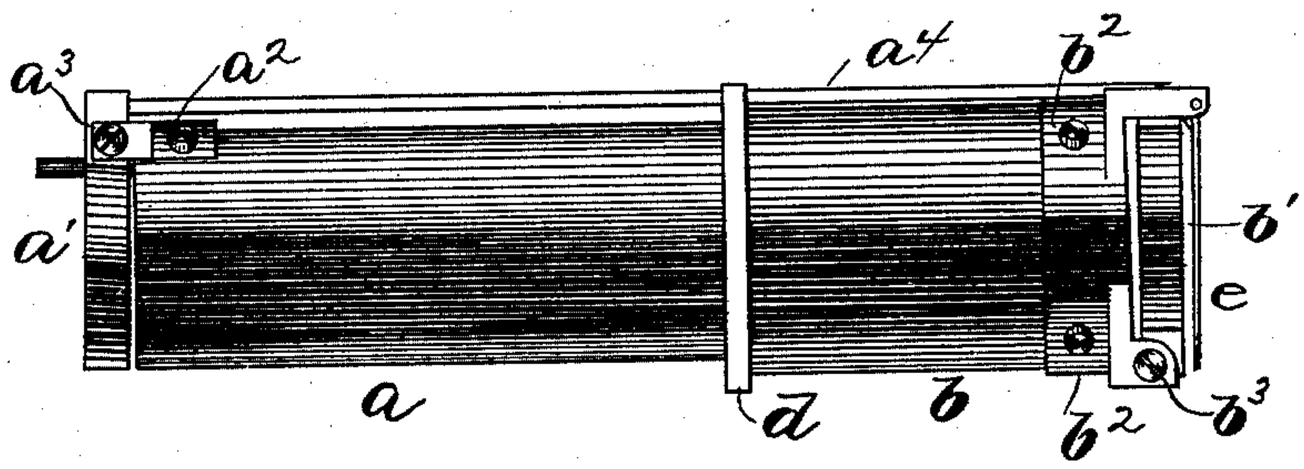
(No Model.) 2 Sheets—Sheet 1.

C. E. SCRIBNER.

ANNUNCIATOR FOR TELEPHONE SWITCHBOARDS.

No. 509,956. Patented Dec. 5, 1893.

Fig. 1



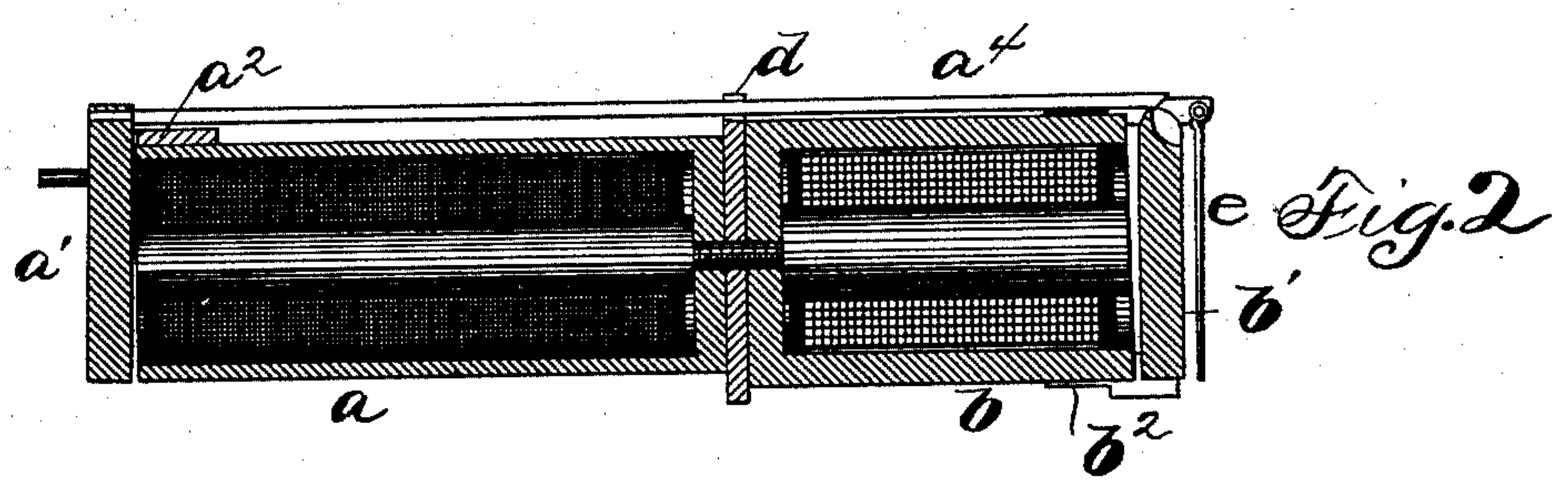
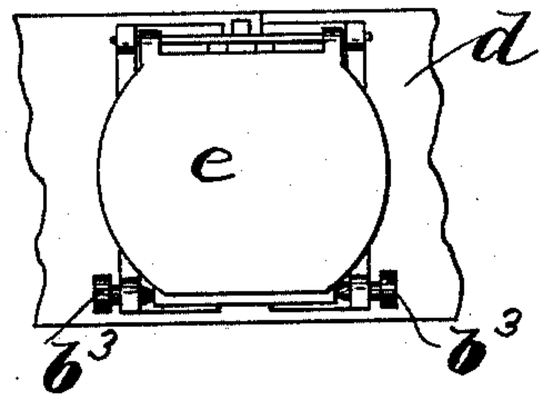


Fig. 2

Fig. 3



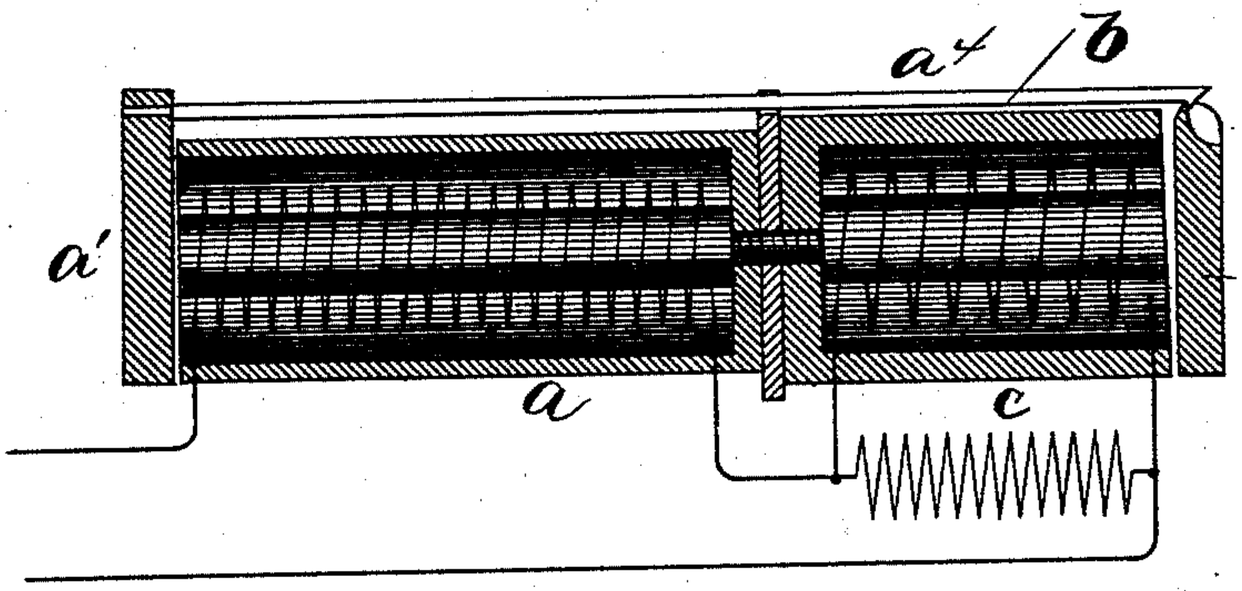


Fig. 4

WITNESSES

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(No Model.) 2 Sheets—Sheet 2

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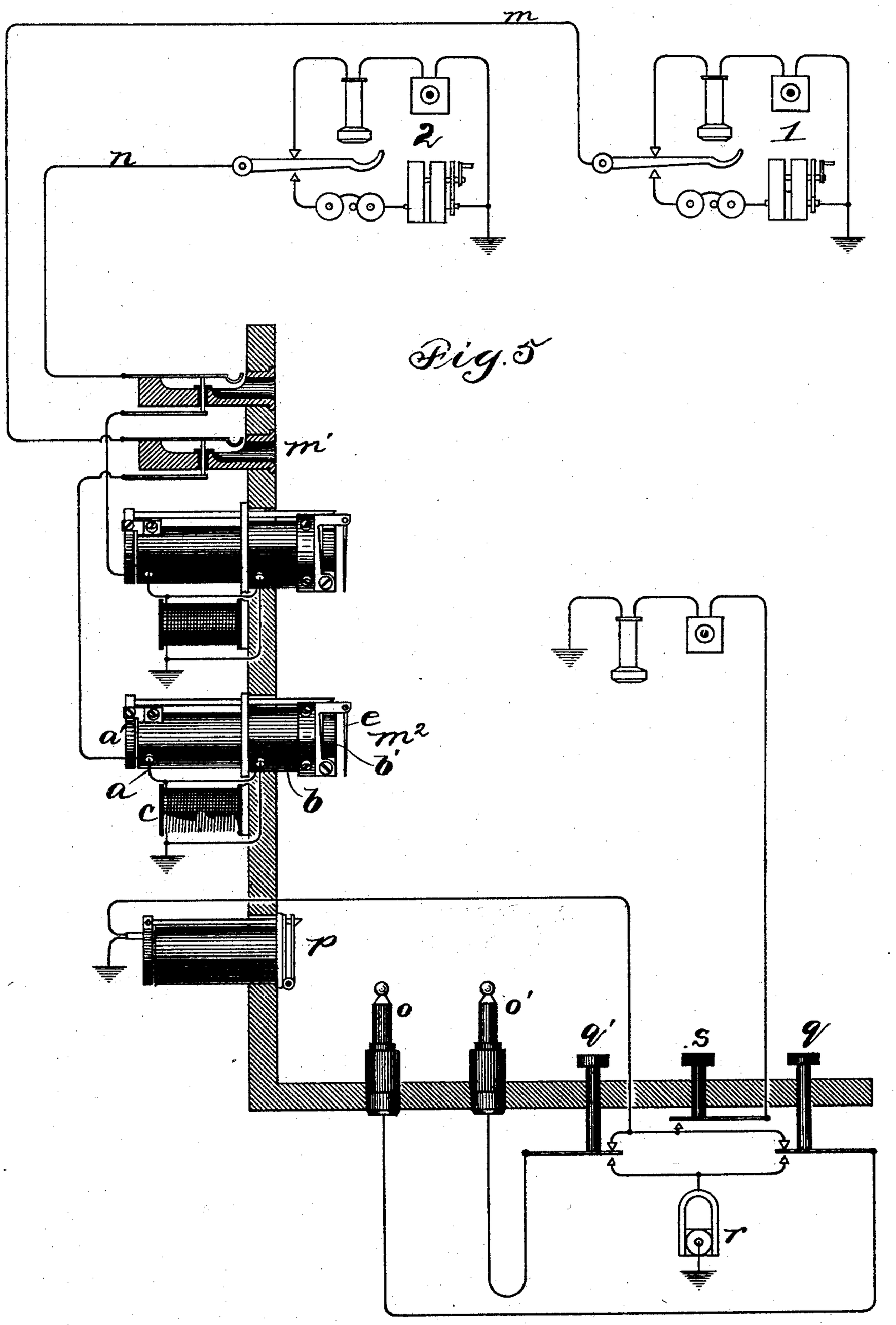
Fig. 5



WITNESSES
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UNITED STATES PATENT OFFICE.

CHARLES E. SCRIBNER, OF CHICAGO, ILLINOIS, ASSIGNOR TO THE WESTERN ELECTRIC COMPANY, OF SAME PLACE.

ANNUNCIATOR FOR TELEPHONE-SWITCHBOARDS.

SPECIFICATION forming part of Letters Patent No. 509,956, dated December 5, 1893.

Application filed May 2, 1893. Serial No. 472,718. (No model.)

To all whom it may concern:

Be it known that I, CHARLES E. SCRIBNER, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Annunciators for Telephone-Switchboards, (Case No. 323,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to signaling annunciators for switchboards of telephone exchanges. Its object is to provide an annunciator which shall be responsive to currents of alternating or pulsating character such as ordinarily employed in signaling, but which shall be unaffected by continuous currents.

In telephone exchange systems in which grounded circuits are employed, the circuits are subject to various electrical disturbances from extraneous sources, such as the leakage of heavy continuous currents over lines whose ground plates are in proximity to grounded electric railway systems.

My invention aims to construct an annunciator for use in receiving signals in the central office, which shall be irresponsive to such continuous currents flowing in the line circuit.

In my annunciator I provide an indicator controlled by a magnet in the line circuit in the ordinary manner, and a second independent electromagnet adapted, when it is energized, to prevent the actuation of the indicator, included also in the line circuit, the latter magnet being of high impedence or self-induction, but of low resistance, and being shunted by a suitable non-inductive resistance. In this device a continuous current finding circuit through the line, traverses the main or operating coil—that one which serves to actuate the indicator—but divides at the terminal of the auxiliary or retaining magnet between the low resistance coil of the magnet and the comparatively high non-inductive resistance, the greater portion passing, in accordance to well known laws, through the coil of the magnet; whereby both the operating magnet and the retaining magnet are energized, and the latter magnet prevents the actuation of the indicator. When, however, a rapidly alternating or pulsating current finds circuit upon the line, the full current traverses as before the main or operating magnet, but upon reaching the terminal of the retaining magnet almost the entire current passes through the non-inductive resistance, being prevented from traversing the retaining magnet on account of its high impedence. Thus while the operating magnet is energized as usual, and releases or actuates the indicator, the retaining magnet remains inert and does not prevent the display of the indicator. Thus my improved annunciator may be connected directly in a telephone line circuit, and while remaining free and sensitive to the normal signaling currents, will remain entirely inert and irresponsive to continuous and approximately constant currents from extraneous sources.

My invention is illustrated in the accompanying drawings, Sheets 1 and 2.

In Sheet 1, I have shown several figures illustrating my improved annunciator, the different views being respectively as follows:—Figure 1 shows in detail a side elevation of the annunciator. Fig. 2 is a longitudinal central sectional view of the same. Fig. 3 is a front elevation. Fig. 4 represents the essential parts of the annunciator, the electric circuits being shown diagrammatically. In Sheet 2, Fig. 5, I have shown a central station switchboard to which a single telephone line is represented as being connected, the line including one of my improved annunciators located upon the switchboard.

Referring to Figs. 1, 2, 3 and 4, I will describe the form of annunciator shown therein. This annunciator consists, essentially, of a main or operating electromagnet *a* which is represented as being of the tubular type, of moderate resistance and impedence, a retaining magnet *b* of lower resistance but of high impedence, separate armatures *a'* and *b'* for the different electromagnets, and a non-inductive resistance coil *c* in shunt of the retaining magnet. The two electromagnets *a* and *b* are mounted in axial alignment on opposite sides of a supporting plate *d* which may be common to several annunciators. The shell of the electromagnet *a* carries a small

bracket a^2 provided with trunnions a^3 upon which the armature a' is pivoted at its upper edge. The magnet b also carries a bracket b^2 provided with trunnions b^3 upon which the armature b' is pivoted at its lower edge and to one side of its center of gravity so that the armature tends to fall outward. The armature a' is provided with an extended arm a^4 terminating in a catch at its forward extremity, which catch is adapted to engage with the edge of armature b', retaining the latter in its normal vertical position. The armature b' thus constitutes the shutter of the annunciator. In front of this shutter is suspended a light shield e in such position that as the shutter b' falls outward, it engages the shield e and throws it into a horizontal position, thus disclosing the face of the shutter; at the same time the support of the shield e limits the motion of the shutter b' and prevents it from falling so far from the magnet b as to be without the range of its attraction. Thus as long as the armature a' remains unattracted, the armature b' is retained in its normal position while the shield e hangs free, concealing the face of the shutter. When the magnet a alone is energized and attracts its armature, the shutter b' is released, being unattracted by its magnet b, and throws the shield e forward, disclosing the number or name upon the face of the shutter.

Referring to the circuit diagram of the annunciator, Fig. 4, the magnet a may be wound to have a resistance of say five hundred ohms and a considerable self induction so that it can be bridged between the different sides of the telephone circuit in the usual manner; the magnet b, however, is constructed with very heavy walls and with a thick magnetic circuit so that its coil, although of comparatively low resistance, will have great impedence or self induction. The resistance c is arranged to be non-inductive and may be equal to, or preferably somewhat greater than, that of magnet b. The circuit will be seen to extend through the coil a to one terminal of the magnet b, where it divides, two parallel paths being provided, one through the magnet b, and the other through the non-inductive resistance c. When a continuous current traverses this circuit it flows through the magnet a to the magnet b and thereat divides between the coil of magnet b and the non-inductive resistance c in inverse proportion to their actual resistances. Both magnets a and b are thus energized, and both armatures a' and b' are attracted to their respective magnets; but the indicator or shield d remains unaffected, since although the shutter b' is disengaged, it is still retained inoperative by its magnet b. When an alternating or pulsating current of comparatively high period traverses the magnet a to the terminal of magnet b, by far the greater portion of the current passes thence in shunt around the magnet b, through the non-inductive resistance c, since the magnet possesses so great impedence. This magnet thus remains inert, or only feebly magnetized, and does not hold the armature b' which, when released through the movement of armature a' toward its magnet a, falls and gives the indication.

In the diagram Fig. 5 are shown two telephone lines m and n extending from substations 1 and 2, respectively, and connected with a single telephone switchboard. Upon this switchboard the usual springjacks are provided for making connection with the line by means of connecting plugs, each springjack comprising a line spring adapted to make contact with an inserted plug, and a contact anvil upon which the line spring normally rests, but from which it is lifted when a plug is inserted into the springjack. From the back contact of the springjack of each line the circuit is continued to earth through the annunciator of that line. By this device the annunciator is disconnected from the line when connection is established with the line through the instrumentality of the connecting plugs. Thus the circuit from station l may be traced over its line m through the contact spring and anvil of the springjack m' and thence to earth through an annunciator m^2 constructed as described.

The switchboard is provided with the usual terminal or connecting plugs o and o', the plugs being connected together by conductors in the usual way. Thus by inserting the different plugs into the springjacks of two different lines which it may be desired to connect for intercommunication, the circuit of each of the lines is disconnected from its annunciator and the ground connection at the central office, and is continued through the other line. The usual clearing-out annunciator p is included in the conducting circuit between the connecting plugs to receive and indicate the signal for disconnection, and keys q and q' are also included in the circuit for signaling to substations, the keys being arranged to connect the terminal plugs with the poles of a generator of signaling current r. A listening key s is also connected with the cord circuit and with the operator's telephone so that the depression of the key connects the telephone with the circuit joining the plugs.

In a system thus organized, the annunciator will be entirely irresponsive to constant or continuous currents from external sources which may find circuit from earth at the substation through the line circuit and the annunciator to earth at the central office, and thus one of the most serious inconveniences attendant upon the operation of grounded circuit telephone exchanges in proximity to electric railways is entirely obviated. When, however, a subscriber at one substation desires connection with some other substation, he signals by rotating his calling generator, in the usual manner, and the annunciator at the central office responds as freely as any ordinarily in use, and indicates

the signal to the attendant operator. Suppose, for example, that subscriber at station 1 desires to be connected with subscriber at station 2. The current produced by the rotation of the generator at station 1 finds circuit over line *m*, through the springjack *m'* and the annunciator m^2 to earth, operating the annunciator. The attendant thereupon inserts one plug *o* of a pair into the springjack *m'* and depresses the listening key *s*, whereby she is placed in communication with the subscriber calling. Having received the order for connection with the line to station 2, she inserts the remaining plug *o'* into the springjack *n'* of that line and depresses the corresponding calling key *q'*, thus sending a signaling current over the telephone line to substation 2. When the subscriber thereat has responded and removed his telephone from the switch hook, the circuits are in condition to permit of telephonic communication between the two subscribers.

While the object of my invention has been especially to produce an annunciator for telephone lines which shall be thus irresponsive to continuous currents, but sensitive to alternating or rapidly pulsating currents, it is obviously not limited to such application. It may be applied in any instance in which an electro magnet possessing these characteristics is desirable. Hence I do not limit myself to the precise form and construction which are herein shown and described, but

I claim, broadly, as new and desire to secure by Letters Patent—

1. In combination, two electromagnets connected with the same electric circuit, one of said magnets being of high impedence but low resistance, separate armatures for the electromagnets, and mechanism controlled by one of the electromagnets adapted to actuate the armature of the other electromagnet when the latter armature is unattracted by its magnet, substantially as described.

2. In combination, two electromagnets connected with the same circuit, one magnet being of high impedence but comparatively low resistance, separate armatures for the different electromagnets, an indicator controlled by the armature of the electromagnet of high impedence, mechanism controlled by the armature of the other electromagnet adapted to actuate the indicator-controlling armature when the magnet of the latter is not energized, whereby the indicator is operated when the magnets are traversed by alternating currents, but remains inert when they are traversed by continuous currents, substantially as described.

3. The combination with two electromagnets in series in the same circuit, one magnet being of high impedence but of comparatively low resistance, of a non-inductive resistance in shunt of the said high impedence magnet, separate armatures for the two magnets, mechanism controlled by the other magnet to be actuated thereby when the magnet is energized, and means controlled by the armature of the magnet of high impedence adapted to prevent the actuation of said mechanism when the latter magnet is energized, whereby the mechanism is actuated when the magnets are traversed by alternating currents, but is irresponsive when they are traversed by continuous currents, substantially as described.

4. The combination with two electromagnets in series in the same circuit, one of said magnets being of high impedence, but comparatively low resistance, of a non-inductive resistance in shunt of the latter magnet, separate armatures for the two electromagnets, an indicator which the armature of the magnet of high impedence tends to actuate when unattracted, a catch controlled by the other armature engaging, when unattracted, with the indicator controlling armature, whereby the actuation of the indicator by continuous currents through the magnets is prevented, while it is responsive to alternating currents, substantially as described.

5. The combination with a telephone line, of an annunciator magnet in circuit therein, an indicator adapted to be actuated by the armature thereof, another electromagnet of high impedence but of low resistance connected with the line having an armature adapted to prevent the actuation of the indicator when its magnet is energized, and a non-inductive resistance in shunt of the latter electromagnet, substantially as described.

In witness whereof I hereunto subscribe my name this 22d day of March, A. D. 1893.

CHARLES E. SCRIBNER.

Witnesses:
ELLA EDLER,
LUCILE RUSSELL.