

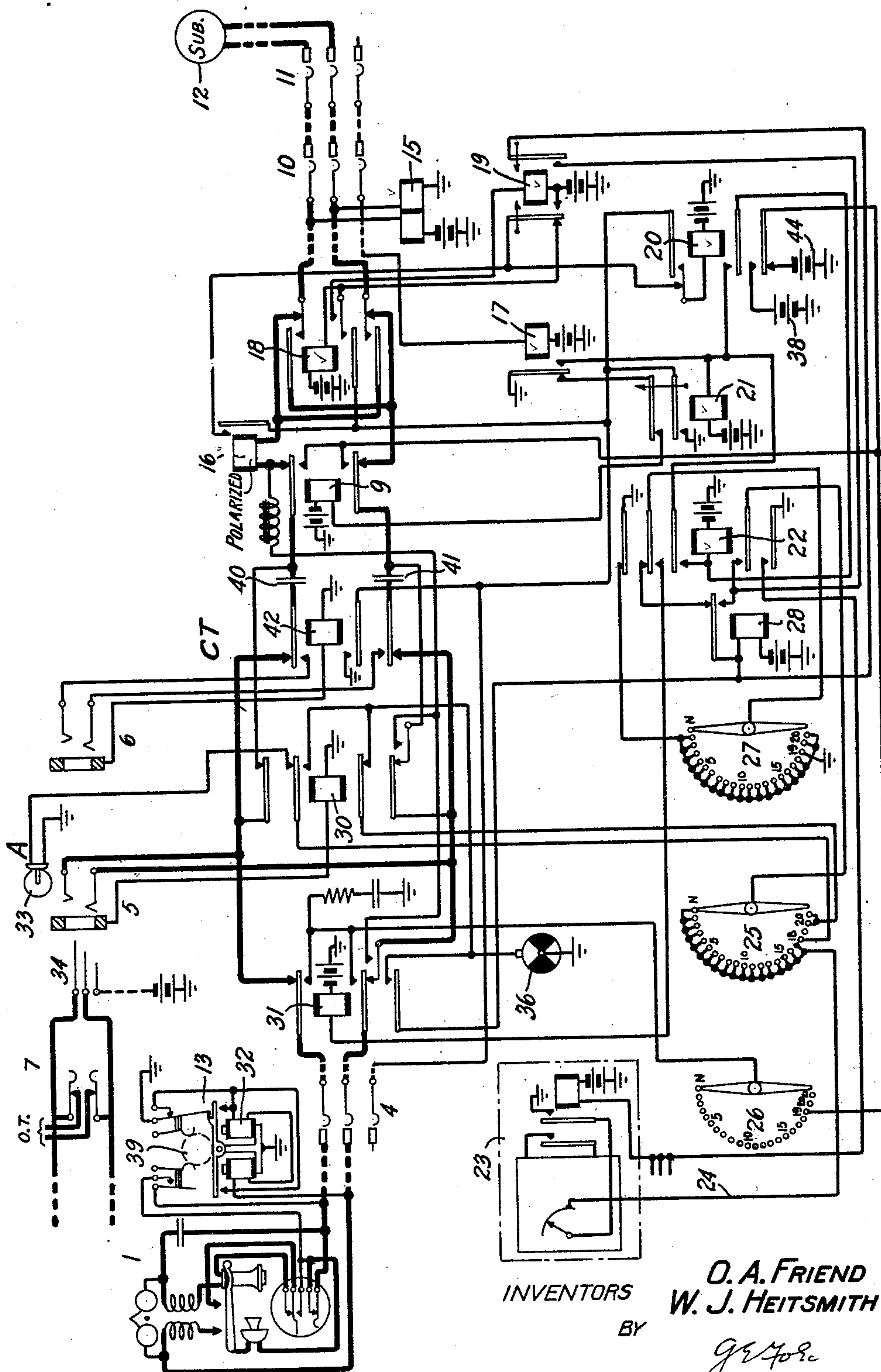
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TELEPHONE SYSTEM

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TELEPHONE SYSTEM

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This invention relates to telephone systems and particularly to means for controlling coin collection in automatic telephone systems.

An object of the invention is to improve and simplify the collection of toll for fixed periods of conversation over a telephone connection.

Heretofore, systems have been provided for collecting toll at the end of the conversation or periodically during the conversation. In the latter case, the collection of coins is either performed by means automatically actuated at predetermined intervals or by an operator having access to the connection through a cord included in the connection and equipped with manually controllable collecting means.

A feature of this invention is a system having means associated with a trunk whereby a signal is actuated at an operator's position when a predetermined period of conversation over a connection including said trunk has elapsed, whereby the operator may connect a cord circuit and a telephone set to this trunk to warn a calling subscriber that the period of conversation, for which a coin was originally deposited, has come to an end and that in case the conversation is to be continued an additional coin must be deposited.

Another feature of the invention is a system having means in the trunk whereby, if the calling subscriber deposits an additional coin and the operator disconnects her cord from the trunk, the signal is again actuated when the second predetermined period of conversation has elapsed and whereby this procedure may be repeated for each additional predetermined period of conversation.

Another feature is an arrangement whereby the signal is disabled and a previously deposited coin is automatically collected each time the operator associates her cord with the trunk in response to the lighting of the signal.

Another feature is an arrangement whereby a cord circuit may be connected by the operator to the trunk at another point to telephonically separate the calling subscriber from the called subscriber without breaking down the connection. This is for the purpose of permitting the operator to converse

with the calling subscriber regarding the deposit of an additional coin and to prevent conversation between the subscribers until the required deposit has been made.

This invention has been illustrated in the accompanying drawing which shows a calling subscriber's line provided with coin box equipment, a trunk circuit arranged in accordance with this invention, a line finder through which the calling subscriber's line has access to the trunk, a selector associated with the trunk, a connector, a called subscriber's line to which a connection may be extended through the selector and connector from the calling subscriber's line and a portion of a standard cord circuit for connection to the trunk. The line finder, selector, connector, called subscriber's line and cord circuit are shown in diagrammatic form as any well-known telephone apparatus of these types may be employed in connection with the invention as illustrated in the trunk circuit.

The trunk circuit CT terminates at line finder 4 through which calling subscribers' lines 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 supervise the coin collection through cords, one of which is shown in diagrammatic form at 7. Trunk CT is also arranged so that the collection or refunding of a coin may be automatically performed when a connection over the trunk is released. The connection from the trunk CT may be extended over selector 10 and connector 11 to the called subscriber at 12. It should be understood that the line finder 4, selector 10 and connector 11 may be of any well-known type commonly used in the telephone art and have not been shown in detail as the construction and circuit arrangements for these switches form no part of the invention.

A description will now be made in detail of the operation of the trunk CT when a connection is extended thereover from the calling subscriber at 1 to the called subscriber at 12. When the calling subscriber at 1 takes his receiver off the switchhook, the line finder 4 is actuated to connect his line with trunk

CT. As the circuit 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 this connection a circuit will be completed through the calling subscriber's loop for the operation of the usual pulsing relay 15 in the selector 10. This circuit may be traced as follows: battery, left-hand winding of relay 15, upper make-before-break contacts of relay 18, winding of polarized relay 16, upper armature and back contact of relay 9, upper outer armature and back contact of relay 30, upper armature and back contact of relay 31, tip conductor of the trunk through the line finder 4 and the loop closed through the subscriber's set at 1, the ring conductor of the trunk through the line finder 4, lower inner armature and back contact of relay 31, lower outer armature and back contact of relay 30, lower armature and back contact of relay 9, lower make-before-break contacts of relay 18 through the right-hand winding of relay 15 to ground. Means in the selector 10, which has not been shown, may cause, through the operation of pulsing relay 15, the transmission of a dial tone over the tip conductor to the calling subscriber to indicate that the circuits are now ready for transmission of dial pulses and for the deposit of a coin to enable the subscriber to make the call and in payment for the first conversational period.

The next operation, therefore, on the part of the calling subscriber will be to deposit a coin in the coin equipment 13 to enable him to dial. The operating magnet of this equipment has been marked 32 and a coin has been indicated at 39. The deposit of the coin opens the shunt circuit around the dial pulsing contacts so that the subscriber is now able to operate the dial to interrupt the circuit for the pulsing relay 15. It should be noted also that the deposit of the coin causes a ground to be connected to a circuit through the coin magnet 32 to the ring conductor of the trunk CT for the purpose of enabling the control over this magnet to collect or refund coins as will hereinafter be described.

The subscriber now dials the number of the desired subscriber and pulsing relay 15 responds to establish the connection. The pulses of the first digit operate the selector 10 to select the connector 11 which in turn is operated by pulses of the second and third digits to select the desired subscriber at 12. The connector 11 on finding the line of the desired subscriber is operated to transmit signalling current over this line to call the subscriber. As stated, selector 10 and connector 11 may be of any well-known design and their operations are therefore not described in detail. It is sufficient to state that when the called subscriber at 12 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 16. It should also be mentioned at this time that after the seizure of selector 10, a ground is connected in any well-known manner to the sleeve conductor to cause the operation of relay 17. This relay closes an obvious circuit for the operation of relay 21 which, in operating, closes a connection to ground for the sleeve conductor of the line finder 4 to maintain it busy, as is well-known in the art. Relay 16, in operating, closes a circuit for the operation of relay 18 over a circuit from battery, winding of relay 18, left-hand armature and back contact of relay 19, armature and front contact of relay 16 to the above mentioned ground on the sleeve conductor of the line finder 4 applied at the upper inner armature and front contact of relay 21. Relay 18 in operating, provides a locking circuit for itself through its lower inner armature and front contact to the ground on the sleeve conductor independent of the original connection through the armature and front contact of relay 16. Relay 18 in operating, also reverses the tip and ring conductors towards the calling subscriber's line to cause the release of relay 16 and for other purposes of no importance in connection with this invention. Another circuit closed by the operation of relay 18 is one for the operation of relay 19 from battery, winding of this relay, contacts and inner lower armature of relay 18 to the ground on the sleeve conductor. This relay in operating, opens the original circuit for relay 18 and closes at its right-hand armature and front contact a circuit for operations relating to the collection of coins as will be hereinafter described.

The operation of relay 16 also closes a circuit for the operation of relay 20 from battery, winding of this relay and its upper make-before-break contacts, armature and front contact of relay 16 to the ground on the sleeve conductor. Relay 20 in operating, provides a locking circuit for itself through its upper armature and front contact to the ground on the sleeve independent of the original circuit closed by the operation of relay 16.

The relay 17, which was operated previously, in conjunction with the operation of relay 20, now closes a circuit for the operation of relay 22 as follows: from battery, winding of relay 22, inner lower armature and front contact of relay 20 to ground at the armature and front contact of relay 17. Relay 22 in operating, closes a locking circuit for itself through its upper inner armature and front contact to the ground at the armature and front contact of relay 17 independent of the original circuit closed by the operation of relay 20. Relay 22 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 the 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 and are employed for the control of the collection of coins on the time basis as will hereinafter be described. The brushes of these banks are shown in normal position.

Relating further to the operation of relay 22, 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, right-hand armature and front contact of relay 19, lower inner armature and front contact of relay 22, brush of bank 25, the zero or normal 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 18 terminals including the normal terminal. The stepping magnet will therefore be operated 18 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 now established from battery, through the stepping magnet 28 and the circuit hereinbefore traced, to the brush of bank 25, the eighteenth terminal, upper inner armature and back contact of relay 30, 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, and 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 connects her telephone set through the cord to the tip and ring conductors of trunk CT. Relay 30, which is now operated over an obvious circuit through the sleeve of jack 5 and plug 34, opens the circuit for lamp 33 and closes 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 28 in this case, will extend from battery, winding of the stepping magnet, contacts of relay 19 as hereinbefore traced, brush of bank 25, eighteenth terminal, upper inner armature and front con-

tact of relay 30 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 31 is operated over a circuit from battery, through the winding of this relay, second upper armature and front contact of relay 22, brush of bank 27, through the nineteenth terminal of this bank to ground. Relay 31 in operating, transmits coin collect current to the coin equipment magnet 32 over a circuit from the coin collect battery 38, lower outer armature and front contact of relay 20, nineteenth terminal of bank 26, the brush of this bank, through the upper and lower inner armatures and front contacts of relay 31, and the tip and ring conductors through the line finder 4 over the calling subscriber's line to ground through magnet 32. Magnet 32 is thereby operated in a direction to collect the coin 39 in payment for the first conversation period of 5 minutes.

Relay 31 in operating, also closes a circuit for the operation of stepping magnet 28 from battery, winding of this magnet, lower outer armature and front contact of relay 31 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 31 will remain operated for one-half second which is sufficient to insure the operation of magnet 32. With the brushes in the twentieth position relay 31 will release as the bank 27 is not provided with ground on its twentieth terminal at this time.

When the operator at A connects her telephone set to the cord 7 she is telephonically connected to both subscribers but electrically only to the calling subscriber as relay 30 in operating opens the direct connection over trunk CT to the called subscriber, the connection now being extended through condensers 40 and 41. 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 may 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 32 to refund or deposit the coin, as required.

If the parties desire to terminate the call at this time, the operator stays on the connection until the usual disconnect signal is received 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 22 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 22, brush of bank 27, the twentieth and twenty-first terminals of this bank, upper outer armature and back contact of relay 22, 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 30 is released before relay 22.

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 5. Relay 30 is then released and the stepping switch returned to normal position by the closure of a circuit from battery, winding of magnet 28, right-hand armature and front contact of relay 19, lower inner armature and front contact of relay 22, brush of bank 25, twentieth and twenty-first terminals of this bank, lower inner armature and back contact of relay 30, to ground at interrupter 36. Due to the fact that relay 22 is maintained operated at this time the stepping switch will now proceed to go through a second cycle of operations to measure the second conversation period. The circuit closed in the normal position of the brush of bank 25 for the stepping magnet 28 moves the switch from normal as hereinbefore described when relay 22 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 42 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 42. The operator is now connected through this second cord by the operation of these armatures of relay 42 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 by operating her listening key in this cord. Jack 6 is connected through condensers 40 and 41 to trunk CT.

When the calling party hangs up at the end of the conversation, relay 17 is released due to the removal of ground from the sleeve of selector 10 on the release of the selector 10 and connector 11 in the usual manner. Relay 17 in releasing closes a circuit for the oper-

ation of relay 9 from battery through the winding of this relay, upper outer armature and front contact of relay 21 to ground at the armature and back contact of relay 17. Relay 9 in operating establishes at its armatures and front contacts a connection from the collect battery 38 and the lower outer armature and front contact of relay 20 to the tip and ring conductors leading to the calling subscriber's line to cause the operation of magnet 32 in the coin equipment 13. This causes the collection of the coin deposited for the last period of conversation. It should be noted that the relay 21 is slow to release, so that it will remain operated for a sufficient period to permit the relay 9 to operate after relay 17 is released, the time of operation of relay 9 being determined by the slow release characteristics of relay 21. It should be noted that relay 21 when it operated applied at its upper armature and front contact a connection to ground for the sleeve lead to the line finder. This is for the purpose of maintaining the line finder operated after the calling subscriber has returned his receiver to the switchhook which would ordinarily cause the line finder to release. The line finder must be maintained operated long enough to permit collect battery current to pass over the subscriber's line to operate the coin equipment. Relay 22 is also released by the release of relay 17 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 upper outer armature and back contact of relay 22, through bank 27, the upper middle armature and back contact of relay 22, and the interrupting contacts of magnet 28. The interrupter equipment 23 will consequently become ineffective to further control the stepping magnet as the circuit therefor is opened at the lower inner armature and front contact of relay 22. If the period has just expired, the stepping switch will be in position 19 and the ground on the nineteenth terminal of bank 27 will when relay 22 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 hereinafter described.

If the called subscriber 12 does not answer or the calling subscriber abandons the call before the called subscriber answers the call, the coin magnet 32 is operated to refund the coin. In this case, the relay 16 will not be operated and thus preventing the operation of relays 20, 18 and 19. However, as relay 17 is operated, the operation of relay 21 takes place. When, therefore, the calling subscriber releases the connection and relay 17 is re-

leased current from the refund battery 44 will be transmitted through the lower outer armature and back contact of relay 20 through the front contacts and armatures of relay 9 to cause the magnet 32 to operate to refund the coin deposited as hereinbefore described to establish a connection. It should also be noted that as relay 19 is not operated relay 22 will not operate and the equipment for collecting coins on a time basis will be prevented from being actuated. Neither can the operator at A exercise any control over the collection or refunding of coins under these circumstances. This is necessary as all that is required is to return the coin that the calling subscriber deposited to enable him to make the call.

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 may be applied to many other circuit arrangements without departing from the spirit thereof and that the invention should be limited only by the scope of the appended claims.

What is claimed is:

1. In a telephone system, a calling station, a coin collecting device thereat, a called subscriber's station, means including a trunk for establishing a connection between said stations, an operator's cord, means for connecting said cord with the trunk, and means associated with the trunk and responsive to the connection of the cord with the trunk for actuating the coin collecting device a predetermined interval after the called subscriber has answered the call.

2. In a telephone system, a calling station, a coin collecting device thereat, a called subscriber's station, means including a trunk for establishing a connection between said stations, a signal for said trunk, means associated with said trunk for actuating said signal at predetermined intervals, an operator's cord, means for connecting said cord to the trunk, and means responsive to said connection of the cord to the trunk for disabling the signal and for actuating the coin collecting device.

3. In a telephone system, a calling station, a coin collecting and refunding device thereat, a called subscriber's station, means including a trunk for establishing a connection between said stations, means individual to said trunk and responsive when the called subscriber hangs up his receiver for actuating said device to collect the coin deposited therein and for refunding the coin if the calling party abandons the call, and independent means associated with said trunk for collecting the coin a predetermined interval after the called subscriber answers the call and for repeatedly collecting coins at succeeding predetermined intervals as long as the connection remains.

4. In a telephone system, a calling station,

a coin collecting device thereat, a called station, means including a trunk for establishing a connection between said stations, operator's cords, means for connecting cords to the trunk at two different points, means responsive to the connection of a cord at one point to the trunk for actuating the coin collecting device a predetermined interval after the called party has answered the call, and means associated with the trunk and responsive to the connection of a cord at another point to the trunk for disconnecting the two stations telephonically but not releasing the connection therebetween.

5. In a telephone system, a calling subscriber's station, a called subscriber's station, means including a trunk line for establishing a connection between said stations, a signal associated with said trunk, a timing device, means for starting the operation of said timing device when the called subscriber answers the call, and means for actuating said signal under control of said timing device a predetermined interval after the starting of this operation.

6. In a telephone system, a calling subscriber's station, a coin collecting device thereat, a called subscriber's station, means including a trunk line for establishing a connection between said stations, a signal associated with said trunk, a timing device actuated to start its operation when the called subscriber answers the call, means for actuating said signal under control of said timing device a predetermined interval after the starting of its operation, and means for thereafter disabling the signal and actuating the coin collecting device under control of said timing device.

7. In a telephone system, a calling station, a coin collecting device thereat, a called subscriber's station, means for establishing a connection between said stations, a signal, means for operating said signal a predetermined interval after the called subscriber answers the call, and means operative after said predetermined interval has elapsed for disabling said signal and for actuating said coin collecting device.

8. In a telephone system, a calling station, a coin collecting device, a called subscriber's station, a cord circuit, means including a trunk and excluding the cord circuit for establishing a connection between said stations, a signal associated with said trunk, means for actuating said signal a predetermined interval after the connection has been established between said stations and the called subscriber has answered the call, means for connecting said cord circuit to said connection between said stations and means responsive to this connection of the cord circuit for disabling the signal and actuating the coin collecting device.

9. In a telephone system, a calling station,

5 a called subscriber's station, means including
a trunk for establishing a connection between
said stations, an operator's position, a signal
at said operator's position associated with
said trunk and means responsive to the called
subscriber answering a call for actuating said
signal a predetermined time thereafter.

10 10. In a telephone system, a calling sub-
scriber's station, a coin collecting device
thereat, a called subscriber's station, means
including a trunk for establishing a con-
nection between said stations, an operator's
position, a signal at said operator's position
associated with said trunk, means responsive
15 to the called subscriber answering the call for
actuating said signal a predetermined inter-
val thereafter, and means operative when
said predetermined interval has elapsed for
disabling said signal and actuating the coin
collecting device.

20 In testimony whereof, we have signed our
names to this specification this second day of
April, 1929.

OTTO A. FRIEND.

WILLIAM J. HEITSMITH.

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