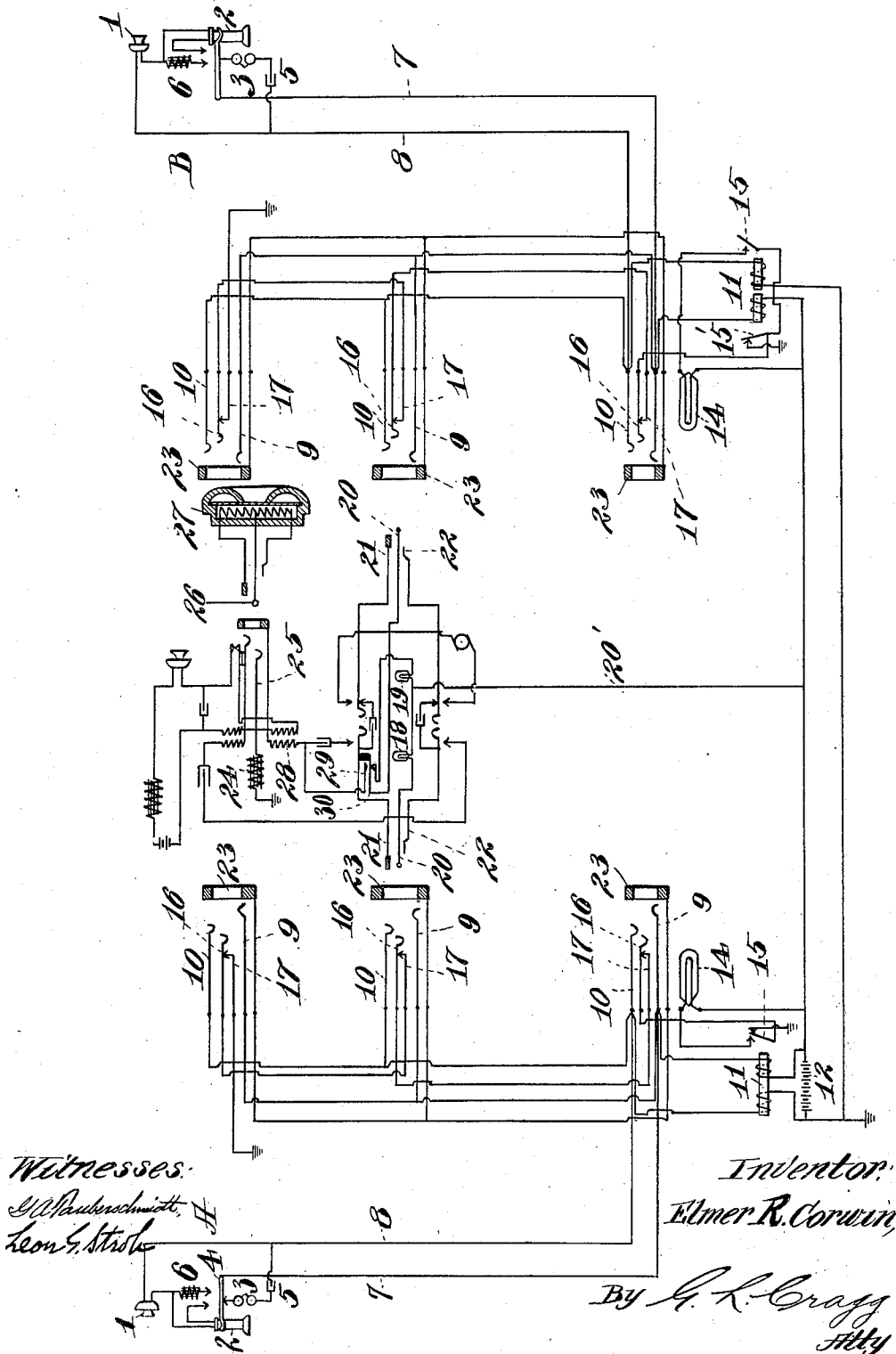


No. 888,873.

PATENTED MAY 26, 1908.

E. R. CORWIN.  
TELEPHONE EXCHANGE SYSTEM.

APPLICATION FILED OCT. 1, 1906.



# UNITED STATES PATENT OFFICE.

ELMER R. CORWIN, OF CHICAGO, ILLINOIS, ASSIGNOR TO MONARCH TELEPHONE MANUFACTURING CO., A CORPORATION OF ILLINOIS.

## TELEPHONE-EXCHANGE SYSTEM.

No. 888,873.

Specification of Letters Patent.

Patented May 26, 1908.

Application filed October 1, 1906. Serial No. 337,028.

*To all whom it may concern:*

Be it known that I, ELMER R. CORWIN, 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 Telephone-Exchange Systems, 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 telephone exchange systems, and has a number of objects in view.

By means of one feature of my invention, I am enabled to dispense with cut-off relays that are now commonly employed in common battery systems, which feature of my invention is serviceable in connection with non-multiple switch-boards and which, in accordance with another feature of my invention, may be made serviceable in multiple switch-boards.

By means of another feature of my invention, the test contacts of the jacks of multiple switch-boards are charged or electrified by test battery current independently of the strands of the cord circuits.

By means of another feature of my invention, my improved control of line signals may be so used in conjunction with the clearing-out or supervisory signals as to simplify the operation of the latter.

As the various features of my invention will be more readily understood by the description thereof as embodied in a working system, I will more fully explain the same in connection with the accompanying drawing, showing the preferred embodiment of the invention, the drawing showing a multiple switch-board system including telephone lines extending from subscribers' stations to an exchange, where suitable apparatus is employed for carrying out the various features of the invention.

There are indicated two of many sub-stations, A, B, each, in the embodiment of the invention shown, having a transmitter 1, a receiver 2, a call bell 3, a switch-hook 4, a condenser 5, and an impedance coil 6, together with suitable contacts and circuit connections, whereby, when the telephone receivers 2 are upon their switch-hooks, the bells 3, together with the condensers 5, are bridged across the sides of the telephone lines 7, 8, and whereby, when the telephone receivers are removed from their hooks, the bridges

including said signaling bells are opened and the transmitters are thrown into conductive connection with the lines, whereby battery may be fed through the impedance coil 6, and whereby the telephonic currents may be impressed upon the lines at the sub-stations at the transmitters or may be received at the receiver. I do not wish to be limited, however, to the particular character of line stations indicated. The limbs 7, 8 of the telephone line are, in multiple switch-board practice, multiplied to jack contacts 9, 10, though there are features of the invention which may be useful in connection with switch-boards that are not multiple switch-boards, in which case but one jack need be supplied to a line. In multiple switch-board practice, one of the jacks may act as an answering jack, the answering jacks, as is understood, being suitably distributed among the different sections of the switch-board, the multiple jacks being multiplied to the several sections of the switch-board, which grouping arrangement or any other preferred grouping is well understood.

In the embodiment of the invention shown, the line relays 11 have their windings desirably permanently associated with the corresponding telephone lines and the common talking battery 12, this talking battery desirably having one of its poles permanently connected with one side of each subscriber's or other telephone line circuit through a fraction of the winding of the corresponding relay 11, and the other terminal permanently connected with the other side of each subscriber's or other telephone line circuit through the remaining portion of the winding of said relay. When a subscriber removes his telephone, the line relay 11 becomes energized, whereby a circuit through the line signal device 14, preferably a small incandescent lamp, may be closed by way of a line relay switch 15 and its front contact, said armature switch 15 being desirably, though not necessarily, connected with one pole of the same battery 12, while the lamp desirably has one terminal permanently connected with the other pole of the same battery, which other pole of said battery becomes connected with said lamp when the switch is moved by the relay 11, a grounded pole of said battery being connected with the other terminal of said lamp when the switch 15 is attracted. Each lamp 14 is thus adapted-

ed for inclusion in a local circuit at the exchange with a source of current. In order that cut-off relays may be dispensed with, I include jack contacts in series with each  
 5 lamp 14, which contacts are in the same local circuit therewith, and which contacts are separated by an inserted plug, in order to open the corresponding local circuit and efface the signal occasioned by the corre-  
 10 sponding line signal device.

Where the invention is embodied in a multiple switchboard system, each jack is desirably provided with these contacts for effacing the line signals in connection with calling telephone lines and for preventing the operation of the line signals associated with  
 15 called telephone lines. These contacts are desirably totally distinct from the talking conductors of the system and are preferably in the form of spring contact members 16 and back contacts 17 normally engaged with said  
 20 spring contact members. In multiple switchboard practice, the local circuit for each line signal device 14 includes the contacts 16, 17 of all of the jacks in association with the  
 25 same line to which each line signal 14 corresponds, so that the local circuit of each line signal device may be opened at any jack.

The contacts 9, 10 of each jack are desirably permanently connected with the limbs of the corresponding telephone line, the contacts 9 being connected in parallel with each other, while the contacts 10 are connected in parallel with each other.

Tracing out in detail a local circuit of one of the line indicators 14 as it occurs in a multiple switch-board we find that its circuit extends from the grounded terminal of the battery 12 through said battery, through the  
 40 lamp 14, the armature switch 15 when attracted, the spring contact 16 of the first jack, contact 17 of said jack, the spring contact 16 of the intermediate jack, contact 17 engaging the latter contact 16, contact 16 of  
 45 the upper jack, and the contact 17 engaging the contact 16, thence to ground back to the grounded terminal, to battery 12.

In order to simplify the operation of the disconnect or supervisory signals, I employ a  
 50 grounded back contact or the armature switch 15, as indicated at the left of the drawing, or else provide a supplemental armature switch 15<sup>1</sup> with a grounded contact normally engaging the same, as indicated  
 55 upon the right of the drawing, the circuit arrangements shown in these two parts of the drawing being similar in function though slightly different in structural characteristics, as will be apparent.

Each of the supervisory lamps 18, 19, (it being preferable, though not necessary, to employ one clearing-out indicator corresponding to each of the connecting subscribers) is included in a local circuit that contains a tip  
 65 plug contact 20, the spring 16 adapted for

engagement with said contact 20 when the plug is inserted, a switch 15 or the switch 15<sup>1</sup>, as the case may be, to the ground placed upon said switch when unattracted, thence to the grounded terminal of the battery 12, through  
 70 said battery, to the tip strand uniting the tip contacts 20 by way of the conductor 20<sup>1</sup>, the battery being connected between the signal lamps 18, 19, that intervene between the conductor 20<sup>1</sup> and the tips 20. The circuit just  
 75 described has reference to the circuit established when connection is made with the lowermost jack, but it is apparent that if the connection is made with any other jack, that this circuit last traced will also include the  
 80 contact elements 16, 17 of the jack or jacks beneath the one with which connection is made.

It will be seen that when the subscriber's telephone is upon its switch-hook, the supervisory or disconnect circuit is closed, and that when the telephone is removed, that the supervisory or disconnect circuit is opened, all due to the position of the armature switch 15 upon the left or the armature switch 15<sup>1</sup> upon  
 90 the right. The contact element or elements 16 thus serve as portions of the line signal circuits and also as portions of the supervisory or disconnect signal circuits that may act in coöperation with the line relays to  
 95 govern the continuity of the line signal circuits and the supervisory signal circuits, this feature of the invention being of material service whether the invention is embodied in a multiple or non-multiple switch-board.  
 100

I have not deemed it necessary to describe in detail the cord and plug connecting outfit illustrated, a plurality of which are employed at the exchange, as is well understood, as the illustration thereof will clearly reveal its  
 105 nature.

It is apparent that the sleeve and body contacts 21, 22 of each of the plugs are the talking contacts adapted respectively for engagement with the jack contact elements 10  
 110 and 9, while the tip contacts 20 are desirably distinct from the talking contacts, being employed purely for the disconnect or supervisory signal circuits and in multiple switch-board practice for testing purposes.  
 115

In multiple switch-board practice I am enabled to electrify the thimbles 23 of the jacks independently of the strands of the cord circuits, to which end the body contacts 22 of the plugs, when inserted in the jacks, connect the thimbles 23 of the engaged jacks with the corresponding spring contacts 9, whereby all of the thimbles 23 in a group having one engaged with a plug, are connected with the ungrounded terminal of the  
 120 battery 12, as all of the thimbles of the jacks corresponding to a line are electrically connected. The testing circuit illustrated, for sake of example, includes the grounded impedance device 24 connected with a spring 25  
 125 130

of a spring jack, the tip 26 of a plug adapted for insertion in said jack, the lower half of the operator's receiver coil 27, the body contact of the plug, the thimble contact of said jack, a portion 28 of the operator's induction coil, normally open contact 29, spring 30 engaged with contact 29 when the operator's key is actuated, thence to the tip of the testing plug, the right hand plug, to the thimble 23 of the jack being tested, the contact 9, if it happens to be connected with the thimble 23 either directly or indirectly, through one winding of the relay 11, to the ungrounded pole of the battery 12, whose grounded pole, obviously, is connected with the grounded terminal of the device 24. It will thus be seen that a very efficient and simple test system is afforded, which has the particular advantage of avoiding clicks in the subscribers' receivers.

It is obvious that changes may be made in the embodiment of the invention specifically illustrated and described, without departing from the spirit of the invention, and I do not, therefore, wish to be limited to the precise embodiment shown, but,

Having thus described my invention, I claim as new and desire to secure by Letters Patent the following:—

1. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, jacks for the telephone lines, said jacks having contacts associated with the circuits of the line signal devices, cord circuits having plugs adapted to operate upon said contacts to alter the circuits of the line signal devices to render the corresponding line signal devices inert, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanism entering into the control of the circuits of the supervisory or disconnect signals, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

2. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in local circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, jacks for the telephone lines, said jacks having contacts associated with the circuits of the line signal device, cord circuits having plugs adapted to operate upon said contacts to alter the circuits of the line signal devices to render the corresponding line signal devices inert, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanism

entering into the control of the circuits of the supervisory or disconnect signals, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

3. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, a jack for each telephone line, each of said jacks having two contacts serially included in the circuit of the corresponding line signal device, cord circuits having plugs adapted to operate upon said contacts of an engaged jack to separate the same and thereby open the circuit of the corresponding line signal device to render the corresponding line signal device inert, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanism entering into the control of the circuits of the supervisory or disconnect signals, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

4. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in local circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, a jack for each telephone line, each of said jacks having two contacts serially included in the circuit of the corresponding line signal device, cord circuits having plugs adapted to operate upon said contacts of an engaged jack to separate the same and thereby open the circuit of the corresponding line signal device to render the corresponding line signal device inert, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanism entering into the control of the circuits of the supervisory or disconnect signals, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

5. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, jacks for the telephone lines, said jacks having contacts associated with the circuits of the line signal devices, cord circuits having plugs adapted to operate upon said contacts to alter the circuits of the line signal devices to render the corresponding line signal devices inert, a source of current

common to the circuits of the line relays and line signal devices, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanism entering into the control of the circuits of the supervisory or disconnect signals, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

6. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in local circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, jacks for the telephone lines, said jacks having contacts associated with the circuits of the line signal devices, cord circuits having plugs adapted to operate upon said contacts to alter the circuits of the line signal devices to render the corresponding line signal devices inert, a source of current common to the circuits of the line relay mechanisms and line signal devices, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanism entering into the control of the circuits of the supervisory or disconnect signals, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

7. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms, at the exchange, line signal devices included in circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, a jack for each telephone line, each of said jacks having two contacts serially included in the circuit of the corresponding line signal device, cord circuits having plugs adapted to operate upon said contacts of an engaged jack to separate the same and thereby open the circuit of the corresponding line signal device to render the corresponding line signal device inert, a source of current common to the circuits of the line relays and line signal devices, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanism entering into the control of the circuits of the supervisory or disconnect signals, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

8. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in local circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, a jack for each telephone line,

each of said jacks having two contacts serially included in the circuit of the corresponding line signal device, cord circuits having plugs adapted to operate upon said contacts of an engaged jack to separate the same and thereby open the circuit of the corresponding line signal device to render the corresponding line signal device inert, a source of current common to the circuits of the line relay mechanisms and line signal devices, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanism entering into the control of the circuits of the supervisory or disconnect signals, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

9. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, jacks for the telephone lines, said jacks having contacts associated with the circuits of the line signal devices, cord circuits having plugs adapted to operate upon said contacts to alter the circuits of the line signal devices to render the corresponding line signal devices inert, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanisms entering into the control of the circuits of the supervisory or disconnect signals and governed by the line relay mechanisms, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

10. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in local circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, jacks for the telephone lines, said jacks having contacts associated with the circuits of the line signal devices, cord circuits having plugs adapted to operate upon said contacts to alter the circuits of the line signal devices to render the corresponding line signal devices inert, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanisms entering into the control of the circuits of the supervisory or disconnect signals and governed by the line relay mechanisms, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

11. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line

signal devices included in circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, a jack for each telephone line, each of said jacks having two contacts serially included in the circuit of the corresponding line signal device, cord circuits having plugs adapted to operate upon said contacts of an engaged jack to separate the same and thereby open the circuit of the corresponding line signal device to render the corresponding line signal device inert, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanisms entering into the control of the circuits of the supervisory or disconnect signals and governed by the line relay mechanisms, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

12. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in local circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, a jack for each telephone line, each of said jacks having two contacts serially included in the circuit of the corresponding line signal device, cord circuits having plugs adapted to operate upon said contacts of an engaged jack to separate the same and thereby open the circuit of the corresponding line signal device to render the corresponding line signal device inert, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanisms entering into the control of the circuits of the supervisory or disconnect signals and governed by the line relay mechanisms, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

13. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, jacks for the telephone lines, said jacks having contacts associated with the circuits of the line signal devices, cord circuits having plugs adapted to operate upon said contacts to alter the circuits of the line signal devices to render the corresponding line signal devices inert, a source of current common to the circuits of the line relays and line signal devices, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanisms entering into the control of the circuits of the supervisory or disconnect signals and governed by the line relay mechanisms, said supervisory

or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

14. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in local circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, jacks for the telephone lines, said jacks having contacts associated with the circuits of the line signal devices, cord circuits having plugs adapted to operate upon said contacts to alter the circuits of the line signal devices to render the corresponding line signal devices inert, a source of current common to the circuits of the line relay mechanisms and line signal devices, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanisms entering into the control of the circuits of the supervisory or disconnect signals and governed by the line relay mechanisms, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

15. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, a jack for each telephone line, each of said jacks having two contacts serially included in the circuit of the corresponding line signal device, cord circuits having plugs adapted to operate upon said contacts of an engaged jack to separate the same and thereby open the circuit of the corresponding line signal device to render the corresponding line signal device inert, a source of current common to the circuits of the line relays and line signal devices, supervisory or disconnect signal circuits associated with the cord circuits, and switching mechanisms entering into the control of the circuits of the supervisory or disconnect signals and governed by the line relay mechanisms, said supervisory or disconnect signal circuits also being adapted to have included therein plug contacts and aforementioned contacts engaged by said plug contacts.

16. A telephone exchange system including telephone lines extending to an exchange, line relay mechanisms at the exchange, line signal devices included in local circuits governed by the line relay mechanisms when said relay mechanisms are operated by calling subscribers, a jack for each telephone line, each of said jacks having two contacts serially included in the circuit of the corresponding line signal device, cord circuits having plugs adapted to operate upon said con-

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tacts of an engaged jack to separate the same  
and thereby open the circuit of the corre-  
sponding line signal device to render the  
corresponding line signal device inert, a  
5 source of current common to the circuits of  
the line relay mechanisms and line signal de-  
vices, supervisory or disconnect signal cir-  
cuits associated with the cord circuits, and  
switching mechanisms entering into the con-  
10 trol of the circuits of the supervisory or dis-  
connect signals and governed by the line  
relay mechanisms, said supervisory or dis-

connect signal circuits also being adapted to  
have included therein plug contacts and  
aforementioned contacts engaged by said 15  
plug contacts.

In witness whereof, I hereunto subscribe  
my name this twenty-sixth day of September  
A. D., 1906.

ELMER R. CORWIN.

Witnesses:

G. L. CRAGG,

LEON G. STROH.