(No Model.)

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TELEPHONE CIRCUIT AND APPARATUS.

No. 265,972. Patented Oct. 17, 1882.

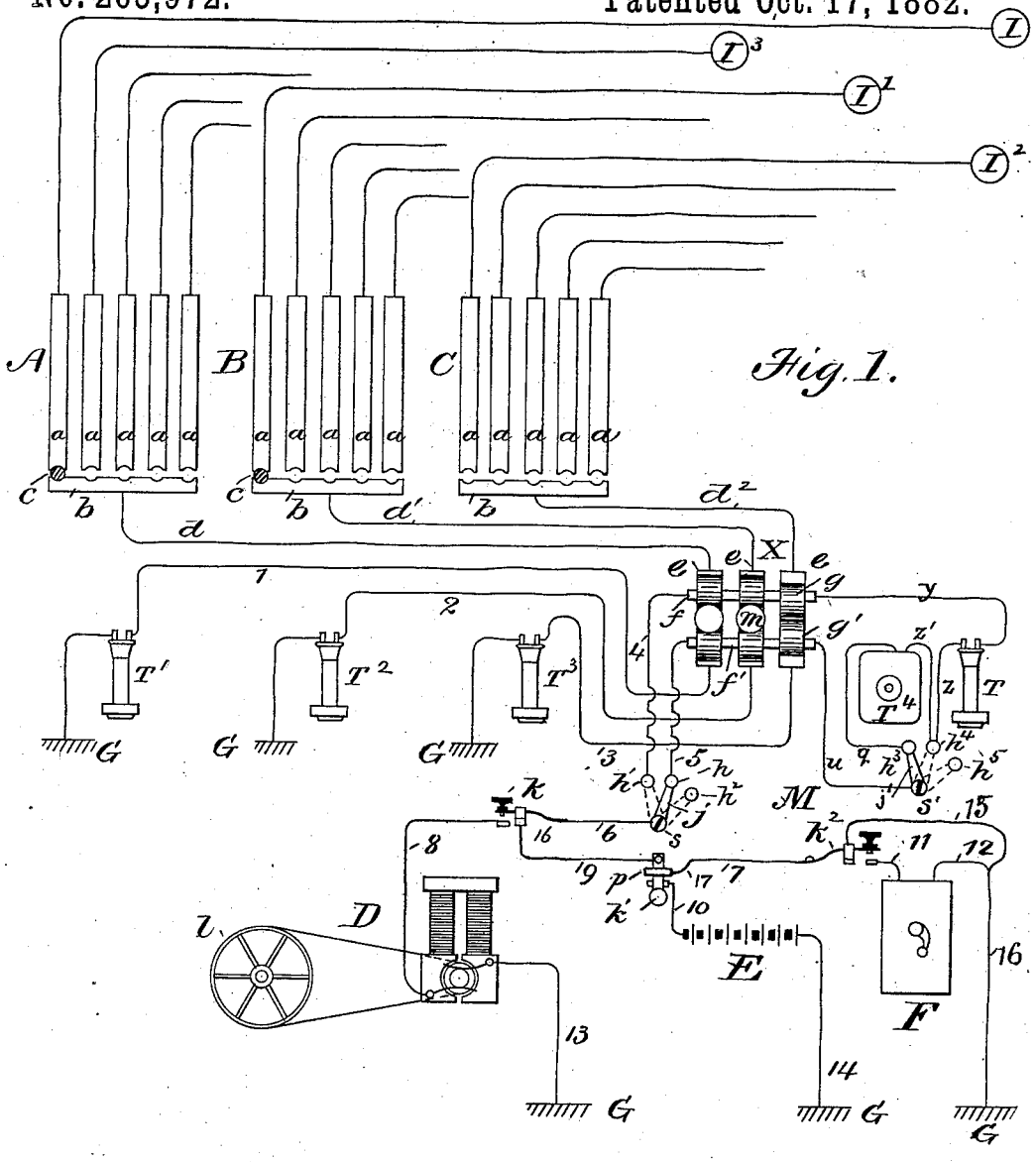

Fig. 1.

Fig. 2.

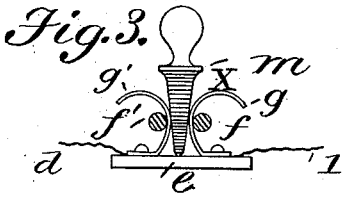

Fig. 3.

Attest
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TELEPHONE CIRCUIT AND APPARATUS.

SPECIFICATION forming part of Letters Patent No. 265,972, dated October 17, 1882.

Application filed July 8, 1882. (No model.)

To all whom it may concern:

Be it known that I, WALTER D. McKINNEY, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Telephone Circuits and Apparatus, of which the following is a specification.

My invention relates to improved appliances and to the disposition and organization of the same in a telephone-exchange system, whereby the chief operator or other person having the charge of a central telephone-station is enabled to effectively supervise the operations of the switch-board operators, and to communicate with subscribers when necessary.

The particular object of my invention is to facilitate such supervision by enabling the chief operator at will to interpose his transmitting and receiving telephones between the instruments of the switch-board operator and those of any subscriber, and thus without the knowledge of the said operator overhear and at pleasure participate in any conversation between the operator and the subscriber. It is further to enable the chief operator to cut off, when desirable, the instruments of the switch-board operator and to signal the subscriber and communicate with him privately and directly.

To this end my invention consists in causing the circuits and wires connected with each switch-board operator's telephones to pass through a circuit-changer at the chief's desk; and, also, in the location at the same desk of telephones and signaling devices adapted for ready and convenient application by means of the said circuit-changer to the telephone-circuit of each switch-board operator.

It is at the present time well understood that each switch-board operator is provided with a telephonic transmitter and receiver for use in conversation with any of the subscribers' lines connected with the board, and that one set of instruments is adapted to be used in response to any number of sub-station instruments. The wires then by which the set of each switch-board may be connected with any of the subscribers' lines are led, after leaving the ground-wire and passing through the operator's telephones, first to the circuit-changer at the chief's desk, as indicated, and then back to the switch-board, where, by means of suitable devices, they may at the will of the attending operator be connected for conversation with any subscriber's line.

In the drawings which accompany and form a part of this specification, Figure 1 is a diagram representing my invention applied to three sectional switch-boards of a central office. Fig. 2 shows an end view of the circuit-changer which I employ when not in use; and Fig. 3 is an end view of the same circuit-closer when by reason of the insertion of a plug it is brought into action.

In Fig. 1, A, B, and C represent the different switch-boards of a central telephone-office, each of which, as usual, is provided with metal bars or equivalent devices *a*, connected permanently with a series of sub-station lines which radiate from the central office to sub-stations I I' I^2 I^3 in the surrounding district. At each switch-board the operator or attendant is provided, as usual, with the telephone T, which in this case may be taken to represent the complete outfit of both transmitting and receiving telephones, which it is not material to show. Each of the telephones T is connected by one binding-screw to a ground-wire, G, and by the opposite binding-screw and the several wires 1, 2, and 3 to the circuit-changer X at the chief's desk M, and thence by other wires, *d*, *d'*, and d^2, to the insulated metal bar *b*, by which, in combination with the plug *c* or other well-known instrumentalities, the telephone branch at each switch-board may be connected, as desired, with any one of the metal line-bars *a*. Thus the circuit-changers X, situated at the chief's desk M, are placed directly in the circuit of each of the switch-board telephone branches at a point between the telephone T and the connecting devices *b* and *c*.

The circuit-changer X is shown in end view by Figs. 2 and 3, and is constructed as follows: On a base-board, *e*, of any preferable non-conducting material—such as wood, hard rubber, or vulcanized fiber—a series of leaf-springs, *g* *g'*, are placed, each pair being in the circuit of one of the switch-board telephone branch circuits, while the individual springs *g* *g'* of each pair are normally in contact with one another, as shown in Fig. 2, and in the pair of springs connected with switch-board C, Fig. 1. As many pairs of leaf-springs are employed as there are

switch-board sections. Running along beneath the curved ends of the series of leaf-springs on each side of the circuit-changer is a metal rod. The rod on one side is designated *f* and the rod on the other side as *f'*. Both rods are suitably supported at the ends in any preferred manner. The leaf-springs of each switch-board are normally insulated from the metal rods *f f'*, but may be brought in contact therewith by the insertion of a plug or wedge, *m*, as in Fig. 3, and in the springs connected with switch-boards A and B in Fig. 1. When the wedge *m* is once more withdrawn the springs, by their own resiliency, leave the rods and resume their normal contact with one another.

In the diagram, Fig. 1, it will be seen that the metal rod *f* is attached at one end to a wire, 4, extending to a metal stud, *h'*, and there terminating. Its other end is also, by a wire, *y*, connected with the chief's telephone T, thence continuing by wire *z* to a metal stud, h^4, by wire *z'* to the transmitter T^4, and by another wire, *q*, to the metal stud h^3, on which, in the drawings, a button-switch, *j*, is shown as resting. The lower circuit-changer rod, *f'*, connects at one end by wire 5 with the button-switch stud *h*. At its other end it connects by wire *u* with the switch *j'*. The button-switch *j* is pivoted, and is capable of being turned on the screw *s*, and may be placed on either of the studs *h* or h^2, *h'* being, as indicated, connected by wire with the circuit-changer rod *f*, *h* with the rod *f'*, while h^2 is insulated from any other connection whatsoever, and is used simply as a rest for the switch when turned thereon. The button-switch *j'* is pivoted and turns on the screw *s'*, and in like manner may be caused to rest on either of the three studs h^3, h^4, or h^5, of which h^3 connects with the transmitter, h^4 with wires leading in one direction to the transmitter T^4 and in the other to the telephone T, and h^5 is, as in the former case, not an electrical connection, but simply a rest for the switch when turned thereon. From the pivotal screws of the switch *j* a branch circuit leads normally to earth through wire 6, key *k*, bridge-piece 16, wire 19, key *k'*, bridge *p*, wire 17, key k^2 and its bridge-piece, and wires 15 16 to earth G. From the anvil or front contact of the key *k* a wire, 8, leads to the generating-coil of a magneto or dynamo electric machine, D, which is kept in a state of continuous operation, and continuing therefrom a second wire, 13, leads to the ground G. The anvil of the second key, *k'*, is in like manner connected by wire 10 with a voltaic battery, E, and thence by wire 14 with the ground. The anvil of the third key, k^2, leads by wire 11 to the hand generator F, and thence by wire 12 to the ground.

The functions of the described instrumentalities and main and branch circuits are hereinafter described, and depend upon the position of the different springs of the circuit-changer X, the position of the button-switches *j* and *j'*, and the operation of the keys *k*, *k'*, and k^2. Since signal-bells of differing character are in use at different sub-stations, it is necessary to use for signaling purposes electrical pulsations correspondingly different. When, for example, the sub-station is provided with a polarized bell, alternating currents are requisite, and by pressing key *k* (if the switches *j* and *j'* are properly set) these developed by the generator D are transmitted to line. If, on the contrary, the sub-station bell is operated by breaking and closing the circuit of a battery, it is only necessary to manipulate the second key, *k'*, which brings the battery E into play.

The third key, k^2, and hand-generator F are only used when from some reason the power-generator is not in operation. Each of the keys, when operated, is adapted to break the normal circuit through its back-contact or bridge-piece to earth before closing the new circuit from the electrical source to be applied.

Referring to Fig. 1, switch-board section C, it will be seen that normally the circuit from the switch-board telephone-bar *b* to the operator's telephone T^3 belonging to the same board is from bar *b*, *via* wire d^2, leaf-spring *g*, second leaf-spring, *g'*, as in Fig. 2, and wire 3, to the operator's telephone T^3, and thence to ground, and ordinarily during the transaction of business between the operator and any of the subscribers such is the course of the telephonic circuit; but if the chief operator or superintendent has business with either operator or subscriber, or if he has reason to suppose that irrelevant or unnecessary conversation is being indulged in between them, he is, by inserting the wedge or plug *m* between the leaf-springs appertaining to any switch-board, enabled to listen to the said conversation, to speak to either, permitting the other to hear or not, at his pleasure, or to transmit call-signals. This organization is of great utility in the event of any dispute between operators or subscribers, or if any real or fancied ground of complaint arises, as the operator may refer the matter at once to the chief, by whom it may be settled.

The operation is as follows: If the chief, for example, desires to listen to the conversation passing between the operator at station B and one of his subscribers whose line, as shown, is connected with the telephone-strip *b* at *c*, he first inserts the wedge *m* between the two leaf-springs connected with the B board and places the button-switch *j* on the stud h^2 and the switch *j'* on the stud h^4. Tracing the connections, it will be seen that the communication between the subscriber's line and the operator's telephone, instead of being direct, as heretofore, is now diverted through the chief operator's instruments by means of the following route: subscriber's line *a*, connector *c*, bar *b*, wire *d'*, leaf-spring *g*, rod *f*, wire *y*, chief's telephone T, wire *z*, stud h^4, switch *j'*, wire *u*, rod *f'*, leaf-spring *g'*, wire 2, operator's telephone T^2 to the ground G. Thus the chief can now listen to the conversation of either operator or subscriber. By turning the switch *j* onto the stud h^3 he loops his transmitter T^4 also into the circuit, and is enabled to speak as well as listen. He wishes to speak to the

switch-board operator without the knowledge of the subscriber. Leaving the wedge *m* still inserted, he moves the switch *j* to the stud *h'* and retains the switch *j'* on the stud h^3. The talking-circuit then follows the route from operator's telephone T^2 over wire 2, leaf-spring *g'*, rod *f'*, wire *u*, switch *j'*, stud h^3, telephones T^4 and T, wire *y*, rod *f*, wire 4, stud *h'*, switch *j*, and to the ground by way of the three keys and their connecting-wires 6, 19, 17, 15, and 16, while the subscriber's line is connected with the ground direct by wire *d'*, spring *g*, rod *f*, wire 4, stud *h'*, switch *j*, and through the keys and their connecting-wires, that part of the circuit from wire 4 to ground-wire 16 being common to both.

If it is desired to signal any line from the chief's desk, the wedge *m* must be inserted, as usual, between the leaf-springs of that line, the button-switch *j* placed on the stud *h'*, and the switch *j'* on the stud h^5. In this position the circuits of the chief operator's telephone and transmitter are opened, and the main line is connected directly with the ground through the several generator-keys. If any of the keys be now pressed, currents of electricity corresponding in character to the source from which they are derived are sent to line. When the key *k* is pressed the power-generator D is brought into play and the line-circuit is connected therewith, as follows: from switch-strip *b* connected with any line *via* wire *d'*, leaf-spring *g*, rod *f*, wire 4, stud *h'*, switch-button *j*, wire 6, key *k*, front contact or anvil of the same, wire 8, and through the power-generator D and wire 13 to the ground. To send battery-currents to line, and thereby ring sub-station bells possessed of neutral armatures, the key *k'* is pressed, and the battery E is thus connected to line over the same line as that of the power-generator. To send magneto-electric currents to line when the power-generator is at rest, the crank of the hand-generator F is rotated and the key k^2 depressed, which operation includes the said generator in the circuit. Having signaled the required sub-station with the proper key, as described, in order to talk with the subscriber there, cutting off the central-office operator from participating in or hearing the conversation, the switch *j* is placed on the stud *h* and the switch *j'* on h^3. In this case, which is the one shown in the drawings, the operator's telephone is short-circuited, and thus practically cut off from the line, and the subscriber's line is made continuous through the chief operator's telephones, the sub-station continuing *via* plate *b*, wire *d'*, spring *g*, rod *f*, wire *y*, telephone T, transmitter T^4, wire *q*, stud h^3, switch *j'*, wire *u*, rod *f'*, wire 5, switch *j*, and through keys to ground.

I do not claim broadly the peculiar form of circuit-changer employed, as it is old; but

I claim—

1. A circuit-changing apparatus at a supervising-desk, through which the telephone-circuit of each switch-board section is looped, in combination with a telephone or telephones, the power magneto-generator D, a battery, E, and an auxiliary generator, F, the switches *j* and *j'*, whereby the telephones or the generating-circuit may be included in the switch-board circuits, and the keys *k*, *k'*, and k^2, whereby the several generating devices are controlled or made operative, substantially as described.

2. In combination with the speaking and listening telephone circuits of a series of central-office switch-boards and a circuit-changer located at a supervising-desk, through which all the said telephone-circuits are looped, a supervising telephone or telephones, an auxiliary signaling-circuit provided with normally-open branches connecting respectively with magneto-generating machines and with a battery, a switch controlling the signaling-circuit, and a separate switch controlling the supervising-telephones and connecting devices, whereby either signaling or telephone circuit may be included in any of the switch-board telephone-circuit loops, substantially as and for the purposes set forth.

3. In a telephone-exchange, a series of separate switch-boards upon which the entering lines are grouped, a normally-open listening and talking circuit, including a telephone for each switch-board and adapted for temporary connection with any of the lines thereof, each of the said normally-open circuits being looped through a circuit-changer located at a chief operator's desk, and a telephone or telephones adapted to be included in any of the listening-circuits by means of the said circuit-changer, all in combination, and for the purposes described.

4. The combination, with two or more switch-boards and the operators' telephone-lines, of circuit-changers on the chief operator's table, through which the operators' telephone-lines are looped, and the chief operator's telephone-circuit adapted for connection with any one of said operators' telephone-lines, substantially as described.

5. The combination, with two or more switch-boards and the operators' telephone-lines, one for each switch-board, of a supervising-circuit, means for including the same in the line between the subscribers' stations and any of said operators' telephones, and a switch under the control of the supervising-operator for grounding the line at his desk and short-circuiting the operator's line, substantially as described.

6. The combination, with a circuit-changer comprising a series of springs arranged in pairs normally in contact, the back contact-rods for said springs, and the wedges, of a switch for grounding either of said contact-rods or for disconnecting the ground, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 6th day of July, 1882.

W. D. McKINNEY.

Witnesses:

J. H. CHEEVER,

GEO. WILLIS PIERCE.