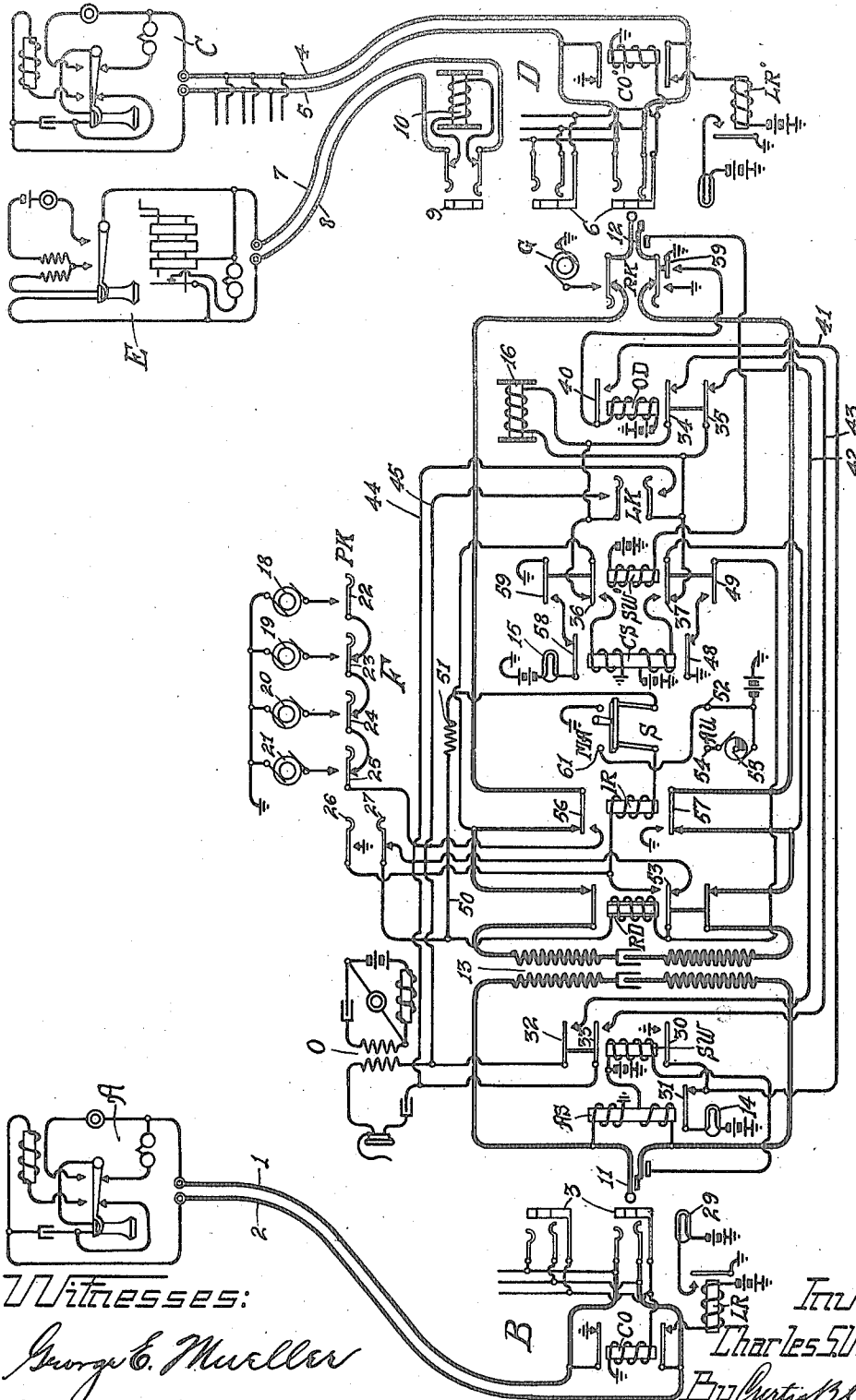


C. S. WINSTON.
 UNIVERSAL CORD CIRCUIT FOR TELEPHONE SYSTEMS.
 APPLICATION FILED SEPT. 20, 1913.

1,197,166.

Patented Sept. 5, 1916.



Witnesses:

George E. Mueller
Wm. Berghahn

Inventor

Charles S. Winston

By Arthur B. Lamp
 Attorney

UNITED STATES PATENT OFFICE.

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

UNIVERSAL CORD-CIRCUIT FOR TELEPHONE SYSTEMS.

1,197,166.

Specification of Letters Patent.

Patented Sept. 5, 1916.

Application filed September 20, 1913. Serial No. 790,821.

To all whom it may concern:

Be it known that I, CHARLES S. WINSTON, 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 Universal Cord-Circuits for Telephone Systems, of which the following is a specification.

In general my invention relates to operators' cord circuits and is directed more particularly to so-called universal cord circuits which are adapted for interconnecting telephone lines of different characters, such as magneto and common battery lines.

One of the features of my invention is the provision of means whereby when connection is made between lines of one character as between two common battery lines, automatic connection and disconnection of the operator's circuit is provided giving so-called secret service, but when connection is made to a called line of a different character such as a magneto or local battery line, although again the automatic connection and disconnection of the operator's telephone is provided, nevertheless the operator is enabled to listen in by the actuation of a manually operated listening key.

In the accompanying drawing I have illustrated a telephone system embodying my invention and I have shown only sufficient apparatus to disclose the operation of the system.

Referring now more in general to the arrangement illustrated, I have provided a common battery calling substation A, connected by means of line conductors 1 and 2 to a line circuit B terminating at a multiple switchboard in multiply connected jacks, 3. Said line circuit B also includes a line relay LR and cut-off relay CO. To the right of the drawing is shown a common battery substation C connected by means of conductors 4, 5 to a line circuit D at the central office comprising multiply connected jacks 6, line relay LR¹ and cut-off relay CO¹. A so-called local battery or magneto telephone line is also shown comprising a well-known form of substation E connected by means of line conductors 7, 8, to a jack 9 at the central office switchboard together with a line signal in the form of a drop 10.

A cord circuit F is provided which is of universal character in that connection may

be made between the two common battery substations A, C, or between substation A and local battery or magneto substation E. At the answering end of the cord circuit, an answering plug 11 is provided which is connected by means of tip and sleeve conductors to the calling plug 12 through the medium of the windings of the repeating coil 13. An answering supervisory relay AS is also provided, being connected in bridge of the answering tip and sleeve conductors and in circuit with a central source of battery. A switching relay SW is also provided and adapted to be energized when the answering plug 11 is inserted in a calling common battery line, relays AS and SW being adapted to control the answering supervisory signal 14. Relay SW also serves to connect the operator's telephone O in circuit with the calling line, when energized.

Referring now to the calling end of the cord circuit, a calling supervisory relay CS is provided which is adapted to be connected in bridge of the calling tip and sleeve conductors only when connection is made to a common battery line, this connection being established through the medium of switching relay SW¹ which is energized when the calling plug 12 is inserted into the jack of a common battery line. When the plug 12 is inserted into the jack of a magneto or local battery line, switching relay SW¹ does not operate and therefore calling supervisory relay CS is not connected in circuit, but as above referred to, when connection is made to a common battery line, relay SW¹ energizes to connect calling supervisory relay CS in circuit and it is by these two relays CS and SW¹ that the calling supervisory signal 15 is controlled. When connection is made with a magneto line, supervision is also provided in the nature of a drop 16 which is adapted to remain connected across the tip and sleeve conductors by the non-operation of the switching relay SW¹ so that when disconnection is desired the magneto subscriber operates the drop 16 by current from the hand generator at the substation.

Now as to the control of the operator's telephone at the calling end of the cord circuit, when connection is made with a common battery line, relay SW¹ is energized as already referred to and therefore dis-

connects the operator's telephone O from the answering end of the cord circuit and it is impossible for the operator to listen in while the answering and calling plugs are connecting two lines. But when connection is made with a called magneto line, relay SW¹ does not energize and the operator's telephone O remains bridged across the tip and sleeve conductors in operative relation with the cord circuit until the ringing key RK is operated at which time the disconnect relay OD is operated to disconnect the operator's telephone. Nevertheless should the operator desire to listen in on a connection to the called magneto line, a listening key LK is provided whereby her telephone O may be connected in circuit with the cord F. This latter connection is desirable where magneto lines are connected with, because such lines are frequently used as toll lines and for this reason the operator usually must be able to converse with the called subscriber or due to the fact that a subscriber at a magneto substation will frequently fail to operate the drop 16 for disconnect purposes, the operator may listen in to ascertain whether the conversation is finished.

In connection with the embodiment of my invention illustrated, I have provided party line ringing apparatus together with automatic ringing control or manual ringing control, either one of which controls may be provided according to the operation of the switch S. This convertible automatic and manual ringing apparatus is preferably provided for the ringing of the common battery lines only, although it is to be understood that my invention is not limited to this particular arrangement in connection with this ringing apparatus. A four party ringing key PK is provided associated with generators of different frequencies such as the generators 18, 19, 20, 21 which may be connected in circuit by the independently operable key contacts 22, 23, 24 and 25 respectively. A common set of contacts 26, 27, are operated when any of the ringing plungers is fully depressed, but when the plungers return to indicating position these common contacts restore to normal. I preferably arrange to apply the ringing current intermittently through an interrupter relay IR when the automatic ringing is connected in circuit, which ringing current is maintained connected to the called line until a response is secured at which time the ringing disconnect relay RD is deenergized to render the interrupter relay IR inert.

At times it is desirable to use manual ringing, such as during the night when few calls are made, and therefore by the use of a switch S, the automatic ringing control is removed and manual ringing control applied. When switch S is in its upper po-

sition MA, manual ringing is provided and when said switch is in its lower position AU, automatic ringing is provided.

Having described in general the characteristics of the preferred embodiment of my invention, its operation in establishing connection between lines will now be described.

Assuming that a connection is to be established between a common battery substation A and a magneto substation E, upon removal of the receiver at substation A, a circuit for its line relay LR is established over the calling line whereby LR is energized to operate the line signal 29. The operator in response to this signal inserts an answering plug 11 into the answering jack 3 of the calling line whereby relay AS is connected in bridge of the calling line. Current will therefor flow from battery through the lower winding of relay AS over the sleeve contacts of plug 11 and jack 3, the line of substation A returning over the tip contacts of jack 3 and plug 11 and through the upper winding of AS to ground. Also responsive to the insertion of plug 11, relays CO and SW are connected in series through the third contacts of the jack and plug whereby said relays are energized, relay CO disconnecting line relay LR. Responsive to energization of SW, its alternate contact 30 is closed but due to the fact that normal contact 31 of AS is interrupted, answering supervisory signal 14 is not lighted. Should the subscriber at A desire to signal the operator, by operating his switch-hook and thus interrupting the circuit of AS, the normal contact 31 is closed and signal 14 lighted. Also responsive to the energization of SW, operator's telephone O is connected in circuit with cord F through alternate contact 32, 33, normal contacts 34, 35 of OD and normal contacts 36, 37 of SW¹. Thus the operator's telephone O is automatically connected in circuit with the calling substation A and the operator finding that connection is desired with a magneto or local battery substation E, will insert the calling plug 12 into the jack 9 thereof. In this instance the switching relay SW¹ does not operate because no circuit is provided through the third contact of the plug. The operator now actuates ringing key RK thus connecting the ringing generator G across the terminals of the called line thereby ringing the call bell at substation E. Also responsive to the operation of the ringing key, its alternate contact 39 is closed establishing an energizing circuit for the operator's circuit disconnect relay OD, which relay locks itself through its alternate contact 40 to ground at alternate contact 30 over conductor 41. Relay OD therefore interrupts its normal contacts 34, 35 thus disconnecting conductors 42, 43, and thereby disconnecting the op-

erator's telephone from the cord circuit. It will be seen from this that the operator's telephone is automatically connected and disconnected from the cord circuit. But as
 5 already pointed out when connection is made with a called magneto line the operator may again cut her telephone O in circuit, this being brought about through the operation of a listening key LK which connects the telephone O through conductors
 10 44, 45 to LK and normal contacts 36, 37 to talking conductors of the cord circuit.

In the present instance the ring-off drop 16 remains bridged across the cord circuit
 15 so that when the subscribers have finished their conversation, an operation of the hand generator at substation E is effective to operate drop 16 while the replacing of the receiver at substation A is effective to interrupt the circuit of relay AS causing
 20 its deenergization. Therefore its normal contact 31 is closed and a circuit for lamp 14 is established through alternate contact 30. The operator in response to these signals
 25 withdraws the plugs 11 and 12 from the spring jacks, the disconnection of answering plug 11 being effective to restore relay SW whereby its contact 30 is interrupted effecting signal 14 and interrupting the locking
 30 circuit for relay OD which also restores.

Assuming now that plug 11 has been inserted into jack 3 in response to a call from substation A, whereby operator's telephone O is connected in circuit as before and that
 35 connection is to be made to a called common battery substation C. Therefore the operator inserts the plug 12 into a jack 6 of the called line whereby switching relay SW¹ and cut-off relay CO¹ are connected in series
 40 over the third contacts of plug 12 and jack 6 causing the energization of these relays. Responsive to the energization of SW¹, its normal contacts 36, 37 are interrupted whereby the connection from the operator's
 45 telephone through conductors 42, 43, is interrupted, thereby automatically disconnecting the operator's telephone. Due to the fact that relay SW¹ remains energized as long as the plug 12 is in the jack 6, the operator's telephone O remains disassociated
 50 from cord circuit F, and furthermore, even should the listening key LK be operated, the telephone O cannot be connected to the cord circuit due to the interruption of normal contacts 36, 37. The operator now actuates the proper party line ringing key
 55 PK, and assuming that the switch S is in its automatic ringing position AU, upon interruption of the common contact 27 of key PK, the short circuit around the winding of ringing disconnect relay RD is interrupted whereby circuit for RD is established
 60 from ground at normal contact 48 of relay CS, alternate contact 49, the winding of RD, conductor 50, resistance 51 and contact 52 to

battery. Relay RD therefore interrupts its normal contact 53 so that when the operator releases her hold upon the actuated ringing button and said ringing button restores to its indicating position, again closing common contact 27, relay RD remains energized.
 70 A circuit for interrupter relay IR is therefore established from ground at normal contact 48 of CS, alternate contacts 49, 53, the winding of IR, contact 54 and interrupter 55 to battery. Relay IR is therefore
 75 alternately energized and deenergized, each energization thereof being effective to close its alternate contacts 56, 57 and thereby connecting ringing current to the terminals of the calling line whereby the call-bell at the proper substation is operated. Upon each deenergization of IR, and due to the closing of its normal contacts 56, 57, the supervisory relay CS is connected in bridge of the
 80 cord circuit conductors but due to the condenser at substation C, relay CS does not operate as long as the receiver is on its switch-hook. Upon removing the receiver at substation C in response to the call, and upon the following deenergization of relay
 85 IR, a circuit for CS is established from ground through the upper winding thereof, alternate contact 36, normal contact 56, tip contacts of plug and jack, over the line and through substation C returning over the sleeve contacts of jack and plug, normal contact 57, alternate contact 37 and the lower winding of CS to battery. Relay CS therefore energizes interrupting the circuit
 90 of lamp 15 at its contact 58, which circuit was previously established through alternate contact 59 of SW¹. Responsive to interruption of normal contact 48 of CS, the circuit for ringing disconnect relay RD is interrupted causing the restoration of RD and thereby rendering relay IR inert.

After the subscribers at substations A and C have finished their conversation, they replace their receivers upon their respective switch-hooks thereby interrupting the circuits for supervisory relays AS and CS. Relay AS therefore restores closing its normal contact 31 and establishing a circuit for
 110 signal 14 while relay CS restores closing its normal contact 58 and establishing a circuit for signal 15. The operator in response to these signals removes plugs 11, 12 from jacks 3, 6, whereby all apparatus is restored to normal.
 120

Assuming now that a connection has been established between substations A and C and the switch S is in its manual ringing position MA, upon the operator depressing a plunger of party line key PK, although
 125 common contact 27 is interrupted relay RD does not energize because of the ground connection to both ends of its winding. But upon the closing of ground to alternate contact 26 of the ringing key, a circuit for relay
 130

IR is established through contact 61 of switch S to battery. Therefore each actuation of key PK effects an operation of relay IR whereby ringing current is connected through alternate contacts 56, 57, to the calling line. When the subscriber at C responds, relay CS energizes as before, effacing signal 15. After the subscribers have finished their conversation they will restore their receivers operating relays AS and CS as before and bring about the operation of the disconnect signals so that the operator may know disconnection is desired.

It will be apparent that many changes and modifications of the system will readily occur to those skilled in the art and it is to be understood that I contemplate applying my invention in other ways than in the embodiment disclosed, and therefore I do not desire to be limited to the exact structure as shown and described but aim to cover all that which comes within the spirit and scope of the appended claims.

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

1. A universal cord circuit for telephone systems, comprising inductively united answering and calling ends, an operator's telephone, a switching relay associated with the answering end for connecting said operator's telephone in talking circuit with the cord, means whereby the calling end of the cord circuit may be used for connection to telephone lines of different characters, an operator's disconnect relay effective to disconnect said operator's telephone when the calling end is connected with the telephone line of one character, and a switching relay adapted for disconnecting said operator's telephone when the calling end of the cord circuit is used in connection with a telephone line of a different character.

2. A telephone system comprising telephone lines of different characters including common battery and local battery lines, a universal cord circuit for interconnecting said lines, an operator's telephone, means responsive to the connection of said cord circuit with a calling one of said lines to automatically connect said telephone with said cord circuit, and means responsive to the connection of said cord to any one of said lines as called lines for automatically disconnecting said operator's telephone.

3. A telephone system comprising telephone lines of different characters including common battery and local battery lines, a universal cord circuit for interconnecting said lines, an operator's telephone, means responsive to the connection of said cord circuit with a calling one of said lines to automatically connect said telephone with said cord circuit, means responsive to the connection of said cord to any one of said

lines as called lines for automatically disconnecting said operator's telephone, and means operative only when said cord is connected to a called line of one of said characters whereby said operator's telephone may again be connected to said cord circuit.

4. A telephone system comprising telephone lines of different characters including common battery and local battery lines, a universal cord circuit for interconnecting said lines, an operator's telephone, means responsive to the connection of said cord circuit with a calling one of said lines to automatically connect said telephone with said cord circuit, means responsive to the connection of said cord to any one of said lines as called lines for automatically disconnecting said operator's telephone, an operator's key, and circuit connections controlled thereby and effective only when said cord circuit is connected to a called line of one of said characters to again connect said operator's telephone to the cord circuit.

5. A telephone system comprising local and common battery telephone lines, line circuits of different characters for said lines, a universal cord circuit for interconnecting said lines, an operator's telephone, means responsive to the connection of said cord circuit with a line circuit of a calling one of said lines to automatically connect said telephone with said cord circuit, and means whereby when connection is made to a line circuit of either character of said lines as called lines for automatically disconnecting said operator's telephone.

6. A telephone system comprising local and common battery telephone lines, line circuits of correspondingly different characters for said lines, a universal cord circuit for interconnecting said lines, an operator's telephone, means responsive to the connection of said cord circuit with a line circuit of a calling one of said lines to automatically connect said telephone with said cord circuit, means whereby when connection is made to a line circuit of either character of said lines as called lines for automatically disconnecting said operator's telephone, and means operative only when said cord is connected with a line circuit of one of said characters whereby said operator's telephone may again be connected to said cord circuit.

7. A telephone system comprising local and common battery telephone lines, line circuits of different characters for said lines, a universal cord circuit for interconnecting said lines, an operator's telephone, means responsive to connection of said cord circuit with a calling one of said lines to automatically connect said telephone with said cord circuit, means responsive to the connection of said cord to the line circuit of any of said lines as called lines for automatically disconnecting said operator's tele-

phone, an operator's key, and circuit connections controlled thereby and effective only when said cord circuit is connected to a line circuit of one of said characters to again connect said operator's telephone to the cord circuit.

8. A telephone system comprising common battery and local battery telephone lines, line circuits of different characters for said lines, a universal cord circuit for interconnecting said lines through said line circuits, an operator's telephone, means responsive to the connection of said cord circuit with the line circuit of a calling one of said lines to automatically connect said telephone with said cord circuit, and means responsive to the connection of said cord circuit to a line circuit of any of said lines as called lines to automatically disconnect said operator's telephone.

9. A telephone system comprising telephone lines, a cord circuit for interconnecting said lines, an operator's telephone, a ringing key for said cord circuit, a switch relay responsive to the connection of said cord to a calling one of said lines to connect said telephone in circuit with the cord, an operator's disconnect relay, and means responsive to the initial operation of said ringing key to operate said disconnect relay to disconnect said telephone from said cord circuit.

10. A telephone system comprising telephone lines including local battery and common battery lines, a universal cord circuit for interconnecting said lines, an operator's telephone, means responsive to the connection of said cord circuit with a calling one of said lines to automatically connect said telephone with said cord circuit, and means for automatically disconnecting the said operator's telephone when a connection is established between said circuit and any one of said lines as called lines.

11. A telephone system comprising telephone lines of different characters including local battery and common battery lines, a cord circuit for interconnecting said lines, an operator's telephone set, means responsive to the connection of said cord circuit with a calling one of said lines to automatically connect said telephone set with said cord circuit, means for automatically disconnecting the said operator's telephone set when connection is established between the said cord circuit and any one of said lines as called lines, and means operative when said cord is connected to called lines of one of said characters whereby said operator's telephone set may again be connected to said cord circuit.

12. A telephone system comprising local and common battery lines, line circuits that correspond to the different characters for said lines, a universal cord circuit for inter-

connecting said lines, an operator's telephone, means responsive to the connection of said cord circuit with the line circuit of a calling one of said lines to automatically connect said telephone with said cord circuit, means for automatically disconnecting the said operator's telephone when connection is established between the said cord circuit and the line circuit of either character of said lines as called lines, and means operative when said cord is connected with a line circuit of one of said characters whereby said operator's telephone may again be connected to said cord circuit.

13. In a telephone system, subscribers' lines of different characters including common battery and local battery lines, a cord circuit for interconnecting the said lines, said cord circuit including a switching relay and a disconnect relay, an operator's telephone set, means for automatically connecting the said operator's telephone set to the said cord circuit when connection is established between the cord circuit and a calling one of said lines, means for energizing the said switching relay to disconnect the said telephone set from the said cord circuit if connection is established between the said cord circuit and one of said common battery lines as a called line, and means for energizing the said disconnect relay to disconnect the operator's telephone set from the said cord circuit if connection is established between the said cord circuit and one of the said local battery telephone lines as a called line.

14. In a telephone system, subscribers' lines of different characters, a universal cord circuit for interconnecting the said lines, a ringer relay for said cord circuit, an operator's telephone, means for automatically connecting the said telephone to the said cord circuit when connection is established between the said cord circuit and a calling one of said lines, means for automatically disconnecting the said operator's telephone when connection is established between the said cord circuit and one of said lines as a called line, and means for operating the said ringer relay either automatically or manually to signal the said called subscriber.

15. A telephone system comprising local battery and common battery subscribers' telephone lines, a universal link circuit for interconnecting said lines, an operator's telephone, and electromagnetic means for automatically connecting and disconnecting said operator's telephone with said link circuit.

16. A telephone system comprising common battery and local battery telephone lines, a universal link circuit for interconnecting said lines, an operator's telephone, means for automatically connecting and dis-

connecting said operator's telephone with said link circuit, a ringer relay, and means for energizing said relay for signaling purposes.

5 17. A telephone system comprising local battery and common battery telephone lines, a universal link circuit for interconnecting said lines, an operator's telephone, means for automatically connecting and discon-
10 necting said operator's telephone, and means for automatically or manually signaling the connected called line.

15 18. A telephone system including both local battery and common battery subscribers' telephone lines, a universal link circuit provided with connection terminals for interconnecting said lines, an operator's telephone, and relays for automatically connecting and disconnecting said operator's
20 telephone and said link circuit.

25 19. A telephone system including telephone lines, a link circuit for connecting said lines in conversational circuit, an operator's telephone, ringing apparatus for said link circuit, a relay responsive to the connection of said link circuit to a calling one of said lines to connect said telephone in circuit with the link circuit, means for

connecting the link circuit to a called one of said lines, a key for connecting said ringing apparatus to said called line to operate the call bell at the called substation, and a relay responsive to an operation of said key to disconnect said telephone from said link circuit. 30

35 20. A telephone system including a calling subscriber's line and a called subscriber's line, a link circuit for establishing connection between said lines, automatic ringing apparatus associated with said link circuit for signaling the called substation, an operator's telephone, a relay responsive to a connection of said link circuit to said calling line for connecting said telephone with said link circuit, a ringing key for connect-
45 ing said ringing apparatus to the called line, and a relay responsive to an initial operation of said key to automatically disconnect said telephone from said link circuit.

Signed by me at Chicago, county of Cook
and State of Illinois, in the presence of two witnesses. 50

CHARLES S. WINSTON.

Witnesses:

GEORGE E. MUELLER,
M. R. ROCKFORD.