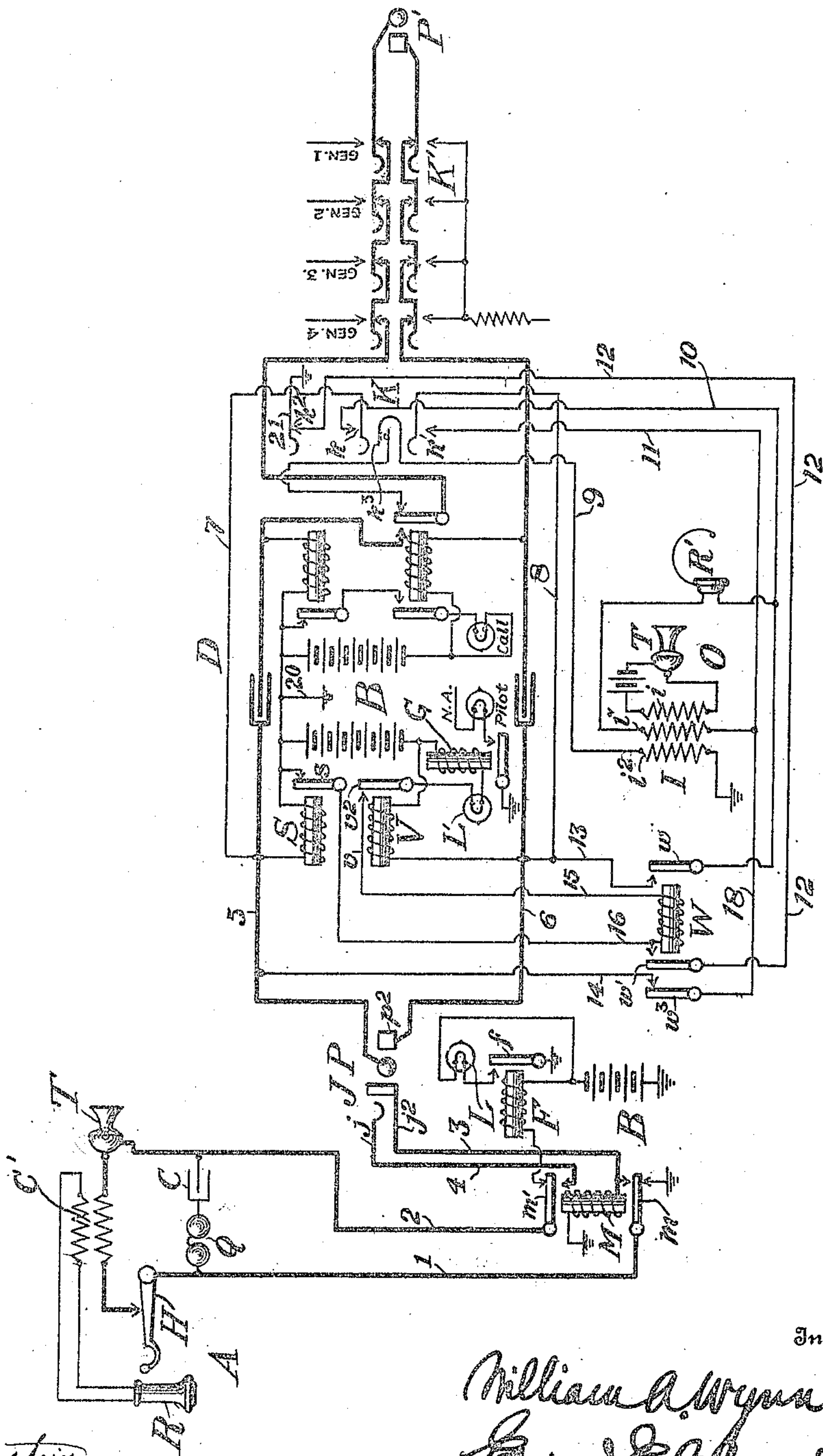


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# UNITED STATES PATENT OFFICE.

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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, WILLIAM A. WYNNE, a citizen of the United States, residing at Raleigh, in the county of Wake and State of North Carolina, have invented certain new and useful Improvements in Telephone Systems, of which the following is a specification, reference being had therein to the accompanying drawing.

My invention relates to telephone systems, and has for its object the provision of means whereby without any change in the substation equipment, a subscriber on a common battery circuit may connect his telephone directly with the answering operator's telephone, without the intervention of the ordinary listening key.

I attain my object by providing in the usual common battery cord circuit branch connections to the operator's telephone controlled by the subscriber through the cord relay or relays. I preferably employ an auxiliary connecting relay controlled jointly by the cord relays and make this auxiliary relay self-locking, carrying the locking circuit therefor through a contact on an operator's cut-out key. The subscriber need only vibrate his hook once in order to talk to the operator, and the operator need only throw over her cut-out key in order to clear herself.

My invention is illustrated in the accompanying drawing in which the figure is a diagrammatic representation of a subscriber's line and an operator's cord circuit including my listening relay.

Referring to the drawing, A is a subscriber's station, provided with the usual common battery equipment, represented as comprising a transmitter T, a receiver R, switch-hook H, ringer Q, condenser C and induction coil C'. This station is connected with a central office marked D, by means of line wires 1—2, terminating at contacts shown as armatures  $m$ ,  $m'$ , of a cut-off relay M, which normally connect them to the ground, and to the line relay F, respectively. On the other side, the relay F is connected to the main battery B, and it controls an armature  $f$ , to open and close the circuit of the line lamp L in the usual manner. Extensions 3 and 4 of the line wires pass from the cut-off relay to the sleeve and spring  $j^2$  and  $j'$  of the jack J. As all the subscribers' lines may be arranged in the

same manner, and provided with the same equipment, I have only shown the one.

To interconnect the lines, I provide the cord circuit 5—6, terminating at one end in the answering plug P, and at the other end in the calling plug P'. The tip and sleeve contacts  $p'$ ,  $p^2$  of the answering plug cooperate with the corresponding contacts of the jack J to connect the line to the cord. Associated with the calling plug P' is a ringing key K', shown as having a plurality of springs for selective ringing, but which may be of any desired type, and combined with the listening key if found expedient. The latter key is marked K, and in the present case has four pairs of contacts marked  $k$ ,  $k'$ ,  $k^2$  and  $k^3$  respectively. The first two of these when closed connect the wires 10 and 11 leading from the operator's telephone set O, to the wires 7 and 8 leading to the cord conductors 5 and 6. The third contact  $k^2$  while closed connects the wire 12 to ground at 21, and when the key is used, this ground is cut off. The wire 12 is the locking wire of the special listening relay W, whose windings are otherwise connected through wires 15 and 16 to contacts  $v$  and  $s$  of the sleeve and tip relays V and S, of the answering end of the cord. These two relays control the answering supervisory lamp L', and derive their current from the main battery during conversation, in the usual manner.

The fourth pair of contacts of the listening key, shown at  $k^3$ , are in the test wire 9, extending from the normally closed back contact of the sleeve supervisory relay of the calling end of the cord, to a tertiary winding  $i^2$  of the induction coil I of the operator's set. The other windings,  $i$  and  $i'$ , of this coil are the usual primary and secondary windings, the first in circuit with the operator's transmitter T', and the second with the operator's receiver R' and the circuit wires 18—19. These two wires extend from their junction with the wires 10—11, to the contacts  $w$ ,  $w^2$  of the listening relay W; and their cooperating contacts are connected through the wires 13 and 14 respectively to the cord conductors 6 and 5.

The foregoing description is sufficient to enable my invention to be understood, the pilot relay G, with its lamp, the condensers in the cord, and the other parts and connections required for complete operation being



of the usual or any desired type and arrangement.

The operation of this system is as follows: To make a call, the subscriber at A removes his receiver from the hook, closing the line circuit and energizing the line relay F over the following path: B, F,  $m'$ , 2, T, H,  $l$ ,  $m$ , and ground to B. The lamp L thereupon lights, by reason of the closing of the contacts at  $f$ . The subscriber's operator inserts the answering plug P in the jack J, closing circuit of the cut-off relay M of the line, and the sleeve relay V of the cord as follows: B (in cord), V, 6,  $p^2$ ,  $j^2$ , 3, M, and ground to B. M is thereupon energized, pulling up the contacts  $m$  and  $m'$ , disconnecting the wires 1 and 2 from the ground and the relay F, and connecting them to their extensions 3 and 4. Current then flows through the line circuit and the tip relay S as follows: B (in cord), V, 6,  $p^2$ ,  $j^2$ , 3,  $m$ ,  $l$ , H, T, 2,  $m'$ , 4,  $j'$ ,  $p'$ , 5, S, and ground 20 to B. Relay V comes up first, simultaneously with M, followed by S. For a brief interval therefore the circuit of relay W is closed as follows: B, G,  $L'$ ,  $v^2$ ,  $v$ , 15, W, 16,  $s$ , 20 to battery. This interval is very brief however, and cannot be relied upon to permit the energization of relay W. The subscriber is therefore instructed to first take down his receiver, and then if he wishes quick service, to press down his switch-hook once with his finger. The plug P is supposed to be inserted instantly, but if not, the calling act on the part of the subscriber can be repeated, as this is the natural way to attract the operator's attention. After the plug has been inserted, the depression of the hook H by leaving the line open for a moment, deenergizes the relay S, thereby closing the circuit of relay W already traced. This relay pulls up its armature, and closes contacts at  $w$ ,  $w'$  and  $w^2$ .  $w$  and  $w'$  connect the wires 13 and 14 to the operator's circuit 17 and 18, while the contact  $w^2$  closes a locking circuit for the relay W as follows: B, G,  $L'$ ,  $v^2$ ,  $v$ , 15, W,  $w'$ , 12,  $k^2$ , 21 and ground back to B. The operator's set is thus bridged across the cord conductors, and when the subscriber releases the hook, a complete talking circuit is established between his station and the operator as follows: T, H,  $l$ ,  $m$ , 3,  $j^2$ ,  $p^2$ , 6, 13,  $w$ , 17, R',  $i'$ , 18,  $w^2$ , 14, 5,  $p'$ ,  $j'$ , 4,  $m'$ , 2, T. The relay S immediately pulls up when this circuit is established, but without effect on the relay W, which remains locked on the wire 12 as long as the listening key K is in its normal or disused position. The subscriber can give the number wanted, or otherwise communicate with the operator, without delay, and if she wishes to cut herself off, she has only to throw down her key K, thereby opening the contacts  $k^2$ , and depriving the wire 12 of its ground, thus deenergizing the relay W.

This operation of the key follows the taking of the number in the ordinary routine, if the switchboard has multiple jacks, for the reason that the operator will then find it necessary to close wire 9 to her tertiary coil  $i^2$ , for testing.

After a connection is established, the calling subscriber may at any time connect his line direct to the operator in the same manner as before, and each time she will clear herself in like manner. At the conclusion of a conversation, when the calling subscriber hangs up his receiver, the deenergization of relay S will again bridge the operator's set, producing a click in her ear, and at the same time enabling her to ascertain without any additional act, that the lines are dead and should be disconnected. This, taken with the supervisory lamp  $L'$ , cuts down the disconnect time by an estimated average of one second, or more than twenty-five per cent., giving an increase in efficiency of the cord equipment of from three to five per cent. For emergency calls, and for recalls, it gives correspondingly increased efficiency, with the single drawback that the calling subscriber may at times succeed in listening in on the operator. This can be prevented however, by keeping all the listening cams of unused cords thrown down, or better still, by making the contacts  $k^2$  separate from the listening keys. Even with the arrangement already described, the operator can always cut off the listener by a momentary pressure on the corresponding listening key. If a separate cut-out key is employed it is preferably common to all the cords on one position.

It is to be understood while I have shown a specific type of common battery circuit herein, I am not limited thereto. The gist of the invention lies in the employment of the self-locking relay W, with means under control of the operator for deenergizing it at will.

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

1. In a telephone system, a plurality of subscribers' lines, operators' connective link circuits for interconnecting the lines, an operator's telephone set and talking circuit, means associated with a link circuit and adapted to be placed under the control of a calling subscriber, to enable said subscriber to connect his line with the operator's talking circuit, and a locking device controlled by said means in its actuation.

2. In a telephone system, a plurality of subscribers' lines, operators' connective link circuits for interconnecting the lines, an operator's telephone set and talking circuit, means associated with a link circuit and adapted to be placed under the control of a calling subscriber, to enable said subscriber



to connect his line with the operator's talking circuit, a locking device controlled by said means to maintain the connection after the subscriber's control has ceased, and means controlled by the operator for unlocking the same.

3. In a telephone system, subscribers' lines, an operator's cord circuit for interconnecting said lines provided with supervisory relays, means controlled by the action of one of said relays for connecting the talking strands of the cord with the operator's telephone set, and a self-locking device controlled in the actuation of said means.

4. In a telephone system, subscribers' lines, an operator's cord circuit for interconnecting said lines, tip and sleeve supervisory relays in said cord circuit, an auxiliary relay controlled through the joint action of said tip and sleeve relays for connecting the operator's head-set to the talking strands of the cord, and a locking circuit for said auxiliary relay closed when the same is energized.

5. In a telephone system, subscribers' lines, an operator's cord circuit for interconnecting said lines, tip and sleeve supervisory relays in said cord circuit, an auxiliary relay controlled through the joint action of said tip and sleeve relays for connecting the operator's head-set to the talking strands of the cord, a locking circuit for said auxiliary relay closed when it is energized, and means under the control of the operator for breaking said locking circuit.

6. In a telephone system, subscribers' lines, an operator's cord circuit for interconnecting said lines, tip and sleeve supervisory relays in said cord circuit, an auxiliary relay controlled through the joint action of said tip and sleeve relays for connecting the operator's head-set to the talk-

ing strands of the cord, a locking circuit for said auxiliary relay, and an operator's key having normally closed contacts in said locking circuit adapted to be opened by the operator to deenergize the relay and disconnect her telephone at will.

7. In a telephone system, a plurality of subscribers' lines, an operator's link for interconnecting the same, a source of current and a pair of supervisory relays bridged on said link circuit, an auxiliary listening relay jointly controlled by said supervisory relays, one of which is adapted to become energized when the link is connected with a line and the other to respond to the act of the subscriber in opening or closing the line circuit at his station, a locking circuit for said auxiliary relay, and an operator's listening key for the locking circuit, together with an operator's telephone set and talking wires, connected in parallel to contacts of the auxiliary relay and contacts of the listening key respectively, said listening key having an extra normally closed pair of contacts included in the locking circuit; whereby the energization of one supervisory relay due to connection of the link and the deenergization of the other due to the act of the subscriber, will cause the supervisory relay to connect the operator's talking circuit to the talking conductors of the link circuit, this connection being maintained after the subscriber restores his line to talking condition, and being finally terminated by deenergization of the auxiliary relay when the operator actuates the listening key.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM A. WYNNE.

Witnesses:

JAMES H. MARR,

CHARLES LOWELL HOWARD.