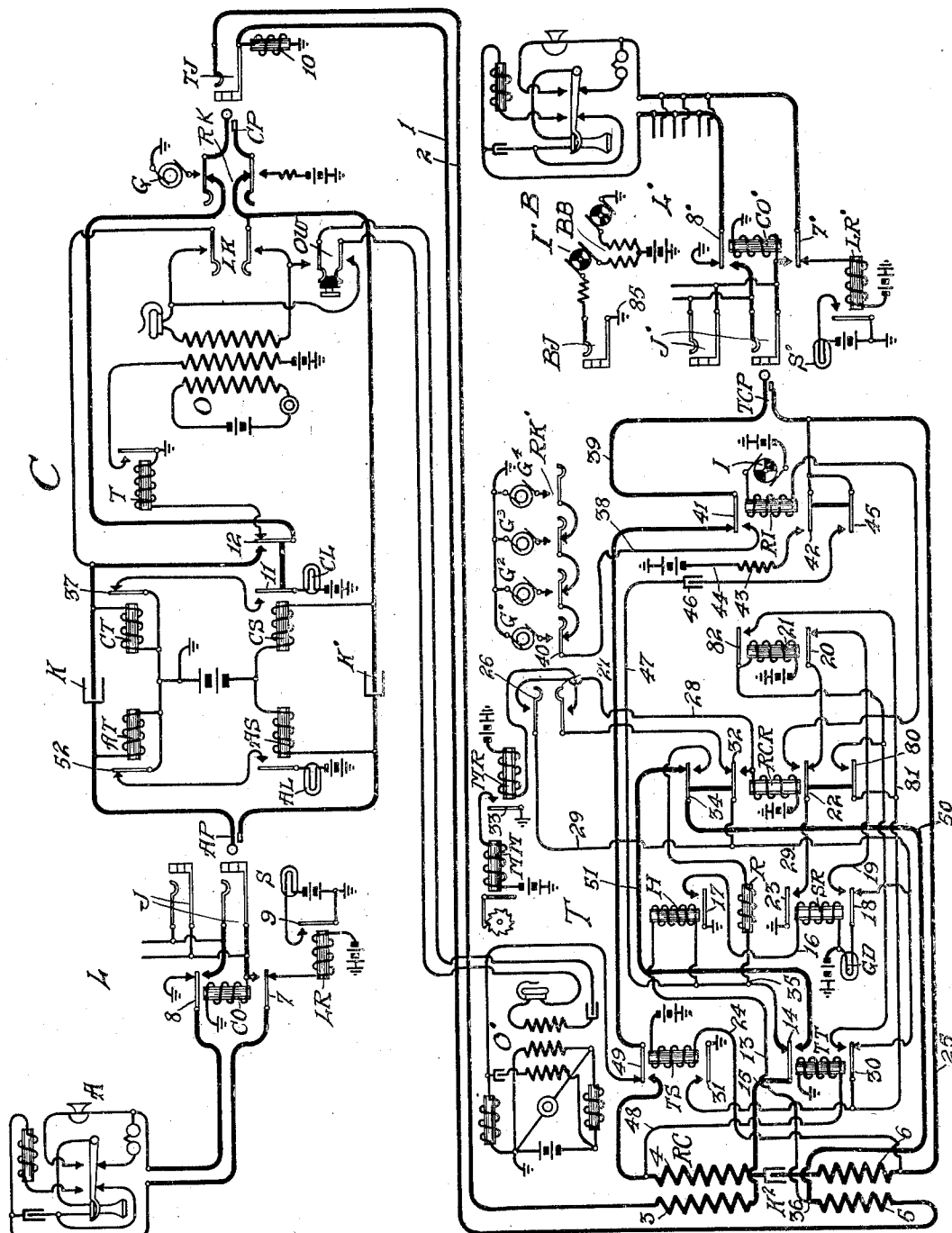


1,358,182.

Patented Nov. 9, 1920.



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UNITED STATES PATENT OFFICE.

CHARLES SPARKS, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TRUNK-CIRCUIT.

1,358,182.

Specification of Letters Patent.

Patented Nov. 9, 1920.

Application filed March 25, 1916. Serial No. 86,553.

To all whom it may concern:

Be it known that I, CHARLES SPARKS, a citizen of the United States of America, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Trunk-Circuits, of which the following is a specification.

My invention relates to telephone systems and has to do more particularly with trunking systems in which calls are extended from a calling substation through operators' cord and trunk circuits to called substations, an object of my invention being to provide an improved system of the above character.

The present trunk circuits provided with selective ringing for use in connection with polystation lines have no means of indicating to the trunk operator that the ringing key has been depressed to ring the called-for subscriber after the plug of the trunk circuit has been inserted into the jack of the wanted line. A feature of my invention is the provision of means whereby the so-called guard and disconnect lamp of the trunk circuit remains glowing until the ringing key of the trunk circuit has been depressed, thereby notifying the operator that the selective ringing key has not been operated, but upon the depression of the ringing key the said guard lamp is effaced, thus giving a positive indication that the ringing key has been depressed and that ringing current is being applied to the line of the called subscriber.

Another feature of my invention is the effacement of the calling supervisory lamp of the local operator's cord when the ringing key of the trunk circuit has been depressed.

Another feature of my invention is the provision of means for flashing the guard lamp associated with the trunk circuit after the trunk plug has been connected to a busy jack and the A cord disconnected from the outgoing trunk jack of the trunk circuit. These and other features of my invention will be more particularly pointed out in the ensuing specification and appended claims.

For a more complete understanding of my invention reference may be had to the accompanying drawing illustrating an embodiment of my invention.

Referring in general to my invention as

illustrated in the accompanying drawing, I show a calling substation A of the well-known common battery type terminating at the exchange in a two-wire common battery line circuit L comprising the usual line relay LR, cut-off relay CO, line signal S and the multiple jacks J.

A cord circuit C is shown for use in extending connections from the line circuit L, and comprises an answering plug AP and a calling plug CP, the two plugs being connected by the heavily marked conductors. The said conductors have the condensers K and K¹ interposed therein. Associated with the answering end of the cord circuit C is an answering tip supervisory relay AT and an answering sleeve supervisory relay AS, the two relays controlling the answering supervisory lamp AL. Associated with the calling end of the cord circuit is a calling tip supervisory relay CT and a calling sleeve supervisory relay CS, the two relays controlling the calling supervisory lamp CL. A listening key LK is also shown which when actuated connects the operator's set O in the cord conductors. An orderwire key OW is provided for connecting the operator's set O with an operator's set, as O¹, of a trunk circuit T at a distant exchange. A ringing key RK is also shown, which when actuated connects the ringing generator G to ring the call bell of the called-for line. The calling plug CP is adapted for connecting to multiple jacks of other telephone lines terminating at the switchboard in the same exchange or for connecting to trunk jacks TJ, which are located at the A-operator's position and which are terminals of trunk circuits, as T, the said jacks TJ being connected to the trunk circuit apparatus at the distant exchange by the heavily marked conductors 1 and 2.

The trunk circuit T comprises a trunk calling plug TCP at its out-going end, the incoming end of the trunk circuit T terminating in a repeating coil RC which comprises windings 3, 4, 5 and 6, the windings 4 and 6 having the condenser K² interposed. A high resistance relay H is associated with the incoming end of the trunk circuit T and is energized when the calling plug CP of the cord circuit C is inserted in the trunk jack TJ. A supervisory relay SR is provided which is energized upon the

actuation of the relay H thereby causing the combined guard and disconnect lamp GD to glow. A trunk sleeve supervisory relay TS is provided which energizes upon the insertion of the trunk plug TCP into the multiple jack of a called line, and a tip trunk relay TT is also provided which energizes upon the response of the called subscriber. A ringing control relay RCR is provided which is energized upon the depression of one of the ringing plungers of the ringing key RK¹, and operates to close a circuit for the interrupter relay RI, which is intermittently energized and deenergized through the medium of the interrupter I to connect the proper ringing frequency from the ringing generators G¹, G², G³ or G⁴ to ring the call bell of the wanted subscriber. A resistance R is provided, and is cut in multiple with the high resistance relay H when the relay RCR actuates to allow the calling tip relay CT of the cord circuit C to operate to efface the signal CL of the cord circuit C thereby notifying the A-operator that the called party is being rung. The energization of the relay RCR also brings about the effacement of the guard and disconnect lamp GD.

Upon the response of the called subscriber the relay TT operates to open the circuit of relay RCR thereby bringing about the disconnection of ringing current from the called line. A meter relay MR and a meter magnet MM are operated upon the actuation of the ringing key RK¹ to register each connection that the trunk circuit T is used for. The called substation B shown at the lower right of the drawing is of the well-known type and terminates at the exchange in a line circuit L¹ similar to that of L and comprises the usual line relay LR¹ cut-off relay CO¹, line signal S¹ and multiple jacks J¹. A busy back jack BJ is shown into which the trunk operator inserts the plug TCP of the trunk circuit T should the called line be busy to transmit a busy signal to the calling subscriber through the agency of a busy back device BB.

Having described in general the apparatus which is embodied in my invention, I will now describe more in detail the operation of the system as illustrated.

Assuming that the subscriber at the substation A initiates a call by the removal of his receiver from its switch-hook, an energizing circuit for the line relay LR is established traced from battery through the winding of said relay, normal contact 7 of relay CO, through the substation A to ground at normal contact 8 of relay CO. Upon the energization of relay LR, its alternate contact 9 is closed bringing about the lighting of the line lamp S. The operator noting the lighted signal S inserts the plug AP of link circuit C into the jack J

of the calling line thereby establishing a series energizing circuit for the cut-off relay CO of the line circuit L and the answering supervisory relay AS of the cord circuit C. This circuit extends from battery through the winding of said relay AS, sleeve contacts of the connected plug and jack and through the winding of relay CO to ground. The relay CO, upon energizing, opens the circuit of the relay LR at contact 7 allowing the said relay LR to restore and efface the line signal S. The answering tip supervisory relay AT is also energized over a circuit traced from battery through the winding of relay AS, sleeve contacts of the connected plug and jack, alternate contact 7 of CO, through the substation A, alternate contact 8 of relay CO, tip contacts of the connected plug and jack and through the winding of the relay AT to ground. The energization of the relays AT and AS prevents the premature glowing of lamp AL. The operator now throws the listening key LK to connect her operator's set O to the cord circuit conductors and inquires the wants of the calling subscriber.

Assuming now that the calling subscriber at A desires connection with a subscriber at the substation B at the distant exchange, the operator at C depresses the orderwire key OW leading to the exchange in which the line of substation B terminates to connect her operator's set O with that of the operator's set O¹ associated with the trunk circuit T. The A-operator of the cord circuit C repeats the number of the called subscriber to the operator at trunk circuit T, and the operator at the trunk circuit T then assigns the trunk to be used by the A-operator.

The A-operator then inserts the calling plug CP into the assigned trunk jack TJ thus bringing about the energization of the calling sleeve supervisory relay CS. This circuit extends from battery through the winding of relay CS, sleeve contacts of the connected plug CP and trunk jack TJ and through the impedance coil 10 to ground. The closing of alternate contact 11 of the relay CS brings about the glowing of the calling supervisory lamp CL. The closing of alternate contact 12 of the relay CS establishes an energizing circuit for the high resistance relay H of the trunk circuit T traced from battery through the winding of the relay CS, sleeve contacts of the connected plug and jack, conductor 1, winding 5 of the repeating coil RC, conductor 13, the winding of relay H, normal contact 14 of relay TT, conductor 15, winding 3 of the repeating coil RC, conductor 2, tip contacts of the connected plug and jack, alternate contact 12 of relay CS and through the winding of the relay CT to ground. The relay H being of comparatively high re-

sistance does not permit sufficient current to flow through the relay CT of the cord circuit C to bring about its energization thus permitting the supervisory lamp CL of the cord circuit C to remain lighted.

Upon the energization of the trunk relay H, a circuit for the supervisory relay SR of the trunk circuit T is established traced from battery through the winding of said relay SR, conductor 16, to ground at alternate contact 17 of the relay H. Upon the closure of alternate contact 18 of the relay SR, the circuit for the combined guard and disconnect lamp GD is established traced from battery through the lamp GD, alternate contact 18 of relay SR, conductor 19, normal contact 20 of relay 21, normal contact 22 of relay RCR to ground at alternate contact 23 of relay SR. The glowing of the lamp GD indicates to the trunk operator that the operator at the originating exchange has plugged into the assigned trunk jack, while if the operator at the originating exchange has plugged into a trunk jack other than that of jack TJ, (the jack of the assigned trunk) the guard lamp GD fails to light due to the failure of relay H to energize. The operator of the trunk circuit T having obtained the number of the called subscriber from the A-operator of the cord circuit C now tests the multiple jack of the wanted line in the usual manner.

Assuming that the called line is idle, the trunk operator now inserts plug TCP into the multiple jack J¹ of the wanted line. This insertion of the plug TCP into jack J¹ establishes a series energizing circuit for the sleeve trunk supervisory relay TS and the cut-off relay CO¹ of the called line circuit L¹. The said circuit extending from battery through the winding of relay TS, conductor 24, sleeve conductor 25 of the trunk circuit T, sleeve contacts of the connected plug and jack and through the winding of the cut-off relay CO¹ to ground. The energization of the relay CO¹ removes the substation control of the line circuit L¹ from the said substation B.

The operator now depresses one of the plungers of the ringing key RK¹ to connect the proper ringing frequency from one of the ringing generators G¹, G², G³ or G⁴ to operate the call bell of the called subscriber at substation B. Upon the depression of a key plunger of the ringing key RK¹, the end springs 26, 27 are momentarily operated when the ringing plunger is in its fully depressed position and the closure of alternate contact 26 of the said end springs establishes an energizing circuit for the ringing control relay RCR traced from battery through the winding of said relay RCR, conductor 28, alternate contact 26 of the end springs, conductor 29 and normal contact 30 of relay TT to ground at alter-

nate contact 31 of relay TS. Upon the energization of the relay RCR, the said relay closes a locking circuit for itself traced from battery through the winding of the said relay, its alternate contact 32, conductor 29 and normal contact 30 to ground at alternate contact 31. The closure of alternate contact 27 of the end springs establishes an energizing circuit for the meter relay MR, said circuit being traced from battery through the winding of the said relay, the alternate contact 27 of the end springs, normal contact 32 of relay RCR, conductor 29, and contact 30 to ground at alternate contact 31. The closing of alternate contact 33 of relay MR brings about the operation of the meter magnet MM to step the register ahead to register one call. The closure of alternate contact 34 of relay RCR places the resistance R in multiple with the high resistance relay H at points 35, 36 thus permitting enough current to flow through the calling tip supervisory relay CT of the cord circuit C to bring about its actuation to open its normal contact 37 to efface the calling supervisory signal CL. The effacement of the said signal notifies the operator at the cord circuit C that the called party is being rung. The opening of normal contact 22 of the relay RCR opens the circuit for the guard lamp GD bringing about its effacement and this effacement of signal GD indicates to the trunk operator that she has depressed the ringing key and that ringing current is being transmitted to operate the call bell to the called substation B. The closure of alternate contact 80 of relay RCR establishes an energizing circuit for the relay 21 traced from battery through the winding of the said relay, alternate contact 80, conductor 81 to ground at alternate 31 of relay TS. Upon the closure of alternate 82 of relay 21 it closes a locking circuit for itself traced from battery through the winding of the said relay, its alternate contact 82 and conductor 81 to ground at alternate contact 31. The relay 21 remains locked up until the withdrawal of the plug TCP from the jack J¹, thus preventing the lamp GD from lighting until the operator of the cord circuit C has disconnected, so that the operator of the trunk T does not receive a premature disconnect signal as will be more fully described in the following specification. The closure of alternate contact 22 of relay RCR establishes an energizing circuit for the interrupter relay RI, said circuit being traced from battery through the constantly rotating interrupter I, through the winding of relay RI and alternate contact 22 of relay RCR to ground at alternate contact 23 of relay SR. The relay RI is thus intermittently energized and deenergized by the interrupter I to connect and disconnect the

ringing lead 38 to the tip conductor 39 of the trunk circuit T. The path for ringing current extends from the underground pole of the generator G¹, which we will assume is the ringing frequency which operates the call bell at the called substation B, through the alternate contact 40 of the ringing key RK¹, the ringing lead 38, alternate contact 41 of relay RI, the tip contacts of the connected plug and jack, alternate contact 8¹ of relay CO¹, through the condenser and call bell of the called substation B, alternate contact 7¹ of relay CO¹, sleeve contacts of the connected plug and jack, alternate contact 42 of the relay RI, resistance 43 and conductor 44 to battery and ground. Part of the ringing current passes through the alternate contact 45, condenser 46, conductor 47, normal contact 14 of relay TT, conductor 15 through the winding 3 of the repeating coil RC to the calling substation A giving the calling subscriber at the substation A an audible signal, which notifies the said calling subscriber that the called substation B is being rung. The call bell of the called subscriber at substation B is thus intermittently rung until he answers. Upon response of the called subscriber an energizing circuit for the tip trunk supervisory relay TT is established traced from ground through the winding of the said relay TT, conductor 48, alternate contact 49 of relay TS, tip conductor 39 of the trunk circuit T, normal contact 41 of relay RI, (when relay RI is in its deenergized position), tip contacts of the connected plug and jack, through the now closed contacts of the switchhook, back through the sleeve contacts of the connected plug and jack, sleeve conductor 25, conductor 24 and through the winding of the relay TS to battery and ground. Upon the energization of the relay TT, its normal contact 30 assumes its alternate position opening the locking circuit for the relay RCR. The said relay RCR deenergizing opens the energizing circuit of relay RI at its alternate contact 22 allowing relay RI to restore thus disconnecting ringing current from the wanted line when the called subscriber answers. The deenergization of the relay RCR and the energization of the relay TT removes the multiple connection of resistance R with that of relay H and the opening of the normal contact 14 of relay TT opens the energizing circuit of relay H allowing relay H to restore to normal. The closing of alternate contact 14 of the relay TT establishes the continuity of the talking conductor and directly connects the windings 3 and 5 of repeating coil RC thus substituting a circuit for the calling tip supervisory relay CT of cord circuit C extending from battery through the winding of the relay CS, sleeve

conductor of the cord circuit C, sleeve contacts of the connected plug CP and trunk jack TJ, conductor 1, winding 5 of repeating coil RC, conductor 50, normal contact 34 of relay RCR, conductor 51, alternate contact 14 of relay TT, conductor 15, winding 3 of the repeating coil RC, trunk conductor 2, tip contacts of the connected plug CP and jack TJ, tip conductor of the cord circuit C, alternate contact 12 of relay CS and through the winding of the relay CT to ground. The calling subscriber at the substation A and the called subscriber at substation B are now in conversational circuit, said circuit being traced over the heavily marked conductors.

Assuming now that the subscribers have finished conversation and have replaced their receivers upon their respective switch-hooks. The replacement of the receiver upon the switch-hook at substation A opens the energizing circuit for the answering tip supervisory relay AT allowing the said relay to restore and close its normal contact 52 to bring about the lighting of the answering supervisory lamp AL thus notifying the operator at the cord circuit C that the subscriber at the substation A has replaced his receiver. The replacement of the receiver at the called substation B opens the energizing circuit of the tip trunk supervisory relay TT at the switch-hook contacts of the called substation B allowing the said relay to restore. The circuit for the high resistance relay H is again established as previously described, thereupon establishing an energizing circuit for the supervisory relay SR at its alternate contact 17 as previously described. The energization of relay SR at this time does not bring about the lighting of lamp GD, it remaining effaced due to its circuit being opened at contact 20 of relay 21, thus preventing the trunk operator from receiving a false disconnect signal before A-operator has disconnected the plug CP from the trunk jack TJ. The energization of the high resistance relay H allows the relay CT of the cord circuit C to deenergize due to the high resistance of relay H, as previously described, bringing about the glowing of the calling supervisory lamp CL of the trunk circuit C. The operator at the cord circuit C noting the two lighted supervisory signals knows that conversation has been terminated between the calling and called subscriber and withdraws the answering plug AP from the jack J of the calling line and withdraws the calling plug CP from the trunk jack TJ. The relay AS at the cord circuit C and the cut-off relay CO at the calling end of the cord circuit C restores to normal. The restoration of the relays AS and CS bring about the effacement of the supervisory signals AL

and CL. The apparatus at the cord circuit C is now at normal and available for establishing other connections.

The withdrawal of the calling plug CP from the trunk jack TJ opens the energizing circuit of the high resistance relay H allowing the said relay to restore, and open the energizing circuit of the supervisory relay SR at contact 17 of relay H. The closing of normal contact 18 of the relay SR establishes a circuit for the combined guard and disconnect lamp GD, said circuit being traced from battery through the said lamp GD, normal contact 18, conductor 29 and normal contact 30 to ground at alternate contact 31 of the relay TS. The lamp GD is thus lighted notifying the trunk operator of the trunk circuit T that conversation has terminated. The trunk operator then withdraws the calling trunk plug TCP from the multiple jack J¹ of the called line. The withdrawal of the said plug from the connected jack opens the series energizing circuit of the relays TS and CO; thus allowing the said relays to restore. The opening of the alternate contact 31 of relay TS opens the locking circuit of the relay 21 bringing about its deenergization. The opening of the alternate contact 31 also opens the circuit of the guard lamp GD bringing about the effacement of the said lamp. The apparatus of the trunk circuit T is now at normal and is available for establishing other connections.

Now assuming that the called substation B is busy. The operation of the cord and trunk circuits is the same as previously described up to the time that the trunk operator tests the called line as to its idle or busy condition. If the line is busy the operator receives the usual busy click and notifies the calling subscriber and the A-operator of the busy condition of the called line by inserting the trunk calling plug TCP into the busy jack BJ to transmit a busy signal from the busy back BB. The insertion of the said plug into the jack BJ closes an energizing circuit for the trunk sleeve supervisory relay TS. The said circuit extends from battery through the winding of the said relay, conductor 24, sleeve conductor 25, sleeve contact of the connected plug and jack to ground 85 operating the said trunk relay TS. The closing of alternate contact 49 of the relay TS brings about the intermittent energization and deenergization of the tip trunk supervisory relay TT over a circuit traced from ground through the winding of the relay TT, conductor 48, alternate contact 49 of relay TS, tip conductor 39 of trunk circuit T, tip contacts of the connected plug and jack and through interrupter I¹ to battery and ground. The relay TT is thus energized and deenergized bringing about the energization

and deenergization of the relay H due to the opening and closing of the contact 14 of the relay TT. When the relay TT is in its energized position its alternate contact 14 is closed thus opening the energizing circuit of the relay H. The relay H restoring allows the relay CT of the cord circuit C to energize as previously described, thus effacing the signal lamp CL. The relay CT is in this manner intermittently energized and deenergized, due to the opening and closing of alternate contact 14 of relay TT, causing supervisory signal CL to intermittently flash, indicating to the A operator at the cord circuit C that the called line is busy. A busy signal is also transmitted to the calling subscriber at the substation A notifying him of the busy condition of the called line. The rapid energizations and deenergizations of the relay H do not affect the supervisory relay SR, said relay remaining energized as previously described due to its sluggish release. The subscriber at the substation A replaces his receiver in response to the busy signal thereby bringing about the lighting of the supervisory lamp AL. The operator noting the flashing of the calling supervisory lamp CL knows that the called subscriber is busy and removes the answering plug AP from the multiple jack J and the calling plug CP from the trunk jack TJ, restoring the apparatus of the cord circuit C to normal. The withdrawal of the plug CP from the jack TJ brings about the deenergization of the relay H and the opening of the alternate contact 17 of the relay H allows the supervisory relay SR to restore. The relay TT is energized and deenergized due to the busy back device and operates to bring about the flashing of the combined guard and disconnect lamp GD due to the opening and closing of its contact 30. The operator noting the flashing of lamp GD withdraws the trunk calling plug TCP from the busy jack BJ bringing about the deenergization of the relays TS, TT and 21. The apparatus of the trunk circuit D is now at normal and available for other connections.

In working out my invention I have shown it operating with a particular form of link circuit, but I contemplate using it in connection with other circuits than that shown and therefore I do not desire to be limited to the exact system as shown, but aim to cover all such changes and modifications as come within the spirit and scope of the appended claims.

Having described my invention, what I claim as new and desire to secure by United States Letters Patent, is:

1. A telephone system including subscribers' lines, a link circuit and a trunk circuit for interconnecting said lines, a sig-

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nal associated with said link circuit, link operator controlled means for causing said signal to glow, trunk operator controlled means for effacing said signal, and subscriber-controlled means for causing said signal to again glow.

2. A telephone system comprising subscribers' lines, an operator's link circuit and an operator's trunk circuit for interconnecting said lines, a signal associated with said trunk circuit, ringing means associated with said trunk circuit, electromagnetic means for intermittently connecting said ringing means with one of said lines, an electromagnet responsive to the connection of said link circuit with said trunk circuit for operating said signal, key controlled means for initiating the operation of said electromagnetic means, and an electromagnet controlled by said last means for restoring said signal to normal.

3. A telephone system including a calling subscriber's line and a called subscriber's line, an operator's link circuit and an operator's trunk circuit for connecting said lines, a supervisory signal for said trunk circuit, signaling means associated with said trunk circuit, means for intermittently connecting said signaling means with said called line, an operator controlled key for initiating the operation of said last means, and means controlled by said operator controlled key for effecting an operation of said supervisory signal.

4. A telephone system comprising subscribers' lines, a manual link circuit and an operator's trunk circuit for interconnecting said lines, a supervisory signal for said link circuit, signaling means for said trunk circuit, an electromagnet for intermittently connecting said signaling means with a called one of said lines, operator controlled means for initiating the operation of said electromagnet, and a circuit for said supervisory signal controllable by said operator-controlled means in such a manner that when said operator-controlled means is actuated said supervisory signal is effaced.

5. A telephone system including a calling subscriber's line and a called subscriber's line, a link circuit and a trunk circuit for connecting said lines, a supervisory signal for each of said circuits, an operator controlled key associated with said trunk circuit, a source of ringing current, a relay for connecting the said ringing current to said called subscriber's line, and means controlled by said operator's key for initiating the operation of said relay and for effecting both of said signals.

6. A telephone system including a calling subscriber's line and a called subscriber's line, a manual link circuit and an operator controlled trunk circuit for connecting said lines, a signal for said link circuit and a

signal for said trunk circuit, means responsive to the connection of said link circuit with said trunk circuit for causing an operation of both of said signals, signaling means associated with said trunk circuit, means for associating said signaling means with said called subscriber's line, and a relay controlled by said associating means for effacing said signals.

7. A telephone system including subscribers' lines, a link circuit and a trunk circuit for interconnecting said lines, a signal for each of said circuits, means for intermittently operating the link circuit signal when the tested called subscriber's line is busy, manual means for disconnecting said link circuit from said trunk circuit, and means responsive to such disconnection for intermittently operating said trunk circuit signal.

8. A telephone system including a calling subscriber's line and a called subscriber's line, a link circuit and an operator's trunk circuit for use in establishing connection between said lines, a signal for each of said circuits, means responsive to the connection of said link circuit to said trunk circuit for operating both of said signals, means controlled by the association of said trunk circuit with a busy signaling device for intermittently operating said link circuit signal, and means responsive to the disconnection of said link circuit from said trunk circuit for thereafter intermittently operating said trunk circuit signal.

9. A telephone system including a calling subscriber's line and a called subscriber's line, a link circuit and an operator's trunk circuit for use in establishing connection between said lines, a signal for each of said circuits, means responsive to the connection of said link circuit to said operator's trunk circuit to operate said trunk circuit signal, automatic intermittent ringing means for said trunk circuit for signaling the called subscriber, means controlled upon the initiation of the operation of said automatic ringing means for effacing said trunk circuit signal, interrupter means associated with said trunk circuit for intermittently operating the said link circuit signal, and relay means responsive to the disconnection of said link circuit from said trunk circuit for switching said interrupter means into association with said trunk circuit signal to intermittently operate the same.

10. A telephone system including a calling subscriber's line and a called subscriber's line, a link circuit and a trunk circuit for connecting said lines, a signal associated with each of said circuits, means responsive to the connection of said link circuit to said trunk circuit to cause said signals to glow, trunk operator controlled means for effacing said signals, and subscriber controlled

means for again causing said link circuit signal to glow.

11. In a telephone system the combination with a link circuit connected to an operator's trunk circuit, of a signal for each of said circuits, "A" operator-controlled means for actuating said trunk circuit signal, automatic intermittent ringing means for said trunk circuit, "B" operator-controlled means for initiating the operation of said automatic ringing means, means controlled simultaneously by the "B" operator when she initiates the operation of said automatic ringing means for effacing said trunk circuit signal, interrupter means for intermittently operating said link circuit signal as long as the link circuit remains connected with the said trunk circuit, and means responsive to the disconnection of said link circuit from said trunk circuit to cause said interrupter means to intermittently operate said trunk circuit signal.

12. A telephone system including subscribers' telephone lines, a link circuit and a trunk circuit for interconnecting said lines, a signal for each of said circuits, circuits for said signals closed responsive to the connection of said link circuit with said trunk circuit, ringing mechanism for said trunk circuit, operator controlled means for connecting said ringing mechanism with a called one of said subscribers' lines, and means controlled by said ringing mechanism for effacing said signals.

13. In a telephone system the combination of an operator's link circuit connected to an operator's trunk circuit, of a signal for each of said operators' circuits, "A" operator-controlled means for actuating said trunk circuit signal, automatic intermittent ringing means for said trunk circuit, "B" operator-controlled means for initiating the operation of said automatic ringing means, means controlled simultaneously by the "B" operator when she initiates the operation of said automatic ringing means for effacing said trunk circuit signal, interrupter means adapted to intermittently operate said link circuit signal, and switching mechanism responsive to the disconnection of said link circuit from said trunk circuit for connecting said interrupter means in circuit with said trunk circuit signal.

14. A telephone system including a calling subscriber's line and a called subscriber's line, a link circuit and a trunk circuit for connecting said lines, a signal associated with each of said circuits, means responsive to the connection of said link circuit to said trunk circuit to cause said signals to glow, trunk operator controlled means for effacing said signals, subscriber controlled means for again causing said link circuit signal to glow, and means responsive to the disconnection of said link circuit from said trunk

circuit to cause said trunk circuit signal to again glow.

15. A telephone system including a calling subscriber's line and a called subscriber's line, a link circuit and a trunk circuit for connecting said lines, a signal associated with each of said circuits, means responsive to the connection of said link circuit to said trunk circuit to cause said signals to glow, trunk operator controlled means for effacing said signals, subscriber controlled means for again causing said link circuit signal to glow, and means responsive to the disconnection of said link circuit from said trunk circuit to again cause said trunk circuit signal to glow and to efface said link circuit signal.

16. A telephone system including a calling subscriber's line and a called subscriber's line, a link circuit and a trunk circuit for connecting said lines, a supervisory signal for each of said circuits, ringing apparatus for said trunk circuit, a manually operable key for connecting said ringing apparatus with the called subscriber's line to operate the call bell of the called subscriber's line, and circuits for said signals affected by such operation of said key.

17. A telephone system including a calling subscriber's line and a called subscriber's line, a link circuit and a trunk circuit for connecting said lines, a signal associated with each of said circuits, means responsive to the connection of said link circuit to said trunk circuit to cause said signals to glow, trunk operator controlled means for effacing said signals, subscriber controlled means for again causing said link circuit signal to glow, means responsive to the disconnection of said link circuit from said trunk circuit to again cause said trunk circuit signal to glow and to efface said link circuit signal, and means responsive to the disconnection of said trunk circuit from said called line to efface said trunk circuit signal.

18. A telephone system including a called subscriber's line, a link circuit and a trunk circuit for extending a connection to said called line, a supervisory signal for each of said circuits, ringing apparatus associated with said trunk circuit, a relay for connecting said ringing apparatus to said called subscriber's line, a manually operable key for operating said relay, and circuits for said signals controllable by said ringing apparatus.

19. A telephone system including a calling subscriber's line and a called subscriber's line, a link circuit and trunk circuit for connecting said lines, a signal for said link circuit, ringing apparatus for said trunk circuit, intermittent means for connecting said ringing apparatus with said called subscriber's line, a manually operable key for initiating the operation of said intermittent means,

and a circuit for said signal affected by such operation of said key.

20. A telephone system including a calling subscriber's line and a called subscriber's line, a link circuit and a trunk circuit for connecting said lines, a signal for said trunk circuit, automatic intermittently operable ringing apparatus for said trunk circuit, a manually operable trunk key for initiating the operation of said automatic ringing apparatus, thereby connecting ringing current to the called subscriber's line, and a circuit for said signal opened responsive to an operation of said trunk key.
21. A telephone system including a calling subscriber's line and a called subscriber's line, a link circuit and a trunk circuit for connecting said lines, a signal for said link circuit, a signal for said trunk circuit, automatic ringing means for said trunk circuit, trunk operator-controlled means for initiating the actuation of said automatic ringing means, and means controlled simultaneously with the actuation of said trunk operator

means for effecting an operation of said signals, means for intermittently operating said link circuit signal, operator controlled means for disconnecting said link circuit from said trunk circuit, and switching means responsive to such disconnection for intermittently operating said trunk circuit signal.

22. A telephone system including a link circuit and a trunk circuit for use in establishing a connection between subscribers' lines, a supervisory signal for said trunk circuit, means for causing said signal to glow, a trunk-operator-controlled key for effacing said signal, and means responsive to the disconnection of said link circuit from said trunk circuit for again causing said supervisory signal to glow.

Signed by me at Chicago, county of Cook and State of Illinois, in the presence of two witnesses.

CHARLES SPARKS.

Witnesses:

G. A. YANOCBOWSKI,
B. O'BRIEN.