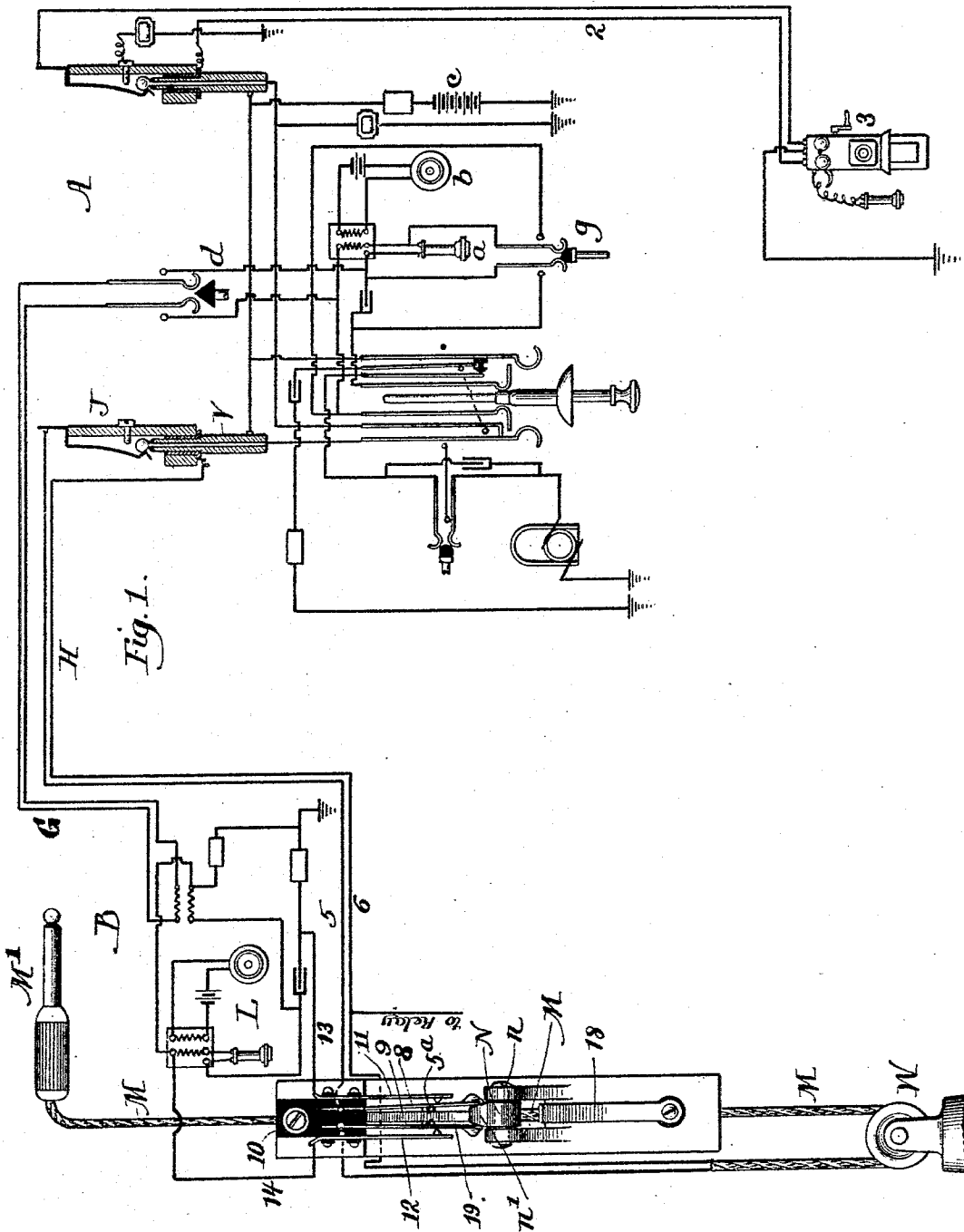


2 Sheets—Sheet 1.

SWITCH AND CIRCUIT FOR TELEPHONE EXCHANGES.

Patented Feb. 27, 1894.



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SWITCH AND CIRCUIT FOR TELEPHONE EXCHANGES.

No. 515,531.

Patented Feb. 27, 1894.

Fig. 3.

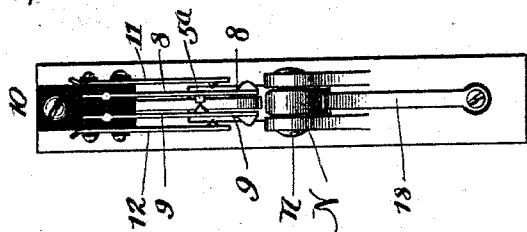
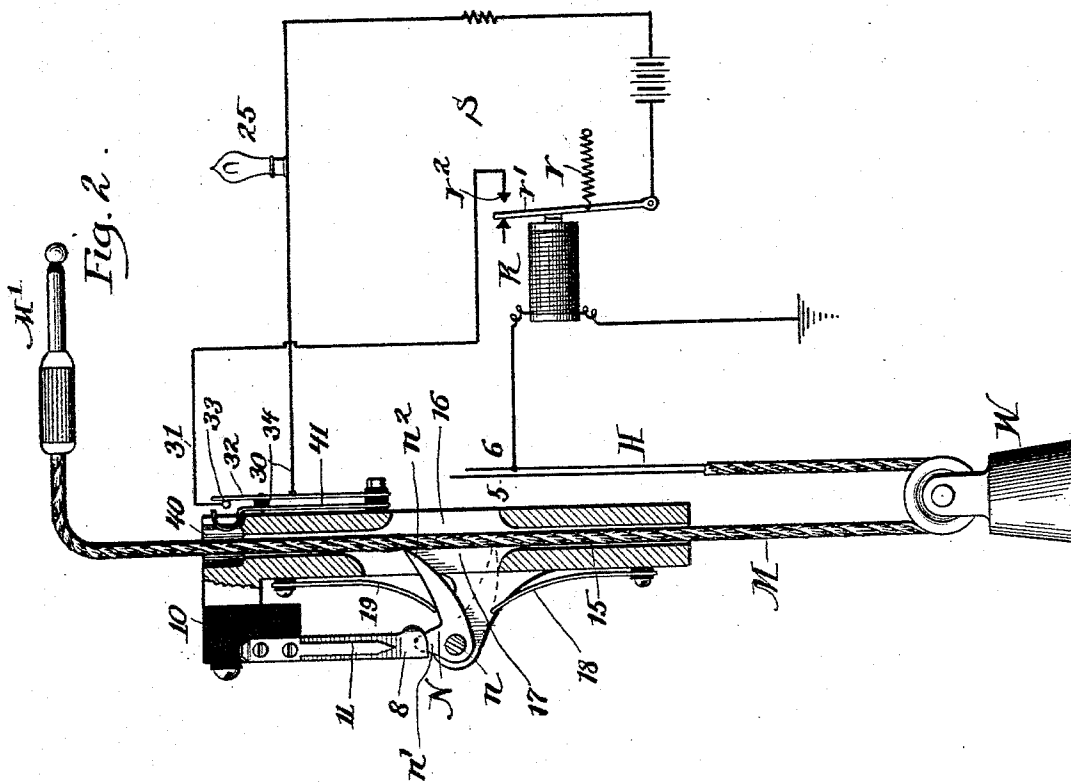


Fig. 2.



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UNITED STATES PATENT OFFICE.

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SWITCH AND CIRCUIT FOR TELEPHONE-EXCHANGES.

SPECIFICATION forming part of Letters Patent No. 515,531, dated February 27, 1894.

Application filed April 17, 1893. Serial No. 470,599. (No model.)

To all whom it may concern:

Be it known that I, JOSEPH J. O'CONNELL, a citizen of the United States, residing at Chicago, county of Cook, State of Illinois, have
5 invented certain new and useful Improvements in Mechanism for Operating Circuit-Changers in Telephone Systems, of which I do declare the following to be a full, clear, and exact description, reference being had to the
10 accompanying drawings, forming part of this specification.

In the operation of telephone exchange systems it is customary to connect the subscribers' lines or trunk lines with the individual
15 spring-jacks of a switch-board by means of plugs attached to plug cords forming the terminals of such lines. When a connection is to be made, the operator, in manner well understood in the art, takes the plug cord of the
20 subscriber's line or of the trunk line that is to be plugged into the switch-board and having shifted a "listening key" in order to throw her own telephone into the desired circuit touches the plug to the metallic casing of the
25 spring-jack of such circuit to test whether such circuit is busy or not. If the circuit is not busy, the plug is inserted in the spring-jack and the operator then reversely shifts her "listening key" in order to throw her telephone out of circuit.
30

One object of my present invention is to provide means whereby as the operator lifts the plug to test the subscriber's circuit and to insert the plug, the "listening key" will be shifted by the movement of the plug cord so as to
35 throw the operator's telephone into the desired circuit. It will be readily seen also that inasmuch as the means, whereby I attain this object of my invention, is susceptible of use
40 in any situation in which it may be desired to utilize the movement of the plug cord for controlling a circuit changer, my invention may be said to consist primarily in the combination with the plug cord and with the contact terminals of an electric circuit of a circuit changer adapted to be shifted by the plug
45 cord as the latter is moved.

It is customary in the operation of telephone exchange systems to connect the exchange offices by trunk lines, these lines usu-

ally terminating at one office in a trunk line switch-board and at the other office in individual plugs adapted to be inserted in the subscriber's switch-board of such office. At the receiving office there are usually provided
55 a number of signals (preferably incandescent lamps) arranged in local circuits, and corresponding in number and arrangement with the trunk lines; the purpose of these signals being to indicate to the receiving operator
60 that a trunk line is to be dis-connected to be in readiness for subsequent service. These signals are placed in normally open circuits, which through the movement of suitable relays will be closed by the operator at the
65 calling office and when so closed the incandescent lamps or other signals will come into play to exhibit to the operator at the receiving office that the corresponding trunk line is to be dis-connected. The operator at the
70 receiving office will then dis-connect the trunk line plug from the subscriber's jack and will open the local signal circuit in order to restore the lamp or other signal to its normal condition.

A further object of my invention is to provide means whereby the operator at the receiving office can by the simple act of restoring the trunk line plug to its seat or support
75 thereby break the local signal circuit and throw the lamp or other signal out of action.

Figure 1 is a diagrammatic view of the telephone system embracing two exchanges, my invention being shown as applied to the apparatus at one of the exchanges only. Fig. 85
2 is a view in vertical section through a plug cord guide and connected parts. Fig. 3 is a view in front elevation.

The exchange office A, which for convenience may be termed the "calling office," is
90 equipped with the usual apparatus such as the operator's telephone and transmitter *a* and *b*, test and relay battery *c*, order wire key *d*, multiple switch-board jacks *f*, shunt key *g*, &c., in usual circuits. A single subscriber's line 2 (a metallic circuit) is shown
95 as leading from the subscriber's telephone 3 to the multiple switch-board of the exchange office A and this office is shown as connected with the exchange office B which may be 100

termed the "receiving office" by means of the "order" line G and a trunk line H each of these lines being shown as comprising two wires to form a metallic circuit. Trunk lines 5 H in required number will connect the offices A and B, each of the trunk lines terminating in a spring jack J at one office and in a switch-cord plug M' at the other office. One of the wires 5 of the trunk line H is broken at the office B the broken ends of this wire connecting to the contact springs 8 and 9 supported by the insulating block 10. To the block 10 are also attached the contact plates 11 and 12 to which connect the terminal wires 13 and 14 of the operator's telephone circuit L. The wires 5 and 6 of the trunk line lead through the plug cord M to the switch plug M' where-by connections will be made with the spring-jacks of a switch-board in manner well understood in the art.

A listening key (or other type of circuit changer) N is pivotally mounted as at n adjacent the ends of the contact springs 8 and 9, this key N having a shoulder n' of insulating material which when thrust between the springs 8 and 9 will break their direct connection at 5^a and at the same time will establish a connection between the springs and the terminal plates 11 and 12 which connect with the operator's circuit, thus placing the operator's telephone in the trunk line circuit. Each of the trunk line plug cords M extends upward through a suitable channel 15 and at a point opposite the key N the walls of the channel 15 are cut away as at 16 and 17 to permit the end n^2 of the key N to engage with cord M. Suitable stops 18 and 19 (preferably spring plates) will limit the extent of movement of the key N which will rest normally against the stop 18 with its free end bearing against the plug cord M and in readiness to be lifted thereby. Hence it will be seen that when the operator at the "receiving" office B has been notified from 45 the "calling" office A to connect trunk line H with the subscriber called for, the operator at office B will lift the plug cord M and plug M' of trunk line H in order to make test and connection with the required circuit. As 50 the plug cord is thus raised, the free end of the key N will be lifted thereby causing its insulated end n^2 to force apart the contact springs 8 and 9 so establishing contact between these springs and the terminal plates 11 and 12 in order to throw the operator's telephone into the trunk line circuit. Consequently, when the plug M' is touched to the metallic casing of the proper spring-jack to make the "busy test" and the connection the 60 operator is enabled without any separate act of shifting her listening key to determine whether the subscriber's line is free or busy. In lifting the plug M' to make connection there should be sufficient slack in the cord M 65 above the key N to permit the key to swing downward to its normal position after the plug has been inserted in the proper spring-

jack as by this downward movement of the key the contact between the springs 8 and 9 will be re-established and the operator's telephone will be thrown out of the trunk line and subscriber's circuit. 70

The trunk line H is shown as connected in usual manner to a relay R which serves at proper time to open the local circuit S wherein is interposed the incandescent lamp 25 or other signal by which the receiving operator is to be notified that the trunk line is to be disconnected. 75

When the operator at the calling office A 80 connects the subscriber with the trunk line H by inserting the plug V into the spring-jack of the trunk line the current from battery c will pass to the relay R thus energizing it and causing it to break the local signal circuit at r^2 . The signal circuit will thus remain broken and the lamp out of action until the subscriber is to be disconnected, when the operator at the calling office will withdraw the plug V from the trunk line jack thereby 90 throwing the battery c out of the trunk line circuit. The relay R being no longer energized, the spring r will shift the armature r' of the relay causing it to complete the local signal circuit and consequently causing the signal lamp to show to the receiving operator that the disconnection is to be made. The receiving operator will thereupon withdraw the plug M' from the subscriber's spring-jack and will break the local signal circuit 100 in order to throw the lamp out of action. Heretofore this breaking of the local signal circuit by the receiving operator has been effected by a key operated by hand, but by my present invention the act of returning the plug to its seat insures the breaking of the local signal circuit. The terminal wires 30 and 31 of the local signal circuit S lead to a point adjacent the seat 40 of the plug M', the wire 30 connecting with a contact spring 32 110 as shown, which is in contact at 33 with the terminal of the wire 31 when the plug M' is connected with the spring-jack of the switch-board. An insulated spring plate or circuit changer 41 has its upper portion preferably 115 curved and extending into the seat 40 of the plug M' so that as the plug M' is returned to its seat (under the stress of the weight W) the circuit plunger 41 will force outward the block 34 and the upper end of the spring plate 120 41 causing it to force the spring plate 32 away from the terminal of the wire 31 and consequently break at such point the local circuit and throw the signal lamp out of action.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is— 125

1. The combination with a plug cord and with the contact terminals of an electric circuit of a circuit changer arranged to be shifted 130 by said cord as the latter is moved, substantially as described.

2. The combination with a plug cord of a switch or key having a part extending into

position to be shifted by said cord as the latter is moved, substantially as described.

5 3. The combination with a plug cord, of a switch or key having a pivoted arm extending into position to be engaged by said cord as the latter is moved, substantially as described.

10 4. The combination with a plug cord, of a guide for said cord having an open space at the side thereof and a switch or key having an arm extending through said opening and into engagement with the cord, substantially as described.

15 5. The combination with a trunk line having appropriate terminals and means for causing the passage of current over said trunk line, of a local signal circuit, a circuit changer for controlling said local signal circuit ar-

ranged adjacent to and in position to be operated by one of said trunk line terminals, 20 and a relay connected with said trunk line circuit and arranged to control said local signal circuit whereby when current is passed over said trunk line, said relay will be energized to change said local signal circuit and 25 whereby when the passage of current over said trunk line is broken at one of its terminals said relay will be de-energized and whereby when the circuit changer of the local signal circuit is operated, said local signal 30 circuit will be again changed, substantially as described.

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