

Oct. 27, 1925.

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E. VON NOSTITZ
TELEPHONE EXCHANGE SYSTEM

Filed Feb. 21, 1921

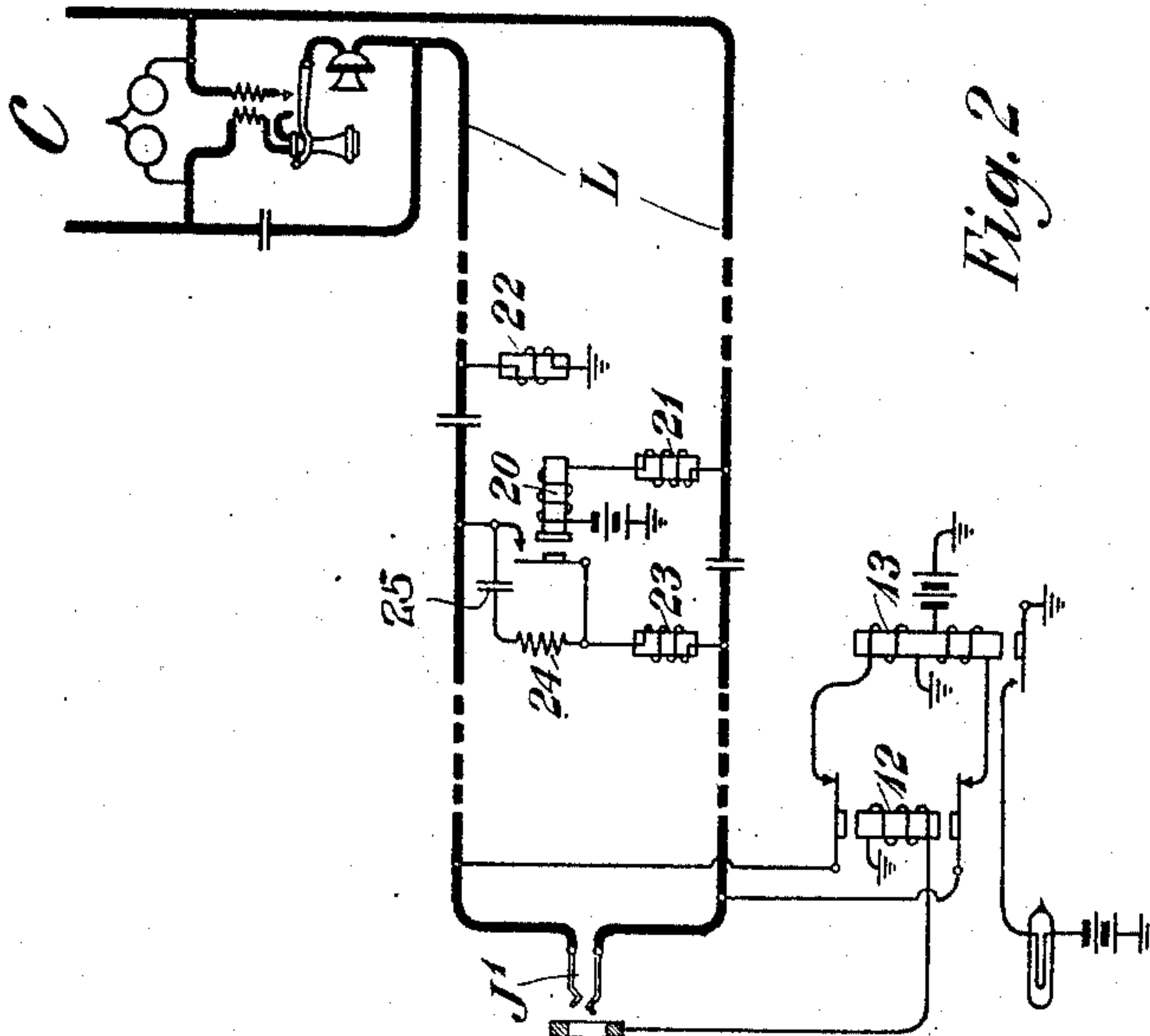


Fig. 2

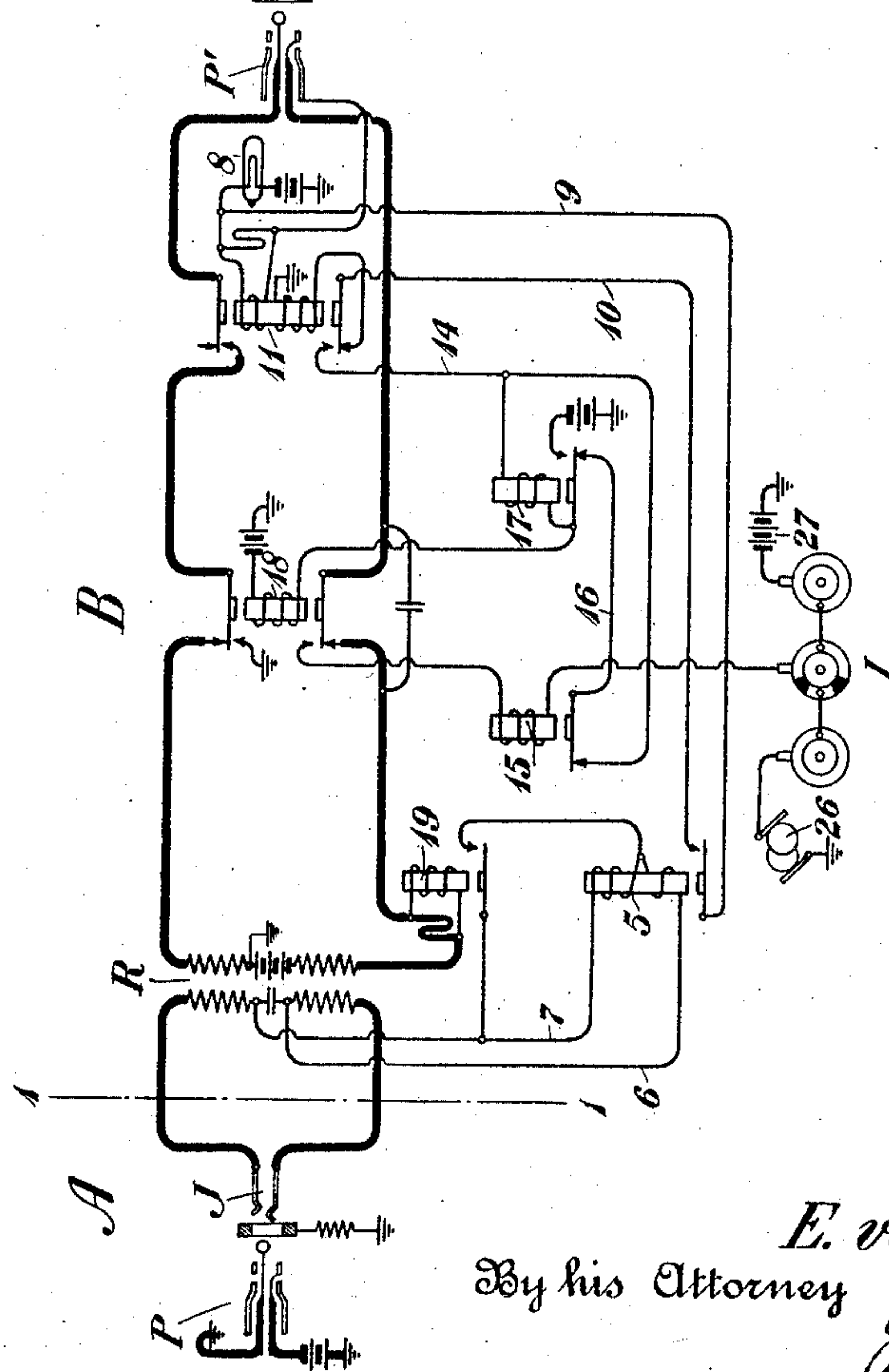


Fig. 1

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UNITED STATES PATENT OFFICE.

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TELEPHONE-EXCHANGE SYSTEM.

Application filed February 21, 1921. Serial No. 446,539.

To all whom it may concern:

Be it known that I, ERICH VON NOSTITZ, residing at Brooklyn, in the county of Kings and State of New York, have invented certain Improvements in Telephone-Exchange Systems, of which the following is a specification.

This invention relates to telephone systems, and more particularly to such systems of the central energy type in which a source of ringing current is automatically connected to and disconnected from a telephone line.

An object of this invention is the production of improved signaling means for systems of this character, in which the signal control apparatus function independently of the length of the telephone lines to which the signaling current may be connected.

In carrying out the object of the invention, there is provided at the central office, means for connecting the source of signaling current with a telephone line, and means associated with the line operable in response to the subsequent closure of said line for disconnecting the source therefrom.

This invention may now be more fully understood from the following description, when considered in connection with the accompanying drawing, in which Figure 1 shows a trunk circuit B extending from a switchboard A and terminating in a plug P'. The portion of the apparatus to the left of the dotted line 1—1 is associated with the switchboard A, while that to the right of said line is associated with a switchboard indicated by the trunk B. In Fig. 2 is shown a jack J' adapted to be associated with plug P' of trunk B, said jack being connected with a long line circuit terminating at a subscriber's station C. The operation of the system will be more fully understood from the following detailed description.

Assuming that an operator B has assigned the trunk B to be used in completing a connection with the telephone line C, and that the operator at A has inserted plug P of a cord circuit (not shown) in jack J, relay 5 will be energized by a circuit from battery and ground connected with said plug, over the tip and ring contacts of plug P and jack J, tip and ring conductors of trunk B, left hand windings of repeating coil R, conductors 6 and 7, through the windings of relay 5 in series. The operation of relay 5 lights the guard lamp 8 over the following circuit:

from battery, filament of lamp 8, conductor 9, make contact of relay 5, conductor 10, lower back contact and lower winding of relay 11 to ground. Relay 11, however, does not operate under this condition. The lighting of lamp 8 serves as an indication to the operator at trunk B that connection has been completed with the assigned trunk and she thereupon inserts plug P' in jack J' of the subscriber's line L, causing the operation of relay 11 over the following circuit: from ground, winding of cut-off relay 12, sleeve conductor and sleeve contacts of jack J' and plug P', upper winding of relay 11, filament of lamp 8 to battery. The closing of this circuit causes the operation of cut-off relay 12, which disconnects the line relay 13 from across the tip and ring conductors of the line L. The operation of relay 11 closes a circuit from ground, through the winding of cut-off relay 12, over the sleeve conductor and sleeve contacts of jack J' and plug P', upper winding of relay 11, conductor 9, make contact of relay 5, conductor 10, lower make contact of relay 11, conductor 14, back contact of relay 15, conductor 16, back contact of relay 17 to battery, through the winding of relay 18. The closure of this circuit causes the operation of relay 18, and connects it in parallel with the guard and disconnect lamp 8, and thereby causes said lamp to be extinguished. The closing of this circuit does not affect relay 17 and this relay remains short-circuited through the back contact of relay 15. The operation of relay 18 closes a circuit, through its upper make contact, from ground, tip conductor of trunk B, upper make contact of relay 11, tip contacts of plug P' and jack J', over the tip conductor of line L and through the usual call-bell at the subscriber's station C, back over the ring conductor of said line, ring contacts of said jack and plug, lower make contact of relay 18, winding of tripping relay 15 to a source of ringing current through interrupter I. The relay 15 is not operated at this time due to the resistance of the circuit. Ringing current is transmitted over the circuit just traced, causing the bell at the station C to operate. When ringing current from the source 26 is not connected over this circuit, direct current from source 27 will be connected thereto. In response to the signal, as indicated by the ringing of the bell, the subscriber at C will remove the receiver from

its hook, thereby closing a circuit from battery, winding of slow operating relay 20, winding of retardation coil 21, over the ring conductor of said line through the subscriber's switchhook, back over the tip conductor of the line to ground, through the retardation coil 22. The closing of this circuit will operate relay 20, which through its contact bridges retardation coil 23 across the line L, and thereby short-circuits resistance 24 and condenser 25. The resistance 24 and condenser 25 are provided to prevent arcing at the contact of relay 20.

Should the receiver at station C be removed during the ringing interval, the tripping relay 15 in trunk B is operated by alternating current from source 26 and should said receiver be removed during the silent interval, said relay will be operated by direct current from source 27. The operation of tripping relay 15 removes the short circuit, previously referred to, from about the winding of relay 17, and this latter relay now operates over the same circuit described for operating relay 18, and closes a locking circuit through its front contact and winding from battery, conductor 14, lower front contact and winding of relay 11, conductor 10, make contact of relay 5, conductor 9, upper winding of relay 11, sleeve contacts of plug P' and jack J', winding of relay 12 to ground. Relay 17 is now used to shunt the guard and disconnect lamp 8, in place of relay 18. The operation of relay 17 short-circuits relay 18, causing it to release and disconnect the source of ringing current from the trunk and line. The release of relay 18 also closes the talking circuit over the tip and ring conductors of trunk B, in the usual manner, and causes the operation of relay 19 over the following circuit: from battery, through the lower right-hand winding of repeating coil R, winding of relay 19, lower back contact of relay 18, ring contacts of plug P' and jack J', winding of retardation coil 23, closed contact of relay 20, tip contacts of said jack and plug, upper make contact of relay 11, upper back contact of relay 18 to ground, through the upper right-hand winding of the repeating coil. The operation of relay 19 short-circuits the high resistance winding of relay 5, thereby reducing the resistance over the trunk B to operator's cord circuit at office A sufficiently to allow the calling supervisory relay to operate and extinguish the calling supervisory lamp thereat in a well known manner.

When the receiver at station C is returned to the switch-hook, the energizing circuit for relay 20 is broken and said relay releases, removing the direct current bridge from across the tip and ring of the line, thereby releasing relay 19. The release of relay 19 removes the short-circuits from about

the high resistance winding of relay 5, increasing the trunk resistance which causes the calling supervisory relay in the cord circuit at the office A to release, lighting the calling supervisory lamp thereat as a disconnect signal. The operator at A, in response to said signal, will remove plug P from jack J, causing the release of relay 5, which removes the shunt from about the guard and disconnect lamp 8, allowing it to light as a disconnect signal, whereupon the operator at trunk B will remove plug P' from jack J', releasing relay 11 and restoring the circuit to normal.

While this improved circuit has been illustrated and described in connection with a line having one subscriber's station connected thereto, it will be understood that it is equally adapted for use with a line having a plurality of connected stations.

What is claimed is:

1. A telephone exchange system comprising a telephone line terminating at a subscriber's station, a link circuit adapted to be associated therewith, a source of ringing current associated with said link circuit, means responsive to the connection of the link circuit and telephone line whereby ringing current is applied to said line and subscriber's station, a tripping relay associated with said link circuit so adjusted that it will not operate when the line is open at the subscriber's station, a slow operating relay connected only with the ring side of the line and entirely unresponsive to the application of ringing current thereto but responsive to the closure of said line at the subscriber's station, means subject only to the control exerted by said slow acting relay for so reducing the resistance presented by the line and link circuit to the ringing current that said tripping relay will be operated, and means controlled by said tripping relay for disconnecting the ringing current.

2. A telephone exchange system comprising a telephone line terminating at a subscriber's station, a link circuit adapted to be associated therewith, a source of ringing current associated with said link circuit, means responsive to the connection of the link circuit and telephone line whereby ringing current is applied to said line and subscriber's station, a tripping relay associated with said link circuit so adjusted that it will not operate when the line is open at the subscriber's station, a second relay connected with only one side of said line said relay and its armature being entirely unresponsive to the application of ringing current thereto but operative upon the closure of said line at the subscriber's station, a bridge across said line closed upon the operation of said second relay whereby the resistance presented by the line and

link circuit to the ringing current is so reduced as to cause the operation of the tripping relay, means associated with said bridge for preventing arcing at the contacts
5 of said second mentioned relay, and means controlled by said tripping relay for disconnecting the ringing current.

3. A telephone exchange system comprising a telephone line terminating at a
10 subscriber's station, a link circuit adapted to be associated therewith, a source of ringing current associated with said link circuit, means responsive to the connection of the
15 link circuit and telephone line whereby ringing current is applied to said line and subscriber's station, a tripping relay connected with said responsive means and with said

source of ringing current, a shunt bridged across said line of such magnitude as to keep the ringing current below the limit
20 of operation of said tripping relay, a slow operating relay connected across said line operable upon the removal of the receiver at the substation, the armature of said relay being connected with said bridged shunt to
25 effectively reduce the impedance of said shunt, thereby increasing the magnitude of the ringing current to operate said tripping relay and disconnect said ringing current
30 from said line.

In testimony whereof, I have signed my name to this specification this 16th day of February 1921.

ERICH VON NOSTITZ.