(No Model.) 2 Sheets—Sheet 1.

# T. N. VAIL.

## ELECTRIC ANNUNCIATOR AND CIRCUIT.

No. 300,168. Patented June 10, 1884.

*Fig. 1.*

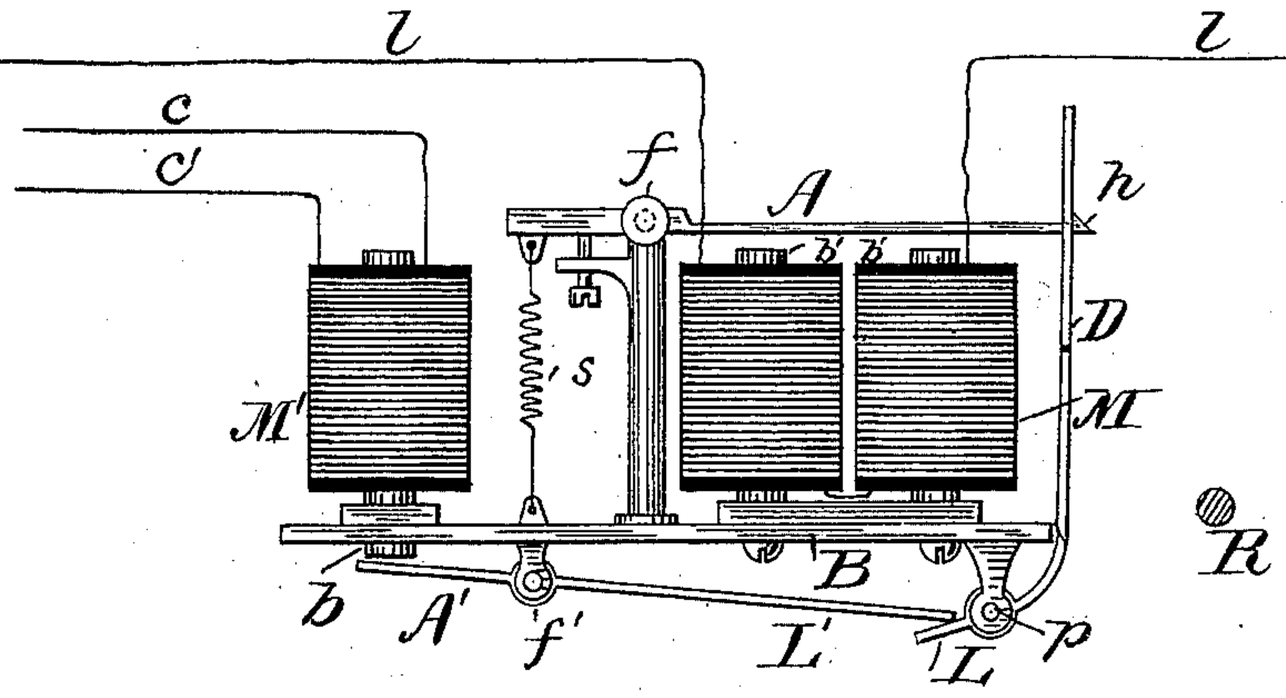


*Fig. 2.*

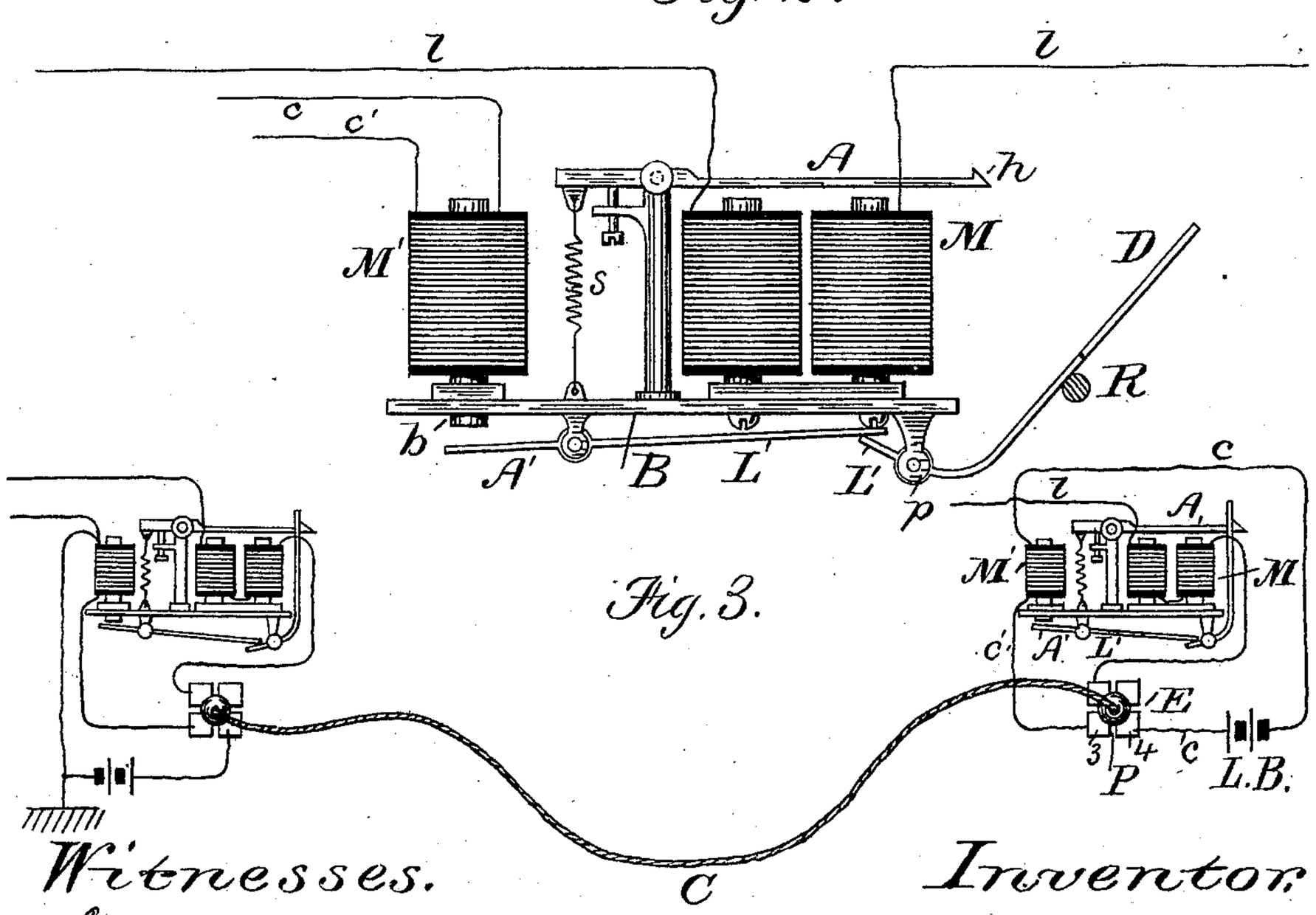


*Fig. 3.*

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(No Model.) 2 Sheets—Sheet 2.

# T. N. VAIL.

## ELECTRIC ANNUNCIATOR AND CIRCUIT.

No. 300,168. Patented June 10, 1884.

Fig. 4.

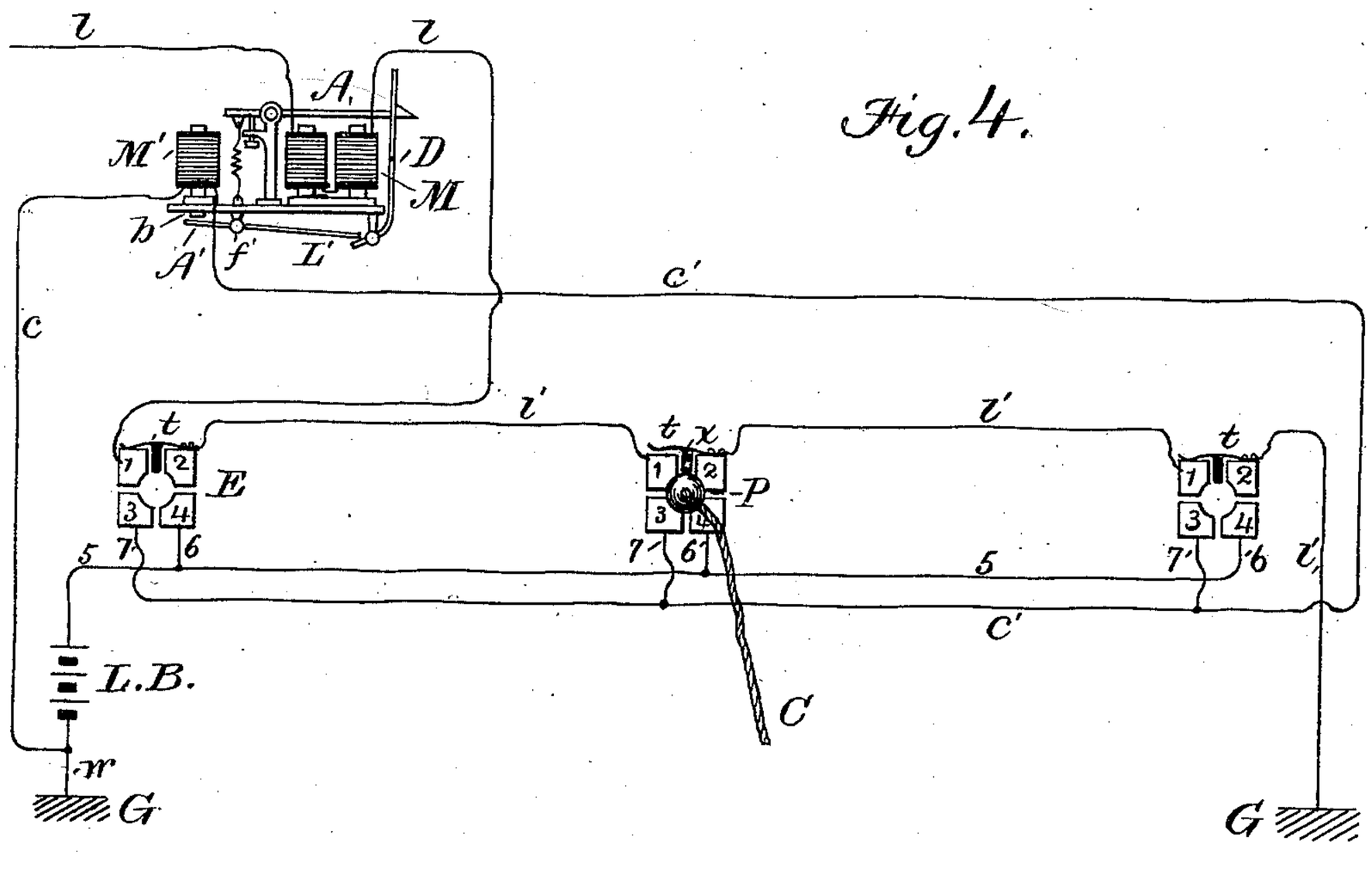



Fig. 5.

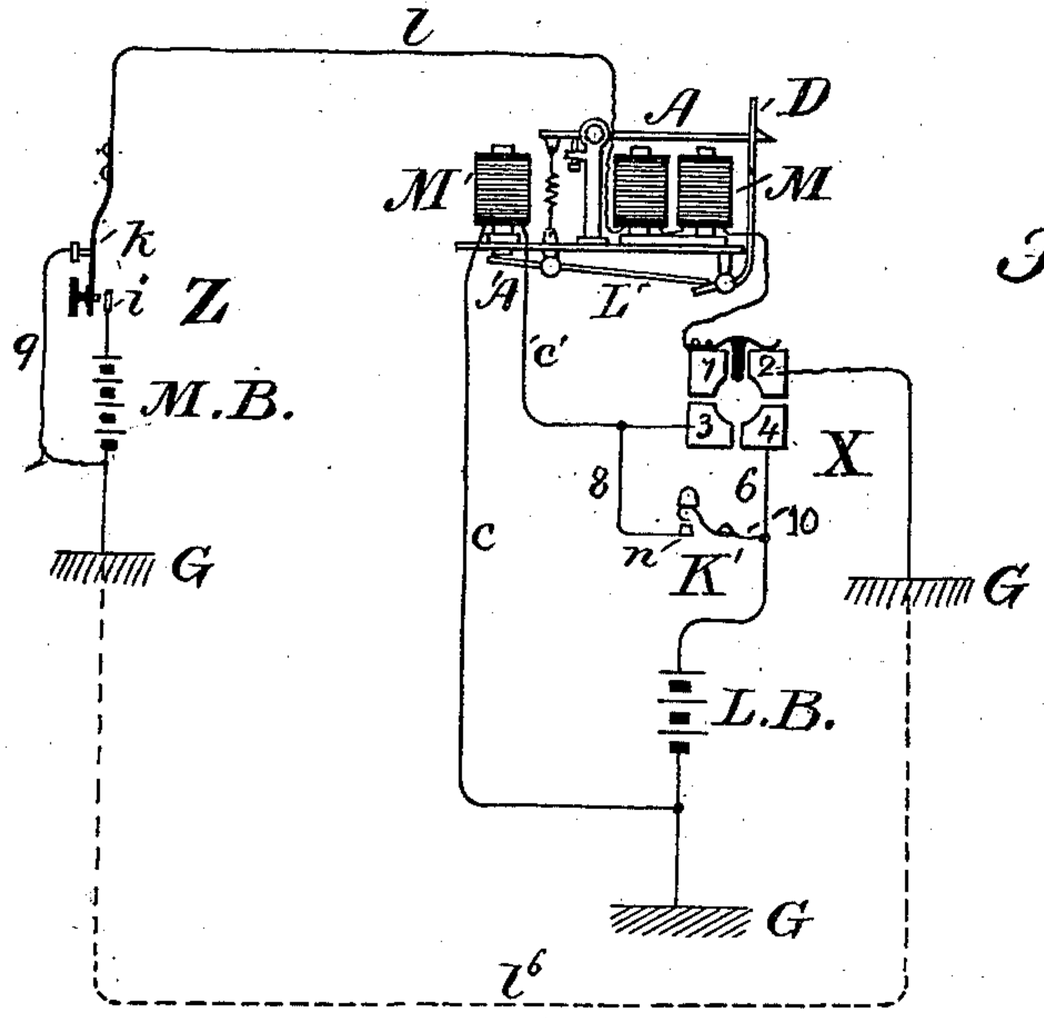
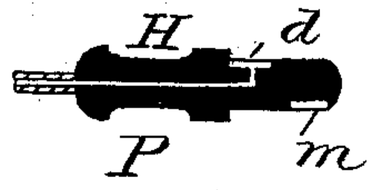



Fig. 6.




Witnesses.
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# UNITED STATES PATENT OFFICE.

THEODORE N. VAIL, OF BOSTON, MASSACHUSETTS.

## ELECTRIC ANNUNCIATOR AND CIRCUIT.

SPECIFICATION forming part of Letters Patent No. 300,168, dated June 10, 1884.

Application filed January 30, 1884. (No model.)

*To all whom it may concern:*

Be it known that I, THEO. N. VAIL, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Electric Annunciators and Circuits, of which the following is a specification.

My invention relates to systems of electric signaling and to signaling apparatus adapted for use in such systems. It relates, particularly, to such electrical signaling appliances as are adapted for use in connection with the central-office apparatus of a telephone-exchange; and the object of the said invention is to provide an annunciator or call-indicating device which, when actuated by the manipulation of an operator at a distant station to drop a tag or shutter and give the signal, is capable of being reset through the instrumentality of electricity, and to furnish, moreover, a suitable and convenient arrangement of apparatus and circuit-closers, whereby the act of electrically resetting the said annunciator may be accomplished by a person at a distance therefrom, either automatically by the act of connecting any two lines together, or by an independent manual operation. By this invention I am, for example, enabled to place the signaling-annunciators in a telephone-exchange so high as to be out of reach, and thereby greatly economize space, or I may accomplish what without my invention is unattainable—*i. e.*, place the annunciators in a part of the room distant from the switch-board operator, yet retaining them under his control.

For the attainment of these purposes my invention consists in the following devices and combinations: first, an annunciator capable of responding to the changing electrical condition of a main circuit and of giving an absolute drop-signal, and furthermore provided with resting devices actuated by an electro-magnet in a local circuit; second, the said annunciator, or an instrument substantially equivalent thereto, combined with a main circuit and a local circuit, one of the said circuits including the signal-giving and the other the signal-setting magnet; third, the convenient arrangement of the said signal-giving and resetting instrumentalities and the said main and local circuits with reference to a switch-board for connecting any two main circuits together, and two suitable circuit-closers for the automatic or manual operation of the resetting device.

In the drawings which illustrate and form part of this specification, Figure 1 represents an elevation of my compound annunciator with the signal set and ready to be actuated. Fig. 2 is also an elevation of the same annunciator with the drop or tag fallen to give the signal. Fig. 3 is a diagram of two annunciators and line-terminals, representing two lines connected together for intercommunication, and showing the adaptation of the line-annunciator for use as a clearing-out signal. Fig. 4 is a diagram of the switch-board connections of a single line and the electrical circuits for the annunciators, showing the automatic operation of the resetting device. Fig. 5 shows the main and local circuits complete and automatic and manual circuit-closers therefor. Fig. 6 is a longitudinal section of a connecting-plug adapted for use in connection with the annunciator-circuit.

Referring now to Figs. 1 and 2, M is an annunciator electro-magnet, mounted upon a base, B, and provided with an armature, A, of the usual pattern, said armature being pivoted at *f*, and normally retracted from the cores *b'* of the magnet by the spiral spring *s*. By the pawl or hook detent *h* the drop signal or tag is held in place when the circuit is at rest and no electricity is passing therethrough. The said drop-signal turns freely upon its pivot *p*, and when released by the pawl *h* falls by gravitation upon the stop R, as shown in Fig. 2. It is furnished with a lever-extension, L, projecting rearward below the base of the actuating-magnet. The electro-magnet is, as shown, connected in a main-line or signaling circuit, *l*, extending from any desired point. An auxiliary electro-magnet, M', which may be, but is not necessarily, mounted on the same base B, is adapted by its terminal wires *c c'* to be included in a separate and independent circuit, and has an armature, A', furnished with a long extension, L', engaged with the heel or lever extension of the drop-signal D. The armature A' of the auxiliary magnet is pivoted at *f'*, and the heel L of the drop-signal serves as a limiting-stop therefor.

When connected for operation--the electro-magnet M in the signaling-circuit and the electro-magnet M′ in the setting-circuit—it is apparent that if an electric current of sufficient strength be passed through the circuit-wires *l*, and consequently through the helices of the magnet M, the said magnet will become energized and attract the armature A to its core *b′*, releasing the drop D, which then falls onto the stop R.

Prior to my invention it has been proposed to reset the drop-signal by means of an auxiliary magnet. In the apparatus devised for that purpose the drop has been placed at the end of a long pivoted lever upheld by a hook at the end of the armature of the first magnet. The armature of the auxiliary magnet is attached to the short arm of the lever, the long arm of which terminates in the tag or shutter. Such apparatus is heavy and not sufficiently delicate to insure certainty of operation. The weight of the drop-lever upon the armature-hook resists the attraction of the magnet and necessitates a strong impulse to release it. The apparatus herein described is lighter and easier to operate and reset. The elevation of the armature A′, under the attractive influence of the cores *b*, causes a sharp and powerful depression of the lever end L′, and this, engaging with the heel or extension lever L, acts thereon and lifts the signal over the pawl *h*, thus resetting the drop and placing it in readiness for another call.

Fig. 3 shows the lines connected through a flexible conductor with two plug ends, the ends being inserted in the two line-circuits. In the drawings the line or main-circuit wire *l*, after passing through the signaling-helices M, continues to the segmental plate 1 of the plug-socket E, from which it is continued through any other desired apparatus to earth, as shown in Figs. 4 and 5. The auxiliary magnets M′ are in the circuit of a local battery, L B, from which one wire, *c*, leads to the said electro-magnet, and another, 5, to the segmental plate 4 of the plug-socket. From the opposite plate, 3, a wire, *c′*, leads to the other side of the electro-magnet.

The plug which I preferably use is of the description shown in Fig. 6. The figure is a longitudinal section, and shows the construction. The shank and handle H may be of any suitable non-conducting substance, while a semicircular metal plate, *d*, electrically connected with the cord-conductor, is let into the upper part of the shank to make contact with the line-segment, and a small metal plate, *m*, is let into the small or lower end, the sole use of the latter being to make a temporary union between the local-circuit sectional plates 3 and 4 while the plug is being inserted, and thus to close the circuit for an instant, permitting it again to be opened as soon as the plug is fully entered into the socket. When a call is received and two lines are thereupon united by means of the plugs P and the connecting-cord C, the act of inserting each plug will, by bridging momentarily the space between the plates 3 and 4 and closing the circuit, cause the electro-magnet M′ to actuate its armature and raise the drop-signal. The original signaling-annunciator may then be used as a "ring-off" signal. These connections are all shown in Figs. 4 and 5, and I have introduced them into Fig. 3 only to show that by my invention the original calling-annunciator may be, when reset automatically by the insertion of the connecting-plug, readily used as a disconnecting-annunciator also.

Fig. 4 shows my annunciator and setting device worked in conjunction with a multiple switch-board, or one in which the same line has a plug-socket at several different places. The main line *l*, after passing through the annunciator-helix, continues to the segment 1 of the plug-socket E of the first switch-board, thence by spring-jack *t* to segment 2 of the same board, and by wire *l′* to the segments of the next board, and so on all through all of the switch-boards to the last, from which it passes to its earth-terminal G. From the local battery L B a wire, 5, is led branching by wires 6 to segment 4 of each plug-socket, at each of which the circuit is normally open. From the other pole of the battery a wire, *c*, leads to the resetting electro-magnet M′, and from the said magnet a return-wire, *c′*, leads, by branches 7, to the segment 3 of each of the plug-sockets of that line. The local circuit may be made operative by the insertion of the plug, as already described. It is not necessary to connect the battery L B to earth by wire *w*, as shown; but in practice this is done, as I am enabled thereby to use the same battery for other purposes and with earth return-circuits. I have shown in this figure the arrangement for but one main line; but it will be at once understood by those skilled in the art that many other main lines may be similarly connected, and that one local battery may serve an unlimited number of resetting-magnets. The arrangement shown in Fig. 5 differs only in degree from that shown in Fig. 4, and includes a manual circuit-closer and also the distant signaling device.

Although I have so far described this annunciator as operated in conjunction with telephone systems, it is applicable to signaling-circuits of any character and length.

In Fig. 5, Z is the signal-transmitting, and X the signal-receiving, station. The main line *l*, as hereinbefore described, after passing through the annunciator-helix M, passes on to the plug-socket segments, and then to the earth G; or, if the circuit is continuously metallic, the return is made, *via* wire $l^6$, to the signaling-station Z. At Z the circuit is provided with appliances whereby the current from a suitable source of electricity may be directed over it to actuate the signal at X. In the drawing I show a battery, M B, and a key, *k*. The battery at one end is connected with the key-anvil *i*, and at the other pole is either united to a ground-wire, G, or connected with

the return-wire $l^6$. In either contingency its circuit is normally open, and may be closed onto the line by the depression of the key. When the key is at rest, it presses upward against its back limiting-screw, and then holds the main circuit closed round the battery by wire 9, which branches from the return or ground wire. In addition to the segmental plates 3 and 4, at which the local circuit at the receiving-station is open, I provide a branch wire, 8, from the wire $c'$, which leads to the key-anvil $n$, and a similar branch, 10, leading from the battery-wire 6, and terminating in a key or press-button circuit-closer, K. By means of this key I am enabled to reset the annunciator if it be dropped a second time while the plug is in place.

Having now fully described my annunciator and its circuit arrangements, I claim—

1. An electric annunciator consisting, substantially as hereinbefore described, of an electro-magnet for a signaling-circuit, an armature therefor, and a drop-signal with lever-extension controlled by said armature, the electro-magnet being adapted, when energized, to attract the armature and release the drop-signal, with an auxiliary electro-magnet adapted for inclusion in an independent circuit, an armature and lever therefor, said lever bearing upon and controlling the lever-extension of the drop-signal, whereby the said drop-signal may be replaced by the attractive power of the auxiliary magnet exerted through its armature and lever.

2. In a telephone-exchange system, the combination of two or more main lines, a switch-board, connecting devices for connecting any two lines together on said switch-board, an annunciator for each line, a local normally-open battery-circuit, and an auxiliary electro-magnet therein adapted on the closing of its circuit to attract its armature, and thereby reset said annunciator, said battery-circuit being connected with said switch-board, substantially as described, whereby the act of connecting any two lines together by means of said connecting devices simultaneously closes said circuit, as set forth.

3. The combination of the main lines, annunciators, switch-board, connecting devices, such as switch-plugs, and resetting electro-magnet in a normally-open circuit connected with said switch-board, whereby the insertion of the switch-plug in its socket to make a connection between two lines momentarily closes said circuit long enough to energize said magnet and reset the annunciator, substantially as described.

4. In a telephone switch-board, the combination of plug-sockets and connecting-plugs adapted to be inserted in the said sockets, with a local circuit normally open at each plug-socket, and including a battery and electro-magnet, the said electro-magnet being attached to a line-annunciator and adapted to reset the same, whereby the act of inserting the plug in its socket automatically effects the closing of the local circuit, for the purposes described.

5. In a telephone-exchange system, the central-office apparatus herein set forth, comprising an annunciator for signaling, switching devices for connecting a line with any other line, resetting devices consisting of an electro-magnet, armature, and armature-lever, the said electro-magnet being in a normally-open local circuit, means for automatically closing the said local circuit by the act of switching one line to another, and means for manually closing the said local circuit, for the purposes described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 17th day of January, 1884.

THEO. N. VAIL.

Witnesses:
THOS. D. LOCKWOOD,
GEO. WILLIS PIERCE.