

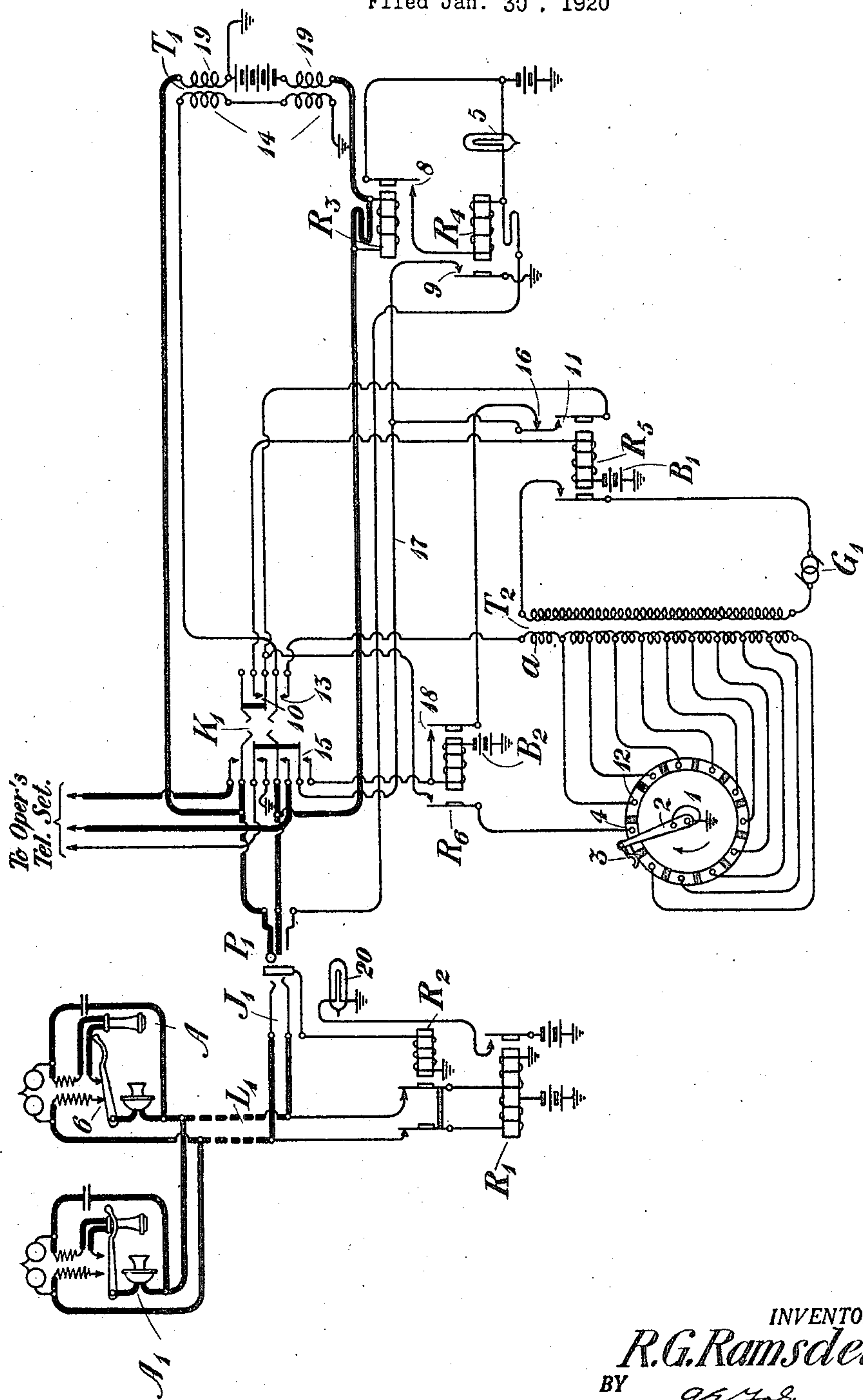
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R. G. RAMSDELL

SIGNALING SYSTEM

Filed Jan. 30, 1920



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SIGNALING SYSTEM.

Application filed January 30, 1920. Serial No. 355,176.

To all whom it may concern:

Be it known that I, ROGER G. RAMSDELL, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Signaling Systems, of which the following is a specification.

This invention relates to improvements in signaling systems and more particularly to that type of signaling system designed to transmit over a subscriber's telephone line a current of varying magnitude adapted to produce in a telephone receiver that may have been left off its hook inadvertently or otherwise, a tone of varying magnitude in order to attract the subscriber's attention and to effect the restoration of the receiver to its hook.

The co-pending application of Kuhn and Ramsdell, Serial No. 355,175, filed Jan. 30, 1920, shows means whereby, in a so called howler circuit adapted to apply a signaling potential to a subscriber's telephone circuit upon which the receiver has been left off its hook, the source of potential may be effectively disconnected from the subscriber's circuit upon the restoration of the receiver to its hook and will not again be connected thereto until the operator, who is responsible for the application of the said signal to the line, has properly supervised the connection. An undesirable feature of the arrangement disclosed in the aforementioned application, and in other arrangements heretofore used, is that it is possible for an operator to apply the howler electromotive force to a line without first listening in on the line and challenging in order to determine whether at that instant any party on the line has the receiver to his ear.

It is well known to those familiar with telephone maintenance and operation that the application to a subscriber's line of a signaling current of sufficient magnitude to produce in a receiver of a subscriber's telephone set, inadvertently left off its hook, a tone adapted to attract the subscriber's attention and to effect the restoration of the receiver to its hook, is undesirable from an operating standpoint, and that the application of such current to a line should be made only after careful supervision indicates that no persons are at that instant attempting to make a telephone call over the said line.

Hitherto it has been customary to instruct all persons charged with the duty of applying the howler signal to subscribers' lines that they should first listen in upon the line and then challenge by some appropriate phrase, but mistakes are liable to occur, due to the fallibility of human nature, which may result in the application of the signaling current to a line upon which some person has a receiver to his ear. It is the object of this invention to interlink the supervisory process with the process of applying the signaling current in such manner that it is substantially impossible to apply the signaling current to the subscriber's line without previously connecting the operator's telephone set with the said line, by which the proper supervision of the said line is reasonably assured.

Other and further objects of this invention will appear from the following description when read in connection with the attached drawing which shows one embodiment thereof.

In the drawing L_1 represents a telephone line having associated therewith subscribers' stations A and A_1 , the former of which is shown with its receiver off its hook. Associated with the said line are the line relay R_1 and the cut-off relay R_2 . The line L_1 may terminate at the switchboard in a jack J_1 , having a line signal lamp 20 associated therewith. The howler cord circuit terminates in a plug P_1 , adapted for insertion into jack J_1 , and has associated therewith a key K_1 , which when operated to the left serves not only to connect the operator's telephone set with the line with which the plug P_1 may then be connected but also initiates the operation for applying howler signals to the line; and when operated toward the right serves to complete the operations by means of which the said signals may be applied to the line.

Associated with the cord circuit are supervisory relay R_3 and control relays R_4 , R_5 and R_6 which serve to control the connection of the signaling electromotive force with the line circuit. A source of varying electromotive force G_1 is connected in series with the primary winding of the transformer T_2 , and operatively controlled by relay R_5 . A plurality of taps are taken from various points of the secondary wind-

ing of said transformer and respectively connected with a plurality of segments of the commutating device 1. Associated with the commutating device is a rotating grounded arm 2 designed to support a brush 3, the said arm being rotated by means of a spring motor or other suitable source of energy whereby the said brush may be brought in contact with the successive segments of the commutating device. The electromotive force induced in the secondary winding of the transformer T_2 sets up a current flow in the windings 14 of the transformer T_1 which in turn induces an electromotive force into secondary windings 19 of the said transformer.

The mode of operation of this circuit is as follows: After a test has been made upon the line L_1 , generally by means of a voltmeter, which indicates that the trouble represented by the steady burning of the lamp 20 is due to a receiver being off its hook, the operator will insert the plug P_1 into jack J_1 and operate the key K_1 to the left. This serves to connect the operator's telephone set with the line L_1 and by listening and challenging prior to the application of the howler potential, the said operator is thereby enabled to determine whether a party on this line is attempting to make a telephone call, or whether a receiver has inadvertently been left off its hook.

When the operator inserted the plug P_1 into jack J_1 , the lamp 5 would tend to light but due to the operation of relay R_3 as the result of the connection of the tip and ring sides of the line at the contact 6 of the hook-switch of substation A, the lamp 5 is shunted through contact 8, and its lighting prevented. Another result of the operation of relay R_3 is the operation of relay R_4 which closes contact 9. Furthermore, when key K_1 was operated in the left hand direction to connect the operator's telephone set with the line, contact 15 was closed thereby establishing a circuit from battery B_2 , winding of relay R_6 , contact 15, conductor 17, and contact 9 to ground, which effected the operation of relay R_6 . By the closing of the right hand contact of this relay, it is locked up over a circuit from the battery B_2 , winding of relay R_6 , contact 18, contact 16, and contact 9 to ground.

After the operator has properly supervised the line, she will move the key K_1 to its right hand position thereby closing contacts 10 and 13 of the said key and she will release the rotatable arm 2 so as to permit its free movement. As the arm 2 of the commutating device 1 moves the brush 3 in contact with segment 4, a circuit will be established from battery B_1 , winding of relay R_5 , contact 10, left hand contact of relay R_6 , and contact of segment 4 and brush 3 to ground, and relay R_5 will be thereby

operated. By the closing of its left hand contact, the circuit including the generator G_1 and the primary winding of the transformer T_2 will be effectively closed. The operation of its right hand armature will close contact 11 and will open contact 16. By the closing of contact 11, relay R_5 will be locked up over a circuit from battery B_1 , winding of relay R_5 , contact 10, contact 11, and contact 9 to ground. By the opening of contact 16 relay R_6 will be released.

It should be clearly noted that by the operation and the locking of relay R_5 , current will flow through the primary winding of transformer T_2 which will induce a potential difference across the sectional secondary winding of the said transformer. As the brush 3 is moved by the rotating arm 2 into contact with segment 12, section "a" of the secondary winding of the transformer T_2 will be connected in a circuit that extends from ground through the rotating arm 2, brush 3 and segment 12 of the commutating device, section "a" of the secondary winding, contact 13 and windings 14 of the transformer T_1 to ground. This flow of current through the winding 14 will set up an electromotive force in the secondary winding 19 of the said transformer which will be impressed upon line L_1 and will produce a tone in the receiver at station A. As the arm continues to rotate in the direction indicated by the arrow the brush 3 will be brought into contact with successive segments which results in connecting into the circuit previously traced an increasing number of sections of the secondary winding of the transformer thereby increasing by gradual steps the voltage impressed upon the windings 19 of transformer T_1 and likewise increasing the tone emitted by the receiver. The voltage reaches a maximum when all sections of the secondary winding have been connected into the said circuit, which occurs when the brush is in contact with the segment preceding segment 4. When the brush moves onto segment 4, the voltage drops to zero and the cycle begins again.

If during the period of application of the signaling current to the line, the subscriber at station A restores his receiver to its hook, the contact 6 will be opened thereby releasing supervisory relay R_3 . Contact 8 will then be opened, thereby lighting lamp 5 and releasing relay R_4 which opens its contact 9. Relay R_5 which, as previously pointed out, was locked up over contact 9 will therefore be released, which opens the primary circuit of transformer T_2 and thereby effectively disconnects the source of signaling potential from the line L_1 .

Upon observing the lighting of the lamp 5, which indicates the restoration of the receiver to its hook, the operator will move

the key K_1 to its left hand position to connect her telephone set with the line to re-supervise this connection. If the supervision of the line indicates that the receiver at fault has been restored to its hook and that line conditions are normal, the operator will withdraw the plug P_1 from the jack J_1 and release the line for service.

If prior to the instant when the operator observed the lighting of the lamp 5 any party on the line L_1 , such as at stations A_1 or A , should attempt to use the line by removing his receiver from its hook, relays R_3 and R_4 will again be operated and contact 9 will be closed but the source of signaling potential will not be reconnected thereby to the line. It will be remembered that relay R_5 was originally operated by the closing of the left hand contact of relay R_6 and also by the movement of brush 3 into contact with segment 4. Since, relay R_6 has been deenergized and can only be operated by the closing of contact 15 of key K_1 , it will be seen therefore that it is necessary for the operator to reconnect her telephone set to the line L_1 by operating key K_1 to the left before the signaling electromotive force may again be applied to the line. This means that proper supervision of the howler connection is ensured and that unintentional, accidental application of the howler electromotive force to the line is entirely prevented.

From the foregoing description it will be seen that my invention discloses simple and effective means to prevent the application of a signaling current to a subscriber's telephone line upon which the receiver has been allowed to remain off its hook, unless prior thereto, the operator, whose duty is to apply the said signaling current, connects her telephone set with the said subscriber's line, and thereby is placed in position to supervise the said line. The invention furthermore covers means for automatically discontinuing the application of the signaling potential to the line when the receiver at fault has been restored to its hook, and prevents a subsequent application of the signaling potential to the same line, upon the removal of a receiver at any station connected with the said line, unless the operator supervises the line by again connecting her telephone set thereto.

Although this invention has been shown embodied in a certain particular form, it is to be understood that it is not limited to this form but is capable of embodiment in other and different forms without departing from the spirit of the appended claims.

What is claimed is:

1. In a signaling system, the combination with a subscriber's telephone line, of a source of signaling potential adapted to be

progressively varied in value, an operator's telephone circuit and switching means arranged to connect said source of signaling potential with the said telephone line when the said potential is at its minimum value and only after said telephone line has been supervised by the connection of the said operator's circuit therewith.

2. In a signaling system, the combination of a telephone line having associated therewith a subscriber's set, the receiver of which has been removed from its hook, and a howler signaling circuit adapted for connection therewith comprising an operator's telephone set, a source of signaling potential, the magnitude of which may be varied, and switching means arranged to connect the said source to the said line when the potential is a minimum value and only after the said operator's set has been connected to the said line.

3. In a signaling system, the combination of a telephone line having associated therewith a subscriber's set, the receiver of which has been removed from its hook, and a howler signaling circuit adapted for connection thereto comprising an operator's telephone set, a source of signaling potential and switching means arranged to successively connect to the telephone line the said operator's set and the said source of signaling potential, the said switching means being so arranged that the said source will be effectively connected to the said line only when the potential is at its minimum, and only after said operator's set has been connected thereto.

4. In a signaling system, the combination of a telephone line having associated therewith a subscriber's set, the receiver of which has been removed from its hook, and a howler signaling circuit adapted for connection thereto comprising an operator's telephone set, a source of signaling potential, switching means arranged to successively connect to the telephone line the said operator's set and the said source of signaling potential, the said switching means being so arranged that the said source will be effectively connected to the said line only when the potential is at its minimum and only after said operator's set has been connected thereto, and means controlled by the restoration of the said receiver to its hook to effectively disconnect the said source of potential from the said line.

5. In a signaling system, the combination of a telephone line having associated therewith a subscriber's set, the receiver of which has been removed from its hook, a source of varying potential adapted to cause the said receiver to produce a signaling tone, an operator's telephone circuit adapted to be connected with the said telephone line and switching means arranged to connect the

said operator's circuit to the said line for supervisory purposes and to initiate the connection of the said source of potential to the said line and switching means to complete the connection of the said source after the said operator's circuit has been disconnected from the said line.

6. In a signaling system, the combination of a telephone line having connected therewith a plurality of sub-station sets, one of which is in operated position, a circuit having a source of signaling potential and an operator's telephone set connected therewith, means to connect the said circuit with the said line, switching means adapted to effectively connect the said operator's set with the said line and to initiate the connection of the said source of signaling potential to the said line and a second switching means arranged to disconnect the said operator's set from the said line and to complete the effective connection of the said source of potential to the said line.

7. In a signaling system, the combination of a telephone line having connected therewith a plurality of sub-station sets, one of which is in operated position, a circuit having a source of signaling potential and an operator's telephone set connected therewith, means to connect the said circuit with the said line, switching means adapted to effectively connect the said operator's set with the said line and to initiate the connection of the said source of signaling potential to the said line, a second switching means arranged to disconnect the said operator's set from the said line and to complete the effective connection of the said source of potential to the said line and means adapted to effectively disconnect the said source of potential from the said line when the operated sub-station set is restored to its non-operated position and to prevent the reap-

plication of the said potential if any sub-station set is subsequently operated.

8. In a signaling system the combination of a subscriber's telephone line circuit the receiver of which is removed from its hook, a source of varying potential adapted for connection with said line circuit so as to cause said receiver to emit a signaling tone, an operator's telephone set adapted also for connection with said line circuit, switching means designed to connect the operator's set with the line circuit and disconnect it therefrom and also arranged to prevent the connection of said source of potential to said line unless and until said operator's set has been connected with said line and means controllable by the operation of said hook to disconnect said source from said line and to render impossible its reconnection until said operator's set has again been connected with said line.

9. In a signaling system, the combination of a telephone line having connected therewith a plurality of subscribers' sets one of which has its receiver off its hook, a cord circuit having associated therewith a source of signaling potential, an operator's telephone set, and switching means designed to effect the connection of said source with said line when the potential is at a minimum and after said operator's set has been connected in supervisory relation with said line, and means to effectively disconnect said source from said line upon the restoration to its hook of the receiver of said one of said subscribers' sets, and to prevent the reapplication of said potential to the line as the result of the subsequent removal of a receiver from its hook at any of said stations.

In testimony whereof, I have signed my name to this specification this 28th day of January, 1920.

ROGER G. RAMSDELL.