

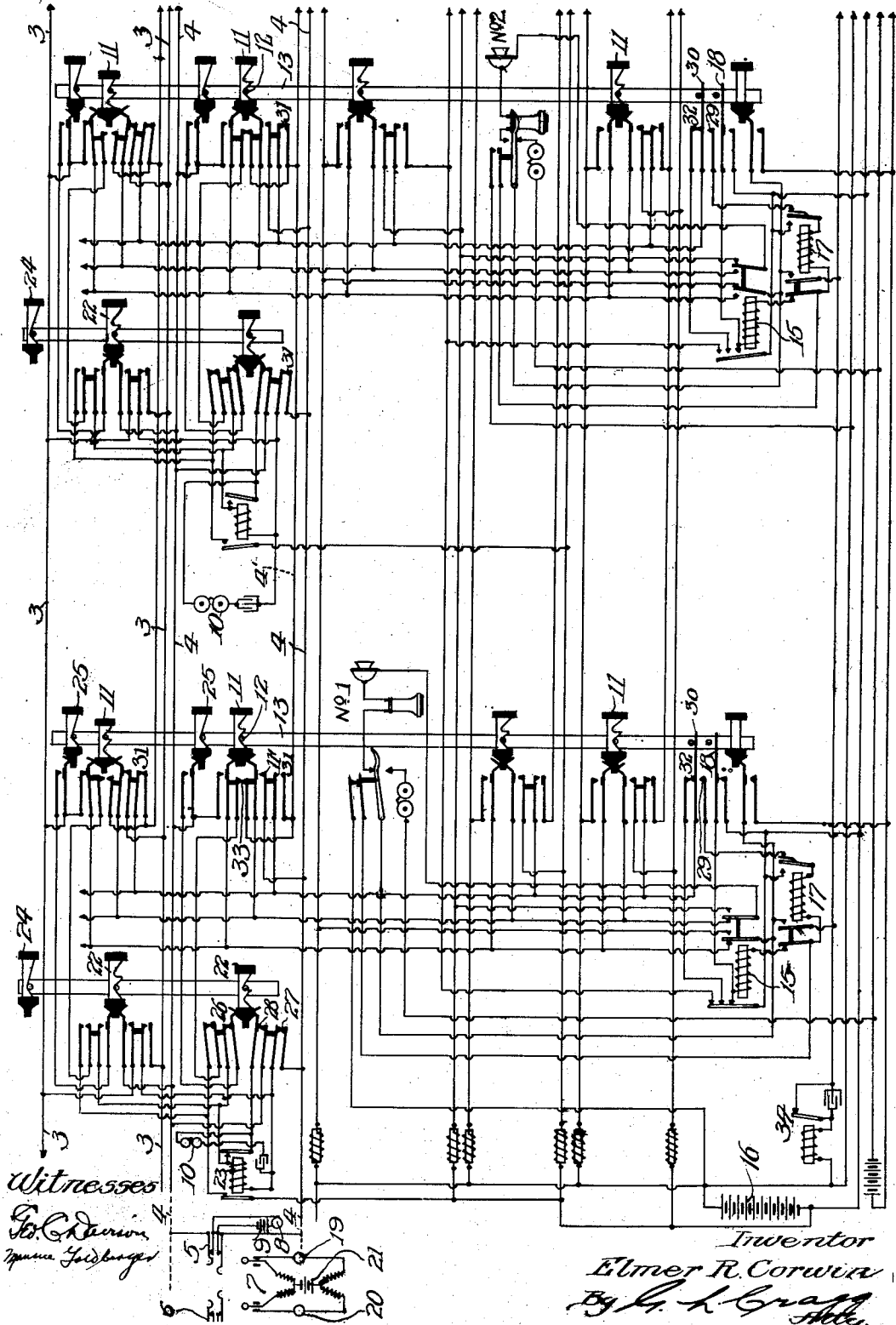
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TELEPHONY.

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Patented July 28, 1914.



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UNITED STATES PATENT OFFICE.

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FRANK B. COOK COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TELEPHONY.

1,105,345.

Specification of Letters Patent.

Patented July 28, 1914.

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To all whom it may concern:

Be it known that I, ELMER REED 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 Telephony, 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 telephony and has for one of its objects the provision of a telephone system including two or more telephone lines; a third telephone line; and means whereby either of the first telephone lines may become connected with the third telephone line and establish a busy test condition in connection with the third telephone line, and whereby the telephone of the station initially becoming connected with the third telephone line may be disassociated from said third lines without removing said busy test condition and may be again restored to connection with said third line so that during the interval of disconnection of such telephone line the third telephone line may not be appropriated by another station.

My invention has for another of its objects the provision of apparatus brought into cooperative relation with the third telephone line by the station initially becoming connected therewith for locking out telephonic apparatus of other stations seeking the third telephone line, and whereby the telephone at the station that has become initially connected with the third telephone line may be disassociated from such line without rendering the lock out condition ineffective.

The foregoing features of my invention find a very important embodiment in connection with intercommunicating telephone systems that have a trunk line or trunk lines extending between the stations of the interior telephone system and an exchange, the aforesaid third telephone line then constituting the trunk line.

Another feature of my invention resides in the provision of means whereby an intercommunicating station, in seeking connection with the station associated with a trunk line, taken for use, will have its telephone locked out and will also have a busy test manifestation to indicate that the wanted trunk line is busy.

My invention has for another of its objects the provision of a plurality of trunk lines intervening between a telephone exchange and the telephone stations of a plurality of telephone lines: signal apparatus at the telephone exchange adapted for association with the trunk lines and controlled by the apparatus at said telephone stations; and means interchangeably associated with said trunk lines operating in conjunction with said telephone stations for governing said signal apparatus.

In the preferred embodiment of my invention the means for rendering the lock out and busy test condition, to prevent an appropriated trunk line from again being appropriated while the trunk line is in use, are interchangeably associated with the trunk lines.

I will explain my invention more fully by reference to the accompanying drawing showing the preferred embodiment thereof and which diagrammatically illustrates two stations of an intercommunicating system and two trunk lines extending to said stations from an exchange.

Intercommunicating station No. 1 and intercommunicating station No. 2 are associated with circuits and apparatus shown in the drawing below the same, whereby each of the stations may be selected by the party at the other when free for selection, and may be signaled when thus selected, and whereby either station seeking the other when the other is busy will secure a busy test manifestation and will have its telephone locked out of circuit relation with the wanted station, all as will be readily understood by those familiar with the practical art. I will therefore not go into detail in describing the inter-relation of station No. 1 and station No. 2. A trunk line 3 and a trunk line 4 are illustrated as extending from a telephone exchange to each of the stations of the intercommunicating system, room, however, permitting only of the diagrammatic illustration of some telephone exchange equipment shown at the left of the trunk line 4, which trunk line is diagrammatically indicated as terminating in the line spring of spring jack 5 at the exchange, at which exchange one spring jack 6 belonging to one of many lines is also illustrated and which may be connected with the jack 5 by means of any suitable cord connecting

apparatus 7 that is adapted to connect the trunk line with such a jack as the jack 6. A line indicator 8 individual to the trunk line 4 (there being some sort of line indicator individual to each trunk line) is bridged between the sides of the trunk line by a bridge connection that includes a battery 9, circuit being closed through this battery at an intercommunicating station appropriating the line. At each intercommunicating station there is a signal receiver 10 individual to one of the trunk lines whereby each intercommunicating station may be signaled from the exchange.

There is provided at each of the intercommunicating stations a plurality of selecting keys 11, one individual to each trunk line and each adapted for coöperation with a pin 12 mounted upon a connecting bar 13, whereby each key upon being fully depressed will release its companion so that one key will always occupy a position to which it is actuated, the lower keys 11 being shown in normal positions. The control that each station has over the trunk line is similar to that possessed by the other and I will therefore describe in detail the association of but one of the intercommunicating stations with the trunk lines with the understanding that such description would apply to each of the other intercommunicating stations, and at this point it should be stated that while my invention has been embodied in connection with an intercommunicating system, I do not limit myself to the use of my invention in connection with intercommunicating stations. Let it be assumed that station No. 1 desires connection with trunk line 4 and thereafter desires to hold that trunk line so as to establish connection with trunk line 3 or for some other reason. The party at station No. 1, in order to accomplish these objects, will fully depress the selecting key 11 individual to trunk line 4 after having removed his telephone from its switch hook. As a consequence of this operation circuit through the battery 9 and the line indicator 8 is closed by way of the sides of the trunk line and a bridge across the sides of the trunk line that is established at station No. 1 and which bridge may be traced from the upper side of the trunk line, the two uppermost contacts of the selecting key 11, the middle armature switch of relay 15 and its alternate contact, the switch hook at station No. 1 and its alternate contact, the telephone receiver and transmitter at this station, the right hand armature switch of relay 15 and its alternate contact, the switch contacts 11¹ of the selecting key 11 to the other side of the trunk line.

The manner in which the relay 15 is energized at this stage of the operation is known to those skilled in the practical art and may be described as resulting from a circuit, traceable from the upper pole of battery 16, the two uppermost contacts of the switch hook at station No. 1, the resting left hand armature switch or relay 17 and its contact, the winding of relay 15, the engaged contacts 18, to the lower terminal of the battery 16, the contacts 18 being engaged owing to the full depression of the actuated selecting key or switch 11 individual to the trunk line 4. A locking circuit is then established for the relay 15 which may be traced from the upper terminal of the battery 16 through the upper contacts of the switch hook at station No. 1, the left hand armature switch of relay 17, the winding of relay 15, the left hand armature switch of relay 15 and its lowermost contact to the lower pole of the battery 16. As a result, the line signal 8 at the exchange is operated and is responded to by the operator at the exchange in the usual way and the operator extends the trunk line into connection with a line wanted by station No. 1 by means of usual or link connecting apparatus at the exchange. The cord circuit 7 is provided with supervisory signaling apparatus individual to the trunk end thereof as indicated diagrammatically at 19, and supervisory signaling apparatus individual to the other end thereof diagrammatically indicated at 20. The battery, indicated at 21, is connected across the cord circuit from which current flows through the supervisory signaling device, the circuit through the supervisory signaling device 19 including the right hand half of the cord circuit, the two sides of the trunk line 4, and the bridge circuit at station No. 1 which has been hitherto traced. If the party at station No. 1 should desire to disconnect his telephone from and at the same time hold the trunk line 4 after having secured connection with another party by way of the exchange or after the exchange subscriber has secured connection with station No. 1 by way of the trunk line, then the party at station No. 1 will depress a holding key 22 to bring the normally disassociated relay 23 into association with the trunk line that is to be held, each key 22 at each station being adapted when operated to bring about the association of the relay 23 with the trunk line to which such key is individual and to remove such relay from association with a trunk line with which it was previously associated owing to the mechanical interrelation between the keys 22 that enables each key to restore each other key 22 to normal position. A releasing key 24 serves to release any key 22 at its station so that the relay 23 will have no operative association. Under the assumption that the trunk line 4 is to be retained by the party at station No. 1, the key 22 individual to the trunk line is placed in the position indicated, whereby a partial circuit is es-

established for the relay 23, this circuit being completed when the button 25 is actuated, each switch 22 being associated with a button or switch 25, there being one such switch 25 for each trunk line.

The circuit for the relay 23 that is established by the coöperation of the switches 22 and 25 may be traced from the upper pole of the battery 21, through the tip of the plug inserted in jack 5, the upper side of the trunk line 4, the contacts of the now actuated key 25, the contacts 26 of key 22, the winding of relay 23, the contacts 27 of key 22, the lower side of the trunk line 4, the sleeve of the plug engaging jack 5, to the lower pole of the battery 21. The relay 23 thereupon establishes a locking circuit through itself and it will be sufficient to trace a bridge connection between the sides of the trunk line through the winding of the relay 23, and which bridge connection is traced from the upper side of the trunk line 4, through the contacts 28, the right hand armature switch of relay 23 and its then engaged contact, the winding of relay 23, the contacts 27, to the lower side of the trunk line. There is thus established a bridge across the trunk line in place of the bridge hitherto traced through the telephone equipment at station No. 1 so that the breaking of the bridge that included the telephone at station No. 1, and which breaking occurred by the depression of the key 25, is not followed by a signal at 19 at the exchange. It is understood that when the key 25 is depressed the telephone equipment at station No. 1 is disconnected from the trunk line 4 because of the consequent release of the button 11, which release is followed by the breaking of the bridge including the telephone at station No. 1 and which breaking occurs at the key 11. The party at station No. 1 is now at liberty to hold conversation with another intercommunicating party, or any other party without the danger of having his conversation transmitted over the trunk line.

When the party at station No. 1 desires to resume connection with the party connected with trunk line 4 he presses the button 11 at his station which is individual to the trunk line 4 so as to reestablish the telephone bridge between the sides of the trunk line at his station and which telephone bridge was previously traced. This telephone bridge is of low resistance compared with the resistance of the relay 23 so that the relay 23 is deenergized to break the bridge that said relay previously held across the trunk line whereby the apparatus at station No. 1 is again placed in control of the signal 19 to enable said signal to respond when the telephone at station No. 1 is restored upon its switch hook thereby to break the only bridge then existing at sta-

tion No. 1 to open the circuit including the signal 19 and thereby cause it to operate.

I will now more particularly describe the means, which constitutes an important feature of my invention, whereby the relay 23 at each intercommunicating station may be used for the purpose which has been described in connection with any of the trunk lines so that it will not be necessary to provide a relay 23 individual to each trunk line at each station. When the relay 23 is unassociated with any trunk line its terminals are free of connection. Each of the terminals of the relay 23 is multiplied, the upper or right hand terminal being multiplied to each of the upper contacts of the contacts 26 while the lower or left hand terminal of said relay is multiplied to each of the upper contacts of the contacts 27. Owing to some previous operation of the key 24, the keys 22 are normal so that these multiplied terminals of the relay 23 are disconnected. It has been described how a depression of the keys 22 and 25 of trunk line 4 will associate the relay 23 with the trunk line 4 and it will be obvious that a similar depression of the key 22 associated with the trunk line 3 will bring about a similar association of the relay 23 with the trunk line 3 when the key 25 individual to the trunk line 3 is operated after the associate key 22 is operated, the key 25 individual to the trunk line 3 having an association with said trunk line similar to the association of the other key 25 individual to the trunk line 4. The circuit which was previously traced as a result of the operation of the keys 22 and 25 individual to the trunk line 4 finds its counterpart in the circuit which results from the depression of the keys 22 and 25 individual to trunk line 3.

I will now describe the circuits and apparatus by which an appropriated trunk line is rendered busy so that another intercommunicating party seeking connection therewith will know of its busy condition and how the telephone apparatus of an intercommunicating party seeking connection with an appropriated trunk line is prevented from having telephonic connection with such trunk line.

Let it be assumed that the party at station No. 2 desires connection with the trunk line 4 at any time after it has been appropriated and whether or not it is held by the apparatus at the intercommunicating station connected therewith. The party at the seeking station, station No. 2, first removes his telephone from its switch hook whereby a circuit is established which may be traced from the upper pole of the battery 16 through the uppermost contacts of the switch hook at station No. 2, the winding of the relay 17, the right hand armature switch of this relay and its normal contact which is a follow

up contact, the contacts 29 and 30, the contacts 31 of the now fully depressed key 11 individual to the trunk line 4 at station No. 2, the conductor 4', the contacts 31 of the key 11 at station No. 1 (it now being assumed that telephone station No. 1 is in telephonic connection with the trunk line 4) the normally positioned contacts 32 at station No. 1, the left hand armature switch of relay 15 and the middle one of its contacts, to the lower side of the battery 16. At this point it will be explained that an alternate circuit connection is established from the contacts 31 at station No. 2 in the event of the key 11 occupying its normal position and of the relay 23 retaining a holding bridge across the trunk line 4 in order that the telephone apparatus at station No. 1 may be disconnected from said trunk line without allowing said trunk line to be appropriated by a seeking station. This alternate circuit is similar to the circuit similarly traced up to the contacts 31 at station No. 2, the circuit then continuing from these contacts 31 to the then engaged contacts 33, the two uppermost contacts of the then actuated key 22, the left hand armature switch of relay 23 to the lower pole of the battery 16. With either circuit the right hand armature switch of the relay 17 at station No. 2 makes connection with its alternate contact before it breaks connection with its normal contact, whereby a locking circuit is established for the relay 17 at station No. 2 which may be traced from the upper terminal of the battery 16 through the uppermost contacts of the switch hook at station No. 2, the winding of the relay 17 its right armature and its alternate contact to the lower pole of said battery.

The magnet 17 after having been energized establishes a busy test circuit which may be traced from the upper pole of the battery 16 through the circuit interrupting apparatus 34, the middle armature switch of relay 17, its then engaged contact, the switch hook at station No. 2, the receiver and transmitter at station No. 2, the right hand armature switch of relay 15 at station No. 2 and its normal contact, to the lower pole of the battery 16 by way of the upper side of the intercommunicating telephone line leading to station No. 2.

As the relay 15 at station No. 2 has to be energized in order to include the telephone at said station in bridge of the line leading to station No. 2, and as the circuit of this relay depends upon the engagement of the left hand armature switch of relay 17 with its contact, the telephone outfit at station No. 2 is excluded from circuit owing to the fact that the relay 17 at station No. 2 was energized as a consequence of the circuit connections resulting from the operation of the key 11 at station No. 2 individual to line 4 and which circuit connections were hitherto

traced. Thus the telephone at station No. 2 is locked out of association with an appropriated trunk line in addition to the party at station No. 2 being informed of the busy condition of the trunk line.

While I have herein shown manual telephone exchange equipment, my invention is not to be limited to such an exchange.

I believe it to be broadly new with me to establish the test and lock out features in connection with trunk lines and the apparatus for holding the trunk lines busy while temporarily disconnected from a telephone station previously connected therewith, whether or not the means for rendering the trunk line busy and for locking out the telephones of other stations are interchangeably related with the trunk lines.

While I have herein shown and particularly described one type of equipment carrying out my invention, I do not wish to be limited thereto as changes may readily be made without departing from the spirit of my invention, but

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

1. A telephone system including two telephone lines extending from telephone stations and each extending from its own station to the station of the other line, there being means governed at the telephone stations whereby telephonic connection may be effected between the stations; a third telephone line; means whereby either of said telephone stations may become connected with the third telephone line, and establish a busy test condition in connection with the third telephone line; and means whereby the telephone of the station initially becoming connected with the third telephone line may be dissociated from said third line without removing said busy test condition and may be again restored to connection with said third line so that during the interval of disconnection of such telephone line the third telephone line may not be appropriated by another station.

2. A telephone system including two telephone lines extending from telephone stations and each extending from its own station to the station of the other line, there being means governed at the telephone stations whereby telephonic connection may be effected between the stations; a third telephone line; means whereby either of said telephone stations may become connected with the third telephone line; apparatus brought into coöperative relation with the third telephone line by the station initially becoming connected therewith for locking out telephonic apparatus of other stations seeking the third telephone line; and means whereby the telephone at the station that has initially become connected with the

third telephone line may be dissociated from such line without rendering ineffective the lock out condition, and whereby such telephone may be restored to its connection with the third telephone line so that during the interval of disconnection of such telephone line the third telephone line may not be appropriated by another telephone station.

3. A telephone system including two telephone lines extending from telephone stations and each extending from its own station to the station of the other line, there being means governed at the telephone stations whereby telephonic connection may be effected between the stations; a telephone exchange; a trunk line intervening between the stations of the aforesaid lines and said exchange; means whereby either of said telephone stations may become connected with the trunk line; and means whereby the telephone of the station initially becoming connected with the trunk line may be dissociated from said trunk line without removing said busy test condition and may be again restored to connection with said trunk line so that during the interval of disconnection of such telephone line the trunk line may not be appropriated by another station.

4. A telephone system including two telephone lines extending from telephone stations and each extending from its own station to the station of the other line, there being means governed at the telephone stations whereby telephonic connection may be effected between the stations; a telephone exchange; a trunk line intervening between the stations of the aforesaid lines and said exchange; means whereby either of said telephone stations may become connected with the trunk line; apparatus brought into cooperative relation with the trunk line by the station initially becoming connected therewith for locking out telephone apparatus of other stations seeking the trunk line; and means whereby the telephone at the station that has initially become connected with the trunk line may be dissociated from such line without rendering ineffective the locking out condition, and whereby such telephone may be restored to its connection with the trunk line so that during the interval of disconnection of such telephone line the trunk line may not be appropriated by another telephone station.

5. A telephone system including two telephone lines extending from telephone stations and each extending from its own station to the station of the other line, there being means governed at the telephone stations whereby telephonic connection may be effected between the stations; a third telephone line; means whereby either of said telephone stations may become connected with the third telephone line and establish a busy test condition in connection with the

third telephone line, and whereby the telephone of the station initially becoming connected with the third telephone line may be dissociated from said third line without removing said busy test condition and may be again restored to connection with said third line so that during the interval of disconnection of such telephone line the third telephone line may not be appropriated by another station; and complementary apparatus at the stations of the first aforesaid telephone lines cooperating with the aforesaid means in performing the function for which it is provided.

6. A telephone system including two telephone lines extending from telephone stations and each extending from its own station to the station of the other line, there being means governed at the telephone stations whereby telephonic connection may be effected between the stations; a third telephone line; means whereby either of said telephone stations may become connected with the third telephone line; apparatus brought into cooperative relation with the third telephone line by the station initially becoming connected therewith for locking out telephonic apparatus of other stations seeking the third telephone line; means whereby the telephone at the station that has initially become connected with the third telephone line may be dissociated from such line without rendering ineffective the lock out condition, and whereby such telephone may be restored to its connection with the third telephone line so that during the interval of disconnection of such telephone line the third telephone line may not be appropriated by another telephone station; and complementary apparatus at the stations of the first aforesaid telephone lines cooperating with the aforesaid means in performing the function for which it is provided.

7. A telephone system including two telephone lines extending from telephone stations and each extending from its own station to the station of the other line, there being means governed at the telephone stations whereby telephonic connection may be effected between the stations; a telephone exchange; a trunk line intervening between the stations of the aforesaid lines and said exchange; means whereby either of said telephone stations may become connected with the trunk line and establish a busy test condition in connection with the trunk line; means whereby the telephone of the station initially becoming connected with the trunk line may be dissociated from said trunk line without removing said busy test condition and may be again restored to connection with said trunk line so that during the interval of disconnection of such telephone line the trunk line may not be appropriated by another station; and complementary appa-

ratus at the stations of the first aforesaid telephone lines coöperating with the aforesaid means in performing the function for which it is provided.

5 8. A telephone system including two tele-
phone lines extending from telephone sta-
tions and each extending from its own sta-
tion to the station of the other line, there be-
ing means governed at the telephone sta-
10 tions whereby telephonic connection may be
effected between the stations; a telephone
exchange; a trunk line intervening between
the stations of the aforesaid lines and said
exchange; means whereby either of said tel-
15 ephone stations may become connected with
the trunk line; apparatus brought into co-
operative relation with the trunk line by the
station initially becoming connected there-
with for locking out telephone apparatus of
20 other stations seeking the trunk line; and
means whereby the telephone at the station
that has initially become connected with the
trunk line may be dissociated from such
line without rendering ineffective the lock-
25 ing out condition, and whereby such tel-
ephone may be restored to its connection
with the trunk line so that during the inter-
val of disconnection of such telephone line
the trunk line may not be appropriated by
30 another telephone station; and complemen-
tal apparatus at the stations of the first
aforesaid telephone lines coöperating with
the aforesaid means in performing the func-
tion for which it is provided.

35 9. A telephone exchange system including
a plurality of telephone lines extending from
subscribers' telephone stations to a telephone
exchange; a plurality of trunk lines inter-
vening between said telephone exchange and
40 the subscribers' telephone stations of the
aforesaid lines; means whereby either of
said telephone stations may become connect-
ed with the trunk lines; signal apparatus at
the telephone exchange adapted for associa-
45 tion with the trunk lines; electro-magnetic
means common to the trunk lines for govern-
ing said signal apparatus; and means at the
stations for interchangeably associating the
latter means with said trunk lines.

50 10. A telephone exchange system includ-
ing a plurality of telephone lines extending
from subscribers' telephone stations to a
telephone exchange; a plurality of trunk
lines intervening between said telephone ex-
55 change and the subscribers' telephone sta-
tions of the aforesaid lines; means whereby
either of said telephone stations may become
connected with the trunk lines; signal appa-
ratus at the telephone exchange adapted for
60 association with the trunk lines; electro-
magnetic means interchangeably associated
with said trunk lines operating in conjunc-
tion with said telephone stations for govern-
ing said signal apparatus; and means for
65 preventing other telephone stations from

effecting operative connection with a trunk
line with which the aforesaid means has be-
come operatively associated.

11. A telephone system including two
telephone lines each extending from a sub-
70 scriber's station to a telephone exchange and
from its own station to the station of the
other line, there being means governed at
the telephone stations whereby telephonic
connection may be effected between the sta-
75 tions; a plurality of trunk lines intervening
between said telephone exchange and the tel-
ephone stations of the aforesaid lines; means
whereby either of said telephone stations
may become connected with the trunk lines; 80
signal apparatus at the telephone exchange
adapted for association with the trunk lines;
means common to the trunk lines for gov-
erning said signal apparatus; and means at
the stations for interchangeably associating 85
the latter means with said trunk lines.

12. A telephone system including two tele-
phone lines each extending from a sub-
90 scriber's station to a telephone exchange and
from its own station to the station of the
other line, there being means governed at
the telephone stations whereby telephonic
connection may be effected between the sta-
tions; a plurality of trunk lines intervening
between said telephone exchange and the 95
telephone stations of the aforesaid lines;
means whereby either of said telephone sta-
tions may become connected with the trunk
lines; signal apparatus at the telephone ex-
change adapted for association with the 100
trunk lines; electro-magnetic means common
to the trunk lines for governing said signal
apparatus; and means at the stations for in-
terchangeably associating the latter means
with said trunk lines. 105

13. A telephone system including two tele-
phone lines each extending from a sub-
110 scriber's station to a telephone exchange and
from its own station to the station of the
other line, there being means governed at
the telephone stations whereby telephonic
connection may be effected between the sta-
tions; a plurality of trunk lines intervening
between said telephone exchange and the 115
telephone stations of the aforesaid lines;
means whereby either of said telephone sta-
tions may become connected with the trunk
lines; signal apparatus at the telephone ex-
change adapted for association with the 120
trunk lines; means common to the trunk lines
for governing said signal apparatus; means
at the stations for interchangeably asso-
ciating the latter means with said trunk
lines, and means for preventing other tele- 125
phone stations from effecting operative con-
nection with a trunk line with which the
aforesaid means has become operatively
associated.

14. A telephone system including two tele-
phone lines each extending from a sub- 130

scriber's station to a telephone exchange and
from its own station to the station of the
other line, there being means governed at
the telephone stations whereby telephonic
5 connection may be effected between the sta-
tions; a plurality of trunk lines intervening
between said telephone exchange and the
telephone stations of the aforesaid lines;
means whereby either of said telephone sta-
10 tions may become connected with the trunk
lines; signal apparatus at the telephone ex-
change adapted for association with the trunk
lines; electro-magnetic means interchange-
ably associated with said trunk lines oper-

ating in conjunction with said telephone sta- 15
tions for governing said signal apparatus;
and means for preventing other telephone
stations from effecting operative connection
with a trunk line with which the aforesaid
means has become operatively associated. 20

In witness whereof, I hereunto subscribe
my name this twenty-third day of March,
A. D. 1911.

ELMER R. CORWIN.

Witnesses:

G. L. CRAGG,
E. L. WHITE.