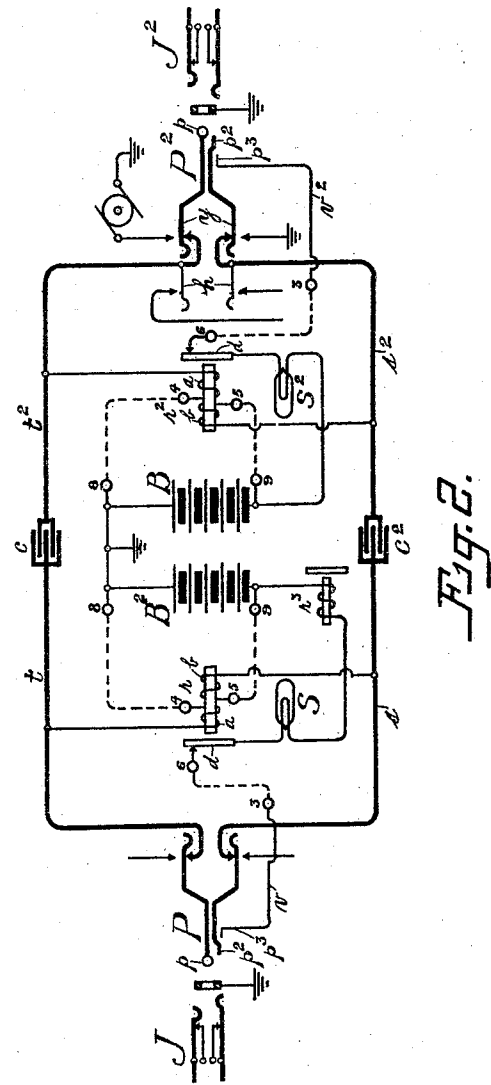
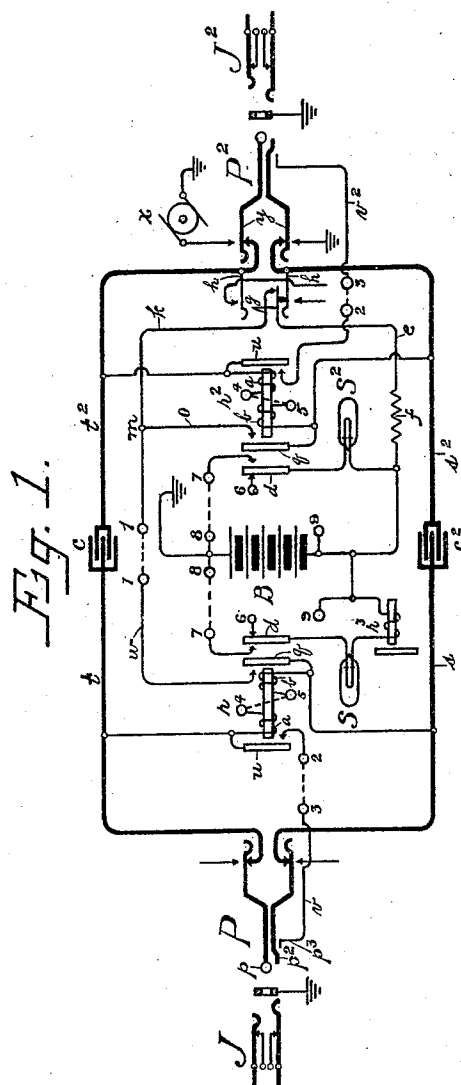
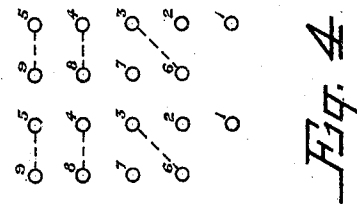
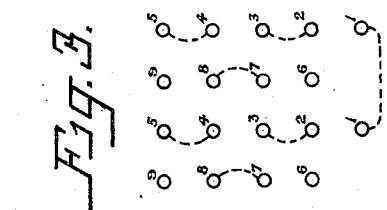


C. S. WINSTON.
METHOD OF WIRING TELEPHONE SWITCHBOARDS.
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METHOD OF WIRING TELEPHONE-SWITCHBOARDS.

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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 the Method of Wiring Telephone-Switchboards, of which the following is a specification.

My invention relates to improvements in the method of wiring cord circuits for telephone systems whereby a system may be readily changed from one type of cord circuit to another by persons unfamiliar with the wiring of the circuits.

In small exchanges it is often desired on the score of economy to initially install a system working upon what is known as the magneto lamp plan and which is to be changed over to a common battery system at some time in the future. In such magneto lamp systems the same apparatus for supervising the connections is employed as in the common battery systems; that is, each cord circuit is provided with a supervisory lamp at each end, which is operated at the end of the conversation by relays that are initially operated by current from the magneto hand generators at the substations of the lines. The line circuits may or may not be provided with lamp signals but in any case such signals are usually controlled by the generators at the subscribers' stations. Under the ordinary system when it is desired later to transform such a telephone system to a common battery system, the old wiring of the cord circuits must be torn out and replaced by the new wiring. Inasmuch as this cannot be done ordinarily by the ordinary workmen around such small exchanges which often are isolated and located in small country towns considerable trouble and expense are caused in making the transformation. My invention seeks to avoid the difficulties mentioned by providing a system of wiring for the cord circuits which when it is desired to change from the one system to the other is readily accomplished by changing the connections between a group of terminals that are located at some convenient point at the back or side of the switchboard, or other desired place. Such changes can be readily made by any unskilled person with the assistance of a code or diagram of the terminals with their cross connections which is of course furnished with the switchboard.

In carrying out the invention, I provide a plurality of terminals preferably arranged in a group located upon a connecting rack at some convenient point and permanently wire the various parts of the apparatus to the said terminals in such manner that by simply changing the short connecting wires between the said terminals, the system is changed from one plan to another. These terminals are then connected together by short pieces of wire to complete the system operating upon the desired plan, and when it is desired to change to the other system it is only necessary to re-arrange the connections between the said terminals according to the prescribed code in order to change the circuits in the desired way.

The invention is illustrated in the accompanying drawing in which the same reference characters are used throughout to designate like parts and in which:

Figure 1 is a diagram of a telephone system as arranged for magneto lamp service; Fig. 2 is also a diagram of the system as arranged for common battery service; Fig. 3 shows the arrangement of the group of terminals and their connections for the system of Fig. 1, and Fig. 4 shows the said terminals connected for the system of Fig. 2.

It will facilitate an understanding of the invention to first describe the circuits involved which are shown in theoretical diagram in Figs. 1 and 2. Referring to Fig. 1 J and J² represent the spring jacks of the magneto telephone lines, the remainder of said lines not being shown since they are not particularly involved in the invention; but it will be understood that the lines are provided with magneto hand generators at the substations and with any suitable signaling devices at the central office responsive to said generators. The cord circuits of which only one is shown are each provided with an answering plug P and a calling plug P² having tip, sleeve and third contacts adapted to register with the corresponding contacts of the jacks when the plugs are inserted therein. The tip contacts *p* of the two plugs are joined by the flexible strands *t* and *t*² and the interposed condenser *c* while their sleeve contacts *p*² are similarly connected by the strands *s* and *s*² and the interposed condenser *c*². The third strands *v* and *v*² lead from the third contacts *p*³ of the plugs to other parts which will be hereinafter described.

A supervisory relay r provided with windings a and b is bridged across the answering end of the cord circuit and a similar supervisory relay r^2 also provided with windings a and b is bridged across the calling end of said circuit. A supervisory signal S is associated with the answering plug P and a similar signal S^2 is associated with the calling plug P^2 . A battery B furnishes current for the operation of these two signals, the local circuit of signal S being controlled through a spring d of the relay r , and containing a suitable pilot relay r^3 , while the local circuit of the signal S^2 is controlled through the similar spring d of the relay r^2 . Said battery also furnishes current to the locking circuits of said relays r and r^2 said circuits including the wire e connected with the live pole of the battery B and containing a suitable resistance f , said wire leading to the normally closed contacts g of the listening key h by means of which the ordinary telephone set is adapted to be connected with the cord circuit, thence by way of wire k to the point m from which it branches by the wire o to the forward contact of spring q of said relay r^2 , and thence through both windings a and b of the relay r^2 , spring u of said relay r^2 , and by way of the third strand v^2 to the sleeve contact of the plug P^2 . The other branch of said locking circuit extends by means of wire w to the forward contact of spring q of relay r , thence through the windings of said relay and by the way of spring u of said relay, its forward contact and the strand v to the third contact of plug P . A suitable ringing generator x is adapted to be connected with the cord circuit by the ringing key springs y .

The operation of the circuit described is as follows: A call coming in over the line connected with the jack J attracts the attention of the operator who inserts the answering plug P of her cord circuit in the said jack to receive the order from the calling subscriber. Upon learning the party wanted the calling plug P^2 is inserted in the jack J^2 of that line, and the ringing key is operated to call the party. After the conversation is ended the subscribers operate their hand generators to give the clearing-out signals and the current from said generators flows through the windings of one of the relays r and r^2 and energizes the same which causes the attraction of their armatures. The closing of the springs d upon their forward contacts competes the local circuits of the supervisory signals S and S^2 which are lighted to indicate to the operator the termination of the conversation. The closing of springs q and u upon their contacts completes the locking circuits above described and since the plugs P and P^2 are now inserted in the jacks the said circuits are completed through the test ring of the jacks

to ground, and said relays r and r^2 being thereafter maintained energized by current from battery B . When the operator takes down the connection, however, these locking circuits are opened and the supervisory signals are returned to normal condition. The operation of the listening key insures the opening of these locking circuits in case either relay had become accidentally operated and the locking circuit thereof closed at the relay before the operator had completed the connection.

In Fig. 2, which is the same circuit adapted for common battery service, the telephone lines for small common battery switchboards of this type are provided with spring jacks similar to, the spring jacks of the magneto lines at least in the feature that the third or ring contact is grounded. A second battery B^2 is shown in this diagram though it is to be understood that but one battery may be employed. In this arrangement the windings a and b of relay r are connected respectively between the strands t and s and the two poles of the battery B^2 . The relay r still controls the local circuit of the supervisory lamp S but the circuit of said lamp is now completed from the live pole of battery B^2 over the third strand v of the answering end of the cord circuit. The supervisory relay r^2 is now also bridged across the calling end of the cord circuit with the battery B interposed between its windings. In this instance also the supervisory signal S^2 has its circuit completed over the third strand v^2 . The operation as a common battery system is evident. The insertion of the plug P into the jack J in response to a call permits current from the battery B^2 to flow over that telephone line to operate the station transmitter and to energize the supervisory relay r which is operated to open the local circuit of the signal S , which circuit is now completed through the ring contact of the jack J to ground. After the wanted subscriber has been called the supervisory signal S^2 is lighted over the third strand v^2 , but is extinguished upon the response of said subscriber since current is fed to the line through the supervisory relay r^2 and energizes the same. At the termination of the conversation the two relays r and r^2 are deenergized and the lamps S and S^2 are lighted, when the cord circuits may be taken down and all parts restored to normal position.

Figs. 3 and 4 show the terminals which are preferably in the form of small brass punchings, provided with means for soldering the wire to each end of the same. These are symmetrically arranged close together in groups, one group for each cord circuit, and are numbered consecutively from 1 to 9 for each end of the cord circuit. The necessary wires of the two systems of Figs. 1 and 2 are

brought to these terminals and permanently soldered or otherwise connected thereto. They may be located at the back or side of the switchboard or at any other accessible point. In Figs. 1 and 2 these terminals are numbered the same as in Figs. 3 and 4 and are shown in connection with the wires of the circuits, the cross connecting wires being indicated by dotted lines. These cross connections of Fig. 1 correspond to those shown in Fig. 3, also in dotted lines and which are merely short wires of sufficient length to span the distance between the terminals that it is desired to connect and are preferably soldered thereto.

Comparing Figs. 1 and 3 the terminals 1, 1 are connected together and are included with their cross connecting wire in the conductor w ; the conductor between terminals 2 and 3 at each end of the cord circuit completes the connection between the third strand v or v^2 and the forward contact u of the relay r or r^2 ; terminals 4 and 5 at each end of the cord circuit are permanently wired to the inner ends of the windings a and b of the relays r and r^2 and are cross connected together as indicated in Figs. 1 and 3. Terminal 6 is connected with the back contact of spring d of relay r or r^2 and in Fig. 1 is not included in any circuit. Terminals 7 and 8 are cross-connected together in Fig. 1 to complete the local circuits of the supervisory signals S and S^2 . Terminal 9 is provided for the accommodation of the second battery B^2 which does not appear in the magneto lamp system.

Referring to Figs. 2 and 4 it will be observed from Fig. 4 that terminals 1 and 1 are no longer connected together. For the sake of clearness such unused wires are omitted from Fig. 2 although it will be understood that in practice it is unnecessary to tear out such unused wiring. Terminal 3 is now cross-connected with terminal 6, this being for the purpose of completing the local circuit of the supervisory signals S and S^2 over the third strands v and v^2 of the cord circuit. Terminal 7 in this arrangement is also left blank and is not used; hence is not shown. Terminals 4 and 8 are cross-connected together, this being necessary to connect the windings a of the relays r and r^2 with the grounded poles of the batteries. Terminals 5 and 9 are also joined as shown in Figs. 3 and 4 thus connecting the windings b of the said two relays to the live poles respectively of batteries B^2 and B . The battery B^2 is added to the installation if desired, but in this case it is necessary to cut the wire from the pilot relay r^3 to battery B . With one battery no such change would be necessary. It is thus seen that when a switchboard wired in accordance with my invention is furnished to an exchange where skilled labor is not employed, it is a simple

operation to change the short connecting wires from the arrangement of Fig. 3 to that of Fig. 4 in order to change the cord circuits over to a common battery system. It is evident that this is of advantage even where skilled labor is accessible since the time required to make the change is very short, and the service need not be interrupted at all whereas were it necessary to tear out the wiring and put in new the exchange could not give service for some time.

While in this description, I have alluded to the change from one particular type of circuit to another particular type, it is evident that the invention is in no wise so limited but that it may be employed in a variety of relations and for other circuits. I therefore do not wish to be limited in all respects and claims to the specific details of the particular method of carrying out the invention thus shown and described.

It will be understood that the condensers c and c^2 in the cord circuit strands should be of such capacity as to readily pass the voice currents but to prevent the passage of the slow alternating currents from the subscriber's hand generators; a condenser of one microfarad capacity has been found satisfactory for this purpose.

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

1. In a switchboard for telephone systems, the combination with telephone circuits having suitable apparatus associated therewith to enable the operator to establish different kinds of connections according to the manner in which the apparatus is connected in the system, of a group of connecting terminals located upon a convenient connecting rack and permanently wired to the apparatus of the system, said terminals being adapted to be connected together in one manner when the telephone circuits are used for one kind of connections and in another manner when the telephone circuits are used for another kind of connections, substantially as described.

2. In a switchboard for telephone systems, the combination with cord circuits having suitable apparatus associated therewith to enable the operator to establish connections with common battery or local battery subscribers' lines according to the manner in which said apparatus is connected into the cord circuit, of a group of terminals conveniently located upon the switchboard permanently connected with the said apparatus and adapted to be connected together by jumper wires in different manners to change the cord circuits according to the class of service with which they are to be used, substantially as described.

3. In a switchboard for telephone systems, the combination with cord circuits adapted

to be used to establish and supervise connections for conversation between subscribers' lines terminating in the switchboard, of a group of terminals to which the apparatus
 5 of the cord circuit is permanently connected, said group being located upon a convenient connecting rack, the system of the cord circuits being adapted to be completed in any
 10 of a plurality of forms by connecting said terminals together in different manners, substantially as described.

4. In a switchboard for telephone systems, the combination with a cord circuit to connect together for conversation lines terminating in the switchboard, of a connecting
 15 rack comprising a group of fixed terminals permanently connected with the apparatus of the cord circuit, a plurality of jumper wires adapted to be connected between said
 20 terminals in different manners to change the cord circuit from one system to another, substantially as described.

5. In a switchboard for telephone systems, the combination with a cord circuit to connect
 25 together for conversation the telephone

lines terminating in the switchboard, of a relay at each end of the cord circuit, a group of terminals, the cord circuit being so wired to the said terminals that by merely changing the connections between the terminals
 30 the said relays may be connected in a bridge at each end of the cord circuit or in a bridge thereof in series with a source of current, substantially as described.

6. In a telephone switchboard, the combination with central office apparatus, of a
 35 group of terminals located upon a connecting rack to which said apparatus is permanently connected, and jumpers adapted to be connected between said terminals in one
 40 manner or another to change the connections of said apparatus with the circuits of the switchboard, substantially as described.

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

CHARLES S. WINSTON.

Witnesses:

ROBERT LEWIS AMES,
 EDITH F. GRIER.