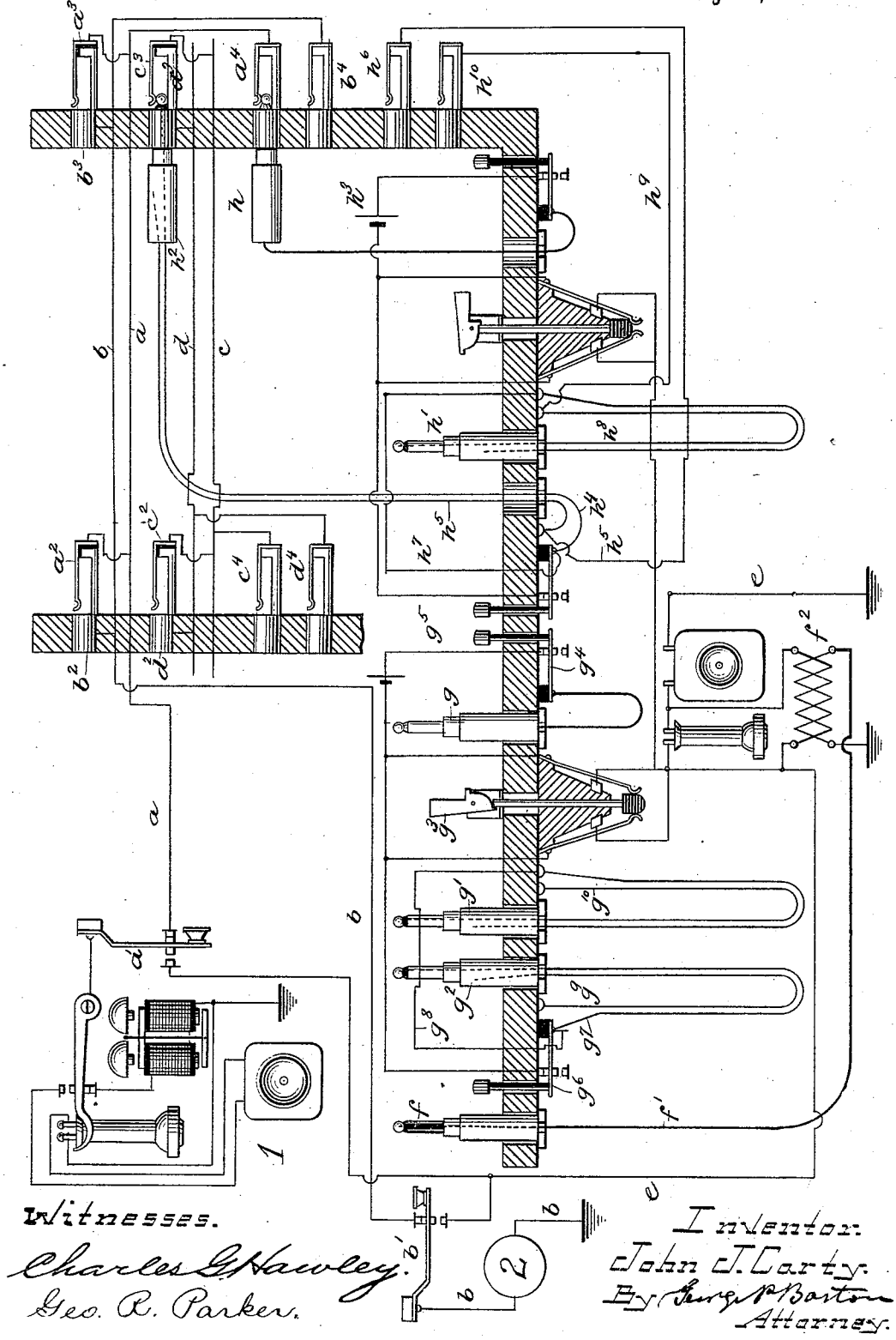
(No Model.)

J. J. CARTY.

MULTIPLE SWITCH BOARD APPARATUS.

No. 427,155. Patented May 6, 1890.



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UNITED STATES PATENT OFFICE.

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MULTIPLE-SWITCH-BOARD APPARATUS.

SPECIFICATION forming part of Letters Patent No. 427,155, dated May 6, 1890.

Application filed October 26, 1889. Serial No. 328,289. (No model.)

To all whom it may concern:

Be it known that I, JOHN J. CARTY, a citizen of the United States, residing at New York, in the county of New York and State of New York, have invented a certain new and useful Improvement in Multiple-Switch-Board Apparatus, (Case 7,) of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawing, forming a part of this specification.

My invention relates to telephone-exchange apparatus, and is designed for use in those exchanges in which multiple switch-boards are employed.

The special object of my invention is to simplify the switch-board apparatus, in order that more lines may be brought within a given space upon the switch-board. My invention is therefore of special utility in large exchanges.

Briefly stated, my invention consists in connecting the telephone-lines in pairs with the different switches on the switch-board, a single series of spring-jack switches serving for two lines, one line being connected with the spring of each of its series on the different switch-boards and the other line of the pair being connected with the frames of the switches of the same series.

My invention consists, further, in the key-board apparatus, whereby the connections and disconnections are made between the lines of the different subscribers, a feature of this key-board-apparatus invention being providing sets of cords and plugs at the different boards, each set consisting of three plugs and their cords, one of said plugs being a single connecting-plug and the other plugs of each set being loop-plugs, the connections of the loop-plugs being so disposed that one of said loop-plugs will be adapted to make connection with one line of a pair, while the other loop-plug will be adapted to make connection with the other line of the pair. Several such sets of plugs and cords, with appropriate loop-keys and calling-keys, are provided at each of the several switch-boards. The loop-plugs may be of the same construction. Their connections, however, will be different, the tip of one being in connection with the cord of the single plug, while the sleeve of the other is in connection with the single plug, the remaining terminal of each plug being provided each with a connection to a different special switch. We have, then, a circuit from the single plug which is branched to one terminal of one of the loop-plugs and to another terminal of the other loop-plug. The strands of the loop-plugs which are not thus connected with the single plug I have sometimes termed the "idle" strands, because ordinarily they will have no function except when after connection has been made with one of a pair of telephone-lines it is desired to make connection with the other line of the pair at the same board. In order that this may be done, I have provided the connection for each of the idle strands of the loop-plugs, at which connections or switches the other wire of a pair when thus wanted may be made accessible for tests and connections.

The telephone-lines, as before stated, are arranged in pairs. The circuit of one line of a pair extends normally from ground at the station thereon through the bell at said station and the telephone-switch to a key, and thence normally to the springs of the switches or connecting devices on the different boards and to its special connecting-key or answering-switch upon one of the boards. The other line of the pair extends from the ground at its station in the same manner through the bell, telephone-switch, and key, and thence to the central office, where it is connected with the other portion—that is to say, the frame of each of the same switches on the different switch-boards and thence to its special answering-switch. The two lines are thus normally open at the central office. In order that the subscribers may call the central office, I provide, preferably, a circuit extending to a number of stations so arranged that a subscriber at any of these stations may, by taking down his telephone and pressing a key, bring his telephone into this circuit, this circuit including a listening-operator's telephone at the central station. Any one of several subscribers, on thus taking down his telephone and pressing the key, may speak directly to the listening operator.

My invention will be readily understood by

reference to the accompanying drawing, in which I have shown the circuits of a pair of telephone-lines extending from the stations thereon, each through the different portions of a series of switches on different switch-boards, the common calling-circuit connecting said stations with the listening operator, the key-board apparatus being shown at one of the switch-boards.

The circuit a of station 1 extends through the bell and switch at said station, and thence through a key a', and thence to the central office, where it is connected with the spring a^2 of the switch on the first board with the spring a^3 of the other switch of the series on the last board, and thence the circuit of line a extends to the connecting or answering switch a^4, which is placed in this instance on the last board. The circuit of the line b of station 2 is connected in the same manner through the subscriber's apparatus at said station 2 to a key b', and from the key b' circuit b extends to the central office, where it is connected with the portion b^2 of the switch of the pair on the first board, and thence to the portion b^3 of the other switch of the series belonging to the pair on the last board, and thence to its special answering-switch b^4. These lines a and b may be said to constitute a pair of telephone-lines. Other pairs of telephone-lines will be connected in a similar manner with each of the switch-boards. Thus line c is connected with the portions c^2 c^3 of another series of spring-jack switches and with the special answering-switch c^4, in this instance placed on the first board. The other line d of the pair is connected with the portions d^2 d^3 of the same series of switches and with the answering-switch d^4 upon the first board. The common calling-circuit e extends through both the stations 1 and 2. Fifty or one hundred stations may thus be connected with one common signal-wire. This wire e is connected through the listening-operator's telephone to ground. Any subscriber, by means of his key, as keys a' b', may put himself in communication with the listening operator and give his order direct. The test-plug f has its shank insulated. The cord f' of this plug is connected through a coil of the converter f^2 to ground, the other coil of the converter being bridged across the terminals of the telephone. The plugs g, g', and g^2 constitute a set of plugs. Each operator will be provided with several such sets. Usually ten sets will be sufficient for each operator. The plug g is a simple single plug. The plugs g' and g^2 are loop-plugs and may each be of the same construction, as shown. Each set of plugs is connected together by strands of flexible cords. A usual loop-switch g^3 is provided for making connection with the operator's telephone. The single plug g is connected through the calling-key g^4 and the test-battery g^5 to the contact of calling-key g^6. From the calling-key g^6 are two branches, one branch g^7 connecting through a strand of the cord of plug g^2 to the tip of said plug g^2. The other branch g^8 is connected with the strand of the cord of plug g', which connects with the sleeve thereof—that is to say, the branches g^7 g^8 are connected the one with the tip of one of the loop-plugs and the other with the sleeve of the loop-plug. Now the switches upon the switch-boards are of such construction that the sleeve of a loop-plug connects with one portion thereof, while the tip connects with the other portion thereof. Thus, suppose plug g^2 inserted in the switch of line a upon the last board. It is evident that the tip thereof will come against the spring a^3, and thus the circuit, including the cord of the single plug, will be closed through the strand or branch g^7 to the tip of plug g^2, and thence to the spring a^3 of the switch, and thence to the line a. Suppose, now, instead of inserting plug g^2 I insert plug g'. In this case the cord of the single plug g will be connected in circuit by the strand g^8 with the sleeve of plug g', and from said sleeve with the portion b^3 of the switch, and thus with the telephone-line b, connecting with said portion b^3. Thus, by inserting the loop-plug g^2 in a socket, connection will be made with one of the lines connected therewith, and by inserting the other plug g' in the same socket connection will be made with the other line connected with said socket. The strands g^9 and g^{10} of the loop-plugs are run ordinarily each to a special connecting device. I have not, however, deemed it necessary to show each of these strands g^9 g^{10} connected with a special socket or connecting device, as such connections and connecting devices are shown with the corresponding strands of the other set of plugs illustrated. This other set consists of a single plug h and the loop-plugs h' h^2.

The telephone-line c is shown connected with the telephone-line a by means of the single plug h, inserted in the answering-switch a^4 of line a, and the loop-plug h^2, inserted in the switch, as shown, to connect its tip with the spring or portion c^3, with which line c is connected. The cord of plug h is connected through the test-battery h^3, and thence to the strand h^4 of plug h^2, which strand connects with the tip of said plug. The other strand h^5 of the cord of plug h^2 connects with the special connecting device h^6. Thus, when connection is made with line c, there will be an open branch from line d, the circuit of which may be traced from the portion d^3 of the switch to the sleeve of plug h^2, and thence by strand h^5 to connecting device h^6. The object of this is to afford means for making connection with line d at the same board at which connection has been made with the line c of the pair. If the plug h' were inserted in a switch, the plug h would be connected by the strand thereof to branch h^7, and thence to the strand connecting with the sleeve of plug h'. The strand h^8 would then be what I term the "idle" strand of plug h'. This strand h^8 is provided with a connection h^9, extend-

ing to the connecting device h^{10}. Thus the idle strand of each loop-plug is provided with a connection extending to a switch or connecting device. Thus, when either of the plugs is inserted in a switch to connect with one line of a pair, connection may be made with the other line of the pair when called for at the same board at the connecting device of the idle strand of the plug which is in use. Thus, suppose after lines *a* and *c* have been connected together, as shown, subscriber at station 2 should call for connection with line *d*. The operator would insert plug *g* of another set of plugs in answering-switch b^4, and with test-plug *f* applied to this connecting device h^6 would test line *d*, and finding line *d* free would immediately insert one of the plugs g' g^2 in the switch h^6. In this case either plug g' or g^2 might be used. The idle strands g^9 g^{10} in this instance have no function.

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

1. A pair of telephone-lines extending each from a different subscriber's station, each to a different corresponding portion of a series of switches, each switch being on a different switch-board, in combination with a set of plugs and cords at each of the switch-boards, said set consisting of a single plug and two other plugs, to different terminals of which the single plug is connected, whereby the switchman may connect either of said pair of lines with the single plug, substantially as and for the purpose specified.

2. A pair of telephone-lines, each connected with a different portion of the same switch upon the switch-board, and two plugs each having a terminal connected with a common wire, the terminal of one plug being adapted to connect with one portion of the switch and the terminal of the other being adapted to connect with the other portion of the same switch, whereby either of said pair of telephone-lines may be connected with the common line by using one plug or the other, substantially as and for the purpose specified.

3. A set of plugs and cords consisting of a single plug having branches, one branch extending to the tip of one loop-plug and the other branch extending to the sleeve of another loop-plug, the remaining terminals of each of said loop-plugs being provided each with a branch connection to different connecting devices, substantially as and for the purpose specified.

In witness whereof I hereunto subscribe my name this 5th day of October, A. D. 1889.

JOHN J. CARTY.

Witnesses:
C. G. HAWLEY,
ELLA EDLER.