

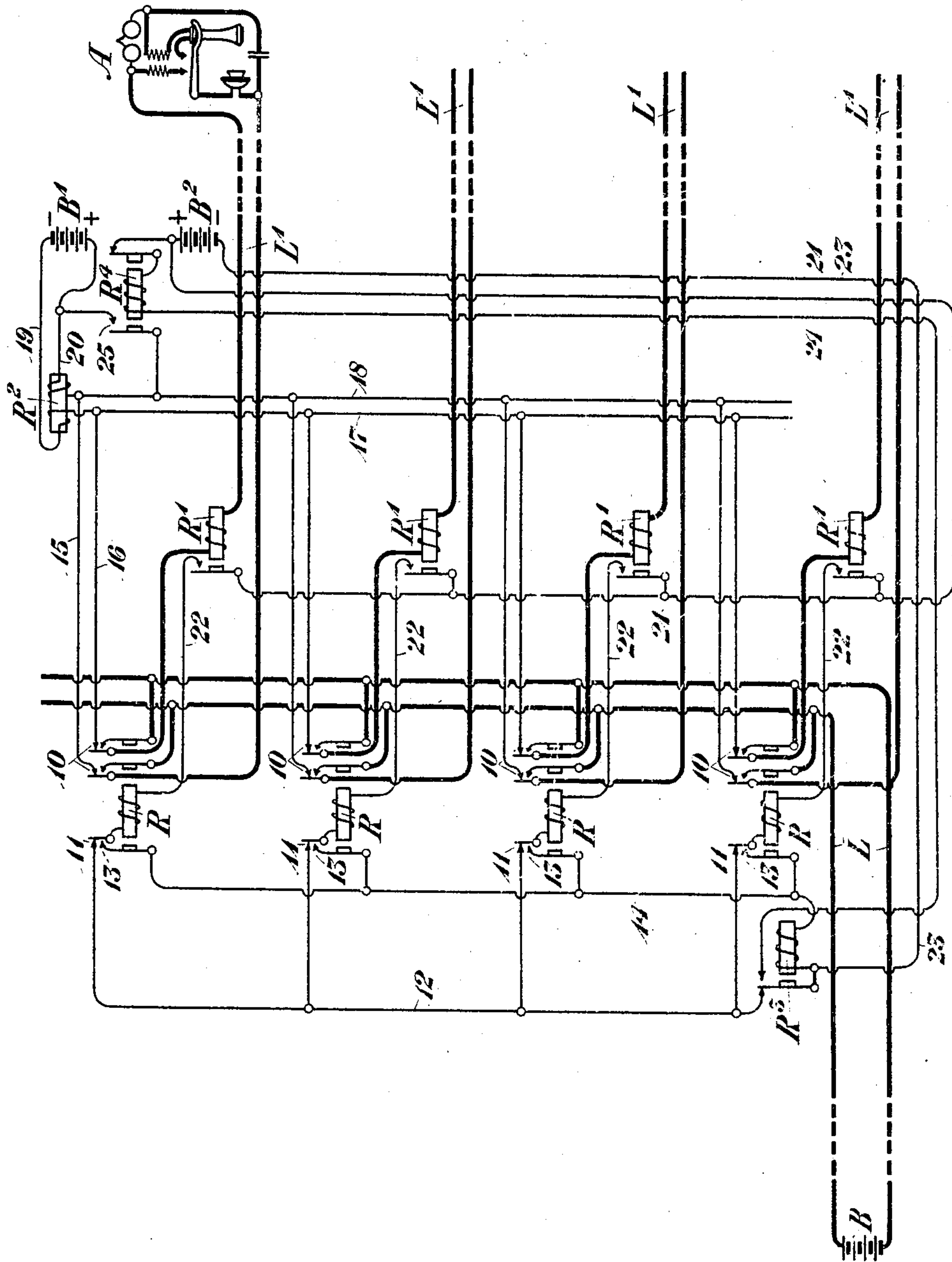
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L. D. BARROWS ET AL

SELECTIVE CONNECTION OF TRUNK LINES

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INVENTORS
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UNITED STATES PATENT OFFICE.

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SELECTIVE CONNECTION OF TRUNK LINES.

Application filed April 1, 1919. Serial No. 286,670.

To all whom it may concern:

Be it known that we, LEON D. BARROWS and LEO H. DARROW, residing at New York, in the county of New York and State of New York, respectively, have invented certain Improvements in Selective Connections of Trunk Lines, of which the following is a specification.

This invention relates to means for connecting any one of a plurality of telephone substations to a common line to the exclusion of other stations. An instance of this occurs in systems in which a particular substation of a group is given sole use of a trunk line leading to a central station during connection therewith. By the present invention this individual connection is brought about when the subscriber at any substation removes the receiver from its hook, the normal condition being automatically restored upon the hanging up of the receiver.

The accompanying drawing is a diagrammatical representation of the more essential parts of a system arranged in accordance with one embodiment of this invention.

To a trunk line L leading from a central or other distant station, and connected to battery B thereat, are joined by leads L¹ a plurality of substations of which the apparatus of but one is illustrated at A. Each substation line is provided with relays R and R¹ which are individual thereto. The conductors L¹ of each substation, are shown in the present instance, as being normally connected through the back contacts 10 of relays R, respectively, and the winding of retardation coil R² to battery B¹. The relays R¹ are shown as connected in series with the substation line leads L¹. Each relay R is connected to the front contact of its associated relay R¹ and through its own back contact 11 and the back contact of a master relay R³ and conductor 23 to the negative side of battery B². The winding of the master relay R³ is common to the group of R relays and is connected to the armatures of all of said relays, and through return conductor 23 to the negative side of battery B². Conductor 21 connects the armatures of relays R¹ to the positive side of battery B².

Upon the initiation of a call from any of the substations, the relay R¹ individual thereto is operated, said relay being in series with leads 15 and 16, windings of retarda-

tion coil R² and battery B¹. The operation of relay R¹ closes its contact, and causes the operation of its associated relay R by a path from the positive side of battery B², conductor 21, armatures and contact of relay R¹ conductor 22, winding of connection varying relay R and its back contact 11, conductor 12, back contact of master relay R³, conductor 23 to negative side of battery B². The operation of relay R disconnects conductors L¹ from the back contacts of relay R and also from conductors 15 and 16, and transfers said conductors L¹ to the front contacts of relay R, and thence to the trunk L, thus completing a circuit from the substation to the distant or central office battery. The operation of relay R also breaks contact 11 previously closing contact 13. The closing of this latter contact connects the winding of master relay R³ in series with the winding of relay R, thus operating relay R³, opening its back contact and closing its front contact. The opening of the back contact results in disconnecting conductor 12, and therefore the windings of all relays R, except the one already operated, from battery B², and therefore prevents their operation as long as relay R³ maintains its operated position. The closing of the front contact of relay R³ provides a locking circuit from positive side of battery B² through the back contact, armature and winding of relay R⁴, conductor 24, front contact and armature of relay R³, conductor 23 to the negative side of battery B². The back contact of relay R⁴ being in series with its operating winding results in a buzzer action or alternate opening and closing of its front contact 25. This front contact 25 in closing short-circuits one winding of retardation coil R² and the alternate opening and closing of this contact results in the development of a tone producing current in the circuit including conductors 17 and 18 and individual conductors 15 and 16 which serves the purpose of indicating to any of the other stations attempting to use the line that the line is busy. As has been stated, a second substation attempting to obtain access to the trunk is prevented by the fact that, although its relay R¹ may operate, the associated relay R will not, because the path to battery B² over conductor 12, which provides for the operation of the last-mentioned relay is open at

the back contact of master relay R^3 . The first substation to gain access to the trunk L therefore is insured privacy and exclusive use thereof until its relays R and R^1 and master relay R^3 are restored to normal by the opening of the circuit at the substation, which occurs when the receiver is returned to its hook.

The details of this circuit may now be more clearly and sufficiently understood from the following description of its operation:

Assuming the subscriber A to have taken the receiver from its hook for the purpose of conversing over the trunk L, a current path is provided from said substation, talking conductor L^1 , through winding of relay R^1 , outer back contact 10 of relay R, conductor 15, left-hand winding of retardation coil R^2 , conductor 19 to negative side of battery B^1 , thence back by way of conductor 20, right-hand winding of said retardation coil, conductor 16, middle back contact of relay R and second lead L' to substation. This circuit causes the operation of relay R^1 , which attracts its armature and closes its front contact, thus providing for the energization of relay R by means of a current path from the positive side of battery B^2 , conductor 21, armature and front contact of relay R^1 , conductor 22, winding and back contact 11 of relay R, conductor 12, back contact and armature of master relay R^3 , conductor 23 to negative side of battery B^2 . Upon the energization of relay R its back contacts 10 are opened and the armatures of said relay make connection with the front contacts, thus connecting leads L' through the armatures of relay R and its front contacts to the trunk L. This completes the talking connection from the substation through to the central or distant office. The energization of relay R also causes it to attract its left-hand armature, breaking contact 11 and making contact 13. When such contact is established, a current path is provided from positive side of battery B^2 , conductor 21, armature and contact of relay R^1 , conductor 22, winding, contact 13 and armature of relay R, conductor 14, winding of master relay R^3 and over conductor 23 to negative side of battery B^2 , thus energizing master relay R^3 and maintaining the operation of relay R associated with the substation line which is in use. The energization of relay R^3 causes it to attract its armature, breaking its connection by way of its back contact with conductor 12 and making connection by way of its front contact with conductor 24. This provides a locking circuit for master relay R^3 by a path from positive battery B^2 , through the back contact, armature and winding of relay R^4 , conductor 24, front contact and armature of relay R^3 , and over

conductor 23 to negative side of battery B^2 . The opening of the back contact of master relay R^2 makes it impossible for other substations to gain access to the trunk, due to the fact that relays R have no path to battery B^2 , thus preventing the operation of relays R, and subsequent connection of a second substation line to the trunk L. The closing of the front contact of relay R^3 results in the operation and subsequent buzzing of relay R^4 which, by means of the alternate opening and closing of its front contact, introduces a busy tone over conductors 17 and 18, thence over conductors 15 and 16 which are individual to each substation. The removal of the receiver from its hook at any of the other substations will energize the associated relay R^1 individual to that line, but, as pointed out above, this will not result in the operation of the associated relay R. The busy tone on leads 15 and 16, however, will be heard at any of the substations which may attempt to gain access to the trunk, and the subscriber will thereby be advised that the trunk line is in use.

When the subscriber at A restores the receiver to its hook the associated relay R^1 is deenergized, thus releasing the associated relay R and master relay R^3 , and thus restoring all relays to normal, including relay R^4 , which results in the removal of the busy tone from conductors 17 and 18. The trunk is then free from any substation to appropriate it for its exclusive use.

It will be evident that by this improved circuit arrangement any one of a number of substations may have exclusive use of a line leading to a central station or the like. By the use of said arrangement means is also provided to inform any other calling subscriber when the line is busy. In carrying out this invention a minimum of apparatus is utilized, and a resulting saving in current consumption is afforded.

While the arrangements of this invention have been illustrated as embodied in certain specific arrangements which have been deemed desirable, it will be understood that they are capable of embodiment in many and widely varied forms without departing from the spirit of the invention, as defined in the following claims.

Having thus described the invention, what it is desired to secure by Letters-Patent is:

1. In a telephone system, a plurality of associated stations, a line for connecting said stations to a distant station, talking conductors for each station, relays associated with each of said talking conductors, relays controlled by each of said first mentioned relays, means controlled by said second mentioned relays whereby exclusive connection may be established between any one of the associated stations and distant station, a retardation coil common to said associated

stations, and means whereby said retardation coil will be intermittently short circuited through one of its windings and a busy tone transmitted to any of the associated stations upon an attempt to send a call therefrom while the line is in use.

2. In a telephone system, a plurality of associated stations, a line for connecting said stations to a distant station, talking conductors for each of said stations, a relay associated with each of said talking conductors, means whereby exclusive connection may be established between any one of said associated stations and the distant station, a retardation coil associated with said relays, and means whereby said retardation coil will be intermittently short circuited through one of its windings and a busy tone transmitted to any of the associated stations upon an attempt to originate a call therefrom while the line is in use.

3. In a telephone system, a plurality of associated stations, a line for connecting said stations to a distant station, talking conductors for each station, connection-changing relays individual to said stations, a second relay associated with each of said connection-changing relays, means adapted to associate any of said talking conductors with said line upon the energization of any of said connection-changing and second relays, a master relay common to said stations and responsive to the operation of an initial connection changing relay, said master relay having its winding connected in series with the winding of the actuated connection changing relay in the energizing circuit thereof, and means including said master relay whereby exclusive connection is established with said distant station upon the association of the talking conductors of that substation with said line.

4. In a telephone system, a plurality of associated stations, a line for connecting said stations to a distant station, talking conductors for each station, a connection-changing relay individual to said stations, a second relay associated with each of said connection varying relays, means adapted to associate any of said talking conductors with

said line upon the energization of any of said connection-changing and second relays, a master relay common to said stations and responsive to the operation of an initial connection changing relay, said master relay having its winding connected in series with the winding of the actuated connection changing relay in the energizing circuit thereof, means including said master relay whereby exclusive connection is established with said distant station upon the association of the talking conductors of that substation with said line, and means whereby a busy indication will be transmitted to any of the associated stations upon an attempt to initiate a call therefrom while the line is in use.

5. In a telephone system, a plurality of associated stations, a line for connecting said stations to a distant station, talking conductors for each station, a connection-changing relay individual to said stations, a second relay associated with each of said connection-changing relays, means adapted to associate any of said talking conductors with said line upon the energization of any of said connection-changing and second relays, a master relay common to said stations and responsive to the operation of an initial connection changing relay, said master relay having its winding connected in series with the winding of the actuated connection changing relay in the energizing circuit thereof, means including said master relay whereby the other of said talking conductors are prevented from being simultaneously associated with said line, an intermittently operable relay, a retardation coil associated therewith and common to said associated stations, and means including said intermittently operable relay and retardation coil whereby a busy indication will be transmitted to any of the associated stations upon an attempt to initiate a call therefrom while the line is in use.

In testimony whereof, we have signed our names to this specification this 31st day of March, 1919.

LEON D. BARROWS.
LEO H. DARROW.