

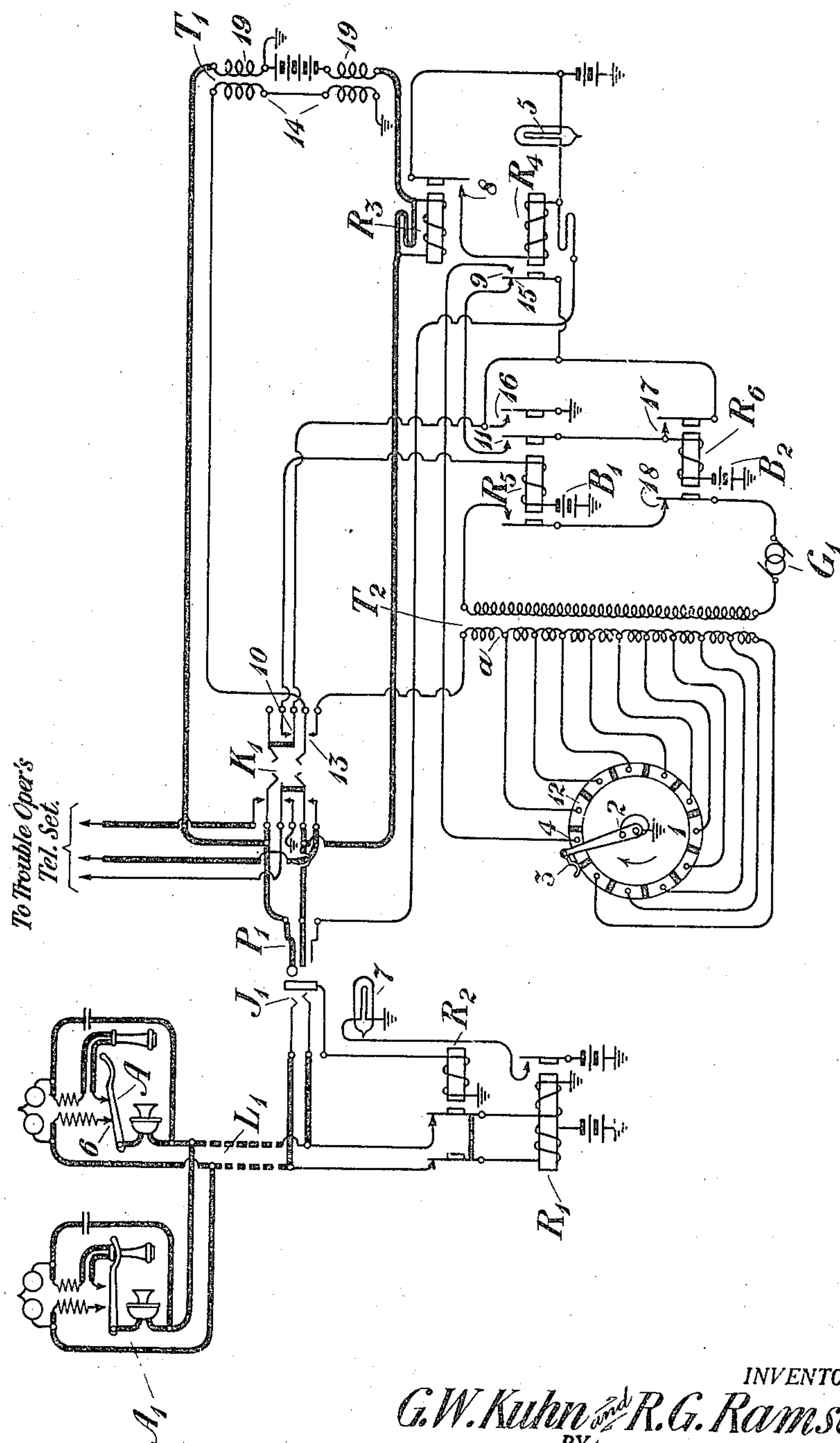
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G. W. KUHN ET AL

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SIGNALING SYSTEM

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SIGNALING SYSTEM.

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To all whom it may concern:

Be it known that we, GEORGE W. KUHN and 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 which is adapted to apply to a subscriber's telephone line upon which the receiver has inadvertently or otherwise been left off its hook, a potential of varying magnitude which causes the receiver to produce a tone designed to attract the attention of the subscriber and thereby to effect the restoration of the receiver to its normal idle position upon the hook.

In the Patent No. 1,279,882, which issued to G. W. Kuhn on September 24, 1918, there was disclosed a howler system adapted to apply a potential of varying magnitude to a subscriber's line and designed to effect the application of the said potential to the line only at the instant when the potential was of minimum magnitude. In the arrangement disclosed in the above patent and in other howler circuits heretofore used, no automatic means are provided to disconnect the source of varying potential from the circuit after the receiver has been restored to its hook and to prevent its reconnection to the circuit in case any subscriber on the line removes his receiver from its hook thereafter but prior to the instant of disconnection from the subscriber's circuit of the source of howler potential by the operator responsible for such action. Thus if the operator failed to act promptly upon receiving the disconnect signal when the subscriber's receiver, inadvertently left off its hook, has been restored thereto, the howler circuit would continue to apply its varying potential to the line and since this is liable to produce a signaling tone in any receiver removed from its hook on this line, it is objectionable from an operating standpoint.

It is one of the objects of this invention to provide means whereby the source of varying electromotive force will be automatically disconnected from the line whenever a receiver, inadvertently left off its hook, has been restored thereto. It is a further object of this invention to prevent

the reconnection of the said source of electromotive force to the line in case a receiver of a telephone set on the same line is subsequently taken from its hook prior to the disconnection of the source of howler potential from the said line.

This invention will be made clear by the following description of the invention and its mode of operation when read in connection with the attached drawing showing one embodiment of the invention.

In the drawing L_1 represents a subscriber's line having connected therewith two subscribers' stations A and A_1 , the former of which station is represented with the receiver removed from its hook. Associated with the line L_1 are a line relay R_1 and a cut-off relay R_2 . The line L_1 may terminate at the switchboard in a jack J_1 as shown into which may be inserted the plug P_1 of the howler cord circuit. Associated with the howler cord circuit is a key K_1 which when operated to the left connects the leads of the operator's telephone set with the cord circuit and when operated toward the right serves to connect the source of varying electromotive force with the windings of the transformer T_1 .

Connected with the cord circuit are a supervisory relay R_3 , a control relay R_4 and a lamp 5. The source of tone G_1 connected with the primary winding of the transformer T_2 may be of any well known type adapted to create a varying electromotive force. The circuit containing the generator G_1 and the primary winding of the transformer T_2 is adapted to be closed by the operation of the relay R_5 and may be opened by the operation of the relay R_6 , which operations will be more fully described hereafter. The secondary winding of the transformer T_2 is connected by means of a plurality of taps with a plurality of segments of the communicating device 1. This commutating device has associated therewith a grounded arm 2 which supports a brush 3 adapted in the course of rotation of the arm 2 to make contact successively with the various segments of the commutating device. One of the segments of the commutating device is not connected with the secondary winding of transformer T_2 but is connected with the circuit of the controlling relays and the function of this segment is to provide one of the means by

which the initial time of application of the varying electromotive force may be controlled. The lamp 5, associated with the supervisory relay R_3 , indicates the restoration of a receiver to its hook.

Having in mind the foregoing description of the parts of this invention, it will now be made clearer by the following description of its mode of operation. If the subscriber at the station A leaves his receiver off its hook, the contact 6 will be closed, thereby operating the relay R_1 and lighting the line lamp 7 at the switchboard. If the operator notices the steady burning of the lamp 7 and obtains no response from a subscriber on this line, she will report the trouble to the operator at the trouble testing position of the said switchboard. The trouble operator after making suitable voltmeter tests will then insert the plug P_1 of the howler cord circuit in the jack J_1 , thereby operating the cutoff relay R_2 and extinguishing the lamp 7. Lamp 5 of the howler cord circuit will tend to light but will be shunted by the closing of contact 8 of relay R_3 , resulting from the connection of the tip and ring-sides of the line at contact 6 of the subscriber's station A. Also by the operation of relay R_3 , relay R_4 will be operated closing its contact 9.

After challenging, the operator will move the key K_1 toward the right and will release the arm 2 of the commutating device 1 which will be rotated by means of a spring motor or other suitable source of energy. A circuit will be established as soon as the brush 3 comes in contact with segment 4 from the battery B_1 , winding of relay R_5 , contact 10 of key K_1 , contact 9 of the relay R_4 through segment 4 and brush 3 to ground thereby energizing relay R_4 , which will be locked over a circuit from battery B_1 , contact 10 of key K_1 and contact 16 of relay R_5 , to ground. As the result of the closing of the left hand contact of relay R_5 , the circuit including the generator G_1 and the primary winding of the transformer T_2 will be closed, thereby energizing the secondary winding of this transformer. As the rotating arm 2 continues to move in the direction of the arrow, the brush 3 will be brought in contact with segment 12, thereby establishing a circuit from ground through brush 3, segment 12, section "a" of the secondary winding of the transformer T_2 through contact 13 of key K_1 , and winding 14 of the transformer T_1 to ground. The current in the section "a" of the secondary winding will flow through the winding 14 of the transformer T_1 and will set up in the secondary winding 19 of this transformer a potential of minimum value which will cause a flow of current over the line L_1 which will produce a relatively low tone in the receiver at the substation A. As the rotating arm 2 moves around bringing the brush 3 in con-

tact with successive segments an increasing number of sections of the secondary winding of the transformer T_2 will be connected in the secondary circuit thereby increasing the magnitude of the electromotive force applied to the winding 19 of the transformer T_1 . The tone emitted by the receiver at station A will continue to increase in magnitude until the arm 2 brings the brush 3 in contact again with segment 4 when the foregoing described process will be repeated.

If, however, during the period of application of this varying electromotive force to the line L_1 , the subscriber at A restores his receiver to the hook, the contact 6 is thereby opened and relay R_3 will be released, opening its contact 8, which in turn releases relay R_4 . When the armature of relay R_4 falls back closing contact 15, a circuit will be established from battery B_2 , winding of relay R_6 , contact 11 of relay R_5 , contact 15 of relay R_4 and contact 16 of relay R_5 to ground. Relay R_6 will be operated, thereby opening the circuit comprising the generator G_1 and the primary winding of the transformer T_2 which as may be readily seen terminates the application of the varying electromotive force to the line L_1 . The relay R_6 will be locked up over a circuit from battery B_2 , contact 17 of relay R_6 and contact 16 of relay R_5 to ground, and it remains locked until the operator subsequently manipulated the key K_1 , as an act in supervising the connection.

When contact 8 of relay R_3 is opened as the result of the releasing of the said relay, the shunt around lamp 5 is removed thereby permitting the lighting of the said lamp, which indicates the receiver at fault has been restored to its hook. Upon the receipt of this signal, the operator will move key K_1 to its left hand position which results in the connection of her telephone set with the line L_1 , and permits her to supervise the line. If now conditions are normal she withdraws plug P_1 from the jack J_1 , thereby releasing the line L_1 for service. By moving key K_1 to the left, all of its right hand contacts are thereby opened, whereby the locking circuit of relay R_5 is opened, allowing its armatures to fall back which, in turn, opens the locking circuit of relay R_6 . The howler cord circuit is thus restored to its normal condition.

If the operator delays in acting upon the signal given by the lighting of the lamp 5, and thereupon, any subscriber on the line such as at station A_1 , or at station A, removes the receiver from the hook in order to make a call the subscriber will not be subjected to the possibility of hearing an unusual noise in his receiver because the relay R_6 remains locked after the receiver is first restored to its hook and the primary circuit of the transformer T_2 therefore remains open as long as the key K_1 remains

in its right hand position. The only effect of the removal of a receiver from its hook at station A₁ or A subsequent to the restoration of the receiver at fault to its hook is to operate the relay R₃, which in turn operates the relay R₄ opening its contact 15 and closing its contact 9. It will be seen that the locking relay R₆ is no longer dependent upon contact 15 to ensure its remaining in an operated position, but remains locked over contacts 17 and 16 to ground. The primary circuit of the howler circuit will therefore remain open and no potential will be impressed upon the telephone line, even though the howler cord circuit remains connected with the line L₁. If the subscriber at station A₁ or A moves the hook switch up and down, the operator at the trouble position will have her attention attracted by the flashing of the lamp 5. She will accordingly move the key K₁ to its left hand position and finding that the party desires to establish a telephone connection, the operator will withdraw the plug P₁ from the jack J₁, the desired connection will be established by a regular cord circuit in the usual manner.

From the foregoing description, it will be apparent that this invention covers a signaling system of the howler type which is adapted to apply a potential of gradually varying magnitude to a telephone line upon which a receiver has been left off its hook, inadvertently or otherwise, and is designed and intended to automatically disconnect the source of varying potential from the line as soon as the receiver at fault is restored to its hook. The principal result of such automatic control of the source of howler potential is to limit to a minimum the period of application of the said potential to the line, which is decidedly advantageous in the case of party lines since such control reduces correspondingly the period of time during which a line is rendered useless from a transmission standpoint by the application of the howler potential thereto. Furthermore, it will be seen that the means described effectively lock open the circuit containing the said source of signaling energy and prevent therefore its accidental application to the line in case a receiver at any subscriber's station on this line be removed from its hook after the disconnection of the source of howler potential from the line.

Although this invention has been described as embodied in a howler circuit at the trouble position of a switchboard, it is to be understood, that it is not thus limited but may be used whenever and wherever in the application of a source of signaling electromotive force to a line it is desired that the control of the connection of the said source with the said line shall be dependent

upon circuit conditions at a point remote from the said source.

And, furthermore, although this invention has been shown as embodied in a definite, specific form, it is to be understood that it is not intended to so limit it since it is capable of embodiment in other and different forms from that shown within the scope of the appended claims.

What is claimed is:

1. In a signaling system, the combination of a telephone line having associated therewith a substation set in its operated position, a source of signaling potential, means for connecting said source with said line at the instant of minimum potential, means for disconnecting automatically said source from said line when said substation set is restored to its normal nonoperated position, and means for automatically preventing the reconnection of the said source if the said substation set is subsequently operated.

2. In a signaling system, the combination of a telephone line having associated therewith a substation set in its operated position, a source of signaling potential, means for connecting said source with said line to produce an audible tone in the receiver of said set, means for automatically disconnecting and for maintaining disconnected the said source from said line, whenever said substation set has been restored to its normal nonoperated position and means to indicate the position of said substation set.

3. In a signaling system, the combination of a subscriber's line having connected therewith a plurality of substation sets one of said sets having its receiver removed from its hook, a cord circuit having a source of signaling potential associated therewith, means to connect said cord circuit with said line, when the said potential is at the point of minimum intensity, switching means associated with said cord circuit and automatically controlled by the restoration to its hook of the receiver at fault to effectively disconnect said source of potential from said line and locking means to prevent the reconnection of said source in event of the subsequent removal of a receiver from its hook at any of said stations.

4. In a signaling system, the combination of a telephone line having connected therewith a plurality of substation sets one of which is in operated position, a cord circuit having a source of signaling potential associated therewith, means to connect said cord circuit with said line, switching means for connecting said source to said line at the instant of minimum potential and means for automatically rendering said source ineffective as soon as the said one of said substation sets is restored to its nonoperated position thereby reducing to a minimum the period during which other parties are

prevented from using said line on account of the application thereto of said signaling potential.

5 In a signaling system, the combination with a subscriber's telephone line in operated position and a signaling circuit adapted to be connected with the said telephone line and comprising a source of varying potential, means for applying the said potential
10 to the said telephone line only when the potential is at its minimum value, means to effect the removal of the said potential from the said line when the latter has been restored to its unoperated position and means
15 to automatically prevent the reapplication of the said potential if the said subscriber's line is subsequently operated.

6. In a telephone howler system comprising a subscriber's line having a subscriber's telephone set connected thereto, the receiver of which is connected so as to be affected by currents transmitted thereover, a source of varying potential and a plurality of switching means for controlling the connection and disconnection of the said source with the said line, the method which consists in applying a varying potential to the said line and discontinuing the application of the said potential to the line as soon as
25 the said receiver is effectively disconnected from the said line.

7. In a telephone howler system comprising a subscriber's line having a subscriber's telephone set connected thereto, the receiver
35 of which is connected so as to be affected by

currents transmitted thereover, a source of varying potential and a plurality of switching means for controlling the connection and disconnection of the said source with the said line, the method which consists in applying a varying potential to the said line, discontinuing the application of the said potential to the line as soon as the said receiver is effectively disconnected from the said line, and automatically preventing the re-application of the said potential upon subsequent re-connection of the said receiver with the said line.

8. In a telephone howler system, the combination with a subscriber's line having a subscriber's telephone set connected thereto, the receiver of which is so connected as to be affected by currents transmitted thereover, of a source of varying potential, switching means initially controlled manually to automatically connect the said source with the said line, switching means to automatically disconnect the said source from the said line when the said receiver is effectively disconnected from the said line, and locking means to automatically prevent the re-connection of the said source with the said line when the said receiver is again re-connected with the said line.

In testimony whereof, we have signed our names to this specification this 28th day of January, 1920.

GEORGE W. KUHN.
ROGER G. RAMSDELL.