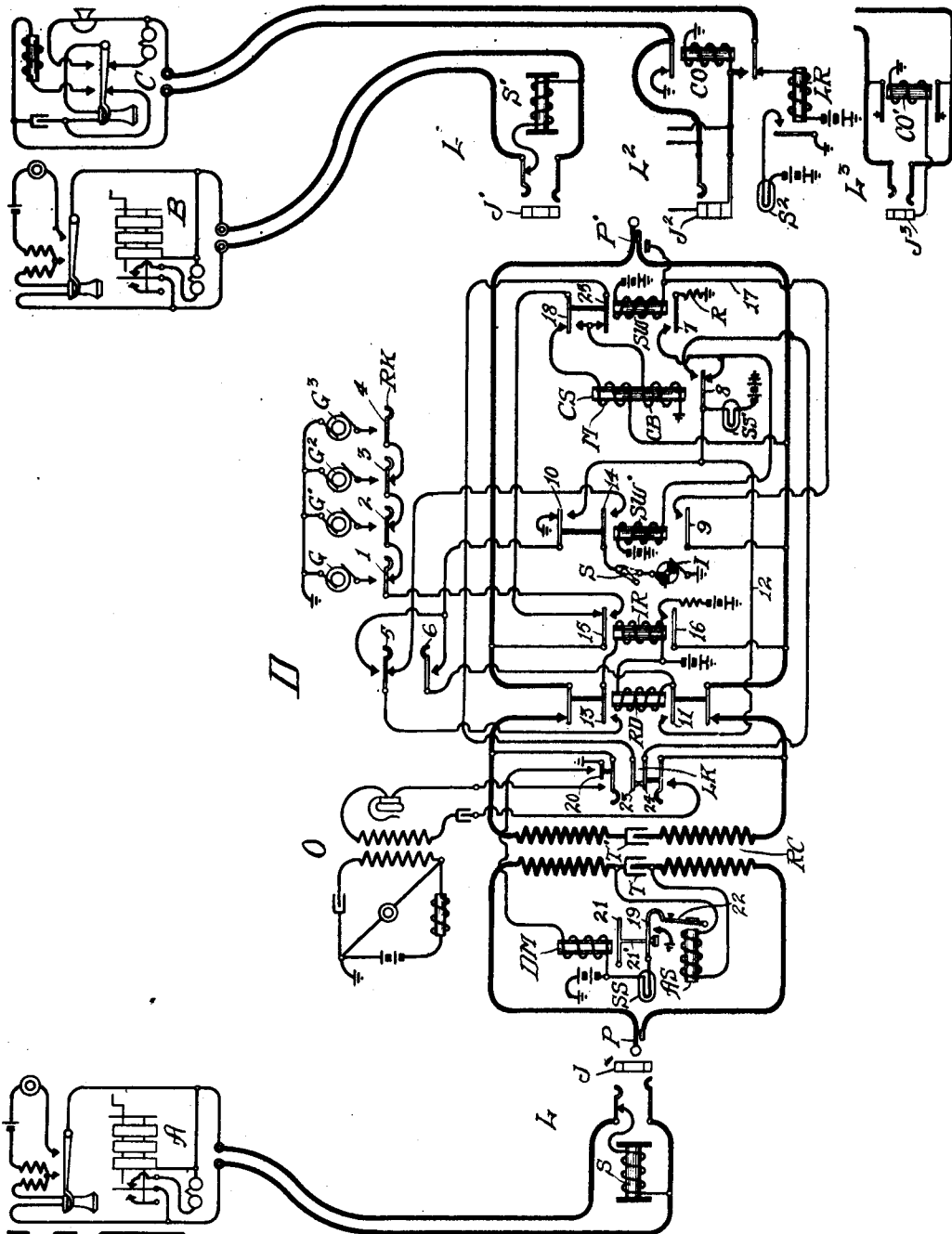


J. E. HILBISH.
UNIVERSAL CORD CIRCUIT.
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Patented Feb. 9, 1915.



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UNITED STATES PATENT OFFICE.

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UNIVERSAL CORD-CIRCUIT.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, JOHN E. HILBISH, a citizen of the United States of America, residing at La Grange, county of Cook, and State of Illinois, have invented certain new and useful Improvements in Universal Cord-Circuits, of which the following is a specification.

My invention relates to universal cord circuits for connection with magneto or common battery telephone lines and has to do more particularly with the provision of a cord circuit having means for automatically adjusting the supervisory apparatus to conform to magneto or common battery control in conjunction with ringing apparatus, automatically adjusted for manual or automatic control according to the character of line connected with. In certain types of switchboards, different lines such as magneto and common battery lines terminate before a single operator's position and the operator's cord circuits must be arranged so that they may be connected with either type of line and although cord circuits have been provided in which supervisory apparatuses automatically adjust themselves according to the character of line connected with, my improvement goes further in that it provides a single supervisory signal automatically adjustable, and ringing apparatus automatically adjustable, according to whether the cord circuit is connected with one or the other character of line.

Another feature resides in the provision of a link circuit which may be connected to either a two or three wire common battery line or a magneto line, automatically adjusting itself so as to properly take care of the ringing and supervisory apparatus in a manner as last outlined.

Referring in general to my invention as illustrated in the accompanying drawing, it comprises a well-known form of magneto substation A terminating in a simple drop and jack line circuit L which consists of a signal S and jack J. To the right of the drawing is shown a magneto substation B similar to that of A and terminating in a line circuit L' similar to that of L. A common battery substation C is also shown terminating in a two-wire common battery line circuit L² comprising a line relay LR, cut-off relay CO, line signal S² and jack J². A so-called

three-wire line circuit L³ is also illustrated in part, the line relay (not shown) being similar to that of circuit L².

A cord circuit D is provided which is of universal character in that connection may be made between two magneto substations such as A and B, or between a magneto and common battery substation A and C, or connection may be made to the three wire line circuit L³. At the answering end of the cord circuit D I provide answering plug P which is connected by the tip and sleeve conductors to a calling plug P¹ through the winding of a repeating coil RC and which has the condensers T and T¹ interposed between the windings of the repeating coil RC. An answering supervisory relay AS is provided and is in bridge of the tip and sleeve conductors. The slow acting disconnect relay DM is associated with the answering supervisory relay which is energized by means actuated to efface the supervisory signal SS when the calling magneto substation has given the disconnect signal, and also for restoring the locking armature of the said relay AS. A listening key LK is associated with the answering end, which when actuated, connects the operator's set O in bridge of the answering tip and sleeve conductors.

Referring now to the calling end of the cord circuit, switching relays SW and SW¹ are provided, the said relay SW operating in series with cut-off relay CO of the common battery line circuit and said relay SW¹ is operated when the said relay SW is energized. It will be apparent that both switching relays always operate together, I having employed two separate magnets on account of the number of contact springs. The switching relay SW does not operate when the cord circuit D is connected to a magneto line as the sleeve of the jack of a called magneto line is on open circuit and therefore bridges the magneto winding M of the calling supervisory relay CS across the cord conductors. The switching relay SW¹ is operated when the switching relay SW closes an alternate contact, the switching relay SW¹ closes a normally open contact to cross the ring and sleeve contacts of the calling plug P¹ to connect the ring and sleeve conductors so as to form a second or sleeve conductor and also for the purpose of supplying battery current for talking purposes.

The switching relay SW¹ automatically adapts itself when either connected to the common battery or magneto line. When the cord circuit D is connected to a common battery line, the relay SW¹ operates automatically thereby adapting itself to automatic ringing. When the switch S is thrown for automatic ringing and when the cord circuit D is connected to a magneto line, the relay SW¹ remains inert by reason of the relay SW not operating, therefore adapting itself automatically. I also provide a calling supervisory relay CS which controls the supervisory signal SS¹ when the link circuit is connected to a common battery line, the supervisory signal SS¹ being effaced or lighted, as the case may be, having its circuit through resistance R to ground causing the lamp to glow brightly. When the link circuit D is connected to a magneto line, the signal SS¹ is used as a disconnect signal only and when the hand generator at the called magneto substation is operated, causing a flow of current through the magneto winding M of relay CS, energizing the relay CS which closes a circuit for the signal SS¹ including the common battery winding CB of the supervisory relay CS, which being of a higher resistance than the resistance R causes the signal to light with a dull glow indicating to the operator that a disconnect signal has been received from the magneto substation. When a common battery substation wishes to recall the operation of the switch-hook, at the called substation, causes the signal SS¹ to flash brightly. Now if a magneto substation wishes to recall, the continued operation of the hand generator causes a flow of current through the winding M of relay CS and this continued operation causes current to be induced into the common battery winding CB of the relay CS and as the winding CB is included in the signal circuit, this causes the lamp to flicker with a dull glow. This distinct signal for a magneto line notifies the operator of the difference between the disconnect and recall signal on a magneto line.

I provide a party line ringing apparatus for either automatic ringing control or manual control, either one of these controls being provided by the operation of a switch S. This party line ringing of automatic and manual control is preferably used in ringing common battery lines only, but I do not wish to be limited to the same. The switch S can be thrown to connect the interrupter I to intermittently energize and interrupt relay IR to connect the circuit to ring the called-for substation or can be thrown to disconnect the interrupter I to ring all called lines manually. I provide a four-party ringing key RK associated with the generators G, G¹, G² and G³ which may be connected in circuit by independently operable

contacts, 1, 2, 3, and 4. A common set of end springs 5, 6 are operated when any one of the key plungers is fully depressed but when returning to indicating position the end springs 5 and 6 assume their normal position. A ringing disconnect relay RD is operated when a key plunger is fully depressed and closes a locking circuit for itself and upon energization of the relay RD the interrupter relay IR is energized to intermittently connect ringing current to the called line until a response is received from the called substation, when the ringing disconnect RD deenergizes opening the circuit of the relay IR, disconnecting the ringing current from the line.

At times it is desirable to use manual ringing as at night when few calls are made and therefore I provide the switch S, which when thrown into its dotted position, automatic ringing is used and when in the position shown manual ringing is used.

Having described in general the apparatus as illustrated, I will now describe the operation of the circuit when connection is made between the different lines as shown.

Assuming now that the subscriber at magneto substation A initiates a call, he operates the hand generator at the substation which throws the drop signal S of the line circuit L and the operator noting the actuated drop inserts the plug P into the jack J. The operator then throws listening key LK to inquire the wants of the calling subscriber, and in operating the key a momentary circuit is closed for the relay DM but this momentary energization does not affect the apparatus. Assuming now that the subscriber at magneto substation A wishes to converse with the subscriber at common battery substation C, the operator tests the multiple jack J² of the called line as to its idle or busy condition and if the called line be busy the operator receives the customary click in her head receiver.

Assuming that the called line is idle, the operator inserts plug P¹ into jack J² of the called line energizing the cut-off relay CO of the line circuit L² and the switching relay SW of the cord circuit D in series, the circuit being traced from battery through the winding of the relay SW, sleeve contacts of the plug P¹ and jack J² and winding of relay CO to ground, the relay CO operating extends the talking conductors to the called line. Upon the energization of switching relay SW, the circuit is closed for the switching relay SW¹ traced from battery through the winding of switching relay SW¹, alternate contact 7 of the relay SW through resistance R to ground. Also upon the closing of the alternate contact 7 of relay SW, a circuit is closed for the supervisory signal SS¹ traced from battery through the lamp SS¹, normal contact 8 of

the relay CS, alternate contact 7 of relay SW, through resistance R to ground, thus lighting the supervisory signal SS¹, said signal remaining lighted until the calling subscriber answers. The closing of the alternate contact 9 of the switching relay SW¹ crosses the ring and sleeve contacts of the plug P¹ to connect a second or sleeve conductor so as to form a two-wire cord circuit for connecting to a two-wire line circuit L² and for supplying battery to the line for talking purposes. The operator now depresses the proper party line ringing key RK, and assuming that it is the generator G that has been connected, and when the key is in its fully depressed position the end springs 5 and 6 are moved to their alternate position closing the circuit for the ringing disconnect relay RD traced from battery through winding of relay RD alternate contact 6, alternate contact 10 of relay SW¹, normal contact 8 of relay CS, alternate contact 7 of relay SW through R to ground, thus energizing relay RD, said relay RD closing a locking circuit for itself traced from battery through winding of relay RD, alternate contact 11 of relay RD, conductor 12, normal contact 8, alternate contact 7 through R to ground. Upon energization of relay RD, circuit is closed for the interrupter relay IR traced from battery through winding of relay IR, alternate contact 13 of relay RD, normal contact 5, alternate contact 14, switch S (assuming that the switch S is thrown for automatic ringing) through the interrupter I to ground. The interrupter IR is intermittently energized to connect ringing current to the tip conductor of the cord circuit D, the tip contacts of the plug P¹ and jack J² through the condenser and call bell to the called-for substation, of sleeve contacts of the jack J² and plug P¹, sleeve conductor of the cord circuit D, alternate contact 16 of relay IR to battery and ground. The relay IR is intermittently energized to intermittently connect ringing current to the line for ringing the called-for subscriber.

When the called-for subscriber answers, an energizing circuit is closed for the calling supervisory relay CS traced from battery through the winding of relay SW, conductor 17, alternate contact 9, of relay SW¹, the sleeve conductor, sleeve contacts of plug P¹ and jack J², through the substation tip contacts of the jack J² and plug P¹, normal contact 15 of relay IR, alternate contact 18 of relay SW, the common battery winding CB of relay CS to ground, this energizes the relay CS and opens the locking circuit of the ringing disconnect relay RD at normal contact 8. The relay RD deenergizing opens its alternate contact 13 and interrupts the circuit of the relay IR and disconnects the ringing current from the line. The ener-

gization of the relay CS also effaces the supervisory signal SS¹ notifying the operator that the called-for subscriber has answered. The subscriber at the magneto substation A and the subscriber at the common battery substation B are now in conversational circuit, the talking circuit being traced over the heavily marked conductors.

Assuming now that conversation has been completed, the subscriber at magneto substation A replaces his receiver and operates the hand generator, the current flowing over the line energizing the answering supervisory relay AS. The relay AS attracts its armature 22 and the spring 19 associated with the armature 22 assumes its alternate position closing a circuit for supervisory signal SS traced from battery through the signal SS to ground at alternate contact 19. This lighting of supervisory signal SS notifies the operator that the subscriber at magneto substation A has operated his disconnect signal. The replacement of the receiver at the common battery substation C opens the circuit of the calling supervisory relay CS at the switch-hook contacts, the relay CS deenergizing closing its normal contact 8 and again closing the circuit for supervisory signal SS¹ as before traced, lighting the lamp and notifying the operator that the subscriber at C has replaced his receiver. To efface the signal SS at the answering end of the cord circuit the operator now throws her listening key closing an energizing circuit for the disconnect magnet DM traced from battery through the winding of relay DM to ground at alternate contact 20 of the listening key LK. The disconnect magnet attracts its armature 21, the extension 21¹ of armature 21 lifting up the spring 19 releasing the armature 22 of the relay AS, the armature returning to normal by gravity. This opens the circuit for supervisory signal SS at contact 19 effacing said signal. The operator now removes plugs P and P¹ from their respective jacks J and J². The removal of the plug P does not affect other apparatus at the answering end of the cord circuit but the removal of the plug P¹ of jack J² opens the energizing circuit of the switching relay SW, the deenergization of the switching relay SW opens the energizing circuit of the switching relay SW¹ at alternate contact 7 deenergizing the said switching relay SW¹. The apparatus of the cord circuit D is now at normal and available for making other connections.

Assuming that the subscriber at the magneto substation A initiates a call, the operation of the hand generator at the substation throws the drop signal S at the line circuit L, and the operator noting the drop signal S inserts the answering plug P into the jack J and throws her listening key LK

to inquire the wants of the calling subscriber. The actuation of the listening key LK momentarily energizes the disconnect magnet DM by the closing of its alternate contact 20 but this momentary energization does not affect the circuit at this time. Assuming that the magneto substation B is wanted, the operator inserts the plug P¹ into the jack J¹ of the line circuit L¹, the sleeve of the jack J¹ being on open circuit does not effect the operation of the switching relay SW. The switching relay SW remaining at normal bridges the magneto winding M of the supervisory relay CS across the tip and sleeve conductors of the cord circuit D. The switching relay SW remaining deenergized does not close an energizing circuit for switching relay SW¹, the said relay SW¹ therefore remaining at normal. The operator now depresses one of the party line ringing keys to manually ring the called for subscriber at the magneto substation B. Assuming that it is the generator G, the operator depresses the key plunger to its fully depressed position operating the end springs 5 and 6. Upon the spring 6 assuming its alternate position, circuit is closed for the ringing disconnect relay RD traced from battery through the winding of relay RD, alternate contact 6, normal contact 10 of relay SW¹ to ground. The energization of relay RD closes an energizing circuit for interrupter relay IR traced from battery through the winding of relay IR, alternate contact 13, alternate contact 5, normal contact 10 of relay SW¹, to ground. The relay IR energizing closes its alternate contact 15, connecting ringing current from the generator G to the tip conductor of the cord circuit, the tip contacts of the plug P² and jack J², the call bell of the called substation, sleeve contacts of the jack J² and plug P¹, sleeve conductor, alternate contact 16 to battery and ground signaling the called for subscriber at substation B. Each time the operator wishes to signal the called-for substation B the key plunger is operated to its fully depressed position to operate the end springs 5 and 6 to energize the relays RD and IR. Each depression of the ringing key connects ringing current to the called line until the subscriber at substation B has answered. The called subscriber having answered, the two magneto substations are now in conversational circuit, the talking circuit being traced over the heavily marked conductors.

Assuming that conversation has been completed, the subscriber at the magneto substation A operates his hand generator energizing the answering supervisory relay AS as before described to light the supervisory signal SS. The subscriber at the magneto substation B operating his hand generator energizes the magneto wind-

ing M of the calling supervisory relay CS, the relay CS energizing closing a circuit for supervisory lamp SS¹ traced from battery through the lamp SS¹, alternate contact 8, normal contact 23, 24 of the listening key LK, normal contact 25 of relay SW, common battery winding CB of relay CS to ground. This lights the lamp SS¹ and also closes a locking circuit for the relay CS. The operator now noting the two disconnect signals SS and SS¹, throws her listening key LK to efface the signal SS, the normal contacts 23 and 24 of the listening key LK are opened interrupting the locking circuit of the relay CS, the relay CS deenergizing opening the circuit of the signal SS¹, at contact 8 and effacing the said signal SS¹. The closing of alternate contact 20 of the listening key LK energizes the disconnect magnet DM, said magnet DM attracting its armature 21 to restore the spring 19, which interrupts the circuit of the supervisory signal SS, the said signal SS effacing. The operator now removes the plugs P and P¹ from their respective jacks, the cord circuit D being now available for other connections.

If connection is to be made to a three-wire link circuit such as L³, plug P¹ is inserted in the jack J³ whereby relays SW and CO¹ are connected in series effecting the energization of both. Therefore the relay SW¹ is also energized closing its alternate contact 9 and thereby crossing the ring and sleeve contacts of both the cord circuit and the line jack J³. The operation of the system thereafter will be readily understood in view of the previous description.

It is to be understood that the automatic switching apparatus at the calling end of the cord circuit which includes the switching relay SW and the supervisory relay CS may be used at the answering end of the cord circuit and in this way providing universal interconnection between any two lines of like or different character. In such case the switching relay would be connected to a third contact of the answering plug P and the magneto winding M connected in normal bridge of the talking conductors at the answering end without the interposition of any contact but 18. The locking circuit for the winding CB at the answering end would of course include a pair of normally closed contacts as 23, 24 on the listening key. It is believed that such arrangement is so obvious that an illustration thereof is unnecessary.

Although in the previous description I have not referred in detail to all possible interconnections, these may be readily traced out and it is to be understood that I do not limit myself to the exact use of my invention as described as I contemplate employing it in other ways and I 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 universal cord circuit for interconnecting magneto and common battery telephone lines, a common supervisory signal, a ringing key, ringing apparatus, and circuit connections between said key and apparatus whereby automatic or manual control of such apparatus is effected according to the character of the line connected with.
2. A telephone system comprising a universal cord circuit adapted for interconnecting different types of telephone lines, a common supervisory signal at the calling end of the cord circuit, a ringing key, automatic and manual ringing apparatus, said key when actuated being adapted to effect manual or automatic ringing control according to the type of line connected with.
3. A telephone system comprising a universal cord circuit adapted for interconnecting magneto and common battery telephone lines, a common supervisory signal at the calling end of the cord circuit, a ringing key, automatic and manual ringing apparatus, said key when actuated being adapted to effect the association of either the manual or automatic ringing control with the cord circuit according to whether the line connected with is common battery or magneto respectively.
4. A telephone system comprising magneto and common battery lines, an operator's link circuit having a connecting terminal for connection with said lines, supervisory apparatus including a common signal differently operable according to the character of line connected with, a ringing key, ringing apparatus, and circuit connections between said key and apparatus whereby automatic or manual control of such apparatus is effected according to the character of the line connected with.
5. A telephone system comprising magneto and common battery lines, an operator's

link circuit having a connecting terminal for connection with said lines, supervisory apparatus including a common signal differently operable according to the character of line connected with, a ringing key, ringing apparatus, and circuit connections whereby when said terminal is connected with a magneto line manual control of said ringing apparatus by said key is effected and whereby when a common battery line is connected with automatic control of the ringing apparatus is effected.

6. A telephone system comprising magneto and common battery telephone lines, two conductor jacks for said common battery lines, a universal cord circuit having a connecting terminal for connection with any of said lines, supervisory apparatus, a ringing key, ringing apparatus, circuit connections whereby when said terminal is connected with a magneto line manual control of said ringing apparatus by said key is effected and whereby when a common battery line is connected with automatic control of the ringing apparatus is effected.

7. A telephone system comprising magneto and common battery telephone lines, two and three conductor jacks for said common battery lines, a universal cord circuit having a connecting terminal for connection with any of said lines, supervisory apparatus including a common signal differently operable according to the character of line connected with, a ringing key, ringing apparatus, circuit connections whereby when said terminal is connected with a magneto line manual control of said ringing apparatus by said key is effected and whereby when either type of jack of a common battery line is connected with automatic control of the ringing apparatus is effected.

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

JOHN E. HILBISH.

Witnesses:

GEORGE E. MUELLER,
M. R. ROCKFORD.