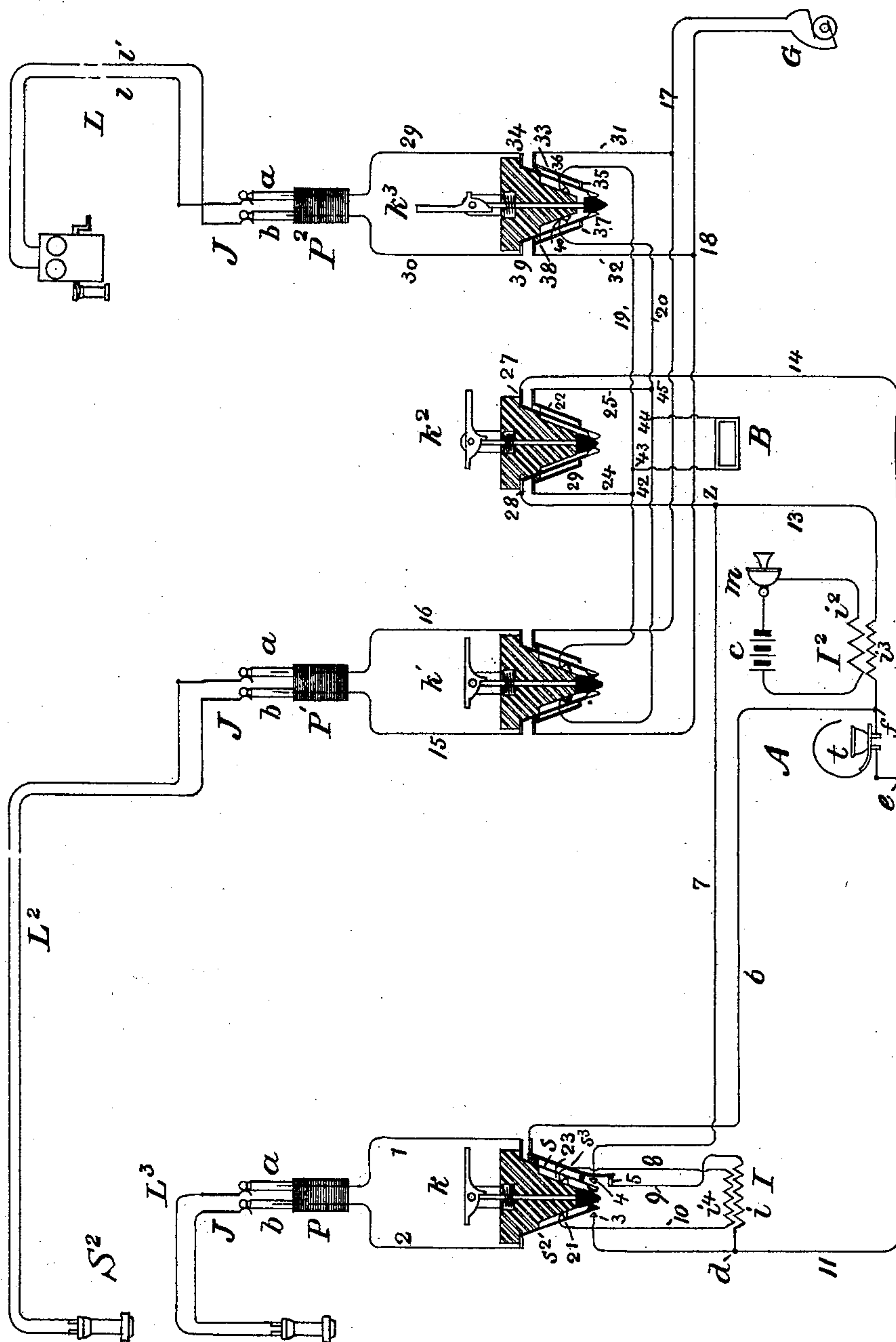


(No Model.)

A. S. HIBBARD.
TELEPHONE EXCHANGE APPARATUS.

No. 482,174.

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Witnesses.
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UNITED STATES PATENT OFFICE.

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TELEPHONE-EXCHANGE APPARATUS.

SPECIFICATION forming part of Letters Patent No. 482,174, dated September 6, 1892.

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To all whom it may concern:

Be it known that I, ANGUS S. HIBBARD, residing at New York, in the county of New York and State of New York, have invented certain Improvements in Telephone-Exchange Apparatus, of which the following is a specification.

In some classes of telephone-exchange work, especially where long-distance circuits extending between two central offices are involved, it is often more convenient, expeditious, and economical to employ a talking-circuit between the said two offices, used wholly for exchanging orders and instructions, than to employ call-bells or other arbitrary signal-call devices. Where this is done, there are then usually three classes of circuits—viz., first, sub-station circuits or local lines; second, interurban circuits extending to distant cities, and, third, one or more of the talking-circuits to which I have already referred.

For the purposes of this specification I shall hereinafter briefly designate these different classes of circuit as "local lines," "trunk-lines," and "order-lines," and it is to be understood that the work of the central office is to connect the local with the trunk lines (which both may likewise be grouped together and designated as "service-lines") upon instructions received over the order-lines. The operators must be enabled to receive and transmit orders over the order-line and also to listen and talk over the local lines while supervising their operation and, if possible, to perform both of these duties by means of a single set of instruments, it being manifestly unreasonable to require an operator to properly manage two independent sets of instruments, one for the order-wire and the other for the local lines. Such a practice, moreover, would be slow and inconvenient; but it is also highly undesirable that orders and instructions received on the order-wire shall be heard by the customers connected with the local wires of a telephone-exchange, as would be the case if the operator's transmitting and receiving instrument were included at all times in the circuit of the said order-wire and were also looped as

frequently as is required into the circuit of the connecting-link between any two local lines or between a local line and a trunk-line.

In view of these considerations the object of my invention is to enable the operator at a central station with but one set of instruments to remain at all times in receiving connection with the order-wire, at will to connect the transmitter also with the said order-wire for the interchange of office communications, and to connect freely with local or trunk lines, or both, without disconnecting the receiver from the order-line and without confusion or interference between the messages traversing the order and local lines, respectively.

In ordinary telephone-exchange work it is customary to connect any two circuits in a switchboard by means of a pair of plug-connectors united by flexible conductors, the said plugs in such operation being thrust into plug-sockets belonging to the two lines, respectively. For metallic circuits of course two flexible conductors and double conductor-plugs are required. A "listening-key," so called, is provided for each connecting-link, which when turned into a given position connects the operator's telephone outfit therewith in a manner well understood.

My invention consists in combining with this telephone outfit and its ordinary connecting apparatus a repeating-coil, a local circuit including the operator's receiving-telephone and one helix of such coil, a second local circuit including the secondary helix of the transmitter induction-coil as well as the receiver, an order-circuit, and a circuit-changing switch which in one position connects the order-circuit with one helix of the repeating-coil, maintains closed the local circuit through the remaining helix of said coil and the receiving-telephone, and maintains open the other local circuit, which includes the transmitting as well as the receiving telephone, and in a second position disconnects the order-circuit from the repeating-coil, closes it directly through the transmitter and receiver circuit, and opens the local receiver-circuit. It consists, also, in providing an order-circuit and a series of service-circuits, together with the

usual set of operator's telephones, comprising a single receiver and transmitter and the usual switch or key whereby the terminals of a loop including the said telephones may be
 5 connected with or disconnected from the said service-lines, and in combining these with suitable appliances whereby the receiver only may remain in permanent connection with and receive signals from the order-circuit without
 10 interfering with its free use upon the service-circuits and without producing confusion between the two sets of circuits, and whereby the transmitter, also, may be connected with such order-circuit. The order-circuit as gen-
 15 erally operated extends between two independent central stations. It is, however, obvious that it may readily be used in the same way between two parts of the same office and that when so used my invention is equally ap-
 20 plicable thereto.

In the drawings which accompany and are a part of this specification, and which are altogether diagrammatic, A is a central tele-
 25 phone-station, to which may converge any number of local lines L and trunk-lines L², both being service-lines, and also order lines or circuits L³. One of these last may be sufficient for the work of a large number of
 30 trunk-lines and is used solely for giving orders concerning the connections which are to be made between service-lines.

The call-receiving annunciators of the service-lines are not shown, they not being concerned in this invention, and for the same
 35 reason I have shown of the switching devices only such a portion as seems sufficient for purposes of illustration.

The local line L enters from the sub-station by wires l and l' and connects with the
 40 spring-jacks J. The trunk-line L² extends between the central station A and a distant central station S², as does also the order-circuit L³, all of these being shown as metallic circuits.

Both trunk and order circuits are provided with plug-sockets J at the central station A, but for different purposes, that of L² being
 45 for interconnections, but that of L³ simply for connection with the telephones for the reception and transmission of orders. P' and
 50 P² are the usual plug-connectors, the conducting-stems a of the two being united through suitable conductors, partly extending through flexible cords, while in the same way the con-
 55 ducting-stems b of the pair are also united.

As shown, the trunk-line L² is by means of the link connection so constituted joined to the local line L. Ringing-keys k' and k³ are
 60 provided for each link connection, and their office is to bring the line connected with their respective plugs into association with the office-call generator for the purpose of sending outgoing calls. In the drawings the key k' is
 65 shown as being depressed, while k³ is elevated and in the act of sending a call over the local line L. To accomplish this, the two

plug-conductors 29 and 30 are united in the key to contact-springs 34 and 39. These during a communication rest, as in key k', on the
 70 contact-pieces 36 and 40, which lead by the main link-connection wires 19 and 20 to similar pieces on the other ringing-key and their
 75 contact-springs and to the conductors 15 and 16 of the second plug; but, the key k³ being depressed in the act of ringing, the springs 34
 80 and 39 are forced away from the contact-pieces 36 and 40 and in lieu thereof are caused to make contact at 35 and 37 with outer con-
 85 tact-springs 33 and 38, which form branch terminals, respectively, through the wires 31
 90 and 32 of the mains 17 and 18 of the call-generator G, and the call-currents are thus enabled to pass to line.

The disconnecting-annunciator B is, as usual, bridged between the main link conduct-
 95 ors 19 and 20 from the points 43 and 44.

The operator's transmitter m is, as usual, connected up in a short circuit including a battery c and the primary helix i² of an in-
 100 duction-coil I² i³, being the secondary helix of the same coil, and it is to be understood that wherever it is stated that the transmitter is
 105 connected in or withdrawn from a given conversation-circuit it is the said secondary helix which is meant. This, together with the op-
 110 erator's receiver t, is included in a loop composed of the wires 13 and 14, of which the con-
 115 tact springs 28 and 27 in the circuit-controlling key k² are respectively the terminals. This telephone-loop in practice may be of
 120 course extended to a number of such pairs of contact-springs, each controlled by their own key and each connected with a separate pair
 125 of plugs.

When the key is in the position shown, the
 130 telephone-loop is disconnected from the link connection; but by turning the key k² into a vertical position the terminal springs 27 and 28 are forced into contact with complemen-
 135 tary springs 22 and 29, which are united by branches 25 and 24 at the points 45 and 42, respectively, with the main link conductors
 140 20 and 19. When this connection is made, the telephones are thereby bridged between the said two main conductors and can communi-
 145 cate with any line connected with either or both plugs. So far the appliances described are not new.

The plug P may permanently be inserted in the socket J of the order-circuit, and its con-
 150 ducting-stems a and b are connected by wires 1 and 2 with the contact-springs s and s² of a special compound circuit-controlling switch or key k. These springs have front contact-
 155 pieces 21 and 23, with which they make contact when the key k, as shown, is in its horizontal position and its spindle therefore ele-
 160 vated, and rear contact-pieces 3 and 4, with which they make contact when the key is placed in its vertical position. It also is pro-
 165 vided with an additional contact-spring s³ and an extra contact-point 5 therefor.

I is a repeating induction-coil having one of its helices i^4 connected by wires 10 and 8 with the front contact-pieces 21 and 23, and thereby (the key being in the position shown) included in the order-circuit. The other helix i of the repeating-coil is by wire 9 attached to contact-point 5 and to any point d on wire 11, leading in one direction to the receiving-telephone and in the other to the rear key contact-piece 3. From the remaining terminal of the receiving-telephone a conductor 6 extends to the additional key contact-spring s^3 , which (the key still being in the position shown) is in contact with the extra piece 5. Thus the order-circuit is closed through one helix of the repeating-coil and the receiving-telephone circuit through the other, and incoming orders are readily received by the said telephone, which ordinarily remains inductively connected with the said order-circuit at all times.

Although the said telephone is often simultaneously connected with the service-circuits, also, there is no interference with the service, the connection between the telephone and the order-circuit being made through a repeating-coil and the only section of conductor common to both circuits being that short section which includes the receiver and which extends from the point e on one side thereof to the point f on the other side. The path of the ordinary supervising telephone-circuit from one of its key contact-springs 27 to the other 28 is by wire 14, point e , receiver t , point f , induction-coil secondary i^3 , wire 13, and spring 28.

The path of the order-circuit through the receiver only, beginning at the telephone itself, is from receiver t , point f , wire 6, auxiliary spring s^3 in key k , contact-point 5, wire 9, repeating-coil winding i , point d , wire 11, point e , and from thence to the other terminal of the receiver; but it is sometimes desirable to speak as well as listen over the order-circuit, when it is, of course, necessary to use the transmitter. In order to accomplish this, I extend the wire 11, leading from the receiver, as already stated, to the key rear contact-point 3 and lead a wire 7 from a point z on wire 13, which extends from the secondary coil i^3 to the spring 28, and to the rear contact-point 4 of the key k . Thus two independent loop-circuits—one including the receiver only and the other employing a part of the conductors of the first and including both receiver and transmitter—are formed, which extend toward the order-circuit, either of which, according to the position of the key k , can be worked in connection therewith. By this I arrange that when the key k is changed to its vertical position the original receiver-circuit is opened at 5 and the original order-circuit through the induction-coil helix i^4 is opened at the points 21 and 23; but the order-circuit is at the same time closed at the points 3 and 4 through a

new operator's circuit including both receiver and transmitter.

By my invention it becomes possible for an operator engaged in answering calls, supervising connections, or other work involving conversation with local lines to remain listening in, on an order-circuit without the interference in any way of one of these functions with the other.

Having now fully described my invention, I claim—

1. The combination, with a series of telephone service-circuits, an order-circuit, an operator's receiving-telephone, and a circuit-changer controlling the connection of said telephone with the said service-circuit, of a repeating-coil having one of its windings connected with the order-circuit and an independent loop extending from the terminals of the said receiving-telephone and formed into a closed circuit with the other winding of the said repeating-coil, substantially as described.

2. The combination, with a series of telephone service-circuits, an order-circuit, operators' receiving and transmitting telephones, and a circuit-changer controlling the connection of said telephones with the said service-circuits, of two independent loop-circuits, one including the receiving-telephone only, and the other including the transmitter also, a repeating induction-coil, and an auxiliary circuit-changer or switch-key controlling the relations of the terminals of the said two loops, the repeating-coil, and the order-circuit and adapted in one position to connect one winding of the said coil with the order-circuit and to form the other winding thereof with the receiving-telephone loop into a closed circuit and in a second position to disconnect the said repeating-coil from the said two circuits and to close the order-circuit through the said second loop containing the said receiving and transmitting telephones, substantially as described.

3. The combination, substantially as hereinbefore described, of a series of telephone service-circuits, flexible link conductors terminating in plug-connectors for uniting any two such circuits, an operator's receiving and transmitting telephone, and a listening-key interposed between the said telephone outfit and the said link conductors and adapted to connect the said telephones therewith and disconnect them therefrom, with an order-circuit, a repeating-coil, a local circuit including the said receiving-telephone, a second and normally-open local circuit including the secondary helix of the transmitter induction-coil as well as the receiver, and a circuit-changing switch interposed between the terminals of the said local circuits and the order-circuit and so constructed and connected that when placed in one position the order-circuit is closed through one helix of the repeating-coil and the receiving-telephone local circuit

through the other, the second local circuit remaining open, and so that when placed in a second position the circuits of the repeating-coil are both opened, while the local circuit, which
5 includes both transmitter and receiver, is connected directly with the order-circuit, substantially as described.

In testimony whereof I have signed my

name to this specification, in the presence of two subscribing witnesses, this 24th day of 10 May, 1892.

ANGUS S. HIBBARD.

Witnesses:

C. R. BANGS,

A. E. HOLCOMB.