k* being thereby adapted to send an alarm by opening one circuit and closing another, and immediately thereafter, through the agency of the supplementary key *k'*, to cause the response-signal bell to be actuated.

5. The combination, with a clock-train or signal-box mechanism and an electro-magnetic releasing or tripping device therefor, of the batteries L and *s*, having opposing poles presented toward the electro-magnet of the releasing device, together with the wire *c*, constituting the permanent portion of a local metallic alarm-circuit including said magnet, circuit-connections extending from both poles of battery *s* and constituting normally the remaining portion of said circuit, and the normally-open circuit, including the battery L, connected upon one side of said battery with the connections leading from the opposite pole of the other and constituting a portion of the said metallic circuit during the sending of alarms, whereby in case of a cross between the main wires of the two batteries they are short circuited and false alarms from the undesired energization of the alarm-magnet are prevented.

6. The combination, substantially as hereinbefore specified, with the batteries L and *s*,

of different strengths, a normally-open circuit including the former and extending for any required distance, and a resistance, R*h*, included therein at a point close to the end thereof, of means for testing from a given station the integrity of said normally-open circuit, said means comprising a normally-closed metallic circuit including the weaker battery, a testing-relay, R, a galvanometer, and a circuit-breaking key, all at a testing-station, and a circuit-changing magnet, M, and armature and lever located near the end of the open circuit of the larger battery, the said circuit being terminated by a connection with the back-stop of said lever, and the said lever being electrically connected with the line-wire leading direct to the galvanometer and relay, so that by pressing the test-key the original circuit may be broken and the open circuit thereupon closed through the armature-lever and stop of the magnet M may be tested by the current of its own battery, weakened by the introduction of the resistance.

7. In a system for electrically actuating an alarm or signal sending mechanism, an electric circuit normally closed upon a weak battery, a relay included therein and partially energized by the current of said battery, the armature of said relay being by such partial energization held in an intermediate position between its limiting-stops, and two independent normally-open local circuits, each including an electric bell, one of said circuits being adapted to be closed by the backward movement and the other by the forward movement of said armature, whereby the same relay may be used alike for an alarm-test and for a signal-sending indicator, as specified herein.

8. In a system for electrically actuating an alarm or signal sending mechanism, an electric circuit normally closed upon a battery, but having a normally-open derived circuit including a stronger battery, a relay included in the said circuit and partially energized by the current of said battery, but adapted to be included in circuit with the larger battery, and thereupon to be fully energized, the armature of said relay being by such partial energization held in an intermediate position between its limiting-stops, two independent normally-open local circuits, each including an electric bell, one of said circuits being controlled by the backward and the other by the forward movement of said armature, whereby one bell is caused to sound when the normal circuit is disarranged for testing purposes and the other when the larger battery is introduced to send a signal, and one or more keys connected with the wires of both batteries and normally maintaining the continuity of the circuit of the first to the relay, but adapted, when depressed, to connect the second with the said relay.

9. The combination, in a system for electrically actuating from any of a series of sub-stations a signal-sending mechanism or alarm-box, of a metallic circuit leading from the said sub-stations to a starting electro-magnet for releasing the said mechanism, a signaling-key at each sub-station adapted to connect a battery with said circuit for the purpose of energizing the said starting-magnet, a response-signal bell, also located at each sub-station in the said metallic circuit, and an automatic circuit-changer located at the signal or alarm box and controlled by the mechanism thereof, whereby the response bell may be affected, for the purpose of indicating that the alarm-box is properly performing its functions.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 6th day of September, 1887.

GEORGE F. MILLIKEN.
HENRY B. LYTLE.

Witnesses:
GEO. WILLIS PIERCE,
FRED J. F. SCHWARTZ.