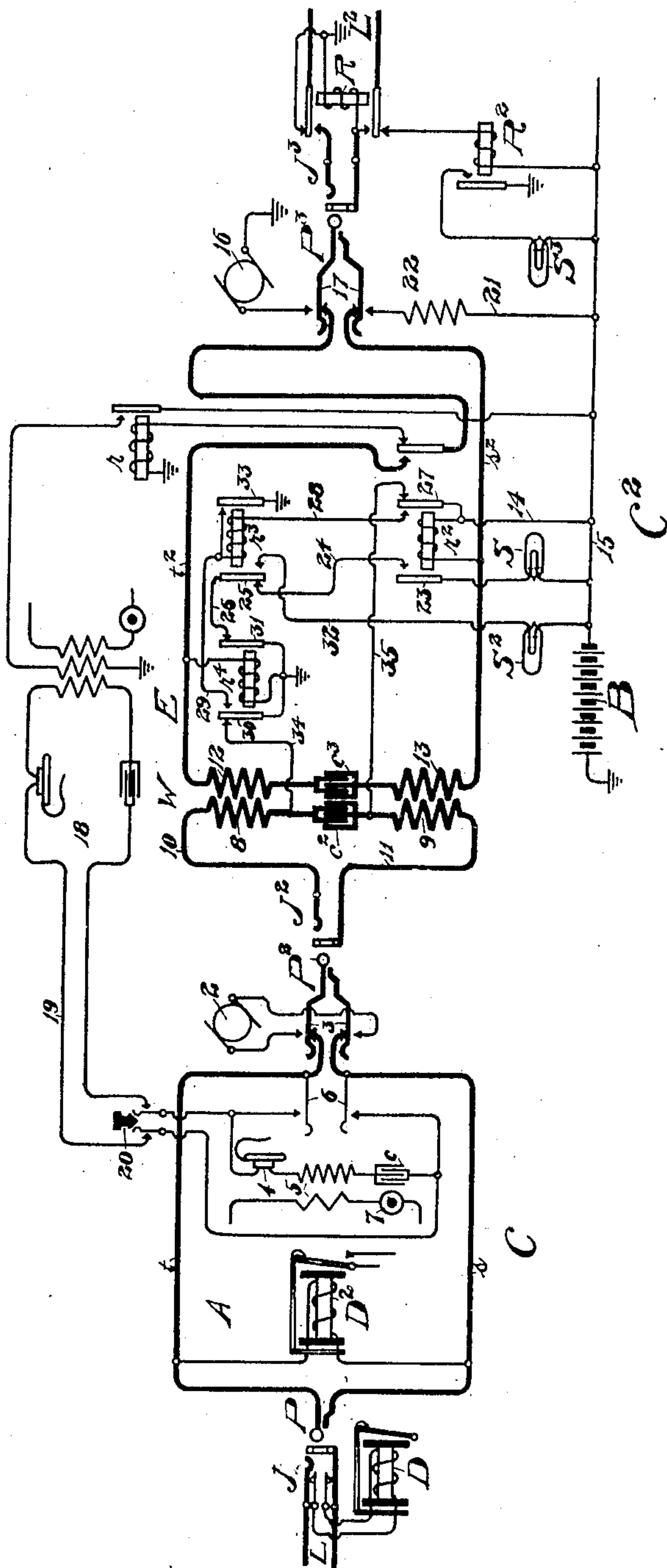


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C. S. WINSTON.  
TELEPHONE CENTRAL OFFICE APPARATUS.

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Witnesses.  
Howard M. Post.  
Edith F. Grier.

Inventor:-  
Charles S. Winston  
by Robert Lewis Ames,  
Attorney.

# UNITED STATES PATENT OFFICE.

CHARLES S. WINSTON, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD & SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

## TELEPHONE CENTRAL-OFFICE APPARATUS.

No. 878,264.

Specification of Letters Patent.

Patented Feb. 4, 1908.

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*To all whom it may concern:*

Be it known that I, CHARLES S. WINSTON, a citizen of the United States, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Telephone Central-Office Apparatus, of which the following is a specification.

My invention relates particularly to means for more accurately supervising connections for conversation between the subscribers of different exchanges and particularly where one of such exchanges is of the ordinary magneto or toll type. In the latter exchanges the cord circuits are usually provided with only a clearing-out drop or signal bridged thereacross and when the subscribers ring off or give the clearing-out signal there are two chances that the drop will be thrown, so that if one subscriber forgets to give the clearing-out ring the other subscriber will be apt to give it so that the connection will not be tied up. When such offices are trunked to other offices, however, the trunk takes the place of one subscriber so that under ordinary circumstances only one clearing-out ring is given at the end of the conversation and if this fails the line and trunk are tied up. Sometimes special cord circuits are employed for such connections and are provided with special apparatus to take care of the matter, but such additional apparatus is expensive and requires the operators to learn and practice more than one method of making connections.

In the system of signaling in vogue on incoming trunks, the incoming operator does not receive the disconnect signal from the called subscriber but from the outgoing operator who receives it from the called subscriber and by taking down the connection automatically transmits it to the incoming operator. This system has its shortcomings when the trunks are used in connection with the common magneto cord circuit at the outgoing end, since failure to receive the disconnect signal from the one magneto subscriber would result in tying up both the lines and the trunk.

In the present invention I seek to provide a signaling apparatus in association with trunks extending between such offices as above mentioned, by means of which the common cord circuits may be employed at the magneto end, the disconnect signal being

received by both operators from their respective subscribers, and in case the common battery subscriber hangs up first and the trunk cord is taken down the disconnect signal is automatically transmitted to the magneto operator, so that if she has not already received the signal from the magneto subscriber it is received from the other operator. This arrangement results in more quickly freeing the lines at the incoming office than if the other system of signaling was employed and since the latter lines are usually the more important and busier, the efficiency of the service is increased as a whole.

My invention is illustrated in the accompanying drawing, in which the figure is a diagram of a telephone system embodying my improvements.

In the figure L represents a magneto telephone line terminating in the usual jack J and drop D at the magneto office C where the usual cord circuits A are provided, each terminating in an answering plug P and a calling plug P<sup>2</sup> having tip and sleeve strands t and s extending between the corresponding contacts of the said plugs. A clearing-out drop D<sup>2</sup> is bridged across the cord circuit and a calling generator 2 is adapted to be connected with the calling plug P<sup>2</sup> by the operation of the ringing key springs 3. The operator's set consists of a head receiver 4, an induction coil 5, and a condenser c, adapted to be suitably connected with the cord circuit through the medium of listening key springs 6. Her transmitter 7 and the primary of her induction coil are adapted to be charged from any suitable source of current.

The trunk line E intervening between the magneto central office C and the common battery office C<sup>2</sup> is provided with a suitable jack J<sup>2</sup> at the magneto office and a connecting plug P<sup>3</sup> at the common battery office, said plug having contacts adapted to register with the corresponding contacts of the springjack J<sup>3</sup> of the common battery telephone lines L<sup>2</sup> terminating at said office. A repeating coil W is interposed in the trunk line, the windings 8 and 9 thereof, together with a suitable condenser c<sup>2</sup>, being connected with the jack of the trunk, while the windings 12 and 13 of said repeating coil, together with a second condenser c<sup>3</sup>, are interposed between the conductors terminating in the tip



and sleeve cord strands  $t^2$  and  $s^2$  leading to the trunk plug  $P^3$ . The forward portion of the tip strand  $t^2$  of the trunk is normally connected with a suitable high resistance and high impedance test relay  $r$  which is dis-associated therefrom and the said strand completed for conversation upon the energization of a second relay  $r^2$  (which may be termed the "sleeve relay") connected upon one side with the strand  $s^2$  and upon the opposite side by conductor 14 with a common battery lead 15 extending from the live pole of the central common battery B. A suitable ringing lamp or signal S has its circuit controlled at one point by normally-open contacts of said relay  $r^2$  and normally-closed contacts of an additional relay  $r^3$  and a fourth relay  $r^4$  which for convenience may be termed the "tip relay". A disconnect signal  $S^2$  is provided for said trunk and has its circuit controlled through normally-open contacts of said relay  $r^3$  and normally-closed contacts of said relay  $r^4$ . A suitable ringing generator 16 is adapted to be connected with the trunk plug  $P^3$  by the ringing key springs 17 to call the wanted subscriber. The trunk operator's telephone set 18 is connected with an order circuit 19 which is adapted to be connected with the operator's set at the magneto office by means of the usual order key 20. The common battery line  $L^2$  is provided with the usual line signal  $S^3$  having its circuit normally controlled by the line relay  $R^2$  and which is adapted to be disconnected from the line during conversation, to render the line signal inoperative, by means of the cut-off relay R.

In the operation of this arrangement, a call coming in upon the magneto line L is answered by the operator who inserts the plug P of her cord circuit in the jack of the calling line, thereby rendering the line signal D inoperative, and connects her set with the cord circuit by means of the listening key 6 to receive the order from the subscriber. Upon learning that the party desires to converse with a subscriber connected with the common battery office, she depresses her order key 20 and informs the trunk operator of the number wanted. The latter operator nominates the trunk to be used for the connection and immediately tests the condition of the wanted line and upon finding the same idle inserts the trunk plug in the jack of that line upon her section of the switchboard and presses the ringing key 17 to call said subscriber. The operator at the magneto office simultaneously inserts the calling plug  $P^2$  of her cord circuit in the jack  $J^2$  of the trunk designated. The insertion of the trunk plug  $P^3$  energizes the cut-off relay R of the line  $L^2$  with which it is connected by means of current from the central common battery B flowing over conductors 15 and 14 through relay  $r^2$ , strand  $s^2$  of the cord circuit and

thence through the winding of the cut-off relay R to ground, thus rendering the line signal of said line inoperative during the connection. The operation of the ringing key 17 severs this path through the relay  $r^2$  but completes a parallel path by means of its sleeve spring through the conductor 21 containing the non-inductive resistance 22 and conductor 15, to maintain the cut-off relay operated during ringing. The ringing current is sent over the tip side of the telephone line, thence through the bridged bell at the substation of said line and back to the central office over the sleeve side of the line and through said conductors 21 and 15 and the battery B to ground.

After the subscriber has been called but before his response, current flows over the path just traced through the cut-off relay, thereby also energizing the sleeve relay  $r^2$ . The actuation of this relay causes several circuit changes; for instance, the ringing lamp S is now lighted over a path from the live pole of the battery B through said lamp, spring 23 of said relay  $r^2$  and its forward contact, conductor 24, back contact and spring 25 of relay  $r^3$ , conductor 26 and the back contact and spring 31 of relay  $r^4$  to ground. This lamp remains lighted until the response of the called subscriber. The actuation of relay  $r^2$  also disconnects the test relay  $r$  and completes the strand  $t^2$  of the trunk circuit for conversation. The spring 27 of said relay  $r^2$  is now in engagement with its forward contact which is joined by conductor 28 with one terminal of the relay  $r^3$  whose opposite terminal is united by a second conductor 29 with the forward contact of spring 30 of relay  $r^4$ . Now when the called subscriber responds a path for current from the battery B is provided over his metallic line with return over the tip side thereof and through the tip relay  $r^4$  to ground. This relay responds to said current and attracts its spring 31, thereby opening the circuit of the ringing lamp S to retire the same and indicating to the operator that the called subscriber has responded. The spring 30 of said relay is also attracted to complete a path for current through the relay  $r^3$  over conductors 29 and 28, spring 27 and conductors 14 and 15, which energizes said relay  $r^3$  causing its spring 25 to contact with conductor 32 containing the disconnect signal  $S^2$ . A locking circuit for said relay is also completed by means of its spring 33 so that said relay thereafter remains energized until the relay  $r^2$  is deenergized, or until the plug  $P^3$  is withdrawn. The parties are now in communication, current from the battery B being supplied to the common battery line  $L^2$  for talking purposes, while a local battery furnishes current to the magneto line L for its conversation. The voice currents are of course repeated from one end to the other of



the complete circuit thus established by means of the repeating coil W. At the termination of the conversation the return of the common battery subscriber's receiver deenergizes the tip relay  $r^1$  which permits its spring 31 to complete a circuit for the disconnect lamp  $S^2$  over conductors 15 and 32, spring 25, conductor 26 and said spring 31 to ground. This indicates to the trunk operator that the conversation has finished and she immediately withdraws the plug  $P^3$  to restore the line  $L^2$  to normal condition. The deenergization of the relay  $r^1$  also permits spring 30 of relay  $r^1$  to rest upon its back contact which completes a path for current from ground through said spring, conductor 34, coil 8 of the repeating coil W, conductor 10 of the trunk circuit, strand  $t$  of the magneto cord circuit A, thence through the clearing-out drop  $D^2$  bridged across said cord circuit, strand  $s$ , conductor 11 of the trunk, winding 9 of the repeating coil W, conductor 35 leading to the back contact of spring 27 of relay  $r^2$ , and if the plug  $P^3$  has been withdrawn via said spring 27, and thence through conductors 14 and 15 to the live pole of the battery B. The current in this path is sufficient to throw the clearing-out drop  $D^2$  in the magneto cord circuit A and thereby to indicate to said magneto operator that the conversation has terminated. Thus the common battery line  $L^2$  is not tied up any longer than is necessary. This differs from the usual method of operating trunks between exchanges since it is not necessary for the initiating operator, such as the operator at the office C, to first receive the disconnect signal and then transmit the same to the trunk operator by the taking down of her cord circuit. The present method of operation is of particular advantage where the magneto exchange is small and of less importance than the common battery exchange, the desideratum being to free the common battery lines as soon as possible.

I claim:

1. The combination with a trunk circuit extending between telephone switchboard sections, of a cord circuit at the outgoing end of the trunk provided with a bridged clearing-out signal, and means whereby when the connection is taken down at the incoming end of the trunk a current is sent through said clearing-out signal in the cord circuit at the outgoing end of the trunk, substantially as described.

2. The combination with a telephone trunk circuit extending between different switchboard sections, of a cord circuit at the outgoing end of the trunk, provided with a bridged clearing-out signal and adapted for use to establish connections between the telephone lines terminating in the switchboard at said end of the trunk and also for connecting such lines with the trunk, and

means whereby when the connection is taken down at the incoming end of the trunk a clearing-out current is sent through said clearing-out signal in the cord circuit at the opposite end of the trunk, substantially as described.

3. The combination with a trunk circuit extending between a magneto telephone exchange and a common battery exchange, of cord circuits to connect the lines of the magneto exchange with the said trunk circuit, a disconnect signal for said cord circuit, a connecting cord provided for the trunk of the common battery office to enable the same to be directly connected with the subscribers' lines terminating at said office, means for indicating to the operator at the common battery office when the subscriber of the line with which the trunk is connected has hung up his receiver, whereby the connection may be taken down at said office and the subscriber's line released and means at the common battery exchange for actuating this disconnect signal, substantially as described.

4. The combination with a trunk circuit extending between a magneto office and a common battery office, a cord circuit at the former office provided with a bridged clearing-out drop and adapted for connecting together the subscribers' lines of said office and for connecting such lines with the trunk, a trunk cord provided for the trunk at the common battery office to enable the same to be directly connected with the telephone lines terminating at said office, means for giving the disconnect signal to the operator at the latter office when the common battery subscriber hangs up his telephone, and means whereby when the connection is taken down at said common battery office a source of current is connected with the trunk to send current thereover to the magneto exchange and through the clearing-out signal in the cord circuit to thereby operate the same and indicate to the operator at the magneto office that the conversation has terminated, substantially as described.

5. The combination with a trunk circuit extending between a magneto central office and a common battery central office, of a cord circuit provided with a bridged clearing-out drop at the former office to connect the subscribers' lines with the trunk, a connecting cord for the trunk at the latter office to enable the same to be directly connected with the subscribers' lines, a source of current at the latter office included by the trunk cord in the telephone line to furnish current thereover for conversation, and means whereby when the common battery subscriber hangs up his telephone the disconnect signal is given to the operator at the common battery office and when the trunk is disconnected from the line said source is connected with the outgoing end of the trunk to send



current thereover to the magneto office to operate the clearing-out drop in the cord circuit, substantially as described.

6. The combination with a trunk circuit extending between telephone switchboard sections, of a cord circuit at the outgoing end of the trunk provided with a clearing-out signal, and means whereby a current is sent through said clearing-out signal when the connection is severed at the incoming end of the trunk, substantially as described.

7. In a telephone system, the combination with a trunk circuit extending between different telephone switchboards, of a cord circuit associated with one of the switchboards and adapted to connect magneto telephone lines together for conversation, a cord associated with the second switchboard and acting as one terminal of said trunk line, said cord being adapted to connect with common battery telephone lines, relays associated with the incoming end of said trunk cord adapted to maintain battery, connected between the limbs of said trunk line whenever said trunk cord is disconnected from a telephone line at the common battery end, and a signal associated with said cord circuit adapted to be operated by said battery under one condition, substantially as described.

8. In a telephone system, the combination with magneto telephone lines, of a cord circuit at the central office thereof adapted to connect said lines together for conversation, a signal associated with said cord circuit adapted to be displayed from any of the substations to which said cord circuit may be connected, a trunk circuit extending from said central office to the central office of a common battery system and terminating in said latter office in a cord and plug; supervisory signals associated with said trunk cord, means whereby after conversation has been established throughout, the supervisory signal of the magneto system is either under control of the magneto subscriber or the trunk operator, and whereby the supervisory signal of the trunk is entirely under the control of the common battery subscriber, substantially as described.

9. In a telephone system, the combination with a plurality of central energy telephone lines terminating at a central switchboard, of a trunk line extending from said central switchboard to a switchboard of a local bat-

tery system, a cord circuit permanently associated with said trunk line at the central energy switchboard, a connecting plug for said cord circuit adapted to connect with any of the subscribers' lines of said central energy system, supervisory relays associated with said cord circuit, two signals associated with said relays at the central energy switchboard, one adapted to be displayed before the central energy subscriber has answered his call and effaced during conversation, and the other adapted to be displayed when said central energy subscriber replaces his receiver on the hook, and effaced when connection is severed with his line, a third signal at the local battery switchboard adapted to be displayed through the deenergization of said supervisory relays when the connection is severed between said plug and the common battery subscriber's line, substantially as described.

10. In a telephone system, the combination with a trunk circuit, of a cord circuit to connect therewith at one end, and a telephone line with which the other end may be connected, a source of current at the incoming end normally bridged between the limbs of the trunk line, a signal associated with the cord circuit actuated by current from said source when the cord is connected with the trunk, and means to disconnect said source when the trunk is connected with the line, whereby said signal becomes inoperative, substantially as described.

11. The combination with a telephone trunk circuit extending between different switchboard sections, of a cord circuit at the outgoing end of the trunk provided with a signal and adapted for use to establish connections between the telephone lines of the switchboard at said end of the trunk, and also for connecting such lines with the trunk, and means whereby current is sent through said signal from the incoming end of the trunk when the connection is severed between the trunk and the telephone line at the incoming end, substantially as described.

Signed by me at Chicago, county of Cook, State of Illinois, in the presence of two witnesses.

CHARLES S. WINSTON.

Witnesses:

EDITH F. GRIER,  
ROBERT LEWIS AMES.