(No Model.) 2 Sheets—Sheet 1.

C. E. SCRIBNER.

LOCKOUT SYSTEM FOR TELEPHONE LINES.

No. 557,898. Patented Apr. 7, 1896.

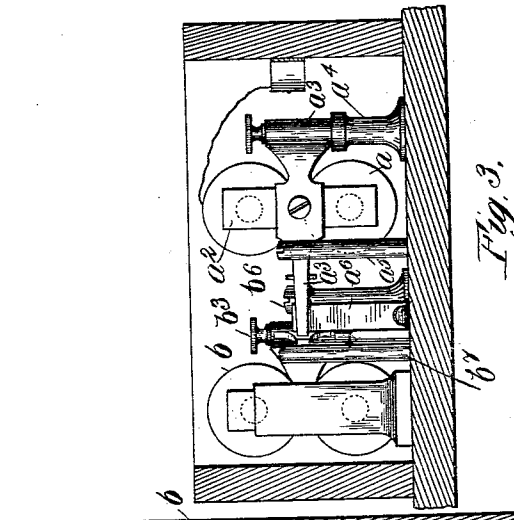

Fig. 3.

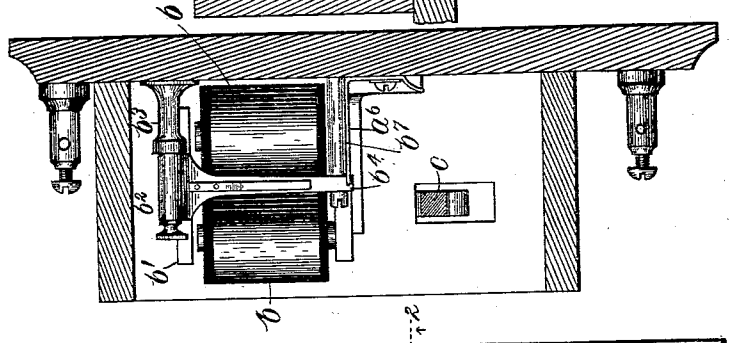

Fig. 2.

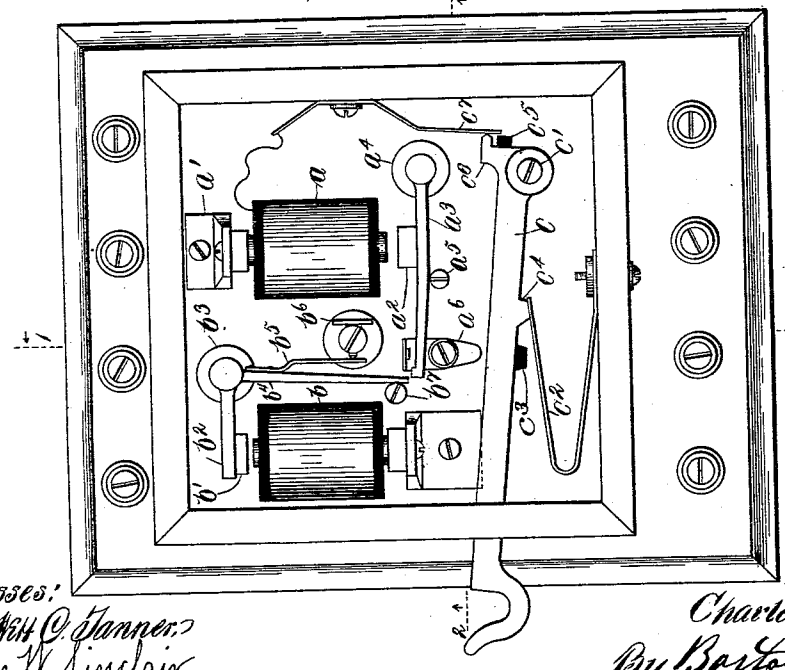

Fig. 1.

Witnesses:
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John W. Sinclair.

Inventor:
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(No Model.) 2 Sheets—Sheet 2.

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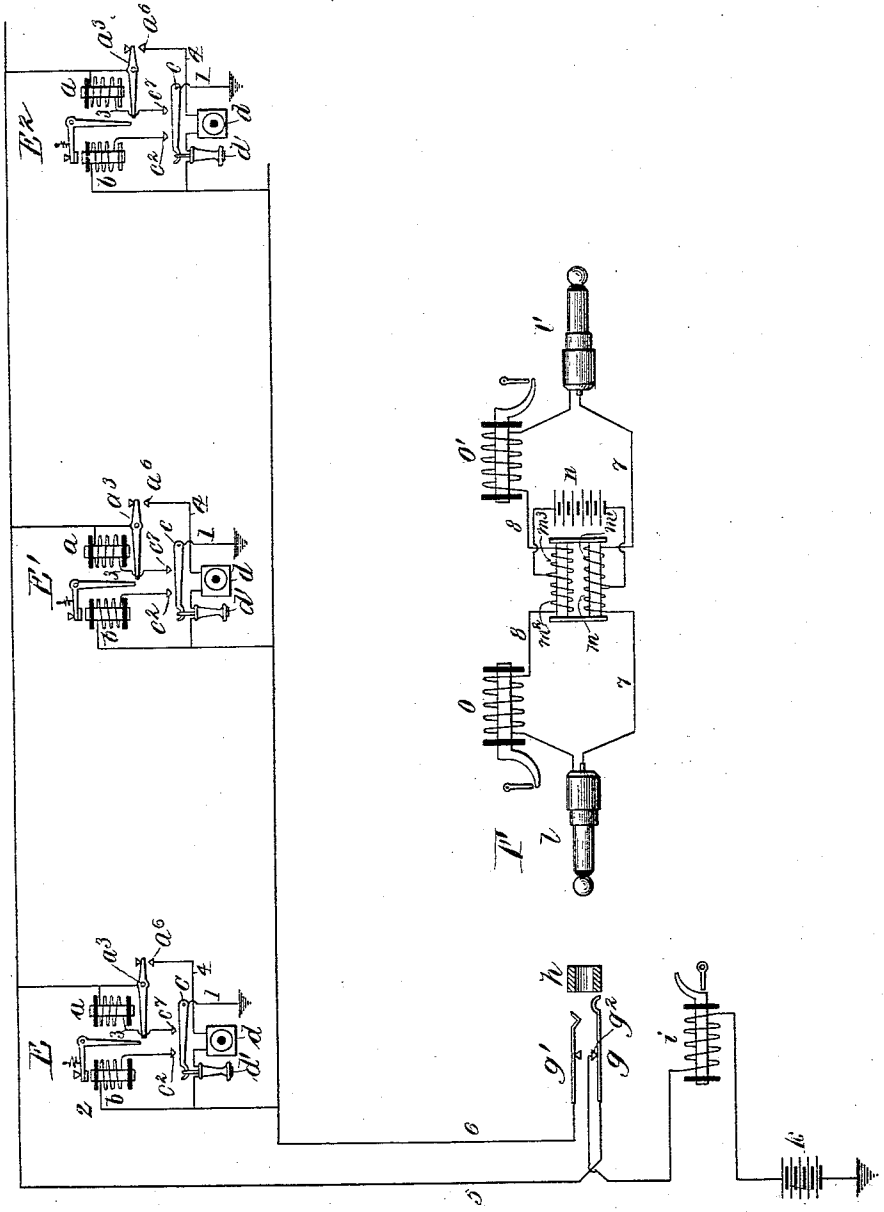

Fig. 4.

Witnesses:
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UNITED STATES PATENT OFFICE.

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

LOCK-OUT SYSTEM FOR TELEPHONE-LINES.

SPECIFICATION forming part of Letters Patent No. 557,898, dated April 7, 1896.

Application filed July 22, 1895. Serial No. 556,719. (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 Lock-Out Systems for Telephone-Lines, (Case No. 379,) 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 apparatus for preventing the simultaneous use of two or more telephones on a line-circuit connected with instruments at several substations, its specific object being to cause the attempt to use a second telephone on a line on which one telephone is already in use to operate mechanism for disconnecting the second telephone from the line-circuit or for preventing its connection therewith.

My invention is adapted for use in connection with metallic-circuit telephone-lines, and particularly with lines provided with a central source of current at a central station for supplying current to the lines to excite or operate the substation telephone-transmitters.

My invention involves the use of a telephone-switch which may preferably be operated automatically in the use of the telephone and two electromagnets, one of which I designate the "circuit-controlling" magnet, which acts through suitable mechanism to close the circuit of the telephone to permit its use when the magnet is excited, and the other of which—the "stop-controlling" magnet—operates when excited to prevent the actuation of the mechanism of the first magnet, and thus to render the use of the telephone impossible. The circuit-controlling magnet is connected with the line-circuit, with which a source of current is connected at any suitable point, in such a manner as to receive an exciting current when the telephone is removed from its switch-hook for use. The stop-controlling magnet is so connected with the line-circuit that it receives current only in the event of the circuit being closed through the telephone at some other substation. The circuits through both these electromagnets are normally open at switch-contacts of the telephone-switch, and these switch-contacts are adjusted so that the circuit through the stop-controlling magnet and that through the circuit-controlling magnet are closed successively as the switch-hook is operated.

When the telephone is removed from its switch-hook at any station, the circuit-controlling magnet at that station is excited and closes the circuit through the telephone, provided no other telephone of the line be already in use; but if some other telephone of the line be in use the stop-controlling magnet will be first excited and will prevent the connection of the telephone with the line-circuit.

My invention is designed to be associated with a system of signaling instruments for automatically indicating at the central station of the line when a telephone is removed from or replaced upon its switch-hook at a substation, for the purpose of automatically transmitting signals for connection and disconnection.

In a form of my invention suitable for practical use one limb of a metallic-circuit telephone-line is connected to earth at the central station through a suitable signaling instrument and a battery, a spring-jack terminal being included in the line-circuit and having switch-contacts to open the ground connection when the line is united with some other line in a telephone-switchboard. At each substation a ground branch from the normally-grounded limb of the telephone-line includes the coil of the circuit-controlling magnet and is normally open at the telephone-switch, the latter switch being adapted to close the ground-circuit when the telephone is removed from it. The lever of this circuit-controlling magnet or relay controls the continuity of a branch or bridge across the metallic circuit, including the telephone-transmitter and the telephone-receiver, these instruments being preferably in series in the circuit. A branch is taken from the remaining limb of the metallic circuit through the stop-controlling electromagnet and terminates in a normally open contact-point of the telephone-switch. Those switch-contacts of the telephone-switch which control the circuit through the stop-controlling magnet are adjusted to be closed together before those

which control the circuit through the circuit-controlling magnet or relay, so that if current be present in the line-circuit when the telephone is removed from its switch-hook the stop-controlling magnet will be first excited and will act to prevent the operation of the mechanism of the other magnet. When a telephone is removed from its switch-hook at any station, no other telephone being then in use, the bridge which is formed between the two limbs of the line-circuit through the telephone permits the flow of current from the battery at the central station through both limbs of the circuit, and hence creates in the circuit the necessary condition to prevent the use of any other telephone. At the same time the closing of the ground branch, through the circuit-controlling magnet, operates the signaling instrument connected with the line-circuit at the central station and indicates the signal to the attendant. Connection may be made with the line for the purpose of uniting different line-circuits by means of the usual plugs and accessory appliances, the plug-circuit being equipped with some form of apparatus by which a source of current is looped into the line-circuit to supply current for operating the substation telephone-transmitters.

My invention is illustrated in the accompanying drawings.

Figures 1, 2, and 3 of the drawings are views of the mechanism of the "lock-out box" with which each substation is equipped, the views being a plan of the apparatus, a section of the box on line 1 1, and a section on line 2 2, respectively. Fig. 4 is a diagram representing a metallic-circuit "party line" extending to three substations and connected at each substation with telephonic appliances and with the lock-out mechanism, the telephone-line being extended to a spring-jack and signal in a telephone-switchboard provided with the usual connecting appliances.

Referring to Figs. 1, 2, and 3, I will first describe the construction and arrangement of the apparatus of the lock-out box.

A magnet a, supported in a suitable manner by a frame a', is provided with an armature a^2, carried upon a lever a^3, pivoted on a post a^4. The box is designed to be placed with the axis of magnet a vertical, the armature being below, so that the armature tends to fall away from the magnet. Its backward movement is limited by a stop a^5. In front of the lever a^3 is placed a contact-point or anvil a^6, against which the lever impinges in its forward movement.

Parallel with magnet a another magnet b is placed. This magnet is provided with an armature b', which is carried upon one arm of a bell-crank lever b^2, pivoted at its angle on a post b^3. The other arm b^4 of the bell-crank lever carries a light spring b^5, against which an adjustable thumb-screw b^6 bears to cause the retraction of armature b' from magnet b. The extent of its retraction is determined by a stop b^7. The extremities of lever a^3 and of arm b^4 are arranged at right angles to each other, and their positions are so adjusted with relation to each other that when arm b^4 is in its normal position lever a^3 plays freely toward and from its magnet; but when armature b' is attracted to magnet b arm b^4 is moved into the path of lever a^3 and prevents the movement of the latter.

A telephone-switch c, of usual form, is provided in the box. The lever is carried at one extremity on a pivot c' and is formed at its free extremity into a hook constituting a support for the telephone-receiver. The lever is acted upon by a bent spring c^2, fixed to the box at one extremity and bearing at its other extremity alternately upon a stud c^3, of insulating material, and a projection c^4 of the lever, after the manner shown in Patent No. 425,058, dated April 8, 1890, to E. P. Warner. When the spring is permitted to throw the lever into the position shown in the drawings, the spring c^2 bears directly upon the projection c^4; but when the telephone is placed on the hook the lever is moved downward and the stud c^3, of insulating material, comes to bear upon the spring c^2 and presses the latter away from the projection c^4, breaking the electrical connection between them. Near its pivotal point the lever c carries another stud c^5, of insulating material, and has another projection c^6, upon which stud and projection a spring c^7 bears alternately in a similar manner, the adjustment being such that the spring c^7 makes contact with the projection c^6 when the lever is relieved from the weight of the telephone. The adjustment of springs c^2 and c^7 with relation to their contact-points is such that the spring c^2 makes contact with the lever c as the latter rises before the spring c^7 touches the projection c^6 on the lever. The electrical circuit connections of these different parts are shown in Fig. 4. The telephone switch-lever c is connected by a conductor 1 to earth. The contact-spring c^2 constitutes one terminal of a conductor 2, which includes the stop-controlling magnet b, and is connected with one of the line conductors. Contact-spring c^7 of the telephone-switch constitutes the terminal of another conductor 3, which includes circuit-controlling magnet a, and is connected with the other line conductor. The conductor 3, after traversing magnet a, is led to the lever a^3 of magnet a, from which it finds circuit, when the armature carried by the lever is attracted to its magnet, to the contact-point a^6, and thence through a conductor 4, which includes a telephone-transmitter d and a telephone-receiver d'.

In the drawings three substations E, E', and E^2 are represented, each equipped with lock-out mechanism and telephonic instruments such as those described, the apparatus at the three stations being connected in parallel branches between line conductors 5 and 6 of a telephone-line. These conductors terminate at the central station F in the springs

g and g' of a spring-jack h in the switchboard. The spring g is provided with a normal resting-contact g^2, which is connected to earth through a signaling instrument i and a battery k.

At the switchboard a pair of plugs l and l' of ordinary construction are provided, the tips of the plugs being connected together through conductor 7 and the sleeves through conductor 8. The conductors 7 and 8 each include the two helices m m' and m^2 m^3, respectively, of an induction-coil. The points of connection of the two pairs of helices are united through a battery n, which is designed to supply current through the plug-circuit for operating the substation telephone-transmitters. Two signaling instruments o and o' are included in the conductor 8, one at each side of the repeating-coil helices.

The apparatus of the plug-circuit is of well-known character, and its operation is familiar to those skilled in the art of telephony.

The apparatus is represented in the drawings in its normal or idle condition. A subscriber at a substation—as, for example, at station E'—wishing to communicate with another subscriber of the exchange system removes his telephone from its switch-hook preparatory to announcing his order to the operator. As the telephone-switch rises it first makes contact with the spring c^2 and later with the spring c^7. The completion of the circuit through spring c^2 to conductor 2 does not affect the apparatus, since there is no source of current in the circuit thus formed; but the contact between the lever and the spring c^7 completes the circuit through conductor 3 and conductor 1 to earth. A current is thus set up from battery k through signal i and contacts g^2 g of the spring-jack h, thence through line conductor 5, conductor 3 of the lock-out box, contact c^7 and lever c, and conductor 1 to earth. The current in this circuit excites the magnet of the signaling instrument i, causing this instrument to give its indication. It also excites the magnet a of the lock-out box at the substation. The magnet b of the lock-out box is not yet excited and the arm b^4 is not in position to obstruct the movement of lever a^3. Hence the latter lever under the attraction of its magnet is brought forward against the contact a^6, closing a circuit from line conductor 5 through the lever a^3, contact a^6, and conductor 4 to conductor 6 of the line-circuit. The telephone-transmitter d and receiver d' are thus brought into a bridge across the line-circuit 5 6.

When the operator at the central station F observes the signal of the annunciator i, she inserts plug l into spring-jack h in the usual way and receives the order for the desired connection from subscriber at station E'. It will be observed that when the plug l is inserted into the spring-jack the branch containing annunciator i and battery k is disconnected from conductor 5 of the line-circuit and that in place of this battery the battery n is looped into the line-circuit. Current flows from this battery n through helices m and m^2 of the induction-coils, conductors 7 and 8 of the plug-circuit, and conductors 6 and 5 of the telephone-line. At the substation E' this battery finds circuit from conductor 5 through conductor 3, including magnet a, contact-spring c^7, lever c, contact-spring c^2, and conductor 2, including magnet b. Both the circuit-controlling magnet a and the stop-controlling magnet b thus become excited; but since the lever a^3 is already in its forward position the excitement of magnet b effects nothing.

In order to observe the operation of the device in its function of preventing interference from other stations while the apparatus at any station is in use, let it be assumed that after the telephone has been removed from its switch-hook at station E' and before the operator has inserted plug l into spring-jack h another subscriber at station E attempts to use the line. By the removal of the telephone at station E the battery k becomes connected with conductor 6 of the line-circuit through the comparatively low resistance path through conductor 4, including the telephone transmitter and receiver. When, under this condition, the telephone is removed from the switch-hook at station E, the switch-lever, in making contact with spring c^2 as the lever rises, closes the conductor 2, including the magnet b, to earth through conductor 1. A battery-circuit is thus formed from line conductor 6 through wire 2 and magnet b to earth. Magnet b becomes excited and throws the arm b^4 into the path of lever a^3. A little later the contact between spring c^7 and lever c is completed, closing the circuit through magnet a at station E; but since the lever a^3 is now obstructed by arm b^4 the circuit through conductor 4, including the telephone, is not closed. Hence the subscriber at station E is unable to use his telephone.

In another case let it be assumed that the subscriber at station E' has removed his telephone from its switch-hook and in response to the signal thus transmitted the operator has inserted plug l in spring-jack h to answer the call. If, while the apparatus is in this condition, the subscriber at station E were to raise his telephone from its switch-hook, a current would flow from line conductor 6 through magnet b to earth through conductor 1, whence it finds circuit through earth, through conductor 1 at station E', and thence through lever c, contact c^7, and conductor 3 to line conductor 5. The magnet b at station E is therefore again excited before magnet a is magnetized, and the closing of the telephone-circuit is prevented.

Having received the order, the attendant completes the connection by inserting the remaining plug l' of the pair into the spring-jack of the line called for in the usual manner. The current set up by battery n through the

line-circuit traverses the telephone-transmitter d and receiver d' and thus furnishes an exciting or operating current for these instruments. The variations in the current produced by the telephone-transmitter are propagated, through the medium of induction-coils $m\,m'$ and $m^2\,m^3$ in the circuit with which plug l' is connected, in a manner which, being in common practice, need not be further explained.

When the subscriber at station E', having terminated his conversation, replaces his telephone upon the switch-hook, the connection from the line conductors of the telephone-circuit to earth and their connection with each other are interrupted. The interruption of the current in the line-circuit is indicated by signal o in the plug-circuit, by which the attendant is notified that the connection is no longer required. When disconnection has been effected by removing plugs $l\,l'$ from the spring-jacks into which they are inserted, the mechanism at the different substations is left in its normal condition, so that any telephone is free for use.

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

1. The combination with a telephone-line, of a telephone at a substation thereof, a relay having switch-contacts adapted to complete a connection of the telephone to permit the use thereof, a device adapted to prevent the completion of the circuit through the telephone and a magnet controlling the said device, and means for exciting the relay-magnet alone or said last-mentioned magnet and the relay-magnet successively, whereby the use of the telephone may be permitted or prevented, substantially as described.

2. The combination with a telephone-line, of a telephone at a substation thereof, a circuit-controlling magnet controlling the circuits of the telephone to permit its use when the magnet is excited, a stop-controlling magnet adapted to prevent the use of the telephone when it is excited, a normally open battery-circuit through said circuit-controlling magnet, means for closing the battery-circuit through the stop-controlling magnet, and a telephone-switch and switch-contacts operated thereby adapted to close the circuit through the stop-controlling magnet and the circuit-controlling magnet successively, whereby the use of the telephone may be prevented by closing the battery-circuit through the stop-controlling magnet, substantially as described.

3. In combination with a telephone-line, a telephone at one substation of the line, a circuit-controlling magnet at that station controlling the circuit through the telephone to permit its use when the magnet is excited, a stop-controlling magnet and a device controlled thereby adapted to prevent the use of the telephone when its magnet is excited, a battery-circuit including the said stop-controlling magnet extending to another substation, a switch at the latter substation to close the battery-circuit, and a telephone-switch at said first-mentioned substation controlling the circuit of the telephone thereat adapted to close the circuit successively through the stop-controlling magnet and the circuit-controlling magnet, substantially as described.

4. The combination with a telephone-line extending in two normally separate branches to two substations, a grounded battery connected with one limb of the telephone-line, a lock-out device adapted to prevent the use of the telephone at one substation, an electromagnet controlling the lock-out device, in a ground branch from that side of the line which is not connected with the battery, and a switch at the other substation operated in the use of the telephone thereat having switch-contacts adapted to connect the two sides of the line-circuit together, substantially as described.

5. In combination, a telephone-line comprising two normally-separated line conductors extending to two or more substations, a battery connected with one of the line conductors, a circuit-controlling electromagnet at each substation in a normally open ground branch from the same line conductor, a bridge including telephonic instruments and switch-contacts controlled by said circuit-controlling magnet, a stop-controlling electromagnet in a normally open ground branch from the other side of the telephone-line having mechanism adapted to prevent the operation of said circuit-controlling magnet, and a telephone-switch hook adapted to close both of said ground branches while the telephone is in use, substantially as described.

6. The combination in a lock-out box, of a circuit-controlling electromagnet adapted when excited to close the circuit through the telephone and to connect together the two limbs of the telephone-line, a stop adapted to obstruct the movement of the armature of said circuit-controlling magnet, a stop-controlling magnet, the circuit-controlling magnet and the stop-controlling magnet being in normally open ground branches from the different sides of the metallic circuit, and a telephone-switch having switch-contacts adapted to close the circuit through the stop-controlling magnet and through the circuit-controlling magnet successively, substantially as described.

In witness whereof I hereunto subscribe my name this 13th day of March, A. D. 1895.

CHARLES E. SCRIBNER.

Witnesses:
ELLA EDLER,
LUCILE RUSSELL.