

Nov. 10, 1931.

T. V. CURLEY

1,831,380

TELEPHONE SYSTEM

Filed Dec. 6, 1930

3 Sheets-Sheet 1

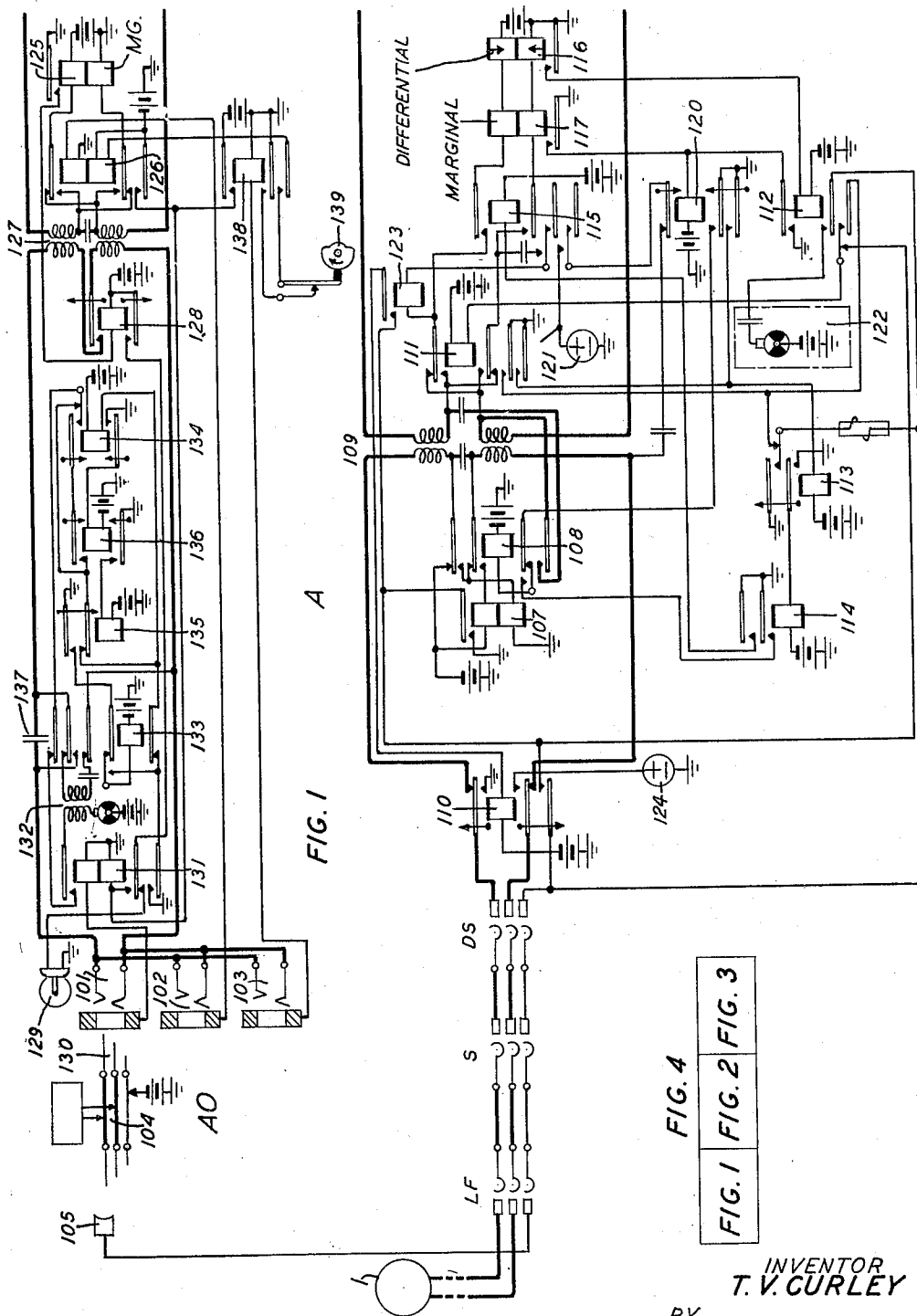


FIG. 4

FIG. 1 FIG. 2 FIG. 3

INVENTOR
T. V. CURLEY

T. V. CURLEY

BY

BY
M. B. McInerney
ATTORNEY

ATTORNEY

Nov. 10, 1931.

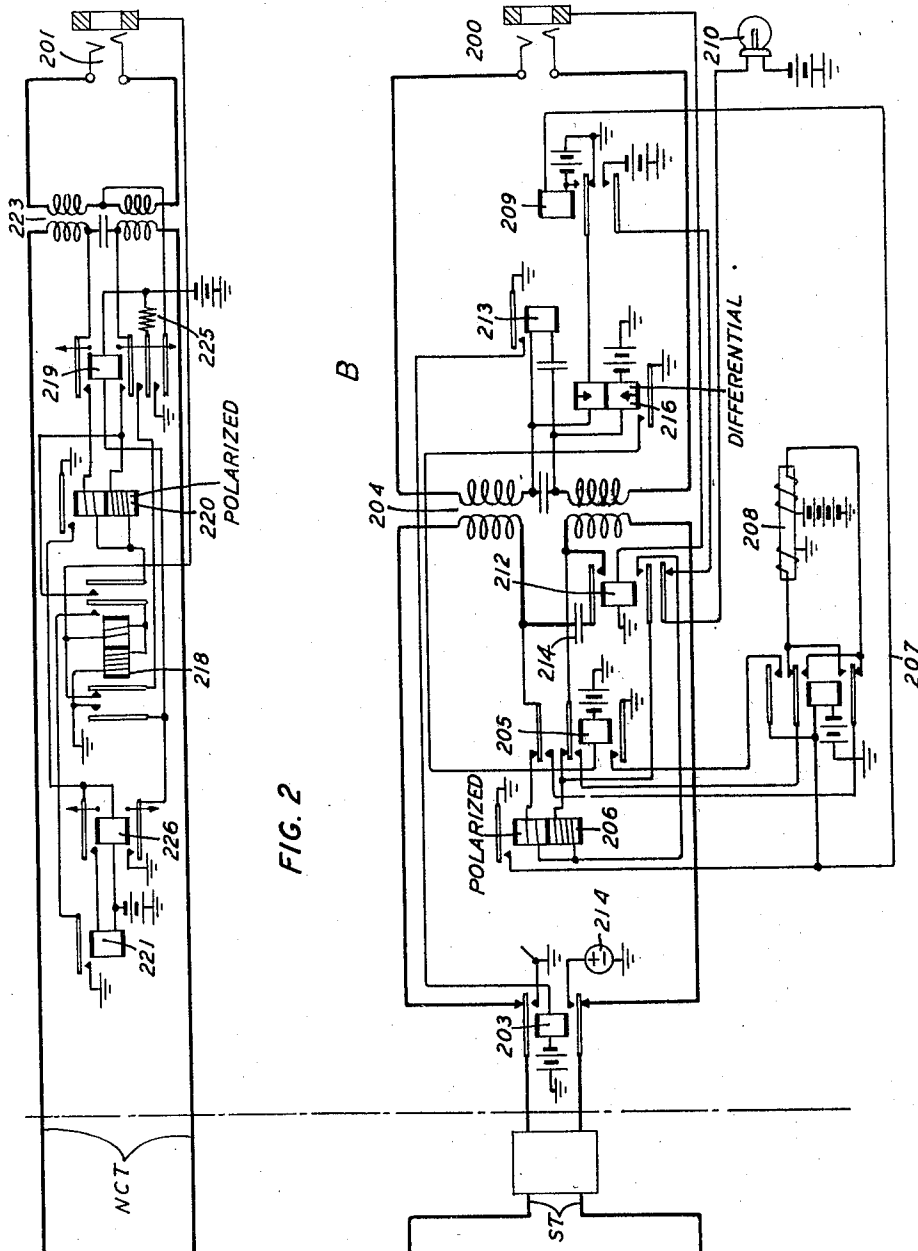
T. V. CURLEY

1,831,380

TELEPHONE SYSTEM

Filed Dec. 6, 1930

3 Sheets-Sheet 2



INVENTOR
T. V. CURLEY
BY
James M. Curley
ATTORNEY

Nov. 10, 1931.

T. V. CURLEY

1,831,380

TELEPHONE SYSTEM

Filed Dec. 6, 1930

3 Sheets-Sheet 3

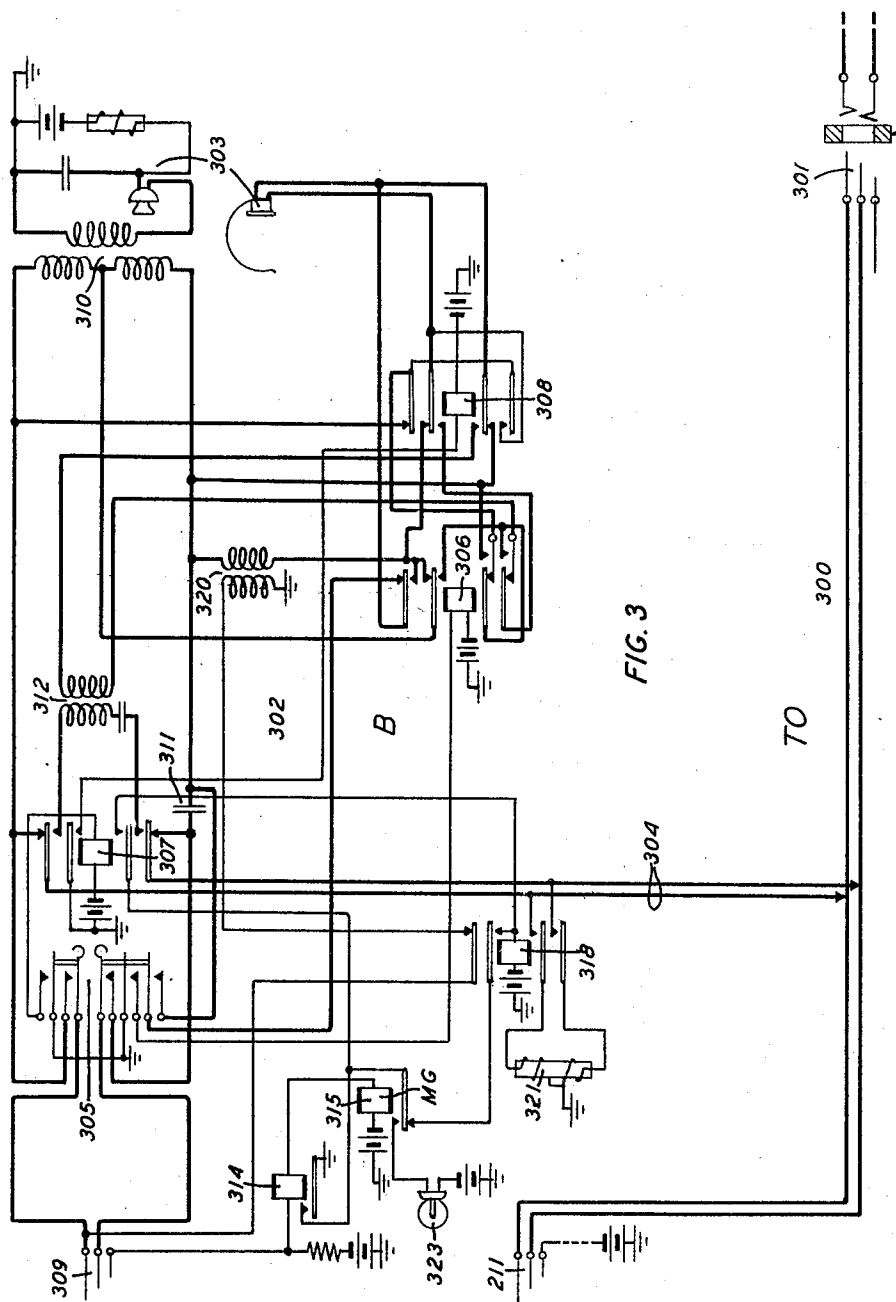


FIG. 3

INVENTOR
T. V. CURLEY

BY

W. P. McFadden
ATTORNEY

UNITED STATES PATENT OFFICE

THOMAS V. CURLEY, OF BROOKLYN, NEW YORK, ASSIGNOR TO BELL TELEPHONE LABORATORIES, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK

TELEPHONE SYSTEM

Application filed December 6, 1930. Serial No. 500,515.

This invention relates to telephone systems and particularly to means for checking calling subscribers' numbers, and the object of the invention is to simplify and improve the checking of numbers when applied to automatic systems.

Heretofore, systems have been proposed in which an operator at one office may check the number given by a calling subscriber at another office, who has established automatically a connection to said operator, by establishing automatically a separate connection to the calling subscriber's line, and causing the application of an alternating current signal over the portions of these connections at the calling subscriber's office and by having this alternating current signal cause a direct current signal to be transmitted over the separate connection back to the operator's position where it is effective in producing a visual signal to indicate to the operator that the calling subscriber gave the correct number. If the calling subscriber did not give the correct number and the operator has established the separate connection to a wrong number an interrupted direct current signal is transmitted to the operator's position to effect an interrupted visual signal. Systems of this kind are disclosed in the pending applications of R. L. Quass, Serial No. 500,492, and P. B. Murphy Serial No. 500,517, filed on the same date with the present application.

A feature of the present invention is an arrangement, in systems of this general kind in which the calling subscriber at one office has established an automatic connection to an operator at a second office over a trunk, whereby this operator may establish manually a connection over another trunk to another operator at the first office, and simultaneously cause an alternating current signal to be transmitted over the automatically established connection, and whereby, after the second operator has received the calling subscriber's number over said second connection from the first operator and established a connection to the calling subscriber's line to detect the alternating current signal said second operator may, by associating her cord

circuit with said second connection in a certain manner, cause a signal to be actuated at the first operator's position to indicate that the subscriber gave the correct number.

Another feature of this invention is an arrangement whereby if the calling subscriber did not give the correct number the operator at the first office may, by associating her cord circuit with the second connection in a different manner, cause said signal to be differently actuated to indicate this condition to the second operator.

Another feature of this invention is an arrangement whereby the alternating current signal is automatically disconnected in response to the second operator associating her cord circuit with the second connection regardless of whether it is associated therewith to cause the signal to indicate that the calling subscriber gave the correct number or a false number.

Another feature of the invention is an arrangement, in the cord circuits employed by the first operator in associating her telephone set with the connection from the calling subscriber, the connection to the second operator and the connection for extending the calling subscriber's line to a desired subscriber's line, whereby the first operator may simultaneously talk and listen to the second operator over the second connection, and listen only over the first connection to the calling subscriber and over the connection to be established to the desired subscriber. The purpose of this arrangement is to permit the first operator to attend to the calling subscriber's instructions and to the extension of the connection to the desired subscriber's line during the number checking operations. The connection to a desired subscriber's line may be extended over toll lines by the aid of other operators and it is desirable to keep in constant touch with these operators during the extension of such connections as well as with the calling subscriber.

This invention has been illustrated in the accompanying drawings in which Figs. 1 to 3 may be arranged as shown in Fig. 4. Figs. 1, 2 and 3 show a complete system for number checking.

Referring now to the drawings a subscriber 1 at office A may extend an automatic connection to a toll operator's position TO at office B over a line finder LF, a selector S and a district selector DS and a trunk ST. Trunk ST terminates in a jack 200 at the toll operator's position TO and toll cord 300 which has been shown in diagrammatic form. This cord may be used for answering calls incoming over trunk ST to jack 200 and for the extension of this call to a subscriber over jack 301 to a desired line. A number checking cord 302 has also been shown in Fig. 3 in detail. This cord may be used for checking a calling subscriber's number over the number checking trunk NCT that terminates at the toll office B in jack 201. This number checking trunk NCT terminates at the call originating office A at an A operator's position AO in jacks 101, 102 and 103. An A operator's cord 104 has been shown in diagrammatic form and this cord may be used by the A operator for checking the calling subscriber's number over checking terminal 105 which is connected to the sleeve conductor of the calling subscriber's line. The circuit details of the number checking trunk NCT have been shown in detail to illustrate features of the invention.

A description will now be made of a connection established by the subscriber at 1 to the toll operator at TO and the establishing of another connection from the toll operator TO to the A operator AO for the checking of the calling subscriber's number.

After the calling subscriber at 1 has established a connection over line finder LF, selector S and district selector DS to trunk ST of any well known automatic system, a circuit is established for the operation of relay 107 as follows: battery, upper outer armature and back contact of relay 108, repeating coil 109, upper armature and back contact of relay 110 over the tip conductor through a loop connection in the district selector DS back over the ring conductor, lower inner armature and back contact of relay 110, repeating coil 109, upper inner armature and back contact of relay 108, winding of relay 107 to ground. Relay 107 in operating closes a circuit for the operation of relay 111 from battery, winding of this relay, make-before-break contacts of relay 112, armature and front contact of relay 107 to ground. Relay 111 in operating partially prepares a supervisory signaling circuit over trunk ST. It also establishes a connection to ground over its lower middle armature and front contact, make-before-break contacts of relay 113 to the sleeve conductor of the district selector to maintain it busy. An obvious circuit is also prepared for the operation of relay 113. This relay in operating supplies another connection to ground for the sleeve conductor to maintain

it busy and prevent it from releasing. Relay 113 closes an obvious circuit for the operation of relay 114 and this relay in turn closes an obvious circuit for the operation of relay 115. This relay in operating closes a ringing induction connection from source 121 to the calling subscriber's line. This relay also extends a connection from battery and ground through windings of relays 116 and 117, armatures of relays 115 and 111, repeating coil 109, trunk ST, armatures and back contacts of relay 203, repeating coil 204, armatures and back contacts of relay 205, through a loop over the windings of relay 206. Relay 116 does not operate in this circuit as it is differentially wound and provides for number checking purposes as will be hereinafter described. Neither does relay 117 operate in this circuit due to the high resistance of the lower winding of relay 206 and the marginal characteristics of relay 117. Relay 206, however, operates and closes a circuit for the operation of relay 207. Relay 207 in operating reverses the connections from battery and ground through retardation coil 208 and the purpose of this will be described in connection with number checking. Relay 206 also closes an obvious circuit for the operation of relay 209 and this relay in operating closes an obvious circuit for the operation of the line lamp 210 associated with jack 200.

The toll operator at TO answers this signal by inserting the answering plug 211 of cord 300 into jack 200. The immediate effect of this connection will be the operation of relays 212 from a battery supplied over the sleeve of cord 300 through the winding of this relay to ground. Relay 212 in operating opens the circuit for the line lamp 210 at its lower outer armature and back contact. The tip and ring conductors of the trunk ST are now connected through the condenser 214 at the upper armature and front contact of relay 212 to provide a talking circuit. Relay 212 also shunts at its lower inner armature and front contact the lower high resistance winding of relay 206. Relay 206, however, remains operated. At the call originating end of trunk ST the marginal relay 117 now operates due to the shunting of the high resistance winding of relay 206. Relay 117 in operating closes an obvious circuit for the operation of relay 120. Relay 120 in operating opens the ringing induction connection from the ringing source 121 to the calling subscriber's line at its upper armature and back contact. Relay 120 also closes an obvious circuit for relay 113 to hold this relay operated to maintain the connection to the calling subscriber's line under control of the toll operator. Relay 120 also closes an obvious circuit for the operation of relay 108. This relay provides a locking circuit for itself under control of relay 114 and

reverses the battery and ground connections over the tip and ring conductor to the district selector DS to cut through by means in the district selector, (not shown) the tip and ring connection from the calling subscriber's line to the trunk ST. It will be noted that the talking connection from the calling subscriber's line now extends through both windings of relay 107 and that relay 108 has closed at its lower outer armature and front contact the talking connection through the outgoing coil of the repeating coil 109. The circuits are now in condition for conversation between the subscriber at 1 and the toll operator at TO.

If the calling subscriber decides to recall the toll operator at TO he will operate the switchhook in the usual manner. This causes the alternate operation and release of relay 107. Relay 111 being under control of relay 107 will follow these operations and cause the battery and ground connections over trunk ST to be alternately reversed. This causes the alternate release and operation of relay 206. Relay 206 in turn causes the alternate operation and release of relay 209. Battery and ground are thereby alternately connected to the tip conductor to flash a supervisory lamp in the cord 300 in any well known manner to notify the operator at TO that the calling subscriber desires further attention. Relay 216 is not operated during supervision regardless of whether relay 209 is operated or not as it is differentially wound.

If the toll operator at TO desires to recall the calling subscriber she will operate the usual ringing key (not shown) in cord 300 and thereby apply alternating ringing current to the trunk ST and cause the operation of ringing relay 213. This relay closes an obvious circuit for the operation of relay 203 which then supplies ringing current from source 214 over the tip and ring conductors of trunk ST to actuate the ringing responsive relay 123. Relay 123 operates relay 110 over an obvious circuit, the ground connection for which is supplied through the armature and front contact of relay 107. Relay 110 in operation provides a locking circuit for itself under control of relay 113 independent of relay 107 and supplies ringing current to the calling subscriber's line from source 124 and the ground return at the upper armature and front contact of relay 110. It will be noted that on the operation of relay 110 relay 107 will release but relay 111 will now be maintained operated under control of relay 113 over a circuit through the lower outer armature and front contact of relay 110. When the operator at TO discontinues the ringing relay 203 will release to cause the release of relays 123 and 110. Relay 110 in releasing again closes a circuit for the operation of relay 107.

After the calling subscriber has instructed

the toll operator at TO to extend a connection to a desired subscriber's line and this connection has been made and conversation completed the calling subscriber may disconnect by replacing his receiver on the hook. This causes the release of relay 107 which in turn causes the release of relay 111. Relay 111 in releasing releases relay 206 which in turn releases relay 209 to continuously light the supervisory lamp in the cord 300 as a disconnect signal. The operator at TO will now disconnect by removing plug 211 from jack 200 thereby causing the release of relay 212. This relay in turn removes the short-circuit from the lower high resistance winding of relay 206 thereby causing the release of relay 117 which in turn causes the release of relay 120. Relay 120 in releasing opens the circuit for relay 113 which in releasing releases relay 114. The release of these relays opens the connection to ground for the sleeve circuit to the district selector and causes the release of this selector and the preceding switches in the connection to the calling subscriber. Relay 114 releases relay 108 and the circuits shown in these figures are thereby returned to normal condition. If the toll operator at TO should release before the calling subscriber, relay 212 will release and thereby cause the lighting of the line lamp 210.

The operation of these circuits while checking the calling subscriber's number will now be described. The toll operator will first, by operating her talking key (not shown) in cord 300, connect her telephone set 303 through cord 300 to the calling subscriber's line and secure the number of this subscriber for the purpose of checking it as well as for the securing of the information for extending the connection to the desired subscriber's line. It will be noted that the toll operator's telephone set 303 is connected through conductors 304 to the cord 300 and the operation of the talking key will connect it through to the calling subscriber's line. When the operator has received the number of the calling subscriber she will actuate key 305 in the number checking cord 302. The operation of this key closes an obvious circuit for the operation of relays 306 and 307 and the latter relay in turn closes an obvious circuit for the operation of relay 308. The effect of the operations of this key and relays is that the telephone operator's set 303 will be connected to the plug 309 for number checking, while the receiver only of this set will be connected to leads 304 so that the toll operator may monitor on the cord 300 while number checking, that is, the toll operator will be able to simultaneously talk and listen over the number checking connection and listen only to anything that may occur on the connection to the calling subscriber's line and over the connection to be established to the

desired subscriber's line. The circuits for the toll operator's telephone set 303 to plug 309 may be traced as follows: from the tip terminal of plug 309, contacts of key 305, repeating coil 310, condenser 311, contacts of key 305 to the ring terminal of plug 309 for the transmitter circuit, while the receiver is connected from the midpoint of the transformer 310, upper inner armature and front contact of relay 306, lower inner make-before-break contacts of this relay transformer 312, lower inner armature and front contact of relay 308 through the receiver, lower outer armature and front contact of relay 308, lower inner make-before-break contacts of relay 306 to the ring conductor. It will be noted that the other winding of the transformer 312 is connected through armatures and front contacts of relay 307 to conductors 304 for monitoring by the toll operator on the toll connection.

The toll operator will now insert the plug 309 of the number checking cord 302 into the jack 201 associated with the number checking trunk NCT. Relay 314 is thereby operated in series with relay 218 over a circuit from battery windings of relays 315 and 314 in series, plug 309, jack 201, through both windings of relay 218 to ground. Relay 315 does not operate in this circuit due to its marginal characteristics and the high resistance of the left-hand winding of relay 218. The operation of relay 314 closes an obvious circuit for the operation of relay 318 for the purpose of initiating the application of the number checking tone to the calling subscriber's sleeve. Relay 318 in operating opens at its upper armature and back contact a connection to the tip terminal of plug 308 from a busy test tone source 320. Relay 318 also provides a locking circuit for itself under the control of relays 314 and 315 independent of the original circuit through contacts of relay 307. Relay 318 also completes through its lower armatures and front contacts a connection to ground through a retardation coil 321 for the tip and ring conductors 304. This ground connection causes the operation of relay 216 regardless of whether relay 209 is operated or not. Relay 216 in operating closes a circuit for the operation of relay 205. Relay 205 in operating disconnects the relay 206 from the trunk ST and thereby causes it to release. If relay 207 is operated at this time it will be held operated by the operation of relay 205 through a locking circuit provided at the lower armature and front contact to ground of relay 205. Under these circumstances when relay 205 operates high voltage battery and ground will be supplied to the trunk as follows: from battery and ground through the windings of retardation coil 208, armatures and front contacts of relay 207, armatures and front contacts of relay 205, transformer 204, armatures and back

contact of relay 203, tip and ring conductors of trunk ST. The high voltage battery will be connected in this case over the ring conductor of trunk ST, to the battery through a winding of relay 116 to ground while ground at 208 will be connected to the tip conductor to ground at relay 116. If relay 207 had not been operated at this time the high voltage battery would have been connected over the tip conductor and in this case the relay 111 would not have been operated so the connection would have been made to the same battery at relay 116. This arrangement is for the purpose of insuring the operation of relay 116 regardless of whether supervision is being carried on during this time or not. That is, regardless how the tip and ring conductors are connected for supervisory signaling as hereinbefore described the battery at 208 will always be switched to oppose the battery at 116 when number checking signaling takes place. In either case, therefore, relay 116 will be operated as it is differentially wound and the high voltage battery causes current to flow through a winding of relay 116 in the opposite direction to that ordinarily flowing from the low voltage battery. Relay 116 in operating closes an obvious circuit for the operation of relay 112 and this relay in operating provides a holding circuit for relay 120 if it has been operated by relay 117 during supervision. If relay 117 was not operated relay 120 will now be operated by relay 112 to maintain the circuit connections established regardless of whether relays 117 and 111 are operated or released during the number checking period. Relay 112 in operating provides a connection from an alternating current source 122 to the sleeve of the connection to the calling subscriber and the extension sleeve of the calling subscriber to jack 105.

It will be recalled that relay 218 operated in series with relay 314 when the plug 309 was inserted into jack 201. The operation of relay 218 closes an obvious circuit for the operation of relay 219, short-circuits the high resistance winding of relay 220 and completes a circuit for the left-hand high resistance winding of relay 218 to the armature of relay 221 which performs no useful function at this time. The operation of relay 219 closes a supervisory circuit over the trunk NCT and due to the high resistance winding of relay 220 being short-circuited by the operation of relay 218, relay 125 of the number checking trunk NCT at the call originating office A operates over a circuit from battery, upper winding of this relay, upper armature and back contact of relay 126, repeating coil 127 over the ring conductor of the trunk NCT, repeating coil 223, lower inner armature and front contact of relay 219, outer right-hand armature and front contact of relay 218, upper low resistance winding of relay 220, ar-

mature and front contact of relay 219, repeating coil 223, tip conductor of trunk NCT, repeating coil 127, lower inner armature and back contact of relay 126 to lower winding of relay 125 to ground. Relay 125 in operating closes an obvious circuit for the operation of relay 128. The operation of relay 128 completes a circuit between the tip and ring conductors of the jack ending portion of the number checking trunk NCT and closes an obvious circuit for the lighting of the line lamp 129 associated with jack 101.

The A operator at AO now answers this signal by inserting plug 130 into jack 101. Relay 131 is thereby operated over the sleeve from the cord 104. Relay 131 provides a locking circuit for itself under control of relay 128 so as to prevent its release until both the toll and the A operator have disconnected. The operation of relay 131 opens the circuit for lamp 129 which is now extinguished. Relay 131 provides at its upper armature and front contact, a circuit to the tone coil 132 through contacts of relays 133, 134, 135, 133 and the lower outer armature and front contact of relay 131 to ground. This closes the primary circuit for the tone coil 132 to cause a tone to be transmitted through the secondary winding of this coil to the toll operator TO over the tip and ring conductors of the number checking cord 302 through armatures and back contacts of relay 133. The ground at the lower outer armature and front contact of relay 131 completes a circuit for the operation of relay 134. Relay 134 is slow in operating to permit a short tone signal to be transmitted to the toll operator. The operation of this relay opens the tone circuit and closes an obvious circuit for the operation of relay 136. This relay in operating again completes a tone circuit at its upper armature and front contact partially prepared by the operation of relay 134 at its upper armature and front contact, to permit a second short tone signal to be transmitted to the toll operator. The operation of relay 136 also completes an obvious circuit for the operation of relay 135, which is also slow-to-operate. When relay 135 operates it opens the tone circuits at its upper inner armature and back contact. The toll operator will therefore, due to the above operations of relays 131, 134, 136 and 135, receive two short signals to notify her that the A operator has answered the connection. The operator of relay 135 now closes an obvious circuit for the operation of relay 133 which provides a locking circuit for itself under control of relay 131 at its upper make-before-break contact. At the time this double tone signal was sent to the toll operator an identical inductive signal was also transmitted to the A operator over the condenser 137. The operation of relay 133 opens the connection for the secondary winding of the coil 132 and short-circuits the condenser 137 and

also causes the release of relays 134, 136 and 135. Relay 133 finally also closes the talking circuit to the A operator past the condenser 137.

If the toll operator wishes to recall the A operator she may do so by alternately disconnecting the number checking cord and reconnecting it to the number checking trunk NCT. Disconnecting the cord releases relay 218 to remove the short-circuit for the high resistance winding of relay 220 and when the toll operator again connects the number checking cord to the trunk relay 218 reoperates to restore the short-circuit for this high resistance winding. The effect of this alternate short-circuiting of the high resistance winding of relay 220 will be the alternate operation and release of relays 125 and 128. Relay 128 in releasing and operating alternately opens and closes the tip and ring connection to the A operator's cord and thereby flashes the usual supervisory lamp in this cord.

The calling subscriber's number to be checked is now given by the toll operator to the A operator who then proceeds to check it by touching the checking terminal 105 associated with a calling subscriber's sleeve with the calling plug of cord 104. If the alternating current signal on this sleeve produced by the device 122 is heard by the A operator she will know that the calling subscriber gave the right number. If no signal is heard at this time it will indicate that the wrong number was given by the calling subscriber and that checking terminal 105 is associated with another subscriber's sleeve. If the check is satisfactory the A operator will disconnect the answering plug 130 from jack 101 and connect it to jack 102 which is called "the check OK jack" which causes the operation of relay 126 over the sleeve circuit. The operation of relay 126 completes a circuit to battery for the operation of relay 131 to provide a means for holding it operated under control of the A operator in case relay 128 should release due to supervision from the toll operator. Relay 126 reverses the current from battery and ground through windings of relay 125 over the tip and ring conductors of the number checking trunk NCT and relay 220 which is polarized will operate in this circuit. Relay 220 in operating closes an obvious circuit for the operation of relay 226 which provides a holding circuit for relay 219 independent of the circuit established for this relay by relay 218. Relay 226 closes an obvious circuit for the operation of relay 221. The operation of relay 221 changes the resistance of the sleeve circuit from a high resistance to a low resistance, that is, the original circuit for the sleeve passes through both windings of relay 218 while on the operation of relay 221 a ground will be supplied to short-circuit the high resistance winding of this

relay. Relay 315 is thereby operated to close an obvious circuit for the lighting of lamp 323 to notify the toll operator that the checking of the calling subscriber's number was satisfactory.

If the A operator had been unable to make a satisfactory check she would insert plug 130 into jack 103. This is called a "no-check jack". This connection causes the operation of relay 138 over the sleeve which also provides a holding circuit for relay 131. Relay 128 closes an obvious circuit through an interrupter 139 for the control of relay 126 to cause it to be alternately operated and released and thereby cause the alternate operation and release of relays 220 and 315 to flash lamp 323 to indicate in this manner to the toll operator that the check was not satisfactory.

In either case of satisfactory or unsatisfactory check, when relay 315 first operates the holding circuit for relay 318 is opened permitting relay 318 to release. This relay in releasing opens the circuit for relay 216 which in turn causes the release of relay 205 to release relay 116. Relay 116 releases relay 112 which then disconnects the alternating current source 122 from the sleeve circuit to discontinue the checking signal.

When the checking signal is received by the toll operator she will disconnect plug 309 from the number checking trunk NCT to cause relay 218 to release. The release of this relay causes the release of relay 125 which in turn causes the release of relay 128. The release of relay 128 causes the supervisory lamp at the A operator's cord to light as a disconnect signal. When now the A operator disconnects her cord 104 from any of the jacks of the number checking trunk the remaining relays in these circuits are released.

While this invention has been illustrated only in a single system it should be understood that it could readily be applied to a number of other systems without departing from the spirit thereof and that the present disclosure is merely illustrative of the invention.

What is claimed is:

1. In a telephone system, a first office, a second office, means for extending an automatic connection between said offices, means for extending a manual connection between said offices, means responsive to the establishing of the manual connection for applying a signal over the automatic connection at the second office, means for detecting said signal at the first office, means for applying a signal over the manual connection at the first office and means for detecting said second signal at the second office.

2. In a telephone system, a first office, a second office, means for establishing an automatic connection between said offices, means

for simultaneously applying a signal over said connection and establishing a second connection from the second office to the first office, means for detecting said signal at the first office, means for applying a signal over the second connection from the first office, and means for detecting said second signal at the second office.

3. In a telephone system, a first office, a second office, means for extending an automatic connection between said offices, means for establishing a manual connection between said offices, means responsive to the establishing of the manual connection for applying at the second office a direct current signal over the automatic connection to the first office, means at the first office responsive to said direct current signal for applying a tone signal to said automatic connection, means for detecting said tone signal at the first office, means for applying a direct current signal at the first office to the manually established connection and means for translating said last mentioned direct current signal at the second office into a visual signal.

4. In a telephone system, a first office, a second office, means for extending an automatic connection between said offices, means for simultaneously applying at the second office a direct current signal over the automatic connection to the first office and for establishing a manual connection between said offices, means responsive to said direct current signal for applying a tone signal to said automatic connection, means for detecting said tone signal at the first office, means for applying a direct current signal at the first office to the manual connection and means for translating said last mentioned direct current signal at the second office into a visual signal.

5. In a telephone system, a first office, a second office, means for extending an automatic connection between said offices, two cord circuits at the second office, a trunk between said offices, means for connecting said cord circuits together, means responsive to the connection of one of said cord circuits to the trunk and the other to the automatically established connection for transmitting a direct current signal over the trunk and a direct current signal over the automatic connection, means for translating the direct current signal over the trunk into a visual signal at the first office, means for translating the direct current signal over the automatic connection into a tone signal at the first office, cord circuits at the first office, means responsive to the connection of one of the last mentioned cord circuits to the automatic connection for detecting the tone signal and means responsive to the connection of another of said last mentioned cord circuits to the trunk for disabling the direct current signal over said trunk, means responsive to the removal of said last mentioned cord circuit from the trunk and

for connecting it in a different manner there-
to for transmitting a direct current signal
over the trunk to the second office, a visual
signal associated with the cord circuit asso-
ciated with the trunk at the second office,
means in this last mentioned cord circuit re-
sponsive to the direct current signal received
over the trunk for actuating the visual sig-
nal and for discontinuing the direct current
signal transmitted over the automatic con-
nection to disable the tone signal.

6. In a telephone system, a first office, a
second office, a subscriber's line at the first of-
fice, an operator's position in the first office,
an operator's position in the second office,
means for establishing a connection from the
subscriber's line to the operator's position in
the second office including a sleeve conductor
extending from the subscriber's line to the
point where this connection leaves the first
office, means for establishing a connection
from the operator's position in the second of-
fice to the operator's position in the first of-
fice, means responsive to the establishing of
said last mentioned connection for transmit-
ting a tone over said sleeve conductor, means
for detecting said tone at the first office,
means for transmitting a direct current sig-
nal from the operator's position in the first
office to the operator's position in the second
office over the connection between said posi-
tions, a signal at the operator's position at
the second office and means for actuating said
last mentioned signal responsive to said di-
rect current signal.

7. In a telephone system, a first office, a sec-
ond office, means for extending an automatic
connection between said offices, means for ex-
tending a manual connection between said
offices, means responsive to the establishing
of the manual connection for applying a sig-
nal over the automatic connection at the sec-
ond office, means for detecting said signal at
the first office, means for applying either of
two types of signals to the manual connection
at the first office and means for translating
said signals into different identifying signals
at the second office.

8. In a telephone system, a first office, a
second office, means for establishing an auto-
matic connection between said offices, means
for simultaneously applying a signal to said
connection and for establishing a second con-
nection from the second office to the first of-
fice, means for detecting said signal at the
first office, means for transmitting different
signals over the second connection from the
first office and means for detecting said dif-
ferent signals at the second office.

9. In a telephone system, a first office, a sec-
ond office, means for establishing an auto-
matic connection between said offices, a means
for establishing a manual connection between
said offices, means responsive to the establish-
ing of the manual connection for applying at

the second office a direct current signal over
the automatic connection to the first office,
means responsive to said direct current signal
for applying a tone signal over said automatic
connection, means for detecting said tone sig-
nal at the first office, means for applying an
interrupted direct current signal at the first
office to the manual connection and means for
translating said interrupted direct current
signal into an interrupted visual signal.

10. In a telephone system, a first office, a
second office, means for extending an auto-
matic connection between said offices, means
for extending a manual connection between
said offices, means for applying a signal to the
automatic connection at the second office,
means for applying a signal to the manual
connection at the first office and means re-
sponsive to the last mentioned signal for dis-
abling the first mentioned signal.

11. In a telephone system, a first office, a
second office, means for extending an au-
tomatic connection between said offices,
means for extending a manual connection be-
tween said offices, means for applying a sig-
nal to the automatic connection at the second
office, means for applying a signal to the man-
ual connection at the first office, a visual sig-
nal at the second office, and means responsive
to the signal over the manual connection for
actuating said visual signal and for disabling
the signal applied over the automatic con-
nection.

12. In a telephone system, a first office, a
second office, means for establishing an au-
tomatic connection between said offices, means
for simultaneously applying a signal to said
connection and for establishing a second con-
nection from the second office to the first of-
fice, means for signaling over the second con-
nection from the first office, and means for
simultaneously detecting the second signal at
the second office and for disabling the first
signal.

13. In a telephone system, a first office, a
second office, means for extending an auto-
matic connection between said offices, means
for extending a manual connection between
said systems, means responsive to the estab-
lishing of the manual connection for apply-
ing at the second office a direct current signal
over the automatic connection in the first
office, means responsive to said direct cur-
rent signal for applying a tone signal over
said automatic connection, means for apply-
ing a direct current signal at the first office
over the manual connection and means for
translating said last mentioned direct current
signal at the second office into a visual signal
and for disabling the first mentioned direct
current signal and the tone signal responsive
thereto.

14. In a telephone system, two lines, a third
line, an operator's telephone set, means for
simultaneously connecting the receiver of

said set to said first two lines through said cord circuit and for connecting both the receiver and the transmitter of said set to the third line.

- 5 15. In a telephone system, two lines, a cord circuit for connecting said lines, a third line, an operator's telephone set, a key, relays, means responsive to the operation of the key for operating said relays, and means controlled by the operation of said relays to connect the receiver of said set to the first two lines through said cord circuit and for connecting both the transmitter and receiver of said set to the third line.
- 15 16. In a telephone system, two lines, a third line, two cord circuits, means for connecting said two lines together by means of one of said cord circuits, and for connecting the other cord circuit to the third line, an operator's telephone set, and means for connecting said cord circuits together, for connecting the receiver of said set to the two lines through the cord circuit connecting said two lines and for connecting both the receiver and
- 20 the transmitter of said set to the third line through said other cord circuit.

In witness whereof, I hereunto subscribe my name, this 4th day of December, 1930.

THOMAS V. CURLEY.

30

35

40

45

50

55

60

65