

June 14, 1932.

W. WHITNEY

1,863,292

TELEPHONE SYSTEM

Filed Dec. 31, 1930

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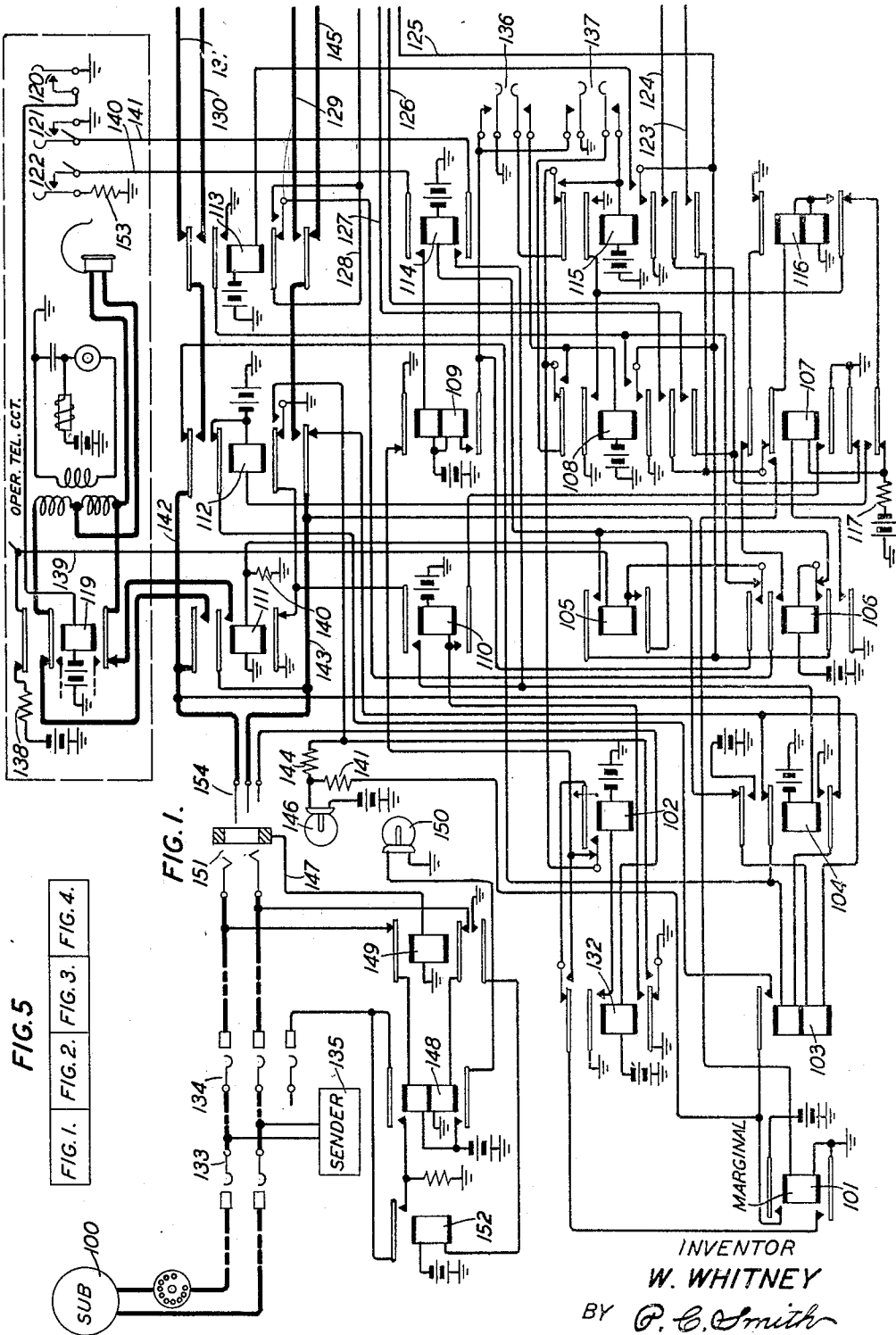


FIG. 1.

FIG. 2. FIG. 3. FIG. 4.

SUB 100

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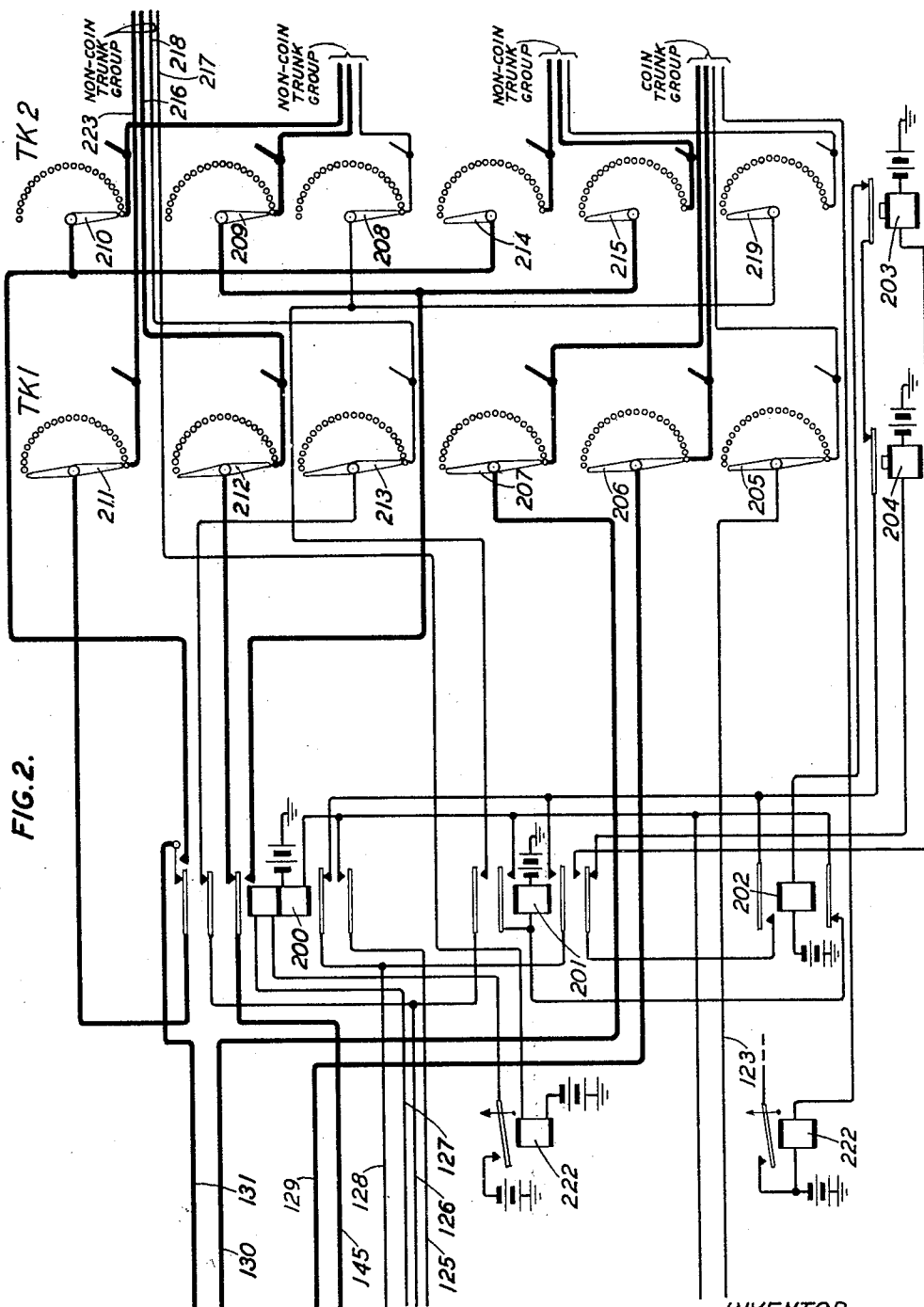
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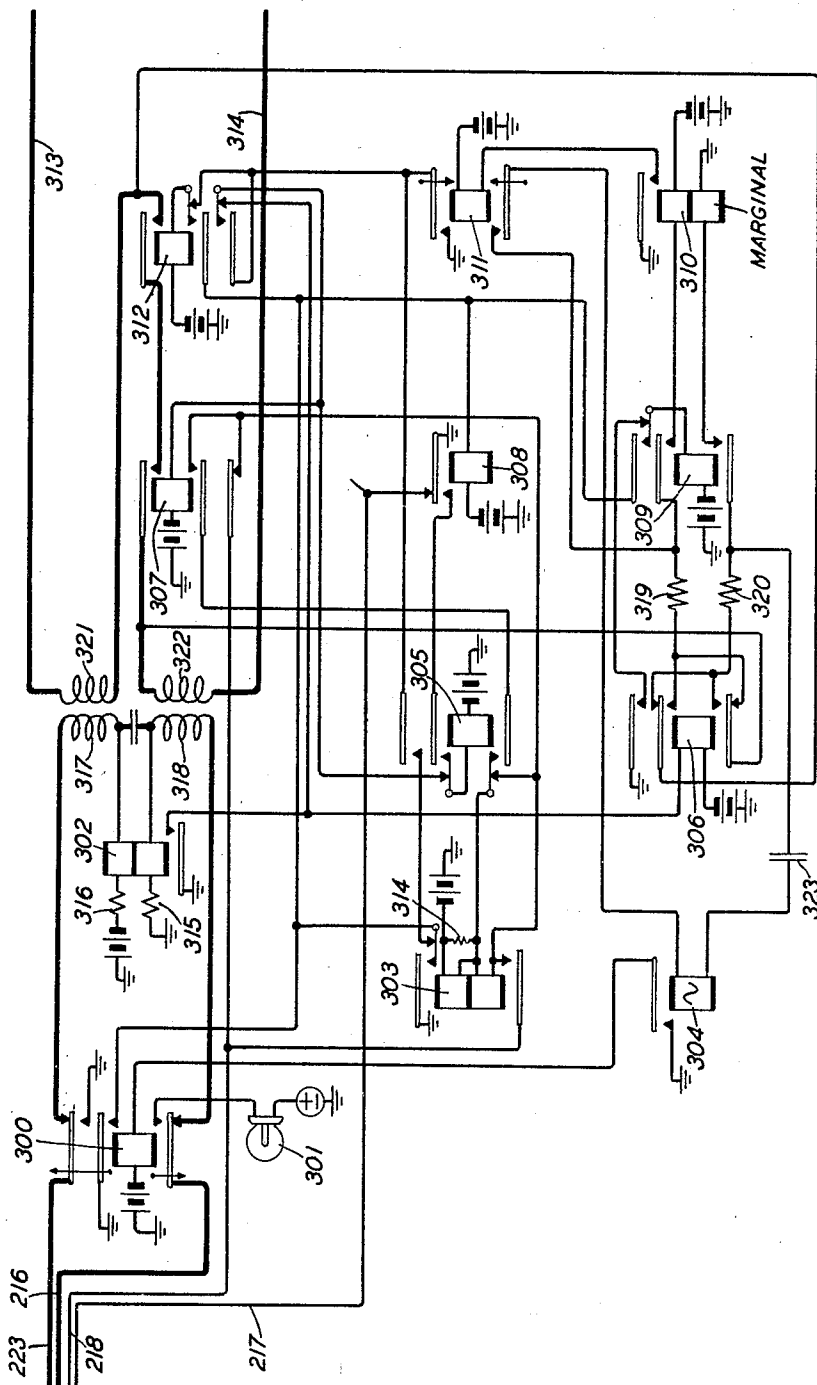
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TELEPHONE SYSTEM

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FIG. 3



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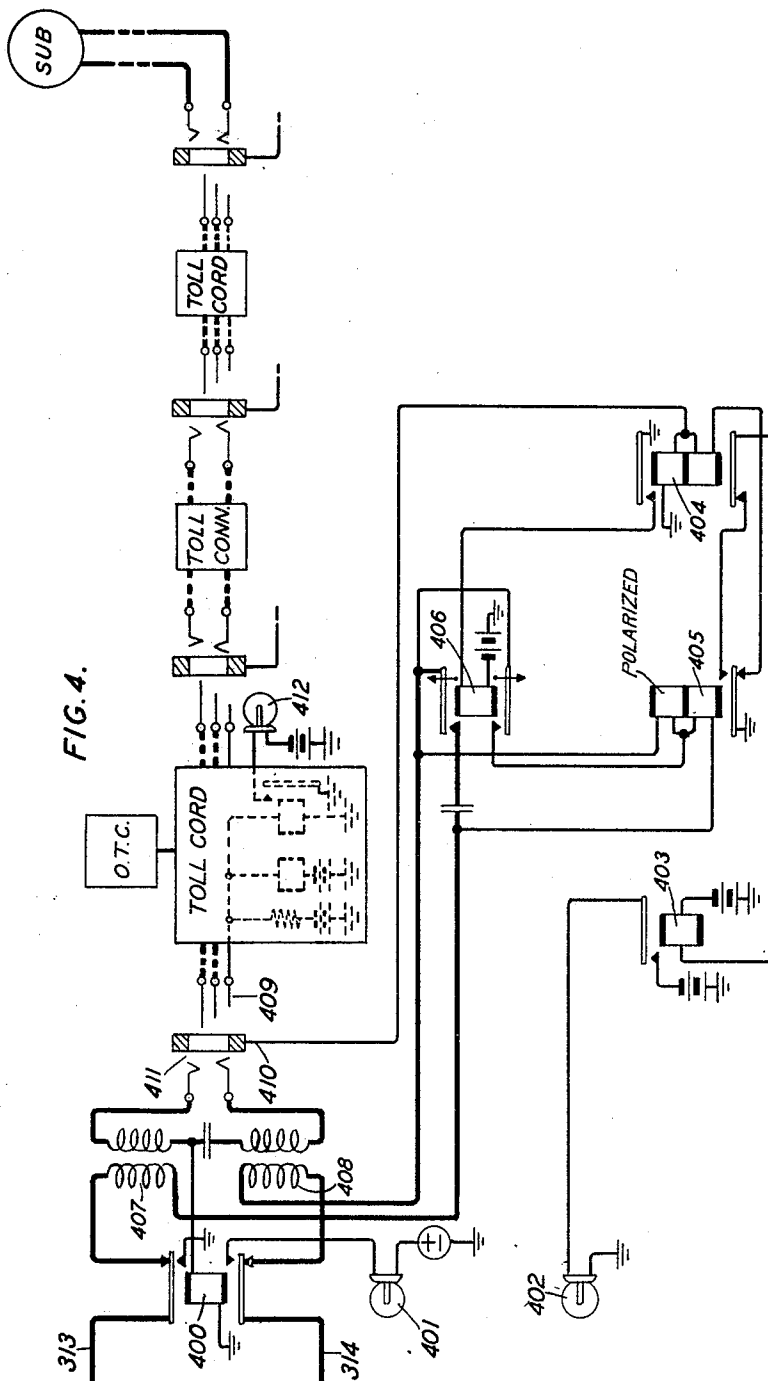
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TELEPHONE SYSTEM

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4 Sheets-Sheet 4



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TELEPHONE SYTSEM

Application filed December 31, 1930. Serial No. 505,823.

This invention relates to improvements in telephone systems and has particular reference to automatic systems in which a calling line is extended from a special service "A" operator's position to a toll switchboard position for the establishment thereof of a toll or long distance connection.

In well known systems of this character an automatic subscriber sometimes dials the special "A" or so-called Zero operator for the establishment of a toll-call when, in fact, the long distance operator is the one desired. The special service operator, under such circumstances, does not request the calling subscriber to restore his receiver and call to the toll operator by dialing the special long distance code but, instead, obtains from him the office and number of the wanted long distance subscriber. The special service operator then establishes a local connection between the special service and toll position by the use of a local selector which, in cooperation with the dialing equipment available at the special service position, selects a trunk connecting the two positions. This connection, however, is purely local between the two operators involved for the passage thereover of the call extending information and since the local selector provides no supervisory facilities to the toll position which can be extended back to control supervision of the calling line, the local selector cannot be used to extend the calling line to the toll position. Under such circumstances it becomes necessary for the special service operator to connect the calling subscriber's line to a single-ended holding cord which terminates on a set of terminals on the banks of the final connector. When the special service operator communicates the desired long distance number to the toll operator she likewise transmits the terminal number of the holding cord. When the toll operator has established connection with the called line, it will then be necessary for her to establish a connection to the calling subscriber's line and this is done by extending a cordless trunk, under the control of appropriate apparatus at the cordless "B" position, to the terminals of the holding cord. Through the cordless trunk

thus used the connection between the calling and called subscriber is completed and the toll operator has talking and supervisory control over the line.

The foregoing routine of operations takes considerable time and, in toll calls where the time required to establish a connection does not justify instructing the calling subscriber to restore his receiver, as is customary on long distance connections, it would appear desirable to reduce the time necessary to extend the calling line to the toll position and thereby reduce the subscriber's waiting time, expedite the establishment of the connection and increase generally the efficiency of the toll plant.

It is one of the objects of this invention, therefore, to provide improved facilities for the direct extension of a calling line from the special service position to the toll position and to make use of these facilities for the transmission of instructions by the special "A" operator to the toll operator as well as for use as a part of the established connection between the two subscribers.

It is intended to carry out this broad object of the invention by the use of direct trunks connecting the toll position with the special service position, the trunks in question terminating on the arcs of rotary selectors to the movable brushes of each selector of which are connected single-ended cord circuits which terminate at the special service position.

The design of the cord circuit in particular affords a number of novel features, one of which is the transfer of supervision over the calling line from the special service operator to the toll operator and vice versa depending upon which of the two operators involved is connected to the calling subscriber's line, it being the intention to always provide the subscriber with facilities for flashing the supervisory signal at either one of the two boards.

A further feature of the invention lies in a new and novel arrangement whereby the selection of a trunk to the toll position by a cord taken into use is controlled over a conductor which, after the trunk is selected

and connection is established thereover to the toll position, is also used to control the supervisory signal of the cord at the special service position.

5 Yet another feature of the invention lies in the automatic make-busy feature of trunk groups in such cases where a plurality of selectors are used to accommodate the number of trunk groups over which such connections
10 may be established, whereby a cord may be given preference over a number of different groups in such a way that when the trunks of the trunk selector first in preference are all busy, the cord conductors and associated
15 circuits are transferred to the trunk selector next in preference without first making an individual test of each busy trunk in the previous trunk selector.

Still another feature of the invention lies
20 in the use of a selector switch associated with the cord whereby access is obtained to different groups of trunks over the same selector switch. The selector switch employed is preferably a rotary switch with two sets of
25 brushes and corresponding bank contacts. This arrangement enables two or more groups of trunks to be used on the same switch and a connection may be extended over one group or another depending upon the set of brushes
30 to which the cord conductors and associated circuits are connected.

In accordance with the invention, therefore, one specific embodiment of which is disclosed herein by way of illustration,
35 the objects and features above stated are accomplished in the following improved manner. A group of switch-ended cords, each having a supervisory lamp, is provided at the special service position and to the
40 arcs of the switch of each cord terminate the groups of trunks which extend to the toll operator's position. Each of these cords contains one key for each trunk group terminating on the arcs of the selector; there
45 being different groups of trunks for different classes of service such as, for example, trunks over which coin collect and refund operations have to be controlled from the toll position and other trunk groups where
50 no such facilities are required. If any calling line is extended to the special operator's position, therefore, and the operator learns that a long distance connection is required, she depresses the key of that cord taken into
55 use which designates the group of trunks over one of which the connection is to be extended to the toll position and the depression of that key causes the trunk hunting testing circuit to be connected over the third conductor of
60 the cord to the particular hunting arc of the switch where terminate the test conductors of the particular group of trunks. An organization of circuits is then set in operation whereby the trunk selector hunts for an idle
65 trunk. If a group of trunks connecting the

two positions exceeds the capacity of a selector switch, then a plurality of switches are used and the cord is arranged to hunt in every selector in a definite preference, with means for automatically skipping any selector all of whose trunks are busy at the time the cord circuit is hunting for an idle trunk. When a trunk is found, the trunk hunting testing circuit is disconnected from the third conductor of the cord and another circuit is
75 connected thereto which is responsive to sleeve supervisory operations in the selected trunk and controls the lighting of the supervisory lamp in the cord.

The cord circuit is arranged so that the special service operator's telephone circuit can be automatically connected to the cord in use and disconnected from some other cord to which it was left connected on a previous call. After the selected trunk is taken up at the toll
85 position, the special service operator transmits to the toll operator the necessary information for establishing the toll call. The cord may be inserted into the jack of the trunk line over which the calling subscriber's line was extended to the special service position either before or after the selection of the trunk to the toll position: the calling line extension having been first made free by the removal
95 of the special service cord with which the subscriber's line was first answered since, at that time, the special service operator did not know whether the calling subscriber wanted assistance in establishing a purely local connection or whether he wanted a toll call. Thereafter the calling subscriber's line is extended to the toll position by the use of the cord and trunk contemplated in this invention, thereby obviating the necessity of the toll operator calling the subscriber over a cordless trunk. The calling subscriber's line is placed under the immediate supervision of the toll operator so that as long as the special service operator's telephone circuit is not connected to the cord the calling line is under
110 supervisory control at the toll position.

A clearer conception of the scope and purpose of the invention will be obtained from a consideration of the following description taken in connection with the attached drawings in which,

Fig. 1 shows a part of the cord circuit which is the subject of this invention together with a subscriber's extended connection to the special service position and a simplified operator's telephone circuit thereat;

Fig. 2 shows the cord trunk selector;

Fig. 3 shows the part of a representative trunk which extends to the toll position;

Fig. 4 shows the remaining part of the trunk which terminates at the toll position together with a schematic representation of a completed toll connection; and

Fig. 5 shows the manner in which the above drawings are to be arranged with respect to

each other in order to completely disclose the invention.

When the calling subscriber 100 initiates a call through the medium of line finder 133, the switching selector 134 and the central office sender 135, the line is extended to the trunk terminating in jack 151 at the special service position. A typical manner in which this may be accomplished is disclosed in Patent No. 1,589,402 to O. H. Kopp, granted June 22, 1926, and hence is neither shown in detail nor made a part of this description. By closure of a circuit loop through the sender and the switching selector 134 as described in the above identified patent, relay 148 is caused to operate. Relay 148 connects resistance ground over its top contact to the trunk terminal on the selector bank to mark it busy to testing selectors and, on its lower contacts, closes an obvious circuit for lamp 150 which lights and indicates that a call is waiting. The operator answers the call with a special service cord, which is not shown, and upon learning that a long distance connection is desired, makes out the usual ticket covering the details of the call and proceeds thereafter to establish a connection between the calling subscriber and the toll position from which the connection to the long distance area can thereafter be completed in the well known manner.

The operator proceeds to extend the said connection to the toll operator's position by depressing a trunk group key of which key 136 and key 137 are representative and which are associated with the cord. The particular key depressed depends upon the character of the service to be rendered to the calling subscriber, which fact is known to the operator by the character of the trunk group over which the calling line was extended to the special service position. For example, if the subscriber initiates the call from a coin box station, then the sender associated with the line finder 133 would direct the switching selector 134 to select a coin group of trunks of which the trunk terminating in jack 151 would be one and this fact would be known to the operator either by the color of the lamp or by the segregation of the various trunk groups to various parts of jack shelf positions or by any other suitable means. It suffices for the purposes of this disclosure that the special service operator will extend the calling line to the toll position over a trunk line designed for the same character of service as that over which the calling line was extended to the special service position. In this description it is assumed that the subscriber is calling from a non-coin line and that key 136 designates the non-coin trunk group. Accordingly, the operator depresses key 136 of any one of the idle cords which she takes into use for this connection. The operation of key 136 closes a circuit for relay 103 from battery, winding of relay 108, lower

contacts of key 136, top outer back contacts of relay 115, normal contacts of relay 102, top contacts of relay 109 to ground. Relay 108 operates and locks over its top outer make contacts to the operating ground on the back contacts of relay 109. Relay 108 closes a circuit from ground over its bottom inner make contacts, top outer normally made contacts of relay 106, winding of relay 105, conductor 139, top outer contacts of relay 119, resistance 138 to battery, operating relay 105. Relay 105, by the closure of its bottom contacts, connects ground to the winding of relay 111 and resistance 140 thereby keeping relay 111 short circuited. Relay 108 also closes a path from ground over its top inner contacts, bottom back contact of relay 116, bottom outer back contacts of relay 107 to one terminal of the winding of relay 107. This last closure is for the purpose of preventing the operation of relay 107 when relay 106 operates as is described hereinafter.

Relay 108, over its bottom middle contacts, closes a path from ground through both windings in series of relay 116, top inner back contacts of relay 107, bottom middle contacts of relay 108, conductor 126, top middle back contacts of relay 200, to brush 213 and corresponding terminal of selector TK1. If, at this time, the trunk extending to the toll position and with which the brushes 211, 212 and 213 of switch TK1 are in contact, is idle, then relay 116 will operate over a circuit from ground through both windings of relay 116 in series, over the circuit path just traced to brush 213 and its corresponding contact, conductor 218, bottom contacts of relay 307, bottom normally made contacts of relay 305, resistance 314 in parallel with the upper winding of relay 303 to battery. Relay 116 operates in the above circuit, short circuits its own bottom high resistance winding by the closure of its bottom contacts and connects the upper low resistance winding to the trunk selector multiple bank terminals to make the selected trunk test busy to relays 116 of other cords. Relay 116, by its operation, also removes the ground from one side of the winding of relay 107 since, as is described hereinafter, if relay 106 operates at this time the operation of relay 107 can take place. Relay 303 likewise operates in the above circuit and locks over its bottom winding and contacts to conductor 218. Relay 303 closes an obvious circuit for relay 308 which operates. Relay 308 removes ground from its back contact to conductor 217 thereby removing one of the parallel grounds to this conductor. The further function of relay 303 is described hereinafter.

If, on the other hand, the trunk with whose terminals on switch TK1 the selector brushes 211, 212 and 213 are connected is busy at the time that the circuit of relay 116 is closed through, then the grounded low resistance

winding of another relay 116 of the cord which is making the trunk busy is connected to the corresponding terminal of brush 213 and the operation of relay 116 of the cord under consideration is prevented. Under such circumstances, the hunting circuit of trunk selector TK1 will or will not be closed depending upon whether or not the operator's telephone circuit is connected to the cord whose trunk group key has been operated.

The present embodiment of the invention is disclosed in connection with an operator's telephone circuit provided with the well known automatic listening feature and whether or not the operator's telephone circuit is connected to the cord under consideration depends upon whether, prior to the cord being taken into use, the said telephone circuit was automatically listened-in on another cord, as, for example, the special cord with which the operator answered the call and which is not shown in the drawings. On the other hand if, prior to taking into use the cord shown in Fig. 1, the operator listened out of the special cord above referred to, the depression of key 136 or 137 automatically connected the operator's telephone circuit to the cord under consideration. This is accomplished when relay 105 operated in the manner described. The operation of relay 105 closed a circuit for relay 106 from battery through the winding of relay 106, bottom inner normally made contacts of relay 106, top contacts of relay 105, bottom middle inner contacts of relay 108 to ground. A parallel circuit is likewise closed to the winding of relay 114 which likewise operates and connects conductors 140 and 141, respectively, to the keys in the operator's position for future use in flashing the toll operator or releasing the trunk connection as more fully described hereinafter. Relay 106 operates, locks over its bottom inner contacts to the said ground at relay 108 and, by opening its top outer normally made contacts, removes the short circuiting ground over the bottom contacts of relay 105 to the winding of relay 111 and resistance 140. Relay 111 now operates in series with the winding of relay 105 to battery on the top outer contacts of relay 119 and by the closure of its top contacts connects the operator's telephone circuit to the cord conductors 142 and 143.

It is also possible that the operator's telephone circuit may have been left connected to another cord by virtue of a previous operating connection therewith and left in that position after service was ended without the operator listening out. Under such circumstances relays 111 and 105 of that cord are locked in series to battery on the top outer contacts of relay 119 in the same manner as relays 111 and 105 of the cord under description. However, when a key such as 136 or

137 is depressed and relay 105 operates, the grounded low resistance winding of this relay is connected to conductor 139 and has the effect of shunting relay 105 in the other cord which relay then releases and opens the circuit of relay 111 thereby disconnecting the operator's telephone circuit from the said other cord. Relay 111 of the cord under description then operates in the manner described and connects the operator's telephone circuit thereto. If the operator is connected to no cord, that is, is "listened-out" by having operated key 120, then relay 119 is operated over an obvious circuit and battery through resistance 138 would not be available to operate relay 105 until relay 119 is released, that is, until the operator had released the "listen-out" key 120.

Relay 106 completes the operating circuit of relay 107 from battery through resistance 117, winding of relay 107 to ground on the bottom outer contacts of relay 106, and also closes the circuit of relay 202 from battery through the winding of relay 202, interrupter contacts of selector magnet 203, interrupter contacts of selector magnet 204, bottom inner back contacts of relay 200, conductor 128, bottom inner normally made contacts of relay 113, top inner contacts of relay 106, top outer back contacts of relay 107 to ground on the top outer back contacts of relay 116. It will be noted that, although the circuit of relay 107 was completed by the operation of relay 106, yet relay 107 does not operate so long as relay 116 remains unoperated since, under these conditions, the ground short circuiting resistance 117 is still effective. That is to say, the above traced circuit for relay 202 is effective only if trunk selector TK1 is standing on the terminals of a busy trunk. Under such circumstances, the above traced circuit of relay 202 is effective and this relay operates. Relay 202 closes the circuit of selector magnet 204 from ground on the top contacts of relay 116, top outer contacts of relay 107, top inner contacts of relay 106, bottom inner back contacts of relay 113, conductor 128, bottom inner contacts of relay 200, top contacts of relay 202, bottom back contacts of relay 201, winding of selector magnet 204 to battery. Selector magnet 204 operates, breaks its interrupter contacts, and opens the circuit of relay 202 which releases. The release of relay 202 releases selector magnet 204 which now advances its brushes to the next terminal in the well known manner and reoperates relay 202 over the previously traced circuit. This cycle of operations is repeated until the brushes 211, 212 and 213 of selector TK1 reach the terminals of an idle trunk, at which time the shunt to both windings of relay 116 is removed and a previously traced operating circuit is then effective to operate relay 116. The operation of relay 116 opens the circuit of relay 202 which releases and the re-

lease of relay 202 opens the circuit of the selector magnet 204, thus stopping the described cycle of operations and leaving the selector brushes resting on the terminals of the selected trunk. The operation of relay 116 removes the short circuit from the winding of relay 107 which now operates and relay 116 further short circuits its own high resistance winding in the manner previously described thereby making the trunk test busy to all other hunting cord circuits.

If it should come to pass that the number of trunks of a particular class as, for example, non-coin trunks, available to the cord exceeds the capacity of one switch, that is, three banks of the switch and the corresponding terminals, while the remaining three banks are already used for a group of trunks rendering a different grade of service, an additional selector switch, such as TK2, may be furnished which, according to the present embodiment of the invention is capable of accommodating two additional groups of trunks; one group on three terminal banks and another group on the remaining three other terminal banks. These two groups may be combined to constitute one larger group if the traffic justifies it, separate and distinct from, though rendering the same character of service as the trunk group on the three upper terminal banks of switch TK1. Or they may be two separate groups of trunks for rendering two separate classes of service. In the present embodiment of the invention, as disclosed in Fig. 2, switch TK2, is used for one large group of trunks similar to the group on the three upper banks of selector switch TK1.

Each group of trunks is provided with a relay 222 whose winding is connected to conductor 217 which is multiplied to the back contacts of all relays 308 of the trunk group. Since the armature contacts of all relays 308 are grounded, an operating circuit exists for relay 222 so long as one or more trunks of the group are idle. As each trunk of the group is taken into use and its associated relay 308 operated, the parallel grounds to the winding of relay 222 are successively removed so that, when all of the trunks in the group have been taken into use, the circuit of relay 222 is opened and relay 222 releases. If relay 222 is associated with the group of trunks terminating on the three contact banks of switch TK1, above described, and all the trunks terminating therein are busy, relay 222 is released and when the operator depresses key 136 and the circuits of the associated cord are operated to connect the said cord with an idle trunk, the fact that the trunks terminating on switch TK1 are all busy and relay 222 is released will serve to close a circuit for relay 200 from battery on the contacts of relay 222, upper winding of relay 200, conductor 127, bottom outer contacts of relay 108 to ground on the bottom

middle back contacts of relay 107, thereby operating relay 200. Relay 200 locks over its lower winding and bottom outer contacts, conductor 125 to ground on the bottom middle inner contacts of relay 108 and this locking ground is then extended by way of the bottom back contacts of relay 202 to the winding of relay 201 which now operates and locks over its top inner contacts to the said ground on conductor 125. Relay 200, on operating, transfers the talking conductors 131 and 145 of the cord from the brushes 211 and 212 of selector TK1 to the corresponding brushes 210 and 209 of switch TK2, which brushes are multiplied to the staggered brushes 214, and 215 respectively of the other three terminal banks of the switch, so that only one of the two sets of brushes will engage a set of trunk terminals at a time. Brush 208 is similarly multiplied to the staggered brush 219. Relay 200, by operating, also disconnects the windings of relay 116 from brush 213 of switch TK1, and relay 201, by operating, connects the windings of relay 116 over conductor 126, over its top outer contacts to brushes 208 and 219 of switch TK2. The circuit of relay 202 is now closed from battery, through the winding of relay 202, interrupter contacts of selector magnet 203 of selector TK2, interrupter contacts of selector magnet 204 of switch TK1, bottom inner contacts of relay 201, conductor 128 and thence to a previously traced ground on relay 116. Relay 201 also disconnects the winding of selector magnet 204 of switch TK1 from the contacts of relay 202 and connects the winding of selector magnet 203 to the above-mentioned contacts of relay 202. Hunting will now take place in trunk selector TK2 until an idle trunk is found either by the set of three brushes 208, 209 and 210 having access to the upper half of the trunk group or by the set of brushes 219, 215 and 214 having access to the lower half.

Consideration so far has been given to a description of the extension of a calling subscriber's line to the toll position over a non-coin trunk. If the call originates at a station having a coin box, the switching selector and sender shown in Fig. 1 cause the connection to be extended over a coin trunk line and the operator must, accordingly, extend the connection to the toll operator's position over a trunk provided with coin collect and coin refund supervisory facilities. When a connection is extended from a coin box substation, therefore, the operator takes up the connection in the usual way with a special service cord, writes out the ticket and refunds the deposited coin to the subscriber. The operator then proceeds to extend the subscriber's line to the toll operator's position by using the cord under description except that instead of depressing key 136, which designates a non-coin group of trunks, she de-

presses key 137 which designates a coin group of trunks. A circuit is thereby closed for relay 115 from battery through the winding of relay 115, bottom contacts of key 137, top outer back contacts of relay 108, normally made contacts of relay 102 to ground on the contacts of relay 109. Relay 115 operates in this circuit and locks over its top outer make contacts to ground at relay 109. Relay 115 opens the operating path of relay 108 at its top outer back contacts, connects ground on its top inner contacts over the bottom back contacts of relay 116 to the bottom outer contacts and one terminal of the winding of relay 107, closes an obvious circuit for relay 113 which operates, and over its bottom outer contacts connects the two windings of relay 116 to conductor 123 and thence to the test wiper 205 of switch TK1. The conductors of this group of trunks terminate on terminal banks of selector TK1 which cooperate with brushes 205, 206 and 207, respectively.

It is thus seen that a trunk selector may be made to accommodate two separate and distinct groups of trunks rendering a different character of service and the selection of a trunk in either group is accomplished simply by connecting the trunk hunting test circuit to the test brush of one group or the other, and although the brushes of the entire switch are rotating together and make contact simultaneously with trunks of both groups, yet only those associated with the trunk group in which a trunk selection is to be made will be effective, the other brushes being inactive at this time.

If, at the time the circuit of relay 116 is closed though the selector brush 205 is contacting with the test terminal of an idle trunk, relay 116 will operate as already described and if it is contacting with the test terminal of a busy trunk, relay 116 will be shunted, relay 107 will not operate and a circuit will be closed for relay 202 from battery through the winding of relay 202, interrupter contacts of trunk selector magnets 203 and 204, bottom inner back contacts of relay 200, conductor 128, bottom inner make contacts of relay 113, top inner make contacts of relay 106, top outer contacts of relay 107 to ground on the top contacts of relay 116, operating relay 202 and causing the operation of trunk selector TK1 to select an idle trunk in the same manner already described for the operation of the same trunk selector for the selection of a trunk in the non-coin trunk group terminating on terminal banks cooperating with brushes 211, 212 and 213.

When the trunk selector has been brought to rest on the terminals of an idle trunk, it matters not from which group, relay 116 operates in series with relay 303 over a previously described circuit. Relay 107 likewise operates in the manner described. The operation of relay 107 opens the operating path

of relays 202 and 116, disconnects relay 116 from conductor 126 or 123 and connects the conductor involved of the two said conductors over its top inner front contacts to the winding of relay 101, and closes a circuit for relay 112 from battery through the winding of relay 112, bottom outer front contacts of relay 107, bottom back contacts of relay 116 to ground on the top inner contacts of relay 108 or relay 115, thereby operating relay 112. Relay 101 is now connected to the test terminal of the selected trunk and the winding of this relay is designed to possess the same electrical characteristics as the upper winding of relay 116 in order to maintain the identical busy condition on the trunk test terminal. Relay 116 releases and relay 101 is now connected in a circuit path from ground through the winding of relay 101, top inner front contacts of relay 107, bottom middle contacts of relay 108 if this relay is operated, or bottom outer contacts of relay 115 if this latter relay is operated, conductor 126 in the former case or conductor 123 in the latter, top middle back contacts of relay 200 to brush 213 and corresponding terminal, or top outer contacts of relay 201 and brush 208 or brush 219 and corresponding terminal of switch TK2, or conductor 123, direct to brush 205 of switch TK1 and corresponding terminal, to the selected coin trunk, or conductor 218 in the case of a non-coin trunk selected from switch TK1, bottom outer contacts of relay 307, bottom normally made contacts of relay 305, upper winding of relay 303 in parallel with resistance 314 to battery. Relay 101 operates in this circuit while relay 303 was operated in the same circuit when relay 116 was in circuit in place of relay 101 and now holds in the same circuit in series with relay 101. The operation of relay 101 connects battery to low resistance 141 and shunts any circuit for lamp 146 thereby keeping the said lamp extinguished. Relay 112 closes the talking conductors 142 and 143 of the cord to the selected trunk and connects ground over its bottom inner contacts to resistance 144. A connection of ground to resistance 144 completes the circuit to lamp 146 but since battery is connected to resistance 141 from the contacts of relay 101, lamp 146 remains shunted.

When relay 112 operates, a circuit is closed from battery through resistance 316 of the selected trunk, upper winding of relay 302, winding 317 of the repeating coil, top outer back contacts of relay 300, conductor 223, brush 211 and corresponding terminal, top outer back contacts of relay 200, conductor 131, top outer back contacts of relay 113, top outer front contacts of relay 112, conductor 142, bottom outer back contacts of relay 104, upper winding of relay 103, top inner contacts of relay 104, bottom winding of relay 103, top outer back contacts of relay 104, bottom outer front contacts of relay 112, bottom

outer back contacts of relay 113, conductor 145, top inner back contacts of relay 200, brush 212 and corresponding terminal, conductor 216, bottom back contacts of relay 300, repeating coil winding 318, lower winding of relay 302, resistance 315 to ground. Relay 103 in the cord and relay 302 in the trunk operate in this circuit. Relay 103 performs no function at this time.

Relay 302 operates and connects ground to the following three parallel paths: one to the winding of relay 306, another by way of the bottom outer normally made contacts of relay 312 to the winding of relay 307 and another over the same contacts of relay 312, top inner normally made contacts of relay 305 to the winding of relay 305. Relays 306, 307 and 305 all operate. Relay 306 connects ground over its top outer contacts, top normally made contacts of relay 309, winding of relay 309 to battery. Relay 309 operates and locks to the top make contact of relay 303. Relay 307, on operating, closes one pair of contacts of the talking circuit, opens its bottom outer back contacts, thereby opening the original operating circuit of relay 303 and, over its bottom inner contacts short circuits the lower winding of relay 303. Since relay 303 is held over conductor 218 in series with marginal relay 101 as above described, the operation of relays 307 and 305 merely transfers the short circuit control to the bottom operated contacts of relay 305. Relay 101 remains operated, therefore, and maintains battery connected to resistance 141 and keeps lamp 146 extinguished. Relay 309 on operating, closes a circuit from battery through the top winding of relay 310, top inner contacts of relay 309, resistance 319, top inner front contacts of relay 306, repeating coil winding 321, conductor 313, top back contacts of relay 400, repeating coil winding 407, both windings in series of polarized relay 405, repeating coil winding 408, bottom back contacts of relay 400, conductor 314, repeating coil winding 322, bottom front contacts of relay 306, resistance 320, bottom contacts of relay 309, bottom winding of relay 310 to ground. Relay 405 operates in this circuit but relay 310 being marginal does not. Relay 405 closes a circuit for relay 403 from ground at its front contacts, bottom contacts of relay 404, winding of relay 403 to battery. Relay 403 operates and closes an obvious circuit for lamp 402 which lights and thereby indicates at the toll position that a call is waiting on the associated trunk.

Should the toll operator delay in taking up the connection the special operator may call the attention of the toll operator by intermittently operating key 121 and cause the flashing of the trunk lamp 402. The operation of key 121 closes an obvious circuit for relay 104. Relay 104, on operating, opens the loop circuit including both windings of relays 103

and 302. Relay 302 releases and in turn releases relay 306. Relay 306, in releasing, reverses the direction of the current flowing over the circuit previously described and including relays 310 and 405. Relay 405 is polarized and the reversal in the direction of the current flowing through its windings causes its release. Relay 403 follows the release of relay 405 and opens the circuit of trunk lamp 402. As the operator alternately operates and releases key 121, lamp 402 is alternately extinguished and lighted.

The toll operator answers the call by inserting the plug of a toll cord into the answering jack 411, which cord is shown diagrammatically in Fig. 4, causing thereby the operation of relay 404 over a circuit from a battery potential in the sleeve of the toll cord, trunk jack sleeve 410, upper high resistance winding of relay 404 to ground. The resistance of the upper winding of relay 404 is such that the relay device in the toll cord which controls the supervisory lamp 412 is not operated on the current flowing through the said circuit and lamp 412, therefore, will not light. Relay 404 operates and opens the circuit of relay 403 which releases and extinguishes trunk lamp 402. Relay 404 also operates relay 406 which, on operating, short circuits the upper high resistance winding of relay 405. The quantity of current now flowing through the previously described circuit, including relays 405 and 310, is increased and is sufficient to cause the operation of relay 310. When this relay operates it operates relay 311 and relay 311, over its top contacts, closes a circuit for operating relay 312, which over its bottom inner front contacts locks to ground on the top make contacts of relay 303. Relay 312, over its top contacts, completes the talking loop of the trunk. Relay 311 also connects the same ground to the top outer contacts of relay 305 and thence to the normal contact of relay 303 to hold relays 308 and 312 from releasing should relay 303, for any reason, release. Relay 311 also closes a holding circuit for relay 307 from battery through the winding of relay 307, bottom outer front contacts of relay 312 to ground on the top contacts of relay 311. Relay 304 is also connected across the talking conductors 310 and 314 by the closure of the bottom contacts of relay 311.

The talking circuit is now established between the telephone circuit of the special service operator and that of the toll operator wherein the telephone circuit O. T. C. of the toll operator is operatively connected to the toll cord in a manner well known to the art and hence not shown in the drawings. The special service operator transmits to the toll operator the necessary information for completing the call and will then listen out by operating the position listen-out key 120 or by listening in on another circuit. This op-

eration releases relay 105 in either one of the two ways already described, and relays 111 and 114 release, thereby disconnecting the operator's telephone circuit and keys 121 and 122 from the cord.

If the special service operator were to listen out prior to the answer of the toll operator, the toll operator, upon taking up the connection, can flash the special service operator by removing and reinserting the plug of the toll cord into the trunk jack 411. This operation causes the alternate release and operation of relay 404 which, in turn, causes the corresponding response of relay 406 and this relay, by opening and closing its bottom contacts varies, in the manner described, the quantity of current flowing through the trunk circuit, above traced, and including marginal relay 310. Relay 310, therefore, alternately releases and reoperates. This, in turn, alternately releases and operates relay 307 which follows relay 311. The release and reoperation of relay 307 alternately removes and restores the short circuit around the lower winding of relay 303, since, as already described, relay 305 is held operated from the contacts of relay 308. This causes an alternate high and low resistance condition on conductor 218 which permits relay 101 to release and reoperate. The release and reoperation of this relay alternately removes and reconnects battery over its top contacts to resistance 141 thereby flashing lamp 146.

As already indicated, the special service operator may answer the original connection with a special service cord, which type of cord is well known to the art, and all of the above described operations take place independent of whether or not the cord plug 154 is inserted into trunk jack 151 and only as the result of operating a trunk group key, such as key 136 or 137. When, however, the operator does remove the special service cord from the subscriber connection and substitutes therefor the cord taken for extending said connection to the toll position, relay 132 operates over a circuit from battery through the winding of relay 132, sleeve conductor 147, winding of relay 149 to ground. Relays 132 and 149 operate. Relay 149 opens the trunk conductors to relay 148 which releases and over its bottom outer contacts closes an obvious circuit for relay 152 which operates and maintains the trunk busy test condition on the selector bank multiple. Relay 132, over its bottom outer contact, connects ground to resistance 144, which ground is in multiple to the ground from the contacts of relay 112. If, at this time, the cord connection has already been extended to the toll position, relay 101 will be operated, as already described, and the battery from the top contacts of relay 101 will be connected to low resistance 141 and the lamp 146 will be shunted and extinguished. On the other hand, if the

cord connection has not been extended to the toll position when the cord plug 154 is inserted into jack 151 neither relay 112 nor 101 will be operated and the operation of relay 132 as above described closes the aforementioned circuit to light lamp 146. Relay 132 also closes obvious circuits for relays 102 and 110 both of which operate. Relay 110 is provided with a locking circuit over its bottom contacts to ground at the bottom inner contacts of relay 107 when this relay operates as described and, over its top contacts, closes a pair of contacts of the circuit of relay 104. When the operator listens out from the cord, relay 111 is released as already described, and the circuit path for relay 104 is completed to ground on the bottom contacts of relay 111. Relay 104, by operating, removes from its transfer contacts the bridge composed of both windings of relay 103 from across the talking conductors 131 and 145, or 130 and 129, and if the connection has been extended to the toll position by this time and relay 112 operated in consequence, relay 302 is placed across the subscriber's loop in a circuit including relay 302, conductor 142, tip of the cord, upper conductor of trunk and line finder extension, subscriber's loop, lower conductor of line finder and trunk, conductor 143 and thence over a previously traced path to both windings of relay 302. Thus as soon as the subscriber's line is connected to the cord taken into use and the cord has been extended to a trunk connecting with the toll position, the circuit for calling subscriber supervision is immediately transferred to the toll position. It is apparent, however, that subscriber supervision at the toll position is dependent upon whether or not the special service operator listens in on the cord. For, if the operator listens in, relay 111 will be operated in the manner described and relay 104 will be released. Under such circumstances the subscriber's loop circuit above described is in parallel with the bridge across conductors 131 and 145 formed by relay 103 and relay 302. Should the subscriber flash, the path through both windings of relay 103 will hold relay 302 operated. Relay 302 holds relay 306 which, in turn, preserves undisturbed the circuit including relays 310 and 405, previously described, and the toll cord lamp 412 will not flash. The special service operator, however, has her telephone circuit bridged across the cord and is, therefore, in a position to challenge if the subscriber should move his switchhook up and down.

If the cord under consideration is substituted for the special service cord prior to the described operations for extending the connection to the toll position by the operation of either key 136 or 137, relay 132 will operate as before. Relay 132 will close the above described circuit for the supervisory lamp 146 lighting it thereby and closing previously

described circuits for relays 110 and 102. Relay 110 closes a circuit for relay 104 as before. Relay 104 operates and connects battery and ground to the calling subscriber's line over a circuit which may be traced from battery at the top outer front contacts of relay 104, lower winding of relay 103, bottom outer back contacts of relay 112, conductor 143, over the loop including the trunk switching stage, line finder and calling subscriber's line, top outer back contacts of relay 112, upper winding of relay 103 to ground on the bottom front contacts of relay 104. Relay 103 operates over this circuit and closes battery from the top inner back contacts of relay 112, contacts of relay 103, resistance 141 to lamp 146 thereby shunting lamp 146. If, now, the calling subscriber flashes or disconnects, relay 103 will follow the flashes and, in turn, flash or light lamp 146. If, in response to a disconnect signal, the cord is disconnected from the multiple at this time, relay 132 will release, in turn, releasing relays 110, 102 and 104 and restore thereby the circuit to normal.

When the cord has been extended to the toll position the toll operator thereafter completes the connection to the wanted subscriber in any well known manner. Supervision of the calling line is under the control of lamp 412 of the toll cord. Should the subscriber flash, relay 302 releases which, in turn, releases relay 306. The release of relay 306, reverses the direction of current flowing in the circuit previously traced and including relays 310 and 405. Relay 405 is polarized and releases as already described. The release of relay 405 connects ground over the back contacts of relay 405 to the low resistance winding of relay 404. The combined parallel circuit of the upper and lower windings of relay 404 increases the current over the sleeve conductor circuit of the cord, previously traced, and the increase in current operates the relay device in the cord which controls the circuit of lamp 412. Lamp 412 lights and, as the subscriber flashes, the above circuits alternately operate and release to flash the lamp.

When conversation has terminated and the calling subscriber restores, the circuit for relay 302 is opened, relay 302 releases, and, in turn, releases relay 306. Relay 306 reverses the trunk conductors to cause the permanent lighting of lamp 412 as an indication that the calling subscriber has restored. Upon receiving the signal, the toll operator disconnects the toll cord from the jack and by so doing releases relay 404. Relay 404 releases relay 406 and thereby opens the short circuit around the high resistance winding of relay 405. The increase in current in the circuit including relays 405 and relay 310, previously traced, causes relay 310 to release.

When relay 310 releases, it in turn, releases relay 311. Relay 311 releases relay 307 and

relay 307, in releasing, removes the short circuit around the lower winding of relay 303. The decrease in current through the circuit including both windings of relay 303 and the winding of relay 101 and resistance 314, previously traced, is not sufficient to maintain relay 101 energized. Relay 101, therefore, releases and removes battery from resistance 141. The removal of shunt battery from resistance 141 causes lamp 146 to light over a previously traced circuit. The lighting of lamp 146 indicates to the special service operator that the toll operator has released the trunk whereupon the special service operator removes the cord plug 154 from trunk jack 151. The disconnection of the cord releases relay 132, thereby releasing relays 102, 110 and 108 or 115. Relay 102 is slow to release so that relay 108 or 115 will have time to release before its locking path is closed again through the back contacts of relay 102 to ground on the contacts of relay 109. The release of relay 108 or 115 releases all operated relays and restores the circuit to normal.

The A operator may also disconnect the connection to the toll operator at any time by listening in and by operating the position disconnect key 122. In order to listen in the operator first depresses key 136 or 137, depending upon the trunk group to which the trunk taken into use belongs, and then depresses key 122. The operation of key 136 closes a previously traced circuit for relay 105 and relay 111 will then remain shunted to ground on the top contacts of key 136 through the bottom contacts of relay 105 until key 136 is released whereupon relay 111 operates and locks in series with relay 105 as already described and connects the operator's telephone circuit to the talking conductors of the cord. The operation of key 122 closes a circuit for relay 109 from ground through resistance 153, contacts of key 122, top contacts of relay 114, upper winding of relay 109 to battery. Relay 109 operates and releases relay 108 or 115. Relay 109 locks over its bottom winding and contacts to ground on the contacts of key 136 or 137. This locking circuit prevents relay 108 or 115 from operating and originating a new call should the corresponding trunk group key be accidentally depressed when relay 114 releases and opens the operating circuit of relay 109. The release of relay 108 or 115, in turn, releases relay 113, if it is operated and relays 200 and 201, if these last two relays are operated and also relays 114, 106, 107 and 112. The release of relay 112 operates relay 104 over a previously described circuit and reconnects battery and ground through relay 103 and the back contacts of relay 112 to the calling subscriber's line, as previously described. Relays 105 and 111 remain operated, however, keeping the operator's telephone circuit connected to the cord. If now, the

calling subscriber is still on the line, relay 103 operates and extinguishes lamp 146. If, however, the calling subscriber has already restored, relay 103 will not operate, lamp 146 will remain lighted and the A operator is free to disconnect the cord from the multiple. When the cord is disconnected all relays, except 105 and 111 release. Relays 105 and 111 will release when the operator listens in on another cord or when she operates the position listen-out key 120. The disconnect signal to the toll operator is given as previously described.

If the A operator disconnects the cord from the multiple before receiving the disconnect signal as described above, the release of relay 132 will not release relay 108 or 115 as either of these relays will hold to ground on the bottom contacts of relay 101 during the interval between the release of relay 132 and the release of relay 102, and thence to ground on the top contacts of relay 109. Relay 110 will remain locked under control of relay 107, thereby keeping relay 104 operated unless the special service operator has listened in on this circuit. Relay 104 being operated under such circumstances keeps relay 103 off the trunk, thereby releasing relay 302 and consequently causing the closure of circuits which light lamp 412 of the toll cord as already described. When the toll operator disconnects, the removal of the short circuit around the lower winding of relay 303 releases relay 101 as already described, and lamp 146 will light, as already described. The special service operator will then release the connection by listening in and by operating the position disconnect key 122.

Although the present embodiment of the invention is based on the assumption that the calling subscriber will not restore the receiver during the interval between giving the toll number and the establishment of a talking connection with the wanted subscriber yet it is realized that subscribers often will restore the receiver and must be recalled. Provision is therefore made to ring back the subscriber from the toll position.

If the subscriber restores, relays 302 and 306 are released and lamp 412 will light as already described. When the connection is ready the operator will depress the ringing key of the toll cord, which is not shown, and this operation will connect battery over the tip of the cord and operate relay 400. Relay 400 operates and closes a circuit for relay 304 from ground on the top outer contact of relay 400, conductor 313, winding 321 of repeating coil, top inner back contact of relay 306, resistance 320, condenser 323, winding of relay 304, bottom contacts of relay 311, resistance 319, bottom outer back contacts of relay 306, winding 322 of repeating coil, conductor 314, bottom front contact of relay 400, ballast lamp 401 to a source of ringing current. Re-

lay 304 operates and connects ground to the winding of relay 300. Relay 300 operates and closes a ringing circuit from ground on the top outer front contacts, conductor 215, over the loop previously described to the subscriber substation, conductor 216, bottom front contact of relay 300, ballast lamp 301 to a source of ringing current. Relay 300 also connects ground over its top inner contacts to the holding conductor for relays 312, 308 and 309 in order to guard against any possible false release of these relays during the ringing period. When the subscriber answers, relay 302 operates and previously described circuits are then effective to extinguish lamp 412.

What is claimed is:

1. In a telephone system, a link circuit, a selector switch in which said link circuit terminates, a plurality of trunk circuits to which said switch has access, means controlled over the test brush of said switch for controlling the hunting movement thereof to cause said switch to connect said link with an idle trunk, a supervisory signal in said link circuit and means for controlling said signal over said test brush.

2. In a telephone system, a link circuit, a selector switch in which said link circuit terminates, the said switch having a plurality of sets of contact banks and a corresponding plurality of sets of cooperating brushes, a plurality of groups of trunk circuits, each of said groups being connected to a separate set of contact banks of said switch, means controlled over the test brush of any set of the said sets of cooperating brushes for controlling the hunting movement of said switch in the corresponding banks to cause said switch to connect said link circuit with an idle trunk, a supervisory signal in said link circuit and means for controlling said signal over said test brush.

3. In a telephone system, a link circuit, a plurality of selector switches, a group of trunk circuits terminating in each of said selector switches, means for connecting said link circuit to each of said selector switches in a definite order or preference, means controlled over the test brush of the selector switch to which said link circuit has first preference for controlling the hunting movement thereof, means responsive to an all busy condition of the trunk group terminating in any selector switch for connecting said link circuit to the next selector switch in the order of preference without testing the busy trunks terminating in the previous selector switch, means controlled over the test brush of the selector switch to which said link circuit has been connected for controlling the hunting movement thereof to cause said switch to connect said link with an idle trunk, a supervisory signal in said link circuit and means

for controlling said signal over said test brush.

4. In a telephone system, an operator's position, a cord circuit at said operator's position, a selector switch in which said cord circuit terminates, a plurality of trunk circuits to which said switch has access, means controlled over the test brush of said switch for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk, a supervisory signal in said cord circuit and means for controlling said signal over said test brush.

5. In a telephone system, an operator's position, a cord circuit at said operator's position, a selector switch in which said cord circuit terminates, the said switch having a plurality of separate sets of contact banks and a corresponding plurality of separate sets of cooperating brushes, a plurality of groups of trunk circuits, each of said groups being connected to a separate set of contact banks of said switch, means controlled over the test brush of any set of said sets of cooperating brushes for controlling the hunting movement of said switch in the corresponding bank to cause said switch to connect said cord circuit with an idle trunk, a supervisory signal in said cord circuit and means for controlling said signal over said brush.

6. In a telephone system, an operator's position, a cord circuit at said operator's position, a plurality of selector switches, means for connecting said cord circuit to each of said selector switches in a definite order or preference, a plurality of groups of trunks terminating in the contact banks of said switches, means controlled over the test brush of the selector switch to which the said cord circuit has first preference for controlling the hunting movement thereof, means responsive to an all-busy condition of the trunk group terminating in any selector switch for connecting said cord circuit to the next selector switch in the order of preference without testing the busy trunks terminating in the previous selector switch, means controlled over the test brush of the selector switch to which said cord circuit has been connected for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk, a supervisory signal in said cord circuit and means for controlling said signal over said trunk.

7. In a telephone system, a calling line, a first and second operator's position, a cord circuit at said first operator's position, a selector switch in which said cord circuit terminates, a plurality of trunk circuits extending to said second operator's position and to which said selector switch has access, means controlled over the test brush of said switch for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk, means

including said cord circuit for extending said calling line to said selected trunk, a supervisory signal in said cord circuit, and means responsive to an operation over said selected trunk at said second operator's position for controlling said signal over said test brush.

8. In a telephone system, a cord circuit, a selector switch in which said cord circuit terminates, said selector switch having a plurality of terminal banks and cooperating brushes, a supervisory signal in said cord circuit, a plurality of groups of trunks connected to the said plurality of banks, each of said trunks being provided with a signal, an operator's telephone circuit, means controlled over one of said brushes for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk in one of said plurality of groups of trunks, means for operatively connecting said operator's telephone circuit, to said cord circuit means responsive to the connection of said operator's telephone circuit to said cord circuit for operating said trunk signal of said selected trunk, means for controlling said supervisory signal over said test brush and means for keeping said trunk signal operated when said operator's telephone circuit is disconnected from said cord circuit.

9. In a telephone system, a calling line, a cord circuit, a selector switch in which said cord circuit terminates, said switch having a plurality of terminal banks and cooperating brushes, a supervisory signal in said cord circuit, a plurality of groups of trunks connected to said plurality of banks, a signal for each of said trunks, an operator's telephone circuit operably associable with said cord circuit, means controlled over one of said brushes for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk in one of said plurality of groups of trunks, means responsive to said connection of said operator's telephone circuit to said cord circuit for operating said trunk signal of said selected trunk, means including said cord circuit for extending said calling line to said selected trunk, means in said selected trunk for controlling the said cord circuit supervisory signal over said test brush and means responsive to a disconnection of said operator's telephone circuit from said cord circuit for maintaining operated said trunk signal from said calling line.

10. In a telephone system, an operator's position, a cord circuit, a selector switch in which said cord circuit terminates, said switch having a plurality of terminal banks and cooperating brushes, a supervisory signal for said cord circuit, a plurality of groups of trunks connected to said plurality of terminal banks and extending to said operator's position, means controlled over one of said brushes for controlling the hunting move-

ment thereof to cause said switch to connect said cord circuit with an idle trunk in one of said plurality of groups of trunks and means controlled over said test brush and responsive to an operation over said selected trunk at said operator's position for operating said supervisory signal.

11. In a telephone system, a cord circuit, a selector switch in which said cord circuit terminates, said switch having a plurality of terminal banks and cooperating brushes, a supervisory signal for said cord circuit, a plurality of groups of trunks connected to said plurality of terminal banks, each of said trunks being provided with a signal, an operator's telephone circuit, means controlled over one of said brushes for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk in one of said plurality of groups of trunks, means controlled over said test brush for operating said supervisory signal and means responsive to an operable connection of said operator's telephone circuit to said cord circuit for operating said trunk signal on said selected trunk.

12. In a telephone system, a calling line, an operator's position, a cord circuit in said operator's position, a selector switch in which said cord circuit terminates, said switch having a plurality of terminal banks and cooperating brushes, a supervisory signal for said cord circuit, a plurality of groups of trunks connected to said plurality of terminal banks, an operator's telephone circuit, means for operably connecting said operator's telephone circuit to said cord circuit, means controlled over one of said brushes for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk in one of said plurality of groups of trunks, means controlled over said test brush for operating said supervisory signal, means for extending said calling line to said first operator's position, means including said cord circuit for extending said calling line to said selected trunk, and means responsive to an operative connection of said operator's telephone circuit with said cord circuit and the disconnection of said selected trunk from said cord circuit for establishing a talking connection between said calling line and said operator's telephone circuit.

13. In a telephone system, a calling line, a first cord circuit, a selector switch in which said cord circuit terminates, said switch having a plurality of terminal banks and cooperating brushes, a supervisory signal for said cord circuit, a plurality of groups of trunks connected to said plurality of terminal banks, means controlled over one of said brushes for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk in one of said plurality of groups of trunks, means controlled over

said test brush for operating said supervisory signal, an operator's position, a second cord circuit at said operator's position, said second cord circuit having a supervisory signal, means including said first cord circuit, said selected trunk and said second cord circuit for extending said calling line to said operator's position and means responsive to a disconnection of said first cord circuit from said calling line to operate said supervisory signal in said second cord circuit.

14. In a telephone system, a calling line, a first and second operator's position, a cord circuit at said first operator's position, a plurality of selector switches, groups of trunks terminating in said switches, means for connecting said cord circuit to each of said selector switches in a definite order or preference, means controlled over the test brush of the selector switch to which said cord circuit has first preference for controlling the hunting movement thereof, means responsive to an all-busy condition of the trunk group of any selector switch for connecting said cord circuit to the next selector switch in the said order of preference without testing the busy trunks terminating in the previous selector switch, means controlled over the test brush of the selector switch to which said cord circuit has been connected for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk extending to said second operator's position, a supervisory signal in said cord circuit, means including said cord for extending said calling line to said selected trunk, and means responsive to an operation over said selected trunk at said second operator's position for controlling said signal over said test brush.

15. In a telephone system, a cord circuit, a plurality of selector switches, groups of trunks terminating in said switches, means for connecting said cord circuit to each of said selector switches in a definite order or preference, means controlled over the test brush of the selector switch to which said cord circuit has first preference for controlling the hunting movement thereof, means responsive to an all-busy condition of the trunk group of any selector switch for connecting said cord circuit to the next selector switch in the said order of preference without testing the busy trunks terminating in the previous selector switch, means controlled over the test brush of the selector switch to which said cord circuit has been connected for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk, a signal for said trunk, a supervisory signal in said cord circuit, an operator's telephone circuit, means for operatively connecting said operator's telephone circuit to said cord circuit, means responsive to the connection of said opera-

tor's telephone circuit to said cord circuit for operating said trunk signal of said selected trunk, means for controlling said supervisory signal over said test brush, and means for keeping said trunk signal operated when said operator's telephone circuit is disconnected from said cord circuit.

16. In a telephone system, a calling line, an operator's position, a cord circuit, a plurality of selector switches, groups of trunks terminating in said switches, means for connecting said cord circuit to each of said selector switches in a definite order or preference, means controlled over the test brush of the selector switch to which said cord circuit has first preference for controlling the hunting movement thereof, means responsive to an all-busy condition of the trunk group terminating in any selector switch for connecting said cord to the next selector switch in the said order or preference without testing the busy trunks terminating in the previous selector switch, means controlled over the test brush of the selector switch to which said cord circuit has been connected for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk, a signal for said trunk, a supervisory signal in said cord circuit, an operator's telephone circuit operably associable with said cord circuit, means responsive to the connection of said operator's telephone to said cord circuit for operating said trunk signal of said selected trunk, means including said cord circuit for extending said calling line to said selected trunk, means in said selected trunk for controlling said cord circuit supervisory signal over said test brush, and means responsive to a disconnection of said operator's telephone circuit from said cord circuit for maintaining operated said trunk signal over said calling line.

17. In a telephone system, an operator's position, a cord circuit, a plurality of selector switches, groups of trunks terminating in said switches, means for connecting said cord circuit to each of said selector switches in a definite order or preference, means controlled over the test brush of the selector switch to which said cord circuit has first preference for controlling the hunting movement thereof, means responsive to an all-busy condition of the trunk group terminating in any selector switch for connecting said cord circuit to the next selector switch in said order of preference without testing the busy trunks terminating in the previous selector switch, means controlled over the test brush of the selector switch to which said cord circuit has been connected for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk, a supervisory signal in said cord circuit, means controlled over said test brush for operating said supervisory signal, and means responsive to

an operation at said operator's position over said selected trunk and over said test brush for flashing said cord circuit supervisory signal.

18. In a telephone system, a cord circuit, a plurality of selector switches, groups of trunks terminating in said switches, means for connecting said cord circuit to each of said selector switches in a definite order or preference, means controlled over the test brush of the selector switch to which said cord circuit has first preference for controlling the hunting movement thereof, means responsive to an all-busy condition of the trunk group terminating in any selector switch for connecting said cord circuit to the next selector switch in said order of preference without testing the busy trunks terminating in the previous selector switch, means controlled over the test brush of the selector switch to which said cord circuit has been connected for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk, a signal for said trunk, a supervisory signal in said cord circuit, an operator's telephone circuit, means for connecting said operator's telephone circuit to said cord circuit, means controlled over said test brush for operating said supervisory signal, and means responsive to said operable connection of said operator's telephone circuit to said cord circuit for operating said trunk signal on said selected trunk.

19. In a telephone system, a calling line, an operator's position, a cord circuit in said operator's position, a plurality of selector switches, groups of trunks terminating in said switches, means for connecting said cord circuit to each of said selector switches in a definite order or preference, means controlled over the test brush of the selector switch to which said cord circuit has first preference for controlling the hunting movement thereof, means responsive to an all-busy condition of the trunk group terminating in any selector switch for connecting said cord circuit to the next selector switch in said order of preference without testing the busy trunks terminating in the previous selector switch, means controlled over the test brush of the selector switch to which said cord circuit has been connected for controlling the hunting movement thereof to cause said switch to connect said cord circuit with an idle trunk, a supervisory signal in said cord circuit, means controlled over said test brush for operating said supervisory signal, an operator's telephone circuit, means for connecting said telephone circuit to said cord circuit, means for extending said calling line to said operator's position, means including said cord circuit for extending said calling line to said selected trunk, and means responsive to an operative connection of said operator's telephone circuit with said cord circuit the dis-

connection of said selected trunk from said cord circuit for establishing a talking connection between said calling line and said operator's telephone circuit.

- 5 20. In a telephone system, a calling line, a first cord circuit, a plurality of selector switches, groups of trunk circuits terminating in said switches, means for connecting said first cord circuit to each of said selector
10 switches in a definite order or preference, means controlled over the test brush of the selector switch to which said first cord circuit has first preference for controlling the hunting movement thereof, means responsive
15 to an all-busy condition of the trunk group terminating in any selector switch for connecting said cord circuit to the next selector switch in said order of preference without testing the busy trunks terminating in the
20 previous selector switch, means controlled over the test brush of the selector switch to which said first cord circuit has been connected for controlling the hunting movement thereof to cause said switch to connect said
25 cord circuit with an idle trunk, a supervisory signal for said first cord circuit, means controlled over said test brush for operating said supervisory signal, an operator's position, a second cord circuit at said operator's position, said second cord circuit having a super-
30 visory signal, means including said first cord circuit said selected trunk and said second cord circuit for extending said calling line to said operator's position, and means respon-
35 sive to a disconnection of said first cord circuit from said calling line to operate said supervisory signal in said second cord circuit.

In witness whereof, I hereunto subscribe my name, this 29th day of December, 1930.

40 WILEY WHITNEY.

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