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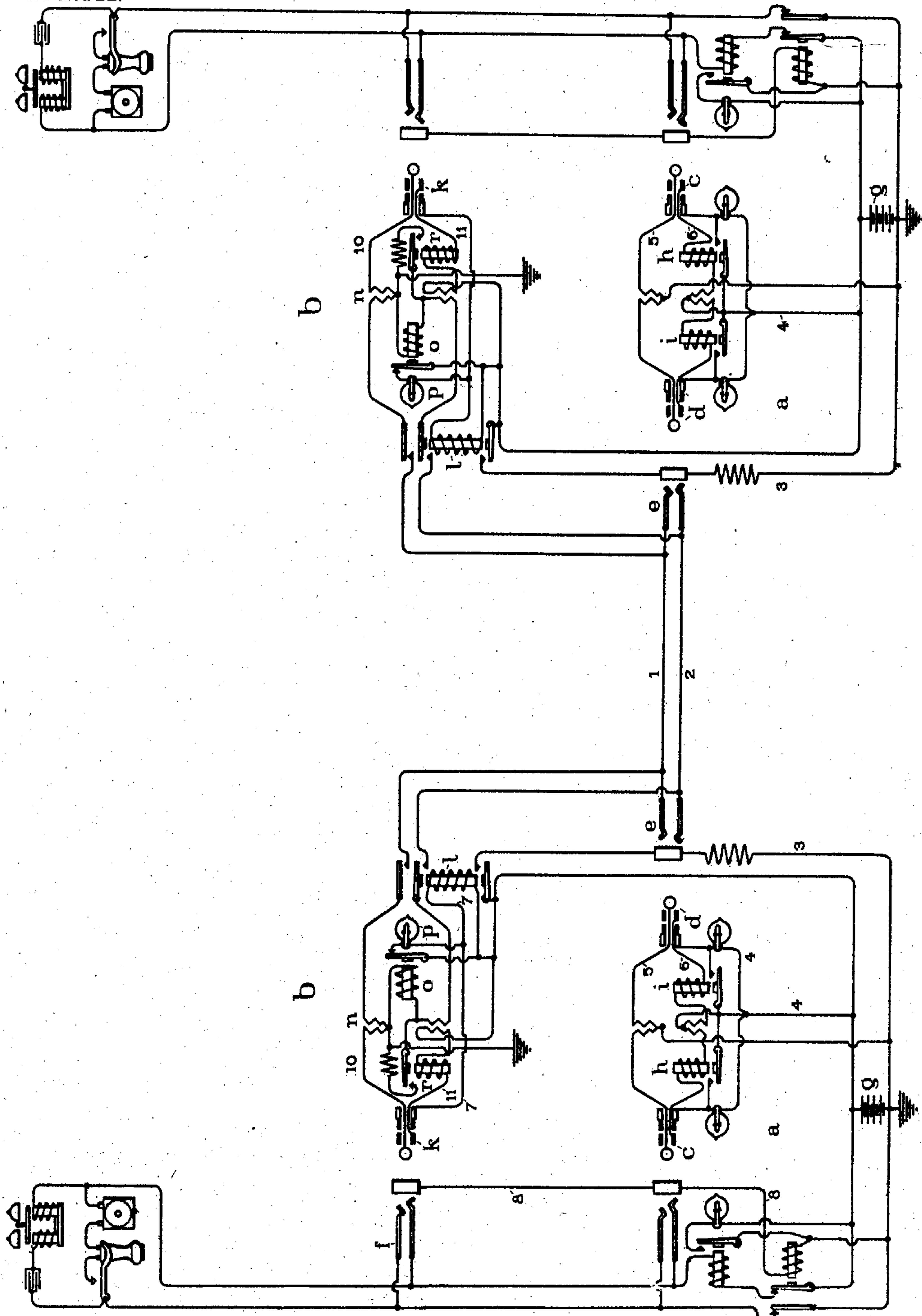
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TRUNK LINE FOR TELEPHONE EXCHANGES.

APPLICATION FILED JAN. 26, 1901.

NO MODEL.



WITNESSES

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TRUNK-LINE FOR TELEPHONE-EXCHANGES.

SPECIFICATION forming part of Letters Patent No. 772,898, dated October 18, 1904.

Application filed January 26, 1901. Serial No. 44,919. (No model.)

To all whom it may concern:

Be it known that I, FRANK R. McBERTY, a citizen of the United States, residing at Evanston, in the county of Cook and State of Illinois, have invented a certain new and useful Improvement in Trunk-Lines for Telephone-Exchanges, of which the following is a full, clear, concise, and exact description.

My invention is a combination, with telephone-lines provided in an exchange with diverse forms of terminal connection devices and their adjuncts for signaling, of switching mechanism for automatically disconnecting one variety of terminal connection in the use of the other, its special application being to interoffice trunk-lines which appear at one or both terminal stations in multiplied spring-jacks in several sections of a multiple switchboard as "outgoing trunks" to the distant station and also in terminal plugs at a special switching-section as "incoming trunks" from the distant station.

It is to be understood that the terminal spring-jacks of the trunk-line, the "outgoing terminals," are distributed upon the several subscribers' sections of the multiple board and serve for uniting any calling subscriber's line with the trunk-line to extend the circuit of the calling-line to the distant terminal station, where it may be completed with the desired correspondent line, the linking of the subscriber's line with the trunk-line being effected by the pairs of plugs ordinarily employed in directly uniting subscribers' lines, and the terminal plug of the trunk-line is located on the same switchboard, upon a separate section of the switchboard, with access to multiple jacks of all subscribers' lines in the central office for use in linking the trunk-line with any subscriber's line of the office called for by a line entering the distant terminal station. The link conductors or plug-circuits in the central battery system, to which the invention is especially adapted, are connected with the central source of energy for exciting the substation-transmitters of united lines and operating supervisory signals associated with the plugs, while the connections of the termi-

nal plug of the trunk-line must be specially arranged to apply current in like manner to a line with which it is connected and to provide for supervision and direction of the switching operator from the distant station.

It is the object of this invention to permit the use of the trunk-line at either terminal for incoming and outgoing calls indiscriminately and so to modify the connections of the line automatically in such use that either terminal fully performs its necessary functions.

I associate with the terminal plug of the trunk-line a source of current, circuit-conductors and apparatus suitable for applying the current in the telephonic circuit, and supervisory apparatus, and a switch actuated in making connection with one set or sort of terminal connectors of the trunk-line, but not in making connection with the other sort controlling the connection of these adjuncts with the trunk-line—as, for example, in the preferred form of the invention I arrange an electromagnetic switch adapted to apply the special circuits of the terminal plug to the conductors of the trunk-line and actuate this switch by closing a local battery-circuit in placing the plug in the spring-jack of a subscriber's line.

I have disclosed the invention in greater detail in the accompanying drawing, which is a diagram representing two station-lines entering different central stations, an interoffice trunk-line between the central stations, and plug-circuits for connecting the trunk-line with substation-lines at either central station.

Each substation-line is represented in the switchboard of the central office, which it enters by a line-signal upon one section of the switchboard and by spring-jacks upon each of the two sections *a* and *b* of the switchboard. Of these sections that designated *a*, at which the subscriber's line-signal appears, is furnished with pairs of plugs *c d* for uniting any calling-line with a line called for or with a trunk-line. It is attended by an operator, whose duty is chiefly to answer subscribers' calls and to supervise connections between lines established in compliance with the calls, and who is for

that reason denominated the "subscribers'" operator. This section is also equipped with terminal spring-jacks *e* of trunk-lines extending to the distant central station, whereby the subscriber's operator receiving a call for connection with a line in the distant station may extend the circuit to that station. These terminal spring-jacks are known as "outgoing-trunk terminals."

The section denoted by the letter *b* is provided with spring-jacks *f* of the subscribers' lines and with terminal plugs of trunk-lines from distant central stations, its function being to permit connection of a trunk-line with a subscriber's line. The operator attending it is known as the "incoming-trunk" or "switching" operator and performs her work at the direction of the subscriber's operator at the distant station, received either by signal or by telephone.

The circuit connections of the trunk-line 1 2, with which alone this invention is concerned, are alike at the two central stations.

The trunk spring-jacks *e* at the subscribers' sections are connected in multiple with the conductors of the trunk-line. The test-thimbles of the jacks form branch terminals of a conductor 3, which is designed to form part of a local circuit 3 4, with a flexible conductor terminating in a corresponding contact part of the plug *d* when the plug is placed in the jack. The plug-circuit 5 6 of plugs *c* and *d* is connected with the central source *g* of current by conductors forming a bridge of the plug-circuit, and signal-controlling relays *h* and *i* are interposed in the circuit in the path of current from this source to the stations of united lines for indicating the condition of the circuits to the subscriber's operator.

Besides the branches from the trunk-line to the outgoing spring-jacks, which constitute terminal connection devices of one class, other branches are taken from the trunk conductors to the terminal plug *k* of the trunk-line at the "incoming-trunk section" of the switchboard, which constitutes the terminal connection device of the other class. These branches are controlled by an electromagnetic switch *l*. The actuating-magnet of the switch is connected in a conductor 7, terminating in the local contact-piece of the plug *k*, and thus adapted to be brought into a complete local circuit 7 8 with the corresponding wire 8 of a subscriber's line when the trunk-line is united with a subscriber's line called for.

Special circuit connections and apparatus are associated with these branches to the plug *k* for supplying current to a line called for indicating the response to the call and for giving the signal for disconnection. The extensions 1 and 2 of the trunk-line after traversing the separable contacts of relay 1 are united through windings of a repeating-coil *n* and the magnet-winding of a relay *o*. This relay is of sufficiently high resistance to pre-

vent the actuation of a supervisory relay *h* or *i* by current through it when a plug-circuit 5 6 is connected with the distant terminal of the trunk-line; but it is itself responsive to such current from the source in the plug-circuit. This relay controls the circuit through a clearing-out signal *p*, which is connected in a branch of conductor 7 in multiple with the magnet of switch *l*. The other windings of repeating-coil *n* are in a circuit 10 11 which is practically a continuation of the trunk-line 1 2 with respect to telephonic currents, but is conductively independent of the main portion of the trunk-line. The circuit includes the source of current *g*. It also includes the magnet of a relay *r*, of which the contacts control a partial shunt of the magnet of relay *o*, the shunt being sufficient to permit the flow of current from the source *g* in the plug-circuit to operate the supervisory relay at the distant station.

The switch *l* has in addition to the contacts for completing the branches of the trunk-circuit to plug *k* when the plug is used a pair of contacts which form a connection between the battery *g* and the test-rings of the terminal springs-jacks of the trunk-line to give the busy indication to any test made while the trunk-line is in use through the plug *k*.

An order-wire may extend, as usual, from all the subscribers' operators at one central station to the incoming-trunk operator at the other central station, by which the former may direct the switching operators in the completion of connections.

While the trunk-line is not in use only the terminal spring-jacks are connected with it. In using the trunk-line a subscriber's order given to a subscriber's operator at one of the central stations for connection with a correspondent line at the distant station is communicated to the incoming-trunk operator at the latter station by means of the order-wire. At the same time the calling-line is linked with the trunk-line by means of plugs *c* and *d*, inserted in the spring-jack of the calling-line and in the outgoing spring-jack *e* of the trunk-line at the same section of the switchboard. The telephonic circuit is thus extended from the calling substation-line to the switchboard containing the called line. The source *g* of current is connected with the calling-line and with the trunk-line. The supervisory-signal controlling-magnets *h* and *i* are associated with the calling-line and with the trunk-line, respectively, to indicate the position of the telephone-switches at the calling and called substations, and thus to permit supervision of the connection.

Complying with the direction of the subscriber's operator, the incoming-trunk operator inserts the terminal plug *k* of the trunk-line into the spring-jack of the line called for at the incoming-trunk section. Thereby the telephonic circuit is further extended to the

called substation, subject to the control of switch *l*. The source *g* of energy is brought into the circuit to the called substation. The switch *l* is actuated, the local circuit 7 8, being closed, and closes the interruptions normally present in the branches of the trunk-line leading to plug *k*. Incidentally in the closure of these branches the clearing-out relay *o* is brought into circuit with the battery *g*, applied to the trunk-line at its outgoing terminal, and being thus excited breaks the circuit of the disconnection-signal *p*. The incoming-trunk operator may then transmit a call to the substation, ringing the bell at that station. When, in response to the call, the telephone there is taken for use and the line-circuit is closed for the flow of continuous currents, the battery *g* produces a current through plug *k* and the line to the correspondent station, which excites relay *r*. This relay closes the shunt of relay *o* and permits a current to flow in the trunk-line sufficient to operate the supervisory relay *i* at the outgoing terminal, and thus to signalize the response to the supervising operator.

The subscriber's operator should preferably be charged with the duty of initiating the disconnection of lines. In response to the display of both supervisory signals *h* and *i* she will remove the plugs *c* and *d* from the spring-jacks. The consequent withdrawal of battery *g* deprives the relay *o* of current and permits it to close the circuit through disconnection-signal *p*, displaying this signal, and thus directing the removal of plug *k* from the spring-jack of the correspondent line. When the terminal plug is removed from the jack, all the circuits and apparatus are returned to their initial condition.

My invention is defined in the following claims:

1. The combination with a telephone-line, of terminal connection devices of two classes, one class adapted for connections from the line to a line called for, and the other class adapted to complete connections to the line in response to calls for it, a switch controlling the telephonic connection of one class of terminal devices with the line, and means actuated in making connection between said line and another through the agency of any connection device of one class for operating said switch, as described.

2. The combination with a telephone-line, of terminal spring-jacks therefor, and a terminal plug therefor, a source of current and supervisory mechanism, said source of current and supervisory mechanism being connected with the plug for supplying current to the substation-transmitter and for supervising the line when united into a through circuit with another line, an electrically-operated switch controlling the telephonic connection of the line conductors with one group of the terminal connection devices, and a cir-

cuit of the actuating-magnet of the switch closed in making connection with the line, as described.

3. The combination with a telephone line or circuit, of spring-jacks thereof in different sections of a multiple switchboard, plugs and plug-circuits at the same sections, for making connections to the line when called for, a source of current in a bridge of each plug-circuit for exciting the substation-transmitters of united lines and supervisory signals in each plug-circuit for supervising connections; a terminal plug of the line in a different section of the switchboard, for making connection to other lines, a source of current in a bridge of the circuit terminating in said plug, supervisory devices in the said circuit responsive to currents in the line; and an electrically-operated switch controlling the connection of said line with one class of said terminal connection devices, signals and a source of current associated therewith, and a local circuit, closed in making use of one of said terminal connection devices, containing the actuating-magnet of said switch, as described.

4. The combination with a telephone trunk-line, adapted to form a through telephonic circuit with telephone-lines arranged to derive their current-supply from a central source, of multiple spring-jacks for the line at each terminal station, plug-circuits for extending circuits to the line at the different sections of the switchboard, a source of current in each plug-circuit and a supervisory signal in each plug-circuit responsive to current in the trunk-line when completed at the distant terminal; a terminal plug for the line at an incoming trunk-section at each terminal station, a repeating-coil interposed in the branch of the line to said plug, a source of current in circuit with said plug, and a supervisory signal associated with the plug but in circuit of the line toward the other terminal station thereof responsive to current from a plug-circuit connected therewith; an electromagnetic switch, controlling the circuit of the line to said supervisory signal and repeating-coil, and a local circuit of the actuating-magnet of said switch closed in registering contacts of the terminal plug and a spring-jack in which said plug is inserted, as described.

5. The combination with a telephone trunk-line, multiple spring-jacks therefor at each terminal station in open branches of the line, and a terminal plug at each station; plugs and plug-circuits for making connection to the line when called for, a source of current in each plug-circuit and supervisory signals in the paths of current from said source through the plugs; a source of current connected with the terminal plug of the trunk-line, and a supervisory relay in the path of current from said source, said relay controlling circuits for actuating the supervisory signal of the plug-cir-

cuit connected with a spring-jack at the distant terminal, and a disconnection-signal associated with the terminal plug responsive to current from said source in the plug-circuit; an electrically-operated switch at each terminal station adapted to complete the circuit of said line with said plug, disconnection-signal, and relay, and a circuit closed in the insertion of said plug in the spring-jack of another line for operating said switch; whereby in the use of either terminal connection device of the

trunk-line at either terminal station, the appropriate supervisory apparatus is automatically brought into operative association therewith.

In witness whereof I hereunto subscribe my name this 27th day of December, A. D. 1900.

FRANK R. McBERTY.

Witnesses:

ELLA EDLER,
DUNCAN E. WILLETT.