

April 7, 1931.

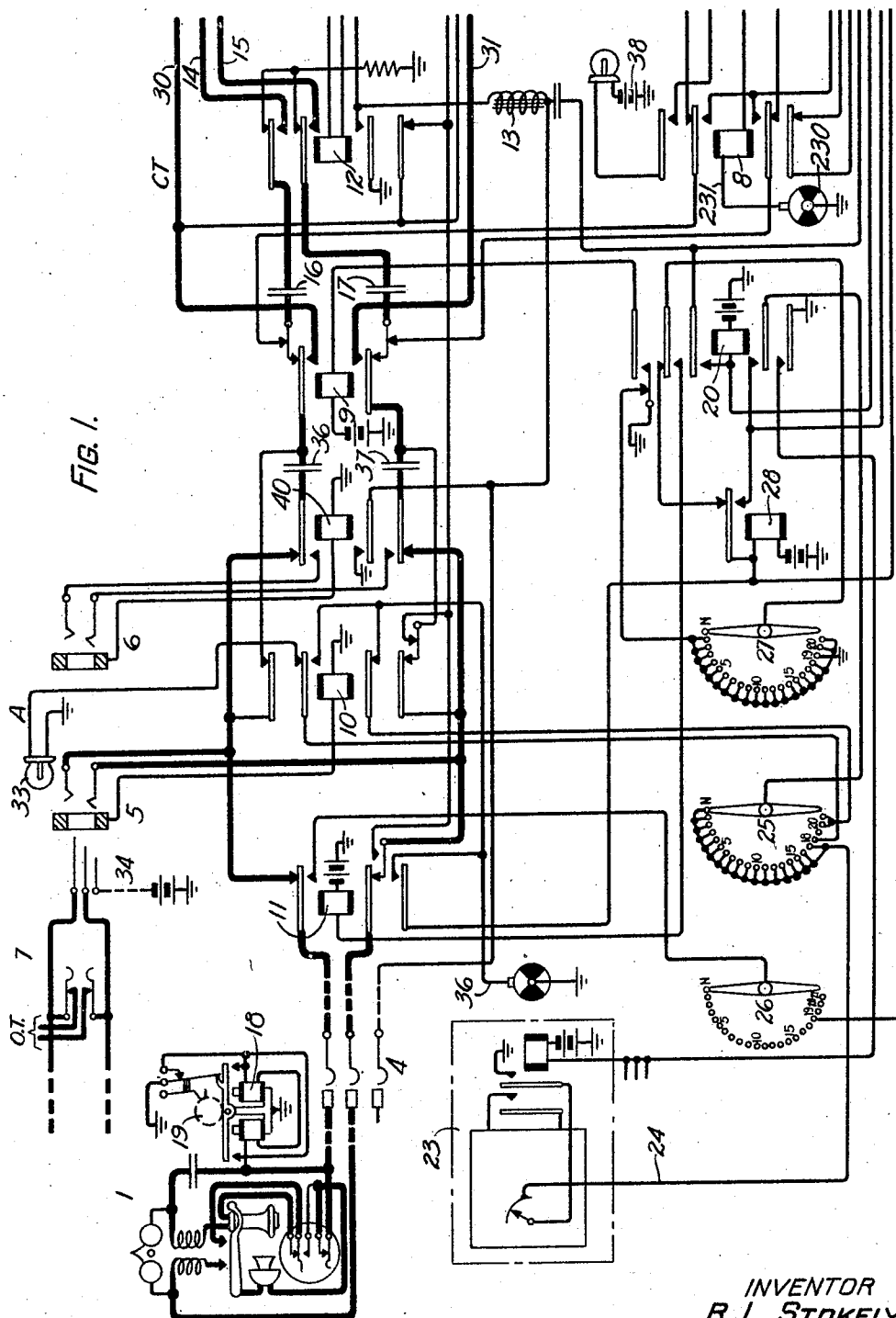
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1,799,653

TELEPHONE SYSTEM

Filed April 5, 1929

3 Sheets-Sheet 1



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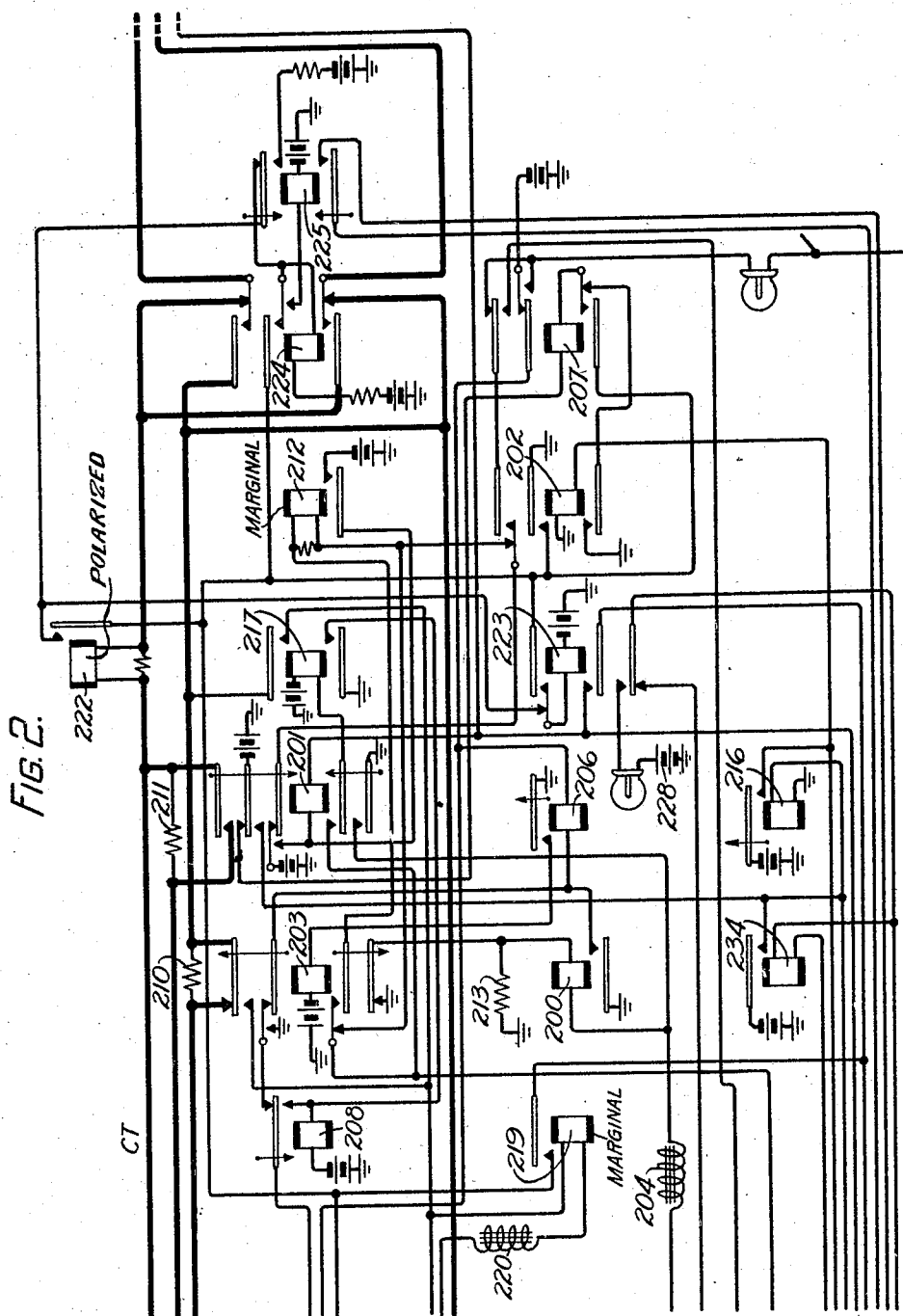
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TELEPHONE SYSTEM

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3 Sheets-Sheet 2



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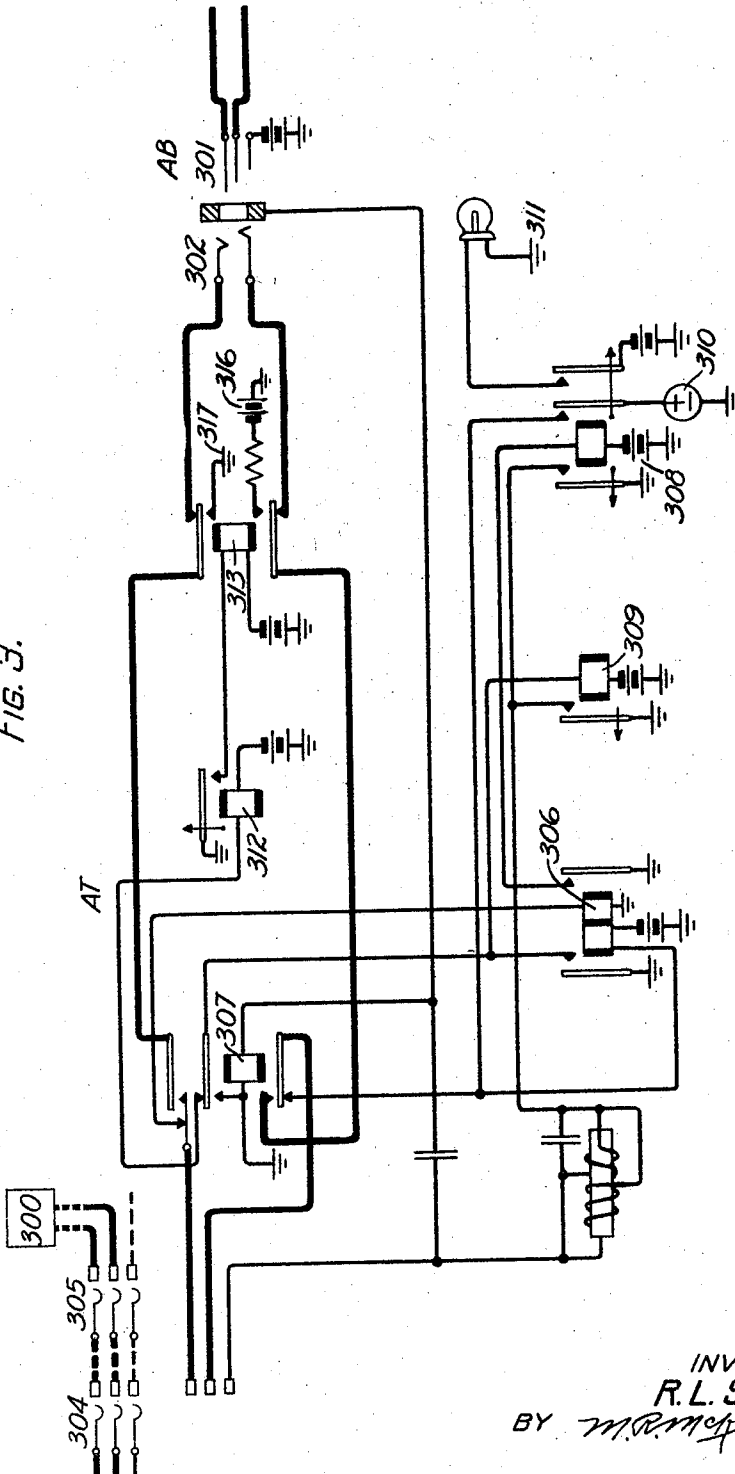
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3 Sheets-Sheet 3

FIG. 3.



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TELEPHONE SYSTEM

Application filed April 5, 1929. Serial No. 352,776.

This invention relates to telephone systems and particularly to systems operated on the pre-payment basis.

An object of the invention is to increase the utility and to otherwise improve and simplify the equipment employed in the establishment of coin controlled telephone connections.

Heretofore, trunks have been employed in local telephone connections having equipment for collecting and refunding coins in combination with equipments for collecting coins at predetermined periods of conversation.

According to this invention, a trunk, normally used for the establishment of connections between telephone lines and equipped with means to enable the periodic collection of coins during conversation, is so arranged that, when taken in use for extending a calling line to an operator's position, the coin collecting means is disabled and the trunk converted from a repeater type trunk to a direct connection type trunk free from any electrical obstructions.

This invention has been illustrated in the accompanying drawings, in which Fig. 1 shows a calling subscriber's line provided with coin box equipment and a portion of a trunk, arranged in accordance with the principles of this invention, to which the subscriber's line has access through a line finder. Fig. 2 shows the remaining portion of this trunk. Fig. 3 shows a selector associated with the trunk and a connector in diagrammatic form having access to a called local subscriber's line, and another trunk accessible by said selector. This second trunk is also arranged in accordance with the principles of this invention and terminates at an operator's position where the plug of an operator's cord has been shown in diagrammatic form.

Referring now to the drawings generally, the trunk CT terminates in Fig. 1 at a line finder 4, through which calling subscribers may be connected to the trunk. Trunk CT also terminates in jacks 5 and 6 at an operator's position A, so that the operator at this position may control coin collection through

a cord, indicated in diagrammatic form. Trunk CT, besides embodying the features of this invention, also has means for controlling collection of coins at predetermined periods of conversation according to the invention of Messrs. O. A. Friend and W. J. Heitsmith covered in a copending application Serial No. 352,127, filed April 3, 1921, and means whereby the collection or refunding of a coin may be automatically performed when the connection between two subscribers is released. It is also provided with means whereby the coin may be refunded automatically when the operator at AB removes her plug 301 from jack 302 in cases where connections are extended over the trunk AT and where no charges are made for the calls. It should be understood that the line finder 4, selector 304 and connector 305 may be of any well-known type commonly used in the telephone art and have not been shown in detail as their construction forms no part of this invention.

Descriptions will now be made in detail of the functions of these circuits, when a connection is extended from the calling subscriber at 1 to the local subscriber at 300 and when a connection is extended from the subscriber at 1 through trunk AT to a distant subscriber through the operator's position at AB.

When the calling subscriber at 1 takes his receiver off the hook and deposits a coin in the coin equipment to enable him to make the call, the line finder 4 is actuated to connect his line with trunk CT. As the circuits for extending the connection to the trunk forms no part of this invention, no description will be made thereof. It will be assumed, therefore, that on the establishing of this connection a circuit will be completed through the calling subscriber's loop for the operation of relay 200 in trunk CT. This circuit may be traced as follows: battery, upper inner armature and back contact of relay 201, upper make-before-break contacts of relay 202, lower make-before-break contacts of relay 203, lower inner armature and back contact of relay 8, lower armature and back contacts of relay 9, lower outer arma-

ture and back contact of relay 10, lower inner armature and back contact of relay 11, the tip and ring conductors of the trunk through the line finder 4 and the loop closed through the subscriber's set at 1, the upper armature and back contact of relay 11, upper outer armature and back contact of relay 10, upper armature and back contacts of relay 9, upper inner armature and back contact of relay 8, retardation coil 204, winding of relay 200, lower outer armature and back contact of relay 203 to ground. Relay 200 in operating closes a circuit for the operation of relays 12 and 206. The circuit for relay 12 may be traced from battery, through the upper inner armature and back contact of relay 207, winding of relay 12, upper armature and back contact of relay 208, upper inner armature and back contact of relay 203 to ground at the armature and front contact of relay 200. The circuit for the operation of relay 206 may be traced from the same battery as the circuit for relay 12, through the winding of relay 206 to ground at relay 200. Relay 12 in operating, closes a connection to ground at its lower inner armature and front contact through retardation coil 13 to the sleeve conductor for line finder 4, to hold it busy and to maintain the connection in a manner well-known in the art. The purpose of retardation coil 13 is to permit supervisory tones to be connected to the sleeve circuit. Relay 12 also connects the tip and ring leads 14 and 15 from one side of condensers 16 and 17 towards the selector 304. The resistances 210 and 211 will be connected in the tip and ring conductors from the selector 304 at a certain period during the establishing of this connection as will become apparent as the description proceeds, and will then serve to prevent high voltage battery from the selector 304 from surging through the condensers 16 and 17 into the relay 212 and cause it to operate falsely when relay 203 is operated as hereinafter described. Relay 206 in operating closes a circuit for the operation of relay 203 as follows: battery, winding of relay 203, armature and front contact of relay 206 to ground. This relay in operating provides a holding circuit for relay 12 independent of the ground at relay 200 by the closing of its upper make-before-break contacts to ground. Relay 203 in operating also removes the short circuit from the resistance 213 to ground for relay 200 so that relay 212 will not operate even though relay 203 in operating opens the by-pass circuit for relay 212 through its lower make-before-break contact. It should be noted that the circuit hereinbefore traced for relay 200 now extends through the lower inner armature and front contact of relay 203, winding of relay 212 to battery at relay 201 and to ground through resistance 213. Relay 212 is marginal in its operation and will

therefore not operate in this circuit. The operation of relay 203 also closes a bridge across the tip and ring conductors towards the selector 304. This bridge includes relay 219 and retardation coil 220 due to the operation of relay 12. The purpose of the bridge is to cause the operation of the usual pulsing relay (not shown) in the selector circuit, so that the selector will be ready for the reception of dialing impulses. Means in the selector (not shown) now cause the transmission of a dial tone over the tip conductor towards the calling subscriber through the resistance 211, conductor 14, and condenser 16 to the calling subscriber to indicate that the circuit arrangement is now ready for transmission of dial pulses and for the deposit of a coin in payment for the first conversation period.

As hereinbefore described the subscriber deposits a coin in the coin equipment when originating the call. The operating magnet of this equipment has been marked 18 and a coin has been indicated at 19. The deposit of the coin closes a circuit to ground in the coin equipment for the operation of relay 212. It should be noted that this ground is connected through the coin magnet 18 and the subscriber's set at 1 with the ring conductor of the trunk CT over the circuit hereinbefore traced for relays 200 and 212. Relay 212 will now operate as this ground shunts the resistance 213 and the winding of relay 200. Relay 200 is released. Relay 201 is operated by the operation of Relay 212 over a circuit from battery, through the armature and front contact of relay 212, winding of relay 201 to ground (not shown) on the sleeve of the selector 304. This ground connection is established on the operation of the pulsing relay in the selector. Relay 201, in operating, closes a locking circuit for itself from battery, through its upper make-before-break contacts, to the ground on the sleeve of selector 304. Relay 212 is now released due to the removal of battery from the circuit by the operation of relay 201. Relay 201 in operating closes an obvious circuit for the operation of relay 216. Relay 216 is locked through its armature and front contact over a circuit through the lower outer armature and back contact of relay 8. Relay 216 in operating closes an obvious circuit for the operation of relay 202. The purpose of the operation of this latter relay will become apparent as the description proceeds. It is sufficient to say at this time that this relay provides a ground connection for the sleeve lead to the line finder in substitute of the ground at relay 12. Relay 201 short circuits the resistance 211 in the tip conductor for purposes of no importance in connection with this invention. Relay 201 also prepares the dialing circuit by establishing a connection for relay 217 through its lower inner armature

and front contact to the ring conductor of the calling line.

Relay 217 now operates from the ground at the coin equipment and closes an obvious circuit for the operation of relay 208. Relay 208 in operating closes a holding circuit for relay 12 through its upper armature and front contact to the ground at the lower armature and front contact of relay 217. Another circuit closed by the operation of relay 217 is a bridge across the tip and ring conductors for holding the pulsing relay in the selector 304 in substitute of the bridge hereinbefore mentioned as established on the operation of relay 203. This bridge may be traced from the ring conductor, through the upper armature and front contact of relay 217, winding of relay 219, retardation coil 220 to the tip conductor.

It should be noted that on the release of relay 200, relays 206 and 203 were released in succession so that the original bridge established by relay 203 is broken but relay 203 is slow in releasing so that this bridge is not open until the above mentioned substitute bridge is established. Relay 203 in releasing short circuits the resistances 210 and 213. It also disconnects relay 212 from the line by establishing the above mentioned by-pass circuit for this relay. It should be remembered that relay 212 had already been released on the operation of relay 201. The circuits are now ready for the reception of dialing impulses.

The subscriber now dials the number of the desired local subscriber and relay 217 responds to these pulses to open and close the bridge for the pulsing relays in the selector 304 and connector 305. It should be mentioned here that on the first release of relay 217 relays 208 and 12 are released and due to the fact that relay 208 is slow to operate it will not operate again during pulsing. The relay 219 and resistance 220 are excluded from the bridge during pulsing due to the release of relay 12. Relay 217 will be permanently released when relay 9 is operated as hereinafter described and hence relay 208 will not remain operated after this release of relay 217. Relay 12 is kept released during pulsing to prevent the pulsing from affecting the circuit through the calling subscriber's line through the condensers 16 and 17. It should be noted however that relays 208 and 12 are reoperated after pulsing to maintain the connection between the calling subscriber's line and the selector telephonically. This is of importance in connection with extensions to an operator's position at AB as will become apparent as the description proceeds. The pulses of the first digit operate the selector 304 to select a connector 305 which in turn is operated by the pulses of the second and third digits to select the desired subscriber at 300. The connector 305 in find-

ing the line of the desired subscriber is operated to transmit signaling current over this line to call the subscriber. As stated the selector 304 and connector 305 may be of any well-known design and their operation is not described in detail as they form no part of this invention. It is sufficient to say that, when the called subscriber at 300 answers, current over the tip and ring conductors of the trunk CT is reversed. This reversal of current causes the operation of the polarized relay 222.

Relay 222 in operating closes a circuit for the operation of relay 223 as follows: battery, winding of relay 223 and its make-before-break contacts, armature and front contact of relay 222 to ground at the upper inner armature of relay 202. Relay 223 provides a locking circuit for itself through its upper armature and front contact to the ground at relay 202 independent of the connection through relay 222. Relay 224 is also operated by the operation of relay 222 from battery through the winding of relay 224, upper armature and back contact of relay 225 to the ground at relay 202. Relay 224 in operating closes a locking circuit for itself through its inner upper armature and front contacts to the ground at relay 202 and also closes an obvious circuit to the same ground for the operation of relay 225. These two relays are now held under control of relay 202 independent of relay 222. Relay 224 in operating reverses the tip and ring conductors to the called subscriber to release relay 222 and for other purposes of no importance in connection with this invention.

Relay 223 closes a circuit for the operation of relay 20 from battery, through the winding of relay 20, inner lower armature and front contact of relay 223, to ground on the sleeve of selector 304. Relay 20 in operating provides a locking circuit for itself through its upper inner armature and front contact, to ground at selector 304 independent of relay 223. Relay 20 also closes a connection to ground for the start lead to the interrupter equipment 23 to start it to function to transmit ground impulses through lead 24 of the selector bank 25. This bank and two others 26 and 27 form parts of an ordinary step-by-step switch controlled by the stepping magnet 28. The brushes of these banks are shown in normal position. The relay 9 is also operated on the operation of relay 20 to complete the connection from the calling subscriber to the called subscriber over its armatures and front contacts and talking conductors 30 and 31 independent of the path through condensers 16 and 17 and conductors 14 and 15. It should be noted that this connection over trunk CT is free from all electrical incumbrances and is maintained in this condition until the connection is released. The operation of relay 9 removes the

pulsing relay 217 from control over the calling subscriber's line. Relay 217 is released causing the release of relays 208 and 12 thus opening the connection to the called subscriber through condensers 16 and 17 and the original connection to ground for holding the line finder busy. The substitute connection to ground for this purpose is still maintained by relay 202. The connection between the calling and the called subscriber now extends as stated over leads 30 and 31 with the tip and ring conductors reversed towards the called subscriber's line.

Relating now to the operation of relay 20, a circuit is completed by the operation of this relay for the stepping magnet 28 to advance the brushes of the banks 25, 26 and 27 at the rate at which the pulses are received over lead 24. The interrupter equipment 23 may be so arranged that a connection to ground is established over lead 24 for a short interval every eighteenth second. The stepping magnet will therefore be operated to advance the brushes one step every eighteenth second, by a circuit from battery, through the winding of stepping magnet 28, lower armature and front contact of relay 225, lower inner armature and front contact of relay 20, brush of bank 25, the zero terminal of this bank, through lead 24, to ground at the interrupter equipment 23. When the brush of bank 25 comes to rest on the first terminal the second impulse is transmitted over lead 24 which is connected to the first eighteen terminals including the zero or normal terminal. The stepping magnet will therefore be operated eighteen times and the brushes of the switch advanced to terminal number 18. In this position the stepping magnet 28 passes out of control of the interrupter equipment 23 and a circuit is established over the brush of bank 25, from battery, through the stepping magnet 28 and the circuit hereinbefore traced, to the eighteenth terminal and the brush of bank 25, upper inner armature and back contact of relay 10, lamp 33 to ground. Lamp 33 which is located adjacent to jack 5 at the operator's position at A is now lighted to indicate that approximately five minutes have passed. This represents the period of time allowed for conversation, for which the deposited coin constitutes payment.

The operator at A noticing the lighted lamp 33 now inserts the plug 34 of cord 7 into jack 5 and thereby enables her telephone set to be connected through the cord to the tip and ring conductors of trunk CT. Relay 10 is operated over an obvious circuit through the sleeve of jack 5 and plug 34 to open the circuit for lamp 33 and close a circuit for the operation of the step-by-step switch to move its brushes into the nineteenth position. The circuit for the stepping magnet in this case will extend from battery, through the winding of the stepping magnet, through the con-

tacts of relay 225 as hereinbefore traced, and the brush of bank 25, eighteenth terminal, upper inner armature and front contact of relay 10 to interrupter 36 through which a ground is made and interrupted at the rate of 120 times per minute. With the brushes in the nineteenth position, relay 11 is operated over a circuit from battery, through the winding of this relay, second upper armature and front contact of relay 20, brush of bank 27, through the nineteenth terminal of this bank to ground. Relay 11 in operating transmits coin collect current to the coin equipment magnet 18 over a circuit from the coin collect battery 228, lower outer armature and front contact of relay 223, nineteenth terminal of bank 26, the brush of this bank, through the upper and lower inner armatures and front contacts of relay 11, and the tip and ring conductors through the line finder 4 over the calling subscriber's line to ground through magnet 18. Magnet 18 is thereby operated in a direction to collect the coin 19 in payment for the first conversation period of five minutes.

Relay 11 in operating also closes a circuit for the operation of stepping magnet 28 from battery, through the winding of this magnet, lower outer armature and front contact of relay 11 to ground at interrupter 36 at the next connection of ground therethrough. The stepping magnet now steps the brushes to the twentieth position and as the ground at interrupter 36 is connected once every half second, relay 11 will remain operated for one-half second which is sufficient to insure the operation of magnet 18. With the brushes in the twentieth position relay 11 will release as the bank 27 is not provided with ground on its twentieth terminal.

The operator at A now connects her telephone set to the cord 7 and is thereby telephonically connected to both subscribers but electrically only to the calling subscriber as relay 10 in operating opens the direct connection over trunk CT to the called subscriber, the connection now being extended through condensers 36 and 37. The operator may now inform the calling subscriber that the first five-minute period of conversation has passed and that in case the conversation is to be continued, another coin must be deposited. When the calling subscriber deposits the coin the operator at A will observe this in the usual manner but in case she has not observed that the coin was deposited, she may associate her own coin collect equipment with the cord and operate the coin magnet 18 to refund or deposit the coin, as required. If the parties desire to terminate the call the operator stays in on the connection until she gets the usual disconnect signal when she removes the plug 34 from jack 5. The stepping switch is thereby returned to normal from the twentieth position due to the fact that relay 20 is released in a manner

hereinafter described. The circuit for the stepping magnet 28 in this case will extend from battery, through the winding of the stepping magnet and its armature and back contact, upper middle armature and back contact of relay 20, brush of bank 27, the twentieth and twenty-first terminals of this bank, make-before-break contacts of relay 20 to ground. The operator remains on the line in order to prevent the step-by-step switch from starting a second cycle of operation on returning to normal which would be the case if the relay 10 is released before relay 20 as will be explained hereinafter.

If on the other hand it is decided to continue the conversation the calling subscriber deposits a second coin for a second period of five minutes of conversation. The operator receives the usual indication of this fact and removes the plug 34 from jack 6. Relay 10 is then released and the stepping switch returned to normal position by the closure of a circuit from battery, winding of magnet 28, lower armature and front contact of relay 225, lower inner armature and front contact of relay 20, brush of bank 25, twentieth and twenty-first positions of this bank, lower inner armature and back contact of relay 10, to ground at interrupter 36. Due to the fact that relay 20 is maintained operated at this time the stepping switch will now proceed to go through a second cycle of operation as described to measure off the second conversation period. The circuit closed in the normal position of the brush of bank 25 for the stepping magnet 28 will now move the switch from normal as hereinbefore described when relay 20 was first operated. At the end of the second period of conversation lamp 33 is again lighted and if the conversation is to be continued further the operations described above are repeated until the connection is released.

Should the calling party refuse to deposit the coin and insist on continuing to talk, the operator will insert the plug of another cord into jack 6. In this case relay 40 is operated over the sleeve circuit to separate the two parties telephonically by opening the tip and ring connections through the upper and lower outer armatures and back contacts of relay 40. The operator is now connected through this second cord by the operation of these armatures of relay 40 in order to enable her to talk to either party without being interrupted by the other party. The operator talks to the calling party through cord 7 by operating her listening key in this cord or to the called party through the cord connected to jack 6, jack 6 being connected through condensers 36 and 37 to trunk CT.

When the calling party hangs up at the end of the conversation relay 201 is released due to the removal of ground from the sleeve of selector 304 on the release of the selector

304 and connector 305 in the usual manner. Relay 20 is also released by the removal of this ground from the sleeve and the stepping switch is thereby returned to normal position as hereinbefore described. The return of the switch takes place regardless of whether the last conversation period has expired or not. If the period has not expired the stepping magnet will be controlled by the circuit completed to ground at the make-before-break contacts of relay 20 and the interrupter equipment 23 will become ineffective. If the period has just expired the step-by-step switch will be in position 19 and the ground on the nineteenth terminal of bank 27 will when relay 20 is released cause the magnet 28 to be operated to step the switch into position 20 from which it will be returned to normal as hereinbefore described. Relay 9 is released by relay 20.

The release of relay 201 causes the operation of relay 207 over a circuit as follows: battery, second upper inner armature and back contact of relay 201, winding of relay 207, lower make-before-break contacts of this relay, inner lower armature and front contact of relay 202 to ground. Relay 207 in operating opens the original circuit to battery for relay 12. It should be observed however that relay 12 is already released. Relay 207 is locked through its lower armature and front contact under control of relay 202. Relay 8 is operated through the operation of relay 207 over a circuit as follows: battery, inner upper armature and back contact of relay 201, upper outer armature and front contact of relay 202, upper outer armature and front contact of relay 207, winding of relay 8, lead 231 to interrupter 230 which establishes a connection to ground once every second.

The operation of relay 8 applies coin-collect battery 228 through the lower outer armature and front contact of relay 223, winding of relay 234, upper and lower inner armatures and front contacts of relay 8 through the tip and ring conductors of trunk CT through the magnet 18 to ground. Relay 234 operates in this circuit and provides a holding circuit for relay 216, which would ordinarily release on the operation of relay 8, but relay 216 is slow in releasing so that it will be maintained operated after relay 8 is operated and until relay 234 becomes operated. Relay 216 maintains relay 202 operated. If the collection of the coin is successful on the first operation of relay 8 ground for magnet 18 will be removed and relay 234 will therefore release before relay 8 releases and has no opportunity to operate a second time from ground at interrupter 230, unless magnet 18 fails to operate on the first impulse. Relay 234 in releasing causes the release of relays 216 and 202 in succession and the release of relay 202 will prevent the

reoperation of relay 8 by the opening of the energizing circuit therefor. Relay 202 in releasing causes the release of relays 224 and 225 in succession and relay 225 opens the circuit for the stepping magnet 28. Relays 223 and 207 are also released by relay 202.

If the calling subscriber at 1 is entitled to free service, that is, if the call is not to be charged for, the coin magnet 18 is operated to refund the coin. In this case the connector 305 will be of the type in which the battery connection is not reversed over the line and the relay 222 will therefore not be operated when the called subscriber answers. Relays 223, 224 and 225 are therefore not operated. Hence relay 20 is not operated to operate relay 9, nor is the circuit for the stepping magnet 28 completed. Consequently relays 208 and 12 will remain operated under control of relay 217 and conversation between the subscriber will therefore be carried on over the connection through the condensers 16 and 17. It is further evident that no control can be exercised by the operator at A over the collection or refunding of coins under these circumstances, nor is this necessary as all that is required is to return the coin deposited by the calling subscriber to enable him to make the call. To this end, when the connection is released and relay 8 operates coin refund battery 38 will be supplied through the upper outer armature and front contact of relay 8, lower outer armature and back contact of relay 223 to the coin magnet 18 to cause it to operate to refund the coin. The circuit will otherwise be released in the same manner as hereinbefore described.

In case the connection is to be extended to an operator at AB instead of to a local subscriber the selector 304 will be actuated to connect with the terminals of the trunk AT. When this takes place the trunk loop is connected to ground and battery through the windings of relay 306 and through upper make-before-break contacts and lower armature and back contact of relay 307. Relay 306 operates and causes the operation of relays 308 and 309 over obvious circuits. Relay 308 in operating applies a ringing tone from the source 310 through the ring conductor of trunk CT to the calling subscriber to indicate that the connection has been extended to the operator at AB. The trunk light 311 is also lighted over an obvious circuit by the operation of relay 308 to indicate to the operator at AB that a connection is desired over trunk AT at jack 302. The operation of relays 309 and 308 apply a busy ground to the sleeve terminal of trunk AB to cause the trunk CT to function as hereinbefore described when the ground is connected on the sleeve of switch 304. The operation of relay 306 also closes an obvious circuit for the operation of relay 312 and this relay in turn

closes an obvious circuit for the operation of relay 313.

The operator at AB will now insert plug 301 into jack 302 and this causes the operation of relay 307 over the sleeve conductor from battery in the operator's cord. Relay 307 in operating opens the circuit for relay 306 which in turn causes the release of relay 308. Relay 308 in releasing removes the tone to the calling subscriber and extinguishes the trunk lamp 311. Relay 309 would also release on the release of relay 306 except that it is slow in releasing so that it will be maintained operated by the operation of relay 307 which closes a circuit to ground at its upper inner armature and front contact to maintain the ground on the sleeve of selector 304.

Relay 307 in operating connects the trunk CT to the trunk AT and also causes the release of relays 312 and 313. Relay 312 is slow in releasing to permit relay 313 to be held operated long enough after relay 307 is operated to transmit a momentary impulse of increased current over the trunk CT from battery 316 and ground 317. This momentary increase of current causes the operation of the marginal relay 219 in trunk CT which is at this time bridged across the tip and ring conductors of trunk CT due to the operation of relays 217 and 12. Relay 219 in operating causes the operation of relay 20. The operation of relay 20 has no effect as far as the starting of the coin collecting and refunding means is concerned. That is, the stepping magnet 28 will not be operated as relay 225 has not been operated since there has been no reversal of current in the trunk AT. This means of controlling the collection is not needed at this time as the coin collecting during conversation will be attended to by the operator at AB in the usual manner. The operation of relay 20, however, closes a circuit for the operation of relay 9 so that circuits will be completed from the calling subscriber to the operator at AB without any electrical obstruction. That is, with relay 10 not operated and relay 9 operated a connection is closed through trunk CT past the condensers 36 and 37 and through tip and ring conductors 30 and 31 directly to the cord of the operator at AB. The operator at AB will now converse with the calling subscriber and extend the connection to the desired wanted subscriber in any well-known manner.

It should be pointed out at this time that with a circuit of the type of trunk CT it is desirable that the trunk should be of the repeater type during the dialing period and of the type in which no electrical obstructions are present on the trunk when a connection is fully established. This is due to the fact that the coin collecting equipment associated with the subscriber's station causes the operation of the pulsing relay 217 with both conductors

from the calling subscriber's station involved. Hence, the tip and ring conductors to the selector 304 have to be separated from the conductors leading to the calling subscriber by the condensers 16 and 17. It has heretofore been described how the condensers divide the circuit during the dialing and how the connection is fully completed to the calling subscriber and to the called subscriber or to the operator at AB to eliminate all electrical obstructions. Should the connection be extended to a test man or other supervisory operator only a talking connection will, as heretofore described in connection with free calls, extend over the trunk CT arranged as a repeater type trunk.

When the conversation is ended the operator at AB collects the coins deposited in payment for the call by operating her usual equipment provided in connection with the cord circuit for this purpose. The collection is done by applying collect battery to the line and thereby operating the magnet 18 accordingly. If the call is free the operator applies refund battery to the line to operate the magnet 18 to refund the coin that the calling subscriber deposited to enable him to make the call. Refunding by the operator at AB may, however, be done at any other time during conversation, for example in case of dispute. On the other hand when the operator at AB disconnects by removing plug 301 from jack 302 the circuits of trunk CT are operated to apply refund battery to magnet 18 so that in case any coins deposited remain in the coin box they are refunded. Relays 307 and 309 are now released and the circuits of trunk CT will then function in the manner as hereinbefore described on the removal of ground from the sleeve of selector 304 to operate relay 8 to refund the coin.

It should be understood that while the invention has been described in connection with but one disclosure, it is not limited thereby, and that the invention could be applied to many other circuit arrangements without departing from the spirit thereof.

What is claimed is:

1. In a telephone system, a calling station, a called station, an operator's position, a trunk, means including said trunk for connecting the calling station with either the called station or the operator's position, coin collecting and refunding means associated with said trunk, and means for rendering said collecting and refunding means effective when a connection is extended to the called station and for maintaining said collecting and refunding means ineffective when the connection is extended to the operator's position.

2. In a telephone system, a calling station, a coin collecting and refunding device thereat, a trunk, means for extending a connection from the calling station to said trunk, coin collecting and refunding means associated

with said trunk, a called subscriber's station, means for extending a connection from the trunk to the called subscriber's station and for actuating the coin collecting and refunding means in said trunk to collect or refund a coin depending on whether or not the connection to the called subscriber is successful, an operator's position, and means for extending the connection from the trunk to the operator's position and for disabling the coin collecting and refunding means when the connection is so extended.

3. In a telephone system, a calling station, a called subscriber's station, means including a trunk for establishing connections between said stations and means associated with said trunk for controlling the collection and refunding of coins, a cord at an operator's position, a switching trunk accessible from said first mentioned trunk and terminating at said operator's position, and means for maintaining the coin collecting and refunding control means ineffective and for converting the first mentioned trunk from a repeater type trunk to a direct connection type trunk free from any electrical obstruction when a connection is established between said trunks and between the switching trunk and the cord.

4. In a telephone system, a calling station, a called station, an operator's position, a trunk, means including said trunk for connecting the calling station with the called station or the operator's position, coin collecting and refunding means associated with said trunk, and means for converting the trunk from one type of transmission circuit to another type and for maintaining the coin collecting and refunding means ineffective when a connection is established to the operator's position and for rendering said collecting and refunding effective when a connection is extended to the called station.

5. In a telephone system, a calling station, a called station, an operator's position, a trunk, means including said trunk for connecting the calling station with the called station or the operator's position, means responsive to the connection of the calling station to the operator's position for transmitting a momentary impulse of current to the trunk, and means in said trunk responsive to said impulse for converting the trunk from one type of transmission circuit to another type.

6. In a telephone system, a calling station, a called station, an operator's position, a trunk, automatic switches, means in said trunk for repeating impulses to operate said switches to establish a connection including said trunk from the calling station either to the called station or to the operator's position, toll-charging means associated with said trunk, and means responsive to the establishment of a connection to the operator's position

tion for disabling said toll-charging means and for converting said trunk into a direct transmission circuit free from said repeating means

5 7. In a telephone system, a calling station, a called station, an operators' position, a trunk, means including said trunk for connecting the calling station with either the called station or the operator's position, coin
10 collecting means associated with said trunk, a polarized relay associated with said trunk, means responsive to the establishing of a connection to a called station for actuating said relay, means responsive to the actuation
15 of said relay for operating said coin collecting means to collect the coin deposited at the calling station, and means for maintaining said relay in non-actuated condition when a connection is established to the operator's
20 position to prevent the operation of the coin collecting means.

8. In a telephone system, a calling station, a called station, an operator's position, a trunk, means including said trunk for connecting the calling station with either the
25 called station or the operator's position, coin collecting means associated with said trunk, a polarized relay associated with said trunk, means responsive to the establishing of a connection to the called station for actuating said
30 relay, means responsive to the actuation of said relay for operating said coin collecting means to collect the coin deposited at the calling station, and means for maintaining said
35 relay in non-actuated condition to prevent the operation of the coin collecting means and for converting said trunk from a repeater type trunk to a direct connection type trunk free from any electrical obstruction when a
40 connection is established to the operator's position.

In witness whereof, I hereunto subscribe my name this 29th day of March, 1929.

RAY L. STOKELY.

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