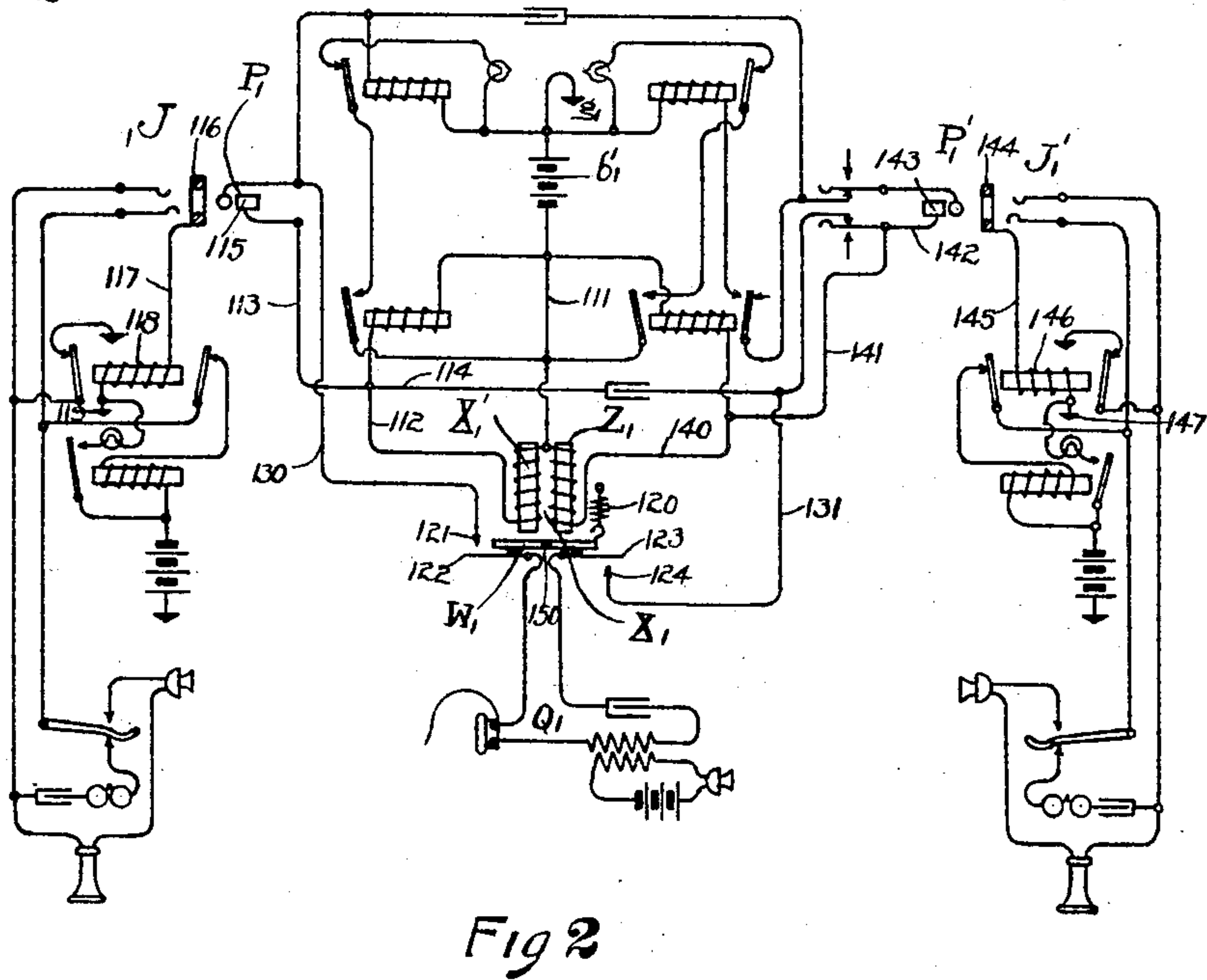
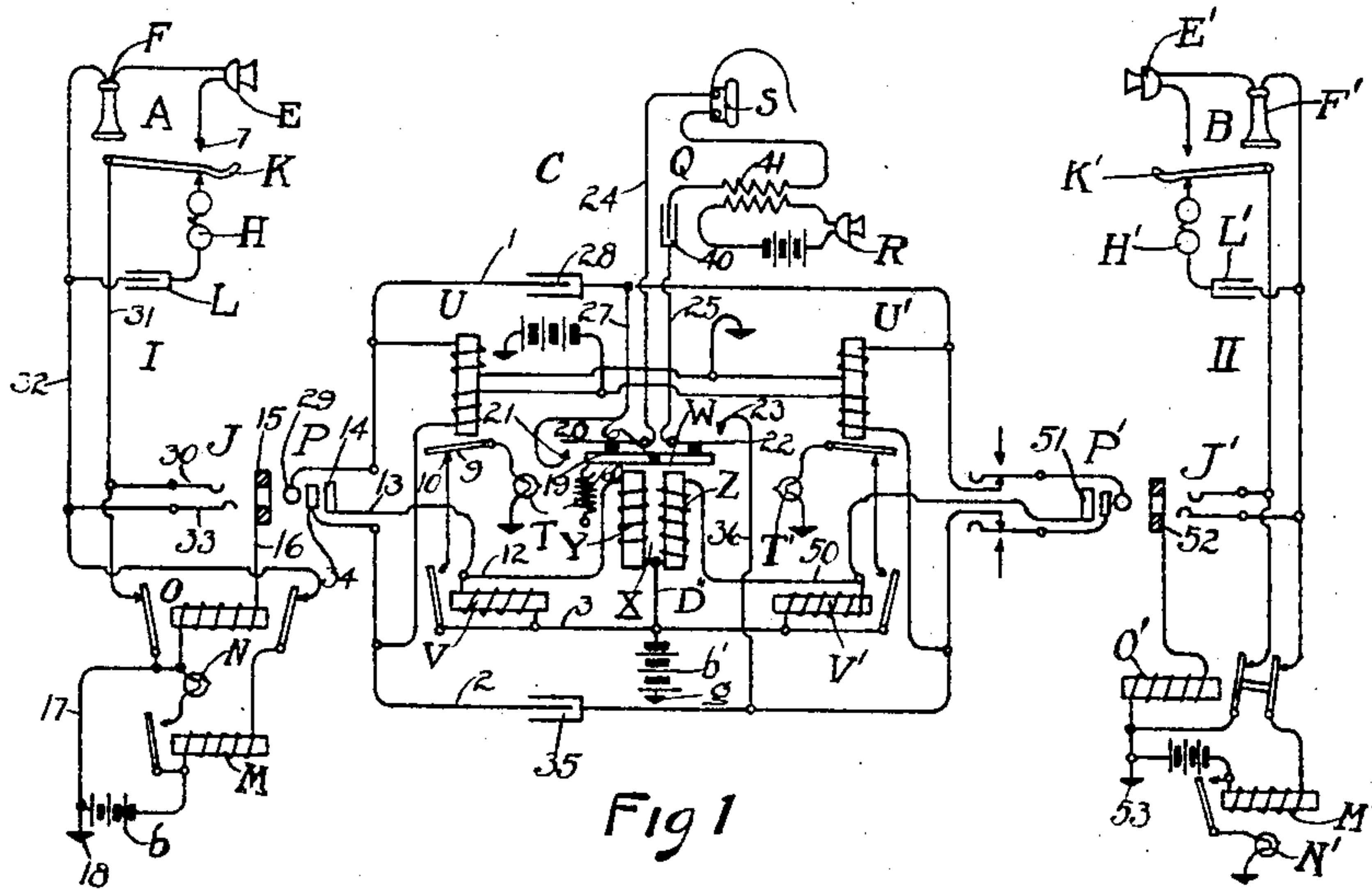


F. M. SLOUGH.
TELEPHONE SYSTEM.
APPLICATION FILED AUG. 14, 1914.

1,238,350.

Patented Aug. 28, 1917.



WITNESSES:
Meta M. Smithberger.
John H. Watson Jr

INVENTOR,
Frank M. Slough
BY J. O. Richey
His ATTORNEY.

UNITED STATES PATENT OFFICE.

FRANK M. SLOUGH, OF ELYRIA, OHIO, ASSIGNOR, BY MESNE ASSIGNMENTS, TO
STROMBERG-CARLSON TELEPHONE MFG. CO., OF ROCHESTER, N. Y., A CORPORATION OF NEW YORK.

TELEPHONE SYSTEM.

1,238,350.

Specification of Letters Patent.

Patented Aug. 28, 1917.

Application filed August 14, 1914. Serial No. 856,735.

To all whom it may concern:

Be it known that I, FRANK M. SLOUGH, a citizen of the United States, residing at Elyria, Lorain county, Ohio, have invented certain new and useful Improvements in Telephone Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to telephone systems, and more particularly I aim to produce a system in which the subscribers are guaranteed a secret conversation, the object of my invention being to automatically cut the operator on when the central station circuit is connected with the calling line, and automatically cut her off when connection is made with the called line. I aim to accomplish this object in a simple and efficient manner, reducing the number of relays which have to be employed, and thereby enabling my invention to be installed in switchboard cabinets constructed for circuits now in use, without increasing the capacity of the cabinets to take care of several additional relays.

Other objects of my invention and the invention itself will be better understood from a description of one or two embodiments of the invention.

Figure 1 is an embodiment of my invention employed with a three-conductor link circuit.

Fig. 2 is an embodiment employed with a two-conductor link circuit.

Referring first to the embodiment shown in Fig. 1, at I and II are shown telephone lines which lead from substations A and B to a central station C. For the sake of convenience, we will assume that I is the calling line and II the called line. I have shown single party lines, though multi-party lines may be used as well. Suitable means are provided at the main station C for connecting telephone lines together. I here show link conductors in the shape of a cord circuit D. Suitable switching means are provided for connecting the cord to the line, here shown as jacks J, J' and plugs P, P'. The cord circuit in Fig. 1 consists of the link conductors 1, 2 and 3, 1 and 2 constituting the talking strand and 3, the third strand of the cord circuit. The substation

set consists of the usual apparatus, here shown as transmitter E, receiver F, bell H, condenser L and hook switch K, at the station A; transmitter E', receiver F', bell H', condenser L' and hook switch K' at station B. The line relays are shown at M, M'; the line lamps at N, N' and the cut-off relays at O, O'. The operator's set at the main station is shown at Q, and here consists of the usual apparatus, including transmitter R and receiver S. The supervisory lamps are shown at T, T'; the supervisory relays at U, U' and V, V'. At X is shown a relay controlling the connection and disconnection of the operator's set to the talking strands of the cord circuit. This relay is provided with two coils Y and Z and an armature W. The armature W is pivoted at 6 and the coil Z is stronger than the coil Y as indicated by the fact that there are more windings upon this coil.

The apparatus shown in Fig. 1 operates as follows, assuming that the subscriber A desires to communicate with the subscriber B: Upon the closing of the switch K, a circuit will be completed through the relay M and the battery b, which will complete a circuit through the line lamp N, signaling the operator for a connection. The operator inserts the plug P into the jack J, completing a circuit through the cut-off relay O, the supervisory relay V, and the battery b', and energizing these relays. The relay O cuts off the line signal N and the line relay M. The relay V will be energized, but the supervisory lamp T will not be operated because at the time the circuit through the relay V was completed, a circuit through the relay U was completed over the talking strands of the cord, and the limbs of the line I. This relay will interrupt the circuit of the lamp T at 9-10. When the plug P is inserted into the jack J, a circuit will also be completed for the winding Y of the relay X, as follows: ground g—battery l'—conductor 11—winding Y—conductor 12—conductor 13—contact D of the plug P—thimble 15 of the jack—conductor 16—O—17—to ground at 18. The winding Y will be energized, attracting the end 19 of the armature W and moving the same about the pivot 6, so that the contact 20 engages with the contact 21 and the contact 22 engages with the contact 23, connecting the operator's set Q

to the talking strands of the cord circuit through the lines 24, 25. The operator will then communicate with the subscriber at A over the following circuit beginning at the
 5 receiver S of the set Q—conductor 24—20—19—27—condenser 28—conductor 1—tip 29 of the plug—tip spring 30—limb 31 of the calling line—K—7—E—F—32—sleeve spring 33—sleeve contact of the plug 34—
 10 conductor 2—condenser 35—conductor 36—23—22—25—condenser 40—coil 41, back to S.

Learning that it is the subscriber at B that is wanted, the operator will, assuming
 15 that the line II is idle, insert the plug P' into the jack J'. This will complete a circuit through the winding Z of the relay X, as follows: $g-b'-11-Z-50-51-52-O'$ —to ground at 53, energizing the coil Z, which
 20 being stronger than the coil Y, will overcome the effects of the coil Y and return the armature W to its normal position shown in Fig. 1, disconnecting the operator from the
 25 talking strands of the cord circuit. It will thus be seen that the operator is permanently and effectively disconnected from the cord circuit, and that she cannot listen in upon the conversation which follows the
 30 ringing and answering of the called subscriber.

When the conversation is finished, the supervisory signal is operated in the well known way, and the system is restored to normal.

35 In the operation of the form shown in Fig. 2, the circuit of the winding Y_1 will be completed when the plug P_1 is inserted into the jack J_1 , as follows: ground g_1 —battery b_1' —conductor 111—winding Y_1 —conductor
 40 112—portion 113 of the talking strand 114 of the cord circuit—contact 115 of the plug—contact 116 of the jack—conductor 117—relay 118—to ground at 119. The winding Y_1 will be energized, attracting
 45 the armature W_1 to overcome the action of the spring 120, closing the switches 121—122 and 123—124 and completing the connection of the operator's set Q_1 to the cord circuit through the conductors 130 and 131.

50 When the plug P'_1 is inserted into the jack J'_1 a circuit is completed for the winding Z_1 of the relay X_1 , as follows: g_1 —battery b_1' —111— Z_1 —140—141—portion 142 of the talking strand—143—144—145—146
 55 to ground at 147. The winding Z_1 being stronger than the winding Y_1 attracts the armature W_1 , rotating it about the pivot 150 and disconnecting the operator's set from the cord circuit.

60 The other features of the operation of this

circuit will be apparent from the description of the operation of the circuit in Fig. 1.

It will be apparent that the coils Y and Z of the relay X may be mounted in any suitable manner, and that they may be so placed
 65 together as to make a very compact structure, occupying little more space than the other relays illustrated in the drawing. With this arrangement the secret listening
 70 service may be installed in switchboards already in use, without increasing the size of the cabinets or otherwise enlarging their capacity.

I claim:—

1. In a telephone system, the combination
 75 of telephone lines, link conductors for connecting the lines together, switching means for connecting the link conductors to the telephone lines, an operator's set, conductors for connecting the operator's set to the link
 80 conductors, apparatus controlling such operator's set conductors, said apparatus including a differential relay, one of the windings of which is stronger than the other
 85 winding, a circuit for each winding, including a portion of the talking strand and contacts of said switching means.

2. In a telephone system, the combination
 90 of telephone lines, a cord circuit for connecting the lines together, plug and jack switching means for connecting the link conductors to the telephone lines, an operator's set, conductors for connecting the operator's
 95 set to the cord circuit, apparatus including a differential relay, controlling said conductors, one of the windings of said relay being stronger than the other, a circuit for each relay winding, including a portion of the talking strand and plug and jack con-
 100 tacts.

3. In a telephone system, the combination
 105 of a called and a calling line, a cord circuit, an answering switch to connect the cord to the calling line, a calling switch to connect the cord to the called line, an operator's set and means including a differential relay to connect and disconnect said set to said cord, said relay having two windings, one
 110 stronger than the other, and a circuit for the stronger winding including a portion of a talking strand of the cord and contacts of the calling switch.

In witness whereof, I have signed my name in the presence of two witnesses this
 3rd day of August, 1914.

FRANK M. SLOUGH.

Witnesses:

GEO. E. ROBERTS,
 J. C. SNYDER.