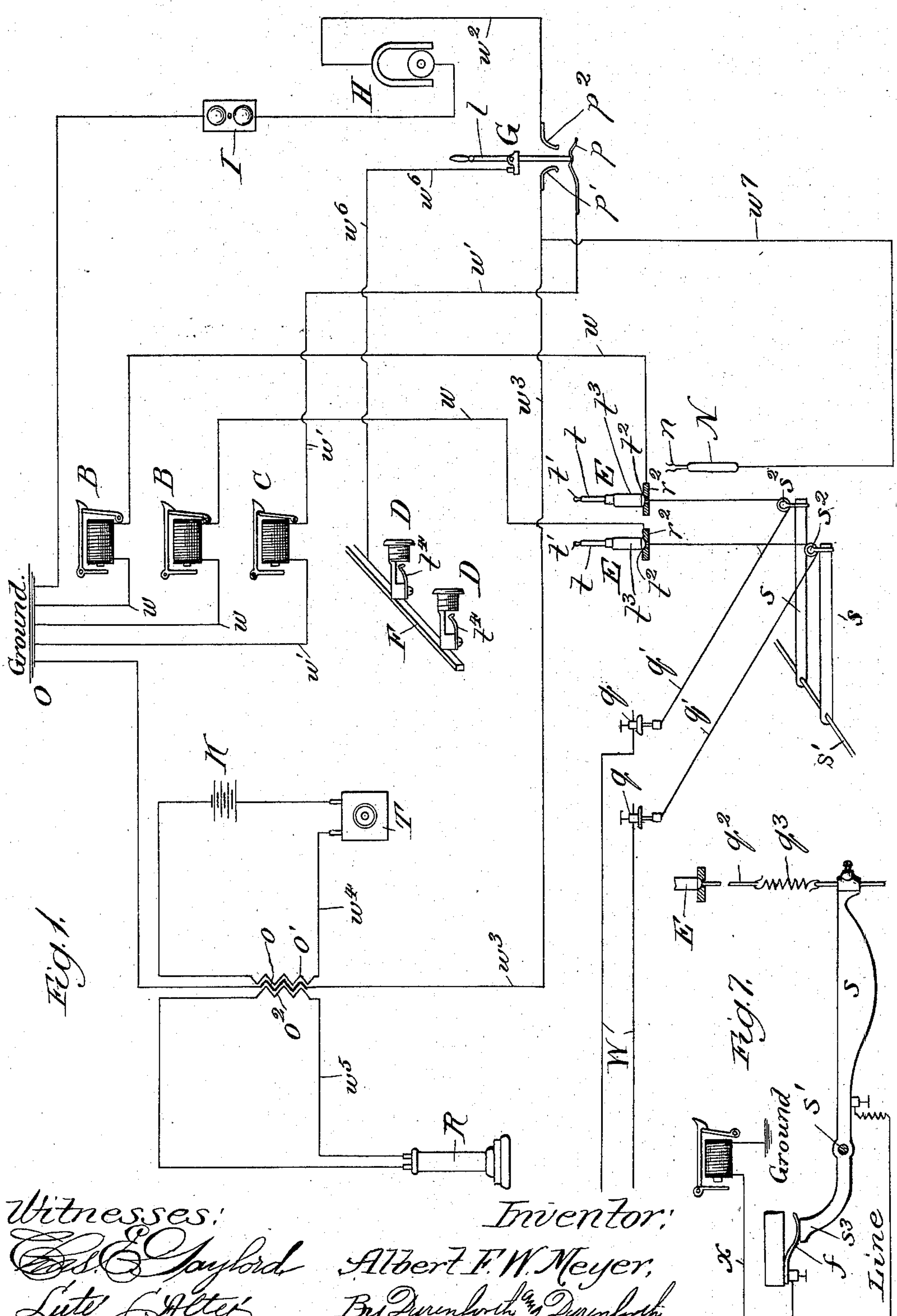
(No Model.)

2 Sheets—Sheet 1.

A. F. W. MEYER.

TELEPHONE EXCHANGE SYSTEM.

No. 565,627. Patented Aug. 11, 1896.



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(No Model.) 2 Sheets—Sheet 2.

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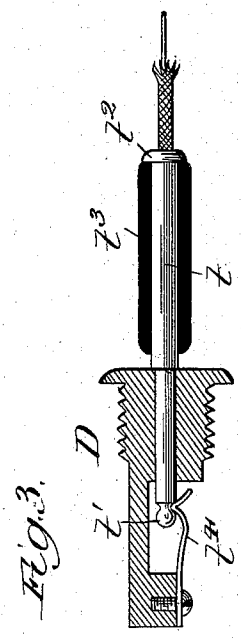

Fig. 3.

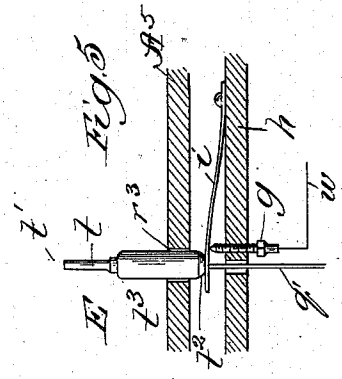

Fig. 5.

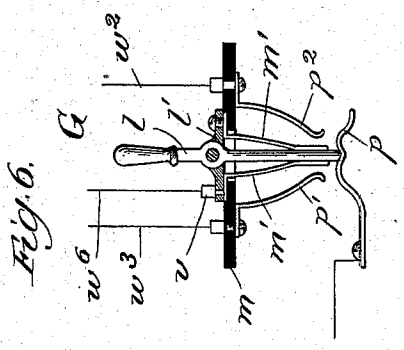

Fig. 6.

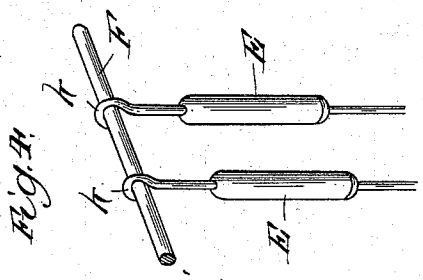

Fig. 4.

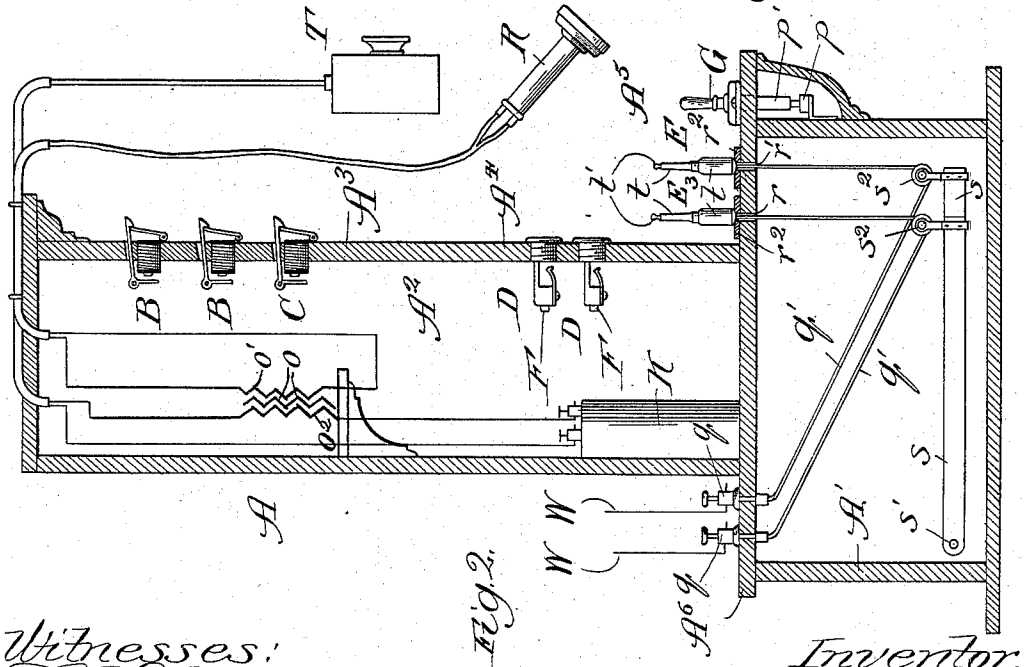

Fig. 2.

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UNITED STATES PATENT OFFICE.

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TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 565,627, dated August 11, 1896.

Application filed August 8, 1895. Serial No. 558,581. (No model.)

To all whom it may concern:

Be it known that I, ALBERT F. W. MEYER, a citizen of the United States, residing at Blue Island, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Telephone-Exchange Systems, of which the following is a specification.

The object of my invention is to provide a generally-improved construction of telephone-switchboard and its connections whereby, among other advantages, confusion shall be avoided by avoiding crossing of the connecting-lines in the exchange and whereby the means for effecting switching at the exchange shall be rendered peculiarly simple, rapid, and effective.

Referring to the accompanying drawings, Figure 1 is a diagram showing the various circuits employed in my improved switchboard mechanism. Fig. 2 is a vertical sectional view of my improved switchboard, with several of the circuits, however, omitted by reason of their not being presentable, at least without undesirable confusion, owing to the nature of the view. Fig. 3 is an enlarged longitudinal sectional view of connected plug-and-socket or "spring-jack" details; Fig. 4, a broken perspective view showing modified means for a purpose the same as the means illustrated in Fig. 3; Fig. 5, a broken sectional view showing a modified construction of a contact detail; Fig. 6, a view in sectional elevation of a preferred construction of switch; and Fig. 7 is a view, in the nature of a diagram, illustrating a modification.

A, Fig. 2, is the switchboard formed with a base A′, from which rises the case A^2, the front of which I prefer to divide into two panels A^3 and A^4, one for supporting the annunciators B and C, and the lower one for supporting the spring jacks or sockets D. In the ledge A^5 of the base A′, which may be formed of wood, are provided any desired number of rows of vertical openings r r', each of which is surrounded by a perforated metal contact-plate r^2, the perforation in which alines with the adjacent opening r or r', and the plate is hollowed out, as shown in Fig. 2, on its upper side about its perforation to afford a seat for the end of a plug E. The construction illustrated of the plug E comprises a metal rod t, reduced toward one end, at the extremity of which it terminates in a rounded head t', the opposite end of the rod being expanded, as shown at t^2, and from this expanded portion for some distance the rod is incased in insulating material t^3. On the back ledge A^6 of the base A′ are provided binding-posts q for connection of the subscribers' lines W W, and from each binding-post there leads a wire q', connecting it with one of the plugs E. The expanded end t^2 of the plug must have good contact with a plate r^2, and to that end is normally maintained in upright position with the end t^2 fitting in the seat about the opening through the plate.

As the means for holding the plugs normally upright, as described, and for holding taut the connecting-wires q' and preventing them from becoming tangled I provide a system of levers s, all fulcrumed at their rear ends on a common rock-shaft s', suitably journaled in the base A′, the levers carrying near their free ends, at which each should extend at least approximately in vertical alinement with an opening r or r', as the case may be, pulleys s^2, underneath which the connecting-wires q' pass in a manner to cause the weight of the levers to bear on the wires, thereby holding them separate and taut and the plugs in their normal vertical positions, with the ends t^2 thereof adequately tight against the plates r^2 to afford good contact.

The spring-jacks D, which are supported in the lower panel A^4 in parallel rows, may involve any suitable construction for adapting them to be connected with plugs, such, for example, as the plugs E. As shown in Fig. 3, each jack comprises a metal socket adapted to receive the reduced end of a plug, which is held or steadied in place by a spring t^4, extending forward from the rear end of the socket to engage the head t' of the bar t. Behind the jacks D are metal (copper) bars F, supported in horizontal position one above the other, each extending across a row of the jacks which are in electrical contact with it.

On the upper panel A^3 are supported the line-annunciators B, provided in rows, like the jacks and plugs, with which they should correspond in number and relative situation, these annunciators being of any suitable variety and construction, the variety shown being the ordinary magnet and drop. Below

the annunciators B is a row of "ringing-off" annunciators C, similar to the others, though they should be wound to a higher resistance; and it is ordinarily necessary to provide but one of the annunciators C to, say, ten of the annunciators B, that being about the proportion of subscribers' lines liable to be in use at any one time.

The circuits will be understood from the following explanation of the diagram: Each line-wire W of the system is connected by its insulated wire q', as shown in Fig. 1, with a plug E. From each contact-plate r^2 there leads a wire w of the signaling-circuit through an annunciator B to ground. G is a switch device, the details of which are hereinafter described, for controlling the three terminals p, p', and p^2. From the terminal p leads the wire w' through an annunciator C to ground. The terminal p^2 is at the end of the line w^2, which includes the generator H and bell I of the operator's call-circuit, and leads to ground. The terminal p' is at the end of the line-circuit formed with the wire w^3, which I cause to lead to ground through a fine or secondary induction-coil o, between a primary induction-coil o' and a repeating induction-coil o^2, the coil o' being in the circuit w^4 containing the local battery K and the transmitter T, and the induction-coil o^2 being in the circuit w^5 containing the receiver R. A branch wire w^6 leads from the contact-lever of each switch G to each bar or rod F. All these branch wires, however, connect with the one generator. I show leading from the wire w^3 a branch wire w^7, terminating in an operator's plug N, which carries at its end a rigid fork n, adapted to engage with the rod t of a plug E below its head t'.

As will be observed, the circuits containing the annunciators B are normally closed by the plates r^2 and expanded ends t^2 of the plugs E being in contact, so that when a subscriber sends a ringing-up signal over his line W the annunciator B on that line lets fall its drop, indicating to the operator at the exchange that the subscriber desires connection with another line. Thereupon the operator raises the plug E, forming the terminal of the line over which the call was received, thus (by pulling the insulated wires q' through the plate r^2 and separating them from the contact end of the plug) breaking the signal-circuit w on that line, and applies the plug N to the plug E, whereby the operator's talking-circuit w^3 is connected with the subscriber, and enables the operator to talk with the latter through the transmitter T and listen through the receiver R. Upon ascertaining the connection desired by the subscriber the operator applies the plug E of the subscriber to be called to any spring-jack D of a disengaged connecting-bar F, and by throwing the lever of the switch G to contact with the terminal p^2 the generator-circuit w^2 is closed, thereby enabling the operator to ring up the desired number.

The construction of the switch G, I prefer to use is illustrated in Fig. 6. It comprises a plate m, of insulating material, from which depend the spring-terminals p' and p^2 and controlling-springs m', which flank the switch-lever l, journaled on a plate l', of insulating material, surmounting the plate m and covering the central opening therein, through which the switch-lever extends, and the controlling-springs m' are held in place by the means for fastening the plate l to the plate m, a binding-post v being employed for connecting the wire w^6 with one of the springs m' and through the latter with the switch-lever with which the spring permanently contacts. After ringing up the subscriber to be called, the switch-lever is released to resume its normal position of contacting with the terminal p, and the operator then inserts the plug E of that subscriber into a socket D on one bar F (or this may best be done as soon as the operator has ascertained who is to be called) and the plug E of the calling-subscriber into a socket on the same bar. Then, as will be seen, the connected subscribers may communicate with each other, the connection being afforded through the medium of one of the series of bars F.

If desired, the plugs E may terminate in hooks k, as shown in Fig. 4, adapted to be suspended on the respective bars F, then suitably situated for the purpose, when, of course, the spring-jacks D may be omitted.

With the switch-lever l in its normal position of contacting with the terminal p, either or both of the connected subscribers may ring off, since the wire w', containing a ringing-off annunciator C, is then in circuit with the bar F, forming the connecting-link between them.

By turning the switch-lever l to contact with the terminal p', the operator may listen through the receiver R to the connected subscribers, as for the purpose of ascertaining whether or not they are still talking or through, since thereby the line-circuit w^3 is closed with the branch circuit w^6 of the connecting-bar F.

As another form of contact means for the plugs E, I show that illustrated in Fig. 5, according to which the plug E passes through an enlarged opening r^3 in the ledge A^5, and bears at its end t^2 against a contact-spring i, which will be understood to be connected with a line W, the spring being fastened on a suitable insulating-support h below the ledge, and the weight of the lever s, controlling the respective line q', causes the plug to force the spring i normally against an annunciator contact g, connected by the line w with an annunciator B. The advantage of this construction is due to the double contact it affords, whereby poor contact, owing to corrosion of the contact-surfaces, is less liable to ensue.

As will be readily understood by those skilled in the art to which my invention relates, instead of grounding the circuits, as

represented at O in Fig. 1, metallic circuits may be employed throughout.

My improved system of telephone-exchange materially facilitates the work of the operator by enabling, among other advantages, the connections to be made at the switchboard without crossing the lines terminated by the plugs E, which tends to prevent confusion, the plugs E in the different rows thereof being so arranged with relation to the bars F or the spring-jacks thereon that a plug from any row may be applied to a connecting-bar at a point most directly in line with or nearest to it and without requiring any of the lines to be crossed by extending them to remoter points on the switchboard.

To facilitate identification of the rows of jacks E, I distinguish them by different colors in a manner to cause each row of the jack-heads to present a different color, and if the jacks are omitted the bars F are differently colored for the purpose.

The details shown and described as involved in my improved mechanism may be variously modified without thereby departing from my invention. Hence I do not wish to be understood as limiting my invention to such details, except where the intention so to do is manifest in the appended claims. One such modification, which suggests itself to me, is illustrated in Fig. 7, and consists in forming the levers *s* of conducting material (metal) connected from their free ends with the plugs E by wires q^2, containing spiral-spring sections q^3, the end of each lever behind its fulcrum being bent upward, as shown at s^3, to extend underneath a contact-spring *f*, connected by a wire *x* through a drop B to ground; and the lines W lead directly to the levers, by which they are connected with the plugs. With this construction, when the operator raises a plug B the lever connected with it is turned on its fulcrum to separate the end s^3 from the spring *f*, thereby breaking the circuit of the line-annunciator the same as by raising the plug with the construction previously herein described.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a telephone-exchange system, the combination with the switchboard, the contact-plugs thereof and the wires connecting the subscribers' lines with said plugs, of conducting-levers bearing toward their free ends on said wires to hold them separate and taut and forming electrical connections between said lines and connecting-wires, substantially as described.

2. In a telephone-exchange system, the combination with the switchboard, the contact-plugs thereof and the wires connecting the subscribers' lines with said plugs, of conducting-levers on a common fulcrum and bearing toward their free ends on said wires to hold them separate and taut and forming electrical connections between said lines and connecting-wires, substantially as described.

3. In a telephone-exchange system, a switchboard having contact-plugs, subscribers' lines leading immediately to said plugs without passing intermediately through any form of resistance, said plugs forming the terminals of said subcribers' lines and line-annunciators in the ground branches from the grounding-plates on which said plugs rest, substantially as described.

4. In a telephone-exchange system, a switchboard having contact-plugs in rows and forming terminals on the subscribers' lines, said subscribers' lines leading immediately to said plugs without passing intermediately through any form of resistance, branch circuits containing line-annunciators and normally closed by said plugs, connecting-bars for the temporary connection of subscribers' lines, branch circuits containing the transmitter, receiver, generator and signal devices, said plugs being removable from their normal positions to open said annunciator-circuits and engageable with said connecting-bars, and switching means for connecting, at will, the generator, and transmitter and receiver circuits with the subscribers' lines through said connecting-bars, substantially as and for the purpose set forth.

5. In a telephone-exchange system, a switchboard having contact-plugs in rows and forming terminals on the subscribers' lines, branch circuits containing line-annunciators in rows, said branch circuits being normally closed by said plugs, a row of ring-off annunciators in branch circuits, connecting-bars, branch circuits containing the transmitter, receiver, generator and signal devices, said plugs being removable from their normal positions to open said line-annunciator circuits and engageable with said connecting-bars, and switching means for connecting, at will, the generator, and transmitter and receiver and ring-off annunciator-circuits with the subscribers' lines through said connecting-bars, substantially as and for the purpose set forth.

6. A telephone-switchboard comprising the base A′ carrying contacts in rows, and the upright portion A^2 carrying line-annunciators B in ground branches from said contacts, plugs carrying contacts and forming terminals on the subscribers' lines, said subscribers' lines leading immediately to said plugs without passing intermediately through any form of resistance and said plugs being normally seated separably on said switchboard-contacts, and connecting-bars F with which said plugs engage in temporarily connecting subscribers' lines, substantially as described.

7. A telephone-switchboard comprising the base A′ carrying contacts in rows, and the upright portion A^2 carrying the rows of line-annunciators B in ground branches from said contacts, plugs carrying contacts and forming terminals on the subscribers' lines, said subscribers' lines leading immediately to said plugs without passing intermediately through any form of resistance and said plugs being

normally seated separably on said switch-board-contacts, connecting-bars F and socket devices D on said bars to receive the plugs, substantially as described.

8. A telephone-switchboard comprising the base A′ carrying contacts in rows, and the upright portion A^2 carrying the rows of line-annunciators B in ground branches from said contacts, the row of annunciators C having terminals p, plugs carrying contacts and forming terminals on the subscribers' lines, said subscribers' lines leading immediately to said plugs without passing intermediately through any form of resistance and said plugs being normally seated separably on said switch-board-contacts, connecting-bars F with which said plugs are engageable, and switch devices in circuit with said bars for connecting the circuits of the annunciators C with the line-circuits, through said bars, substantially as described.

9. A telephone-switchboard comprising the base A′ carrying perforated contact-plates r^2 in rows and affording seats, and the upright portion A^2 carrying the rows of line-annunciators B in ground branches from said contact-plates, plugs E, each comprising a bar t surrounded by insulating material t^3 and forming contacts at its opposite ends, said plugs being normally seated, separably, in upright position on said contact-plates and forming terminals on the subscribers' lines, said subscribers' lines leading immediately to said plugs without passing intermediately through any form of resistance and connecting-bars F with which said plugs are engageable, substantially as described.

10. A telephone-switchboard comprising the base A′ carrying perforated contact-plates r^2 in rows and affording seats, and the upright portion A^2 carrying the rows of line-annunciators B in ground branches from said contact-plates, plugs E, each comprising a bar t surrounded by insulating material t^3 and terminating at its opposite ends respectively in contact-heads t' and t^2, said plugs forming terminals on the subscribers' lines which lead immediately to the plugs without passing intermediately through any form of resistance and said plugs being normally seated at their heads t^2 in upright position on said contact-plates, connecting-bars F and spring-jacks D on said bars to receive the plugs, substantially as described.

11. In combination with a telephone-switchboard, a switch device for circuits thereon, comprising an insulated support carrying terminals p' and p^2 of said circuits, a switch-lever l passing through said support and fulcrumed on a metallic support on said insulated support and being adapted to contact at its end with the terminal p of a circuit, and controlling-springs m' extending from said metallic support and bearing against opposite sides of the lever, substantially as described.

ALBERT F. W. MEYER.

In presence of—
J. H. LEE,
J. N. HANSON.