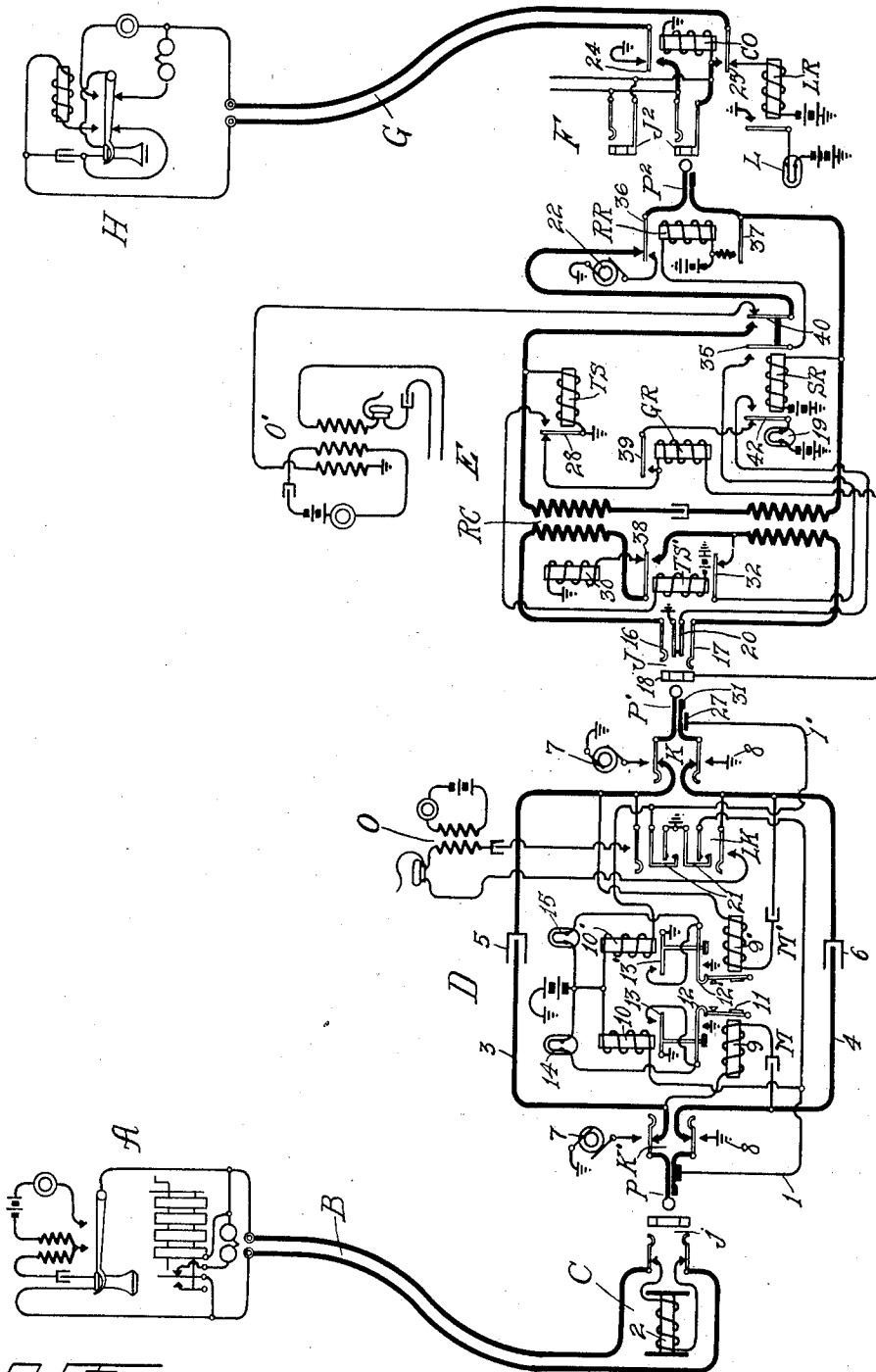


C. S. WINSTON.
TELEPHONE SYSTEM.
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Patented Sept. 29, 1914.



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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, CHARLES S. WINSTON, a citizen of the United States, residing in Chicago, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Telephone Systems, of which the following is a specification.

My invention relates to telephone systems and has to do more particularly with circuits involved in interconnecting magneto and common battery lines, an object being to provide an improved circuit arrangement which is more simple and positive in operation.

In the magneto line telephone systems which are being installed at the present period, lamp signals are coming into general use, and one of the features of my invention is to provide improved circuit arrangements in which mechanical locking supervisory relays are employed which may be controlled from a connected magneto line or through the medium of a trunk circuit from a connected common battery line.

Referring now to the accompanying drawing, I have illustrated a circuit arrangement adapted for interconnecting magneto or magneto and common battery lines, said arrangement comprising a magneto telephone A connected by a line B with a central office terminal C. The cord circuit D is adapted for interconnecting the magneto lines B or connecting a magneto line B through the medium of a trunk circuit E to a common battery line circuit F connected by a line G to common battery telephone H. For the purpose of illustration, we will assume an exchange with a plurality of magneto lines B terminating at a switchboard equipped with cord circuits D and a plurality of trunk jacks J terminating at the magneto switchboard and connected to a trunk E terminating in plugs P² at a common battery switchboard having a plurality of common battery lines G terminating thereat.

Referring now more in detail to the apparatus involved in the system illustrated, the substation A is of a well known magneto or local battery type connected by line conductors B to a jack *j* at the central office, said jack having a signal 2 connected in circuit therewith and in bridge of the line conductors.

The magneto operator's cord circuit D comprises answering and calling plugs P

and P¹, respectively, said plugs being connected by the talking strands 3 and 4 having condensers 5 and 6 interposed therein. A ringing key K is connected with the calling plug P¹ and is adapted to connect the ringing generator 7 and ground 8 to the tip and ring terminals of the plug. A so-called ring back key K¹ is similarly connected to the answering plug P. A supervisory trip relay as M is associated with each end of the cord circuit, which relay comprises two cooperating electromagnets 9 and 10. Magnet 9 is adapted when energized to attract its armature 11, whereby said armature moves to trip the contact spring 12, allowing it to move downwardly and into connection with its alternate grounded contact. It will be seen that with armature 11 attracted, due to the tripping of spring 12, and the locking thereof over the armature 11, although magnet 9 may be deenergized, the alternate contact 12 remains closed. To restore contact 12, magnet 10 is energized, attracting its armature 13, whereby the insulated connection extending to contact 12, raises the said contact 12 clear of the armature 11 allowing the retraction thereof, and thereafter when electromagnet 10 is deenergized, retracting its armature 13, spring 12 rests upon armature 11 maintaining contact 12 interrupted. Supervisory signals 14 and 15 are provided for the answering and calling ends, respectively, of the cord circuit D, being displayed by energization of either one of the associated relays 9 or 10. Listening key LK is adapted when actuated to connect the operator's telephone circuit O across the talking strands of cord circuit D, said key LK also having contact springs 21 which are closed when key LK is operated, to operate the restoring magnets 10 and 10¹. Branch circuits 1 and 1¹ extend from relays 10, 10¹, respectively, to the third contact of the associated plug, as an alternate operating circuit for these relays when connection is made to a trunk circuit E.

Trunk circuit E comprises a trunk jack J having a trip contact 16, a ring contact 17 and a third or sleeve contact 18. The tip and ring contacts of jack J are connected by the heavily marked talking conductors through the windings of a repeating coil RC to a calling plug P². A sleeve supervisory relay SR is connected to the so-called sleeve talking strand of the trunk circuit E, and a

tip supervisory relay TS is connected to the tip talking strand. An auxiliary tip supervisory relay TS¹ is connected to the tip relay TS and is adapted to be energized during energization of the tip relay. Relays TS and TS¹ might be combined as a single relay, but are arranged in the manner shown to provide a more sensitive control due to being operated by current over the called telephone line. A combined guard and supervisory lamp signal 19 is provided for trunk circuit E, being controlled through contacts of the supervisory relay SR and jack contacts 20, and also by guard relay GR. A ringing relay RR is provided for connecting ringing current from generator 22, said relay being preferably controlled from the originating operator at cord circuit D, the control of RR being preferably by the operation of key K which connects ground to the sleeve talking strand and through the winding of RR to battery. An operator's telephone circuit O¹ is provided for trunk circuit E being connected by means of an order wire to the operators at the magneto switchboard having access to trunk circuits E.

The common battery line circuit F is of a well known type, comprising a line relay LR, cut-off relay CO, a line lamp L and multiple jacks J² and the common battery substation H is also of the well known Kellogg type.

Operation: Assuming now the subscriber at A desires to communicate with a subscriber at substation H, he will operate his hand generator thereby throwing the drop 2 at the central station, whereupon the operator inserts an answering plug P into the jack j, and then throws her listening key LK to ascertain the wants of the calling subscriber. Upon finding that the wanted substation is a common battery line terminating at a distant switchboard for example, she communicates by means of an order wire to the operator's telephone O¹ of a trunk operator. The trunk operator then replies designating the number of the trunk to be used, and having ascertained the number of the called line, tests the wanted line and finding it idle, inserts the answering plug P² into a jack J² thereof. The act of inserting the plug P² connects supervisory relay SR and cut-off relay CO in series circuit over the sleeve talking conductor, whereby said relays are energized, the energization of CO affecting the closure of its alternate contacts 24, 25, thereby extending the connection from the talking strands of link circuit E to the line conductors G and substation H. The local operator at cord circuit D inserts the calling plug P¹ into the jack J of the selected trunk E, thus establishing a circuit over the third conductor of the plug and jack including relay 10¹ and

guard relay GR. This circuit may be traced from battery through the winding of relay 10¹, the branch conductor 1¹ and third contact 27 of plug P¹, third contact 18 of jack J, winding of GR to ground at normal contact 28. Relay 10¹ is therefore energized establishing a circuit for supervisory signal 15 which remains lighted until the called subscriber responds as will be further described. The energization of guard relay GR resulting from the previously traced circuit has no effect unless the trunk operator has picked up a plug P² of a trunk different from that into which the magneto operator has inserted plug P¹. For instance should the magneto operator insert the plug into the wrong jack J, guard relay GR will be energized as described and due to the fact that the sleeve relay SR of this trunk is not energized a circuit for lamp 19 will be established from battery through said lamp, normal contact 42, alternate contact 39, to ground at normal contact 28. The operator observing this signal will know that the wrong trunk has been plugged into. Furthermore if the trunk operator has picked up the wrong plug P² and inserted it in a jack J², relay SR is energized, closing alternate contact 42 and thereby establishing a circuit for lamp 19 to ground at contacts 20 of jack J.

From the above it will be seen that unless the trunk E is connected to at both ends, lamp 19 will be lighted as a guard signal.

In the present embodiment of my invention I have preferably arranged the ringing of distant called substations to be controlled by the originating operator. Therefore, after the operator inserts the plug P¹, she throws ringing key K, connecting generator 7 to the tip strand, which causes ringing current to flow through a winding of the repeating coil RC, normal contact 38 and impedance coil 30 to ground. This circuit is of no purpose, but the impedance coil 30 is provided as a path for current from generator 7 so that no bad inductive effect is produced in the cables of the switchboard which might result if no path for current from generator 7 were provided. The connecting of ground 8 by key K, affects the operation of ringing relay RR, this circuit being traced from said ground 8, contacts 31, 17, a winding of repeating coil RC, normal contact 32, alternate contact 35, and the winding of RR to battery. Upon each operation of ringing key K, ringing relay RR is thus operated, closing its alternate contacts 36, 37, thereby connecting ringing generator 22 in bridge of the called line.

The subscriber at substation H in response to the call removes the receiver thereat, whereby a circuit for tip supervisory relay TS is provided, traced from ground through the winding of TS, alternate contact 40, nor-

mal contact 36, tip contacts of plug and jack, alternate contact 24, the line G and substation H, alternate contact 25, sleeve contacts of jack and plug, and the winding of SR to battery. Relay TS therefore energizes, closing its alternate contact 28, and establishing a circuit for TS¹ causing it to energize and close the talking circuit through its alternate contact 38 and interrupting the ringing control circuit at its normal contact 32. The energization of TS also interrupts the circuit for relay GR, and relay 10¹ of cord circuit D, whereby alternate contact 13¹ of relay 10¹ is restored effecting supervisory signal 15 and indicating to the originating operator that the called subscriber has responded. After completing conversation, the subscriber at A gives his hand generator a ring-off operation and magnet 9 being connected in bridge of the talking strands of the cord circuit and line, is operated to attract its armature 11 whereby alternate contact 12 is closed establishing a circuit for supervisory signal 14. The subscriber at H upon replacing his receiver, interrupts the circuit for relay TS, which deenergizes, interrupting the circuit for TS¹, which also restores. The closing of normal contact 28 at TS reestablishes the series circuit through relay GR and relay 10¹ of cord circuit D, whereby these relays are energized, the energization of 10¹ effecting an operation of signal 15 while the operation of GR is at this time only incidental.

The operator at D observing the two disconnect signals 14 and 15, withdraws plugs P and P¹ from their engaged spring jacks and also throws her listening key LK to close alternate contacts 21 thereof. The closing of these contacts 21 establishes energizing circuits for relays 10 and 10¹, whereupon relay 10 energizes, lifting the contact 12 clear of armature 11, allowing said armature to restore and holding contact 12 open. The energization of 10¹ by the key operation in this instance is unnecessary as it will be remembered magnet 9¹ was not operated. Upon restoration of key LK, the circuits for magnets 10 and 10¹ are interrupted, allowing said magnets to restore. The withdrawal of plug P¹ from jack J causes the closing of contact 20 of jack J and a circuit is therefore established for supervisory lamp 19 through alternate contact 42, as it will be remembered that SR is still energized. The trunk operator observing signal 19, withdraws plug P² from its connected jack, whereby the circuit for SR being interrupted it restores interrupting the circuit for signal 19. Cut-off relay CO having restored, all of the apparatus is again at normal and available for use in establishing other connections.

Assuming now that the subscriber at A has signaled the operator and desires con-

nection with another magneto telephone line, the operator after having inserted plug P in the jack j of calling line B, inserts plug P¹ into a jack j of the called line. This last operation of course disconnects the bridged drop signal 2 and the operator thereupon through key K connects ringing generator 7 in bridge of the called line to signal the called substation. After the subscribers have finished their conversation they restore their receivers upon their respective switchhooks also giving a ring-off operation to their hand generators and thereby energizing the bridged electromagnets 9, 9¹. The operation of these magnets trips their associated contacts 12, 12¹ effecting the operation of supervisory signals 14, 15. The operator observing these signals withdraws plugs P and P¹ and upon throwing listening key LK contacts 21 are closed establishing an energizing circuit for magnets 10 and 10¹, whereby the springs 12, 12¹ are lifted to interrupt their contacts and allow restoration of the armatures 11, 11¹, respectively.

It will be apparent that many changes to the circuit arrangement will readily suggest themselves and therefore I do not desire to be limited to the exact system as shown and described, but aim to cover all those changes and modifications as come within the spirit and scope of the appended claims.

What I claim as new and desire to secure by United States Letters Patent is:

1. A telephone system comprising magneto and common battery lines, a cord circuit connected to a magneto line, a trunk circuit interconnecting said cord circuit and a common battery line, a pair of talking conductors included in the connection extending between said lines, a supervisory relay for the cord circuit, a supervisory relay for the trunk circuit included in circuit with and controlled over the called line, and a circuit connection including the winding of said cord supervisory relay, normally closed contacts on said trunk relay and a third conductor between said cord and link circuits.
2. A telephone system comprising magneto and common battery lines, a cord circuit for directly interconnecting the magneto lines and connected to a calling one of them, a trunk circuit interconnecting said cord circuit and a common battery called line, a pair of talking conductors included in the connection extending between said line, an answering supervisory relay for the cord circuit, an answering supervisory relay for the trunk circuit, and a control circuit for the cord supervisory relay independent of said talking conductors and including normally closed contacts of the trunk supervisory relay and a third conductor between said cord and trunk circuits.

3. A cord circuit comprising a pair of three conductor connecting terminals, a pair

of talking conductors extending between two of the conductors of said connecting terminals, a relay at each end of said cord circuit having a winding connected in bridge of said conductors, a second relay at each end of the cord circuit connected to the third conductor of the corresponding terminal, a signal common to the pair of relays at each end of the cord circuit, and circuit connections extending from said signal to contacts on each of said relays, each circuit being adapted for independently displaying the associated signal.

4. A telephone system comprising magneto and common battery lines, a cord circuit connected at its answering end to a magneto line, a trunk circuit connected to the calling end of the cord circuit and adapted for extending the connection to a common battery line, a pair of talking conductors included in the connection between said cord and trunk circuits, a supervisory relay for the cord circuit, a guard signal relay for the link circuit, and a series operating circuit for said relays closed when said cord is connected to the trunk and including a third conductor between said cord and trunk circuits.

5. A telephone system comprising magneto and common battery lines, a cord circuit connected at its answering end to a magneto line, a trunk circuit connected to the calling end of the cord circuit and adapted for extending the connection to a common battery line, a pair of talking conductors included in the connection between said cord and trunk circuits, a supervisory relay for the cord circuit, a guard signal relay for the link circuit, a series energizing circuit for said relays closed when said cord is connected to the trunk and including a third conductor between said cord and trunk circuit, and a guard signal for said trunk having an operating circuit including contacts of the guard relay said circuit being adapted to be closed if the cord is connected to the trunk before the trunk is connected to a called common battery line.

6. A telephone system comprising magneto and common battery lines, a cord circuit, a trunk circuit, said cord circuit being adapted for directly interconnecting the magneto lines or for use in connection with the trunk circuit for interconnecting calling magneto and called common battery lines, a pair of

talking conductors for said cord circuit, a supervisory relay in bridge of said conductors for use when said cord is interconnecting magneto lines, a second supervisory relay for said cord connected to a third conductor extending to said trunk circuit when connection is made therewith, means at the trunk circuit for controlling the latter supervisory relay, and a common signal controlled by said relays.

7. A telephone system comprising magneto and common battery lines, a cord circuit connected to a magneto line, a trunk circuit adapted for interconnecting said cord circuit and a common battery line, a pair of talking conductors included in the connection extending between said cord and trunk, a supervisory relay for the cord circuit, a guard signal relay for the trunk circuit, a series energizing circuit for said relays including a third conductor between said cord and trunk and closed upon connection made between said cord and trunk, a signal for the cord responsive to the energization of its supervisory relay, a guard lamp and circuit adapted to be closed by said guard relay if said cord and trunk are connected before said trunk is connected to the common battery line, and means at the trunk circuit for interrupting said series circuit to deenergize the supervisory relay and signal, said means being controlled over the common battery line.

8. A cord circuit comprising a pair of talking conductors connecting the answering and calling ends thereof, a magnet winding in bridge of each end thereof, a locking armature and contact for each magnet rendered effective responsive to said magnet, a supervisory signal for each magnet controlled through the associated contact, a restoring magnet for each locking contact, energizing circuits for said restoring magnets controlled by an operator's key, and branch conductors from the last said circuits extending to a third conductor terminating at each end of the cord circuit.

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

CHARLES S. WINSTON.

Witnesses:

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B. O'BRIEN.