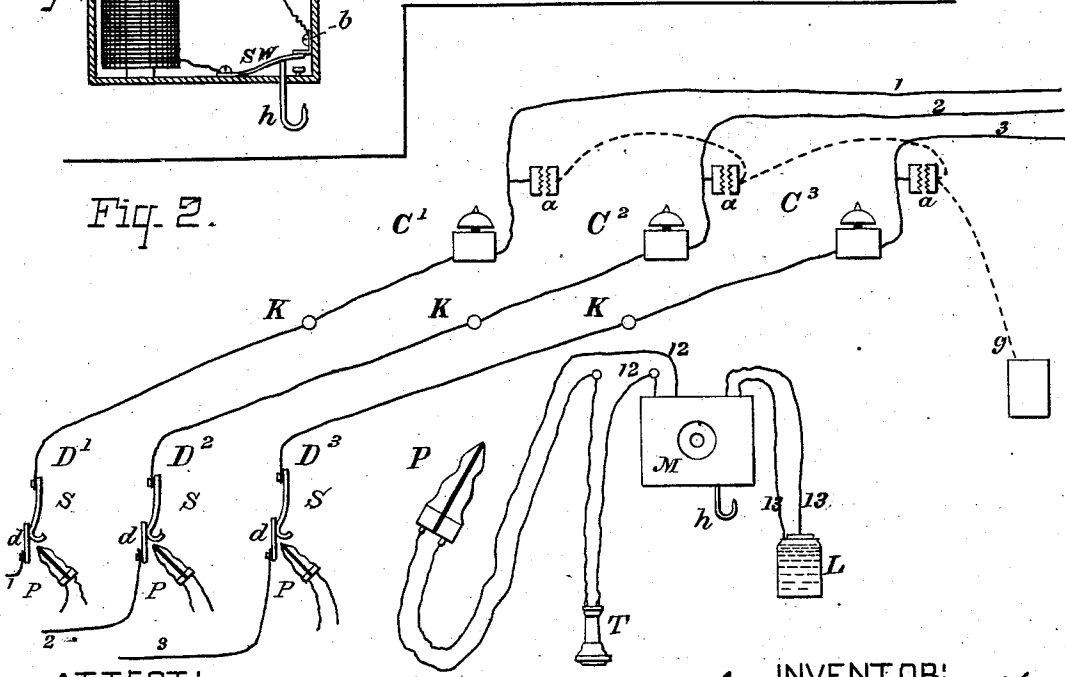
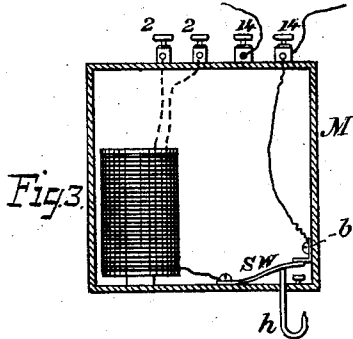
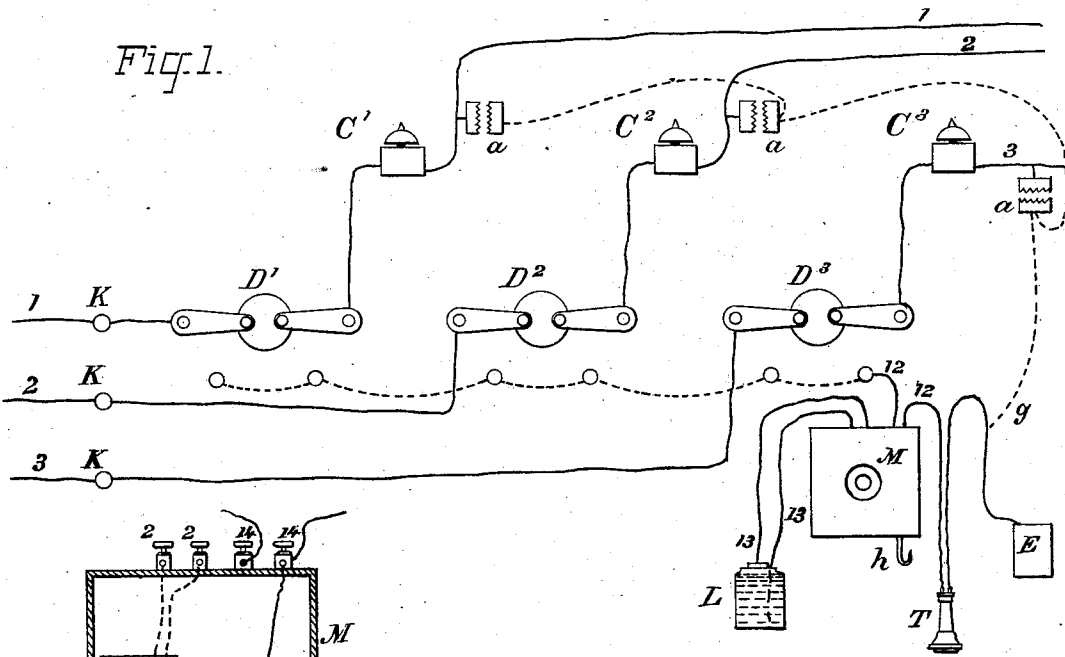


C. E. BUELL.

TELEPHONE EXCHANGE SYSTEM.

No. 248,134.

Patented Oct. 11, 1881.



ATTEST:

*Geo. Duffley*  
*Julian A. Hurdle*

INVENTOR:

*Chas. E. Buell*  
 by *W. C. Townsend*  
*Att'y*

(No Model.)

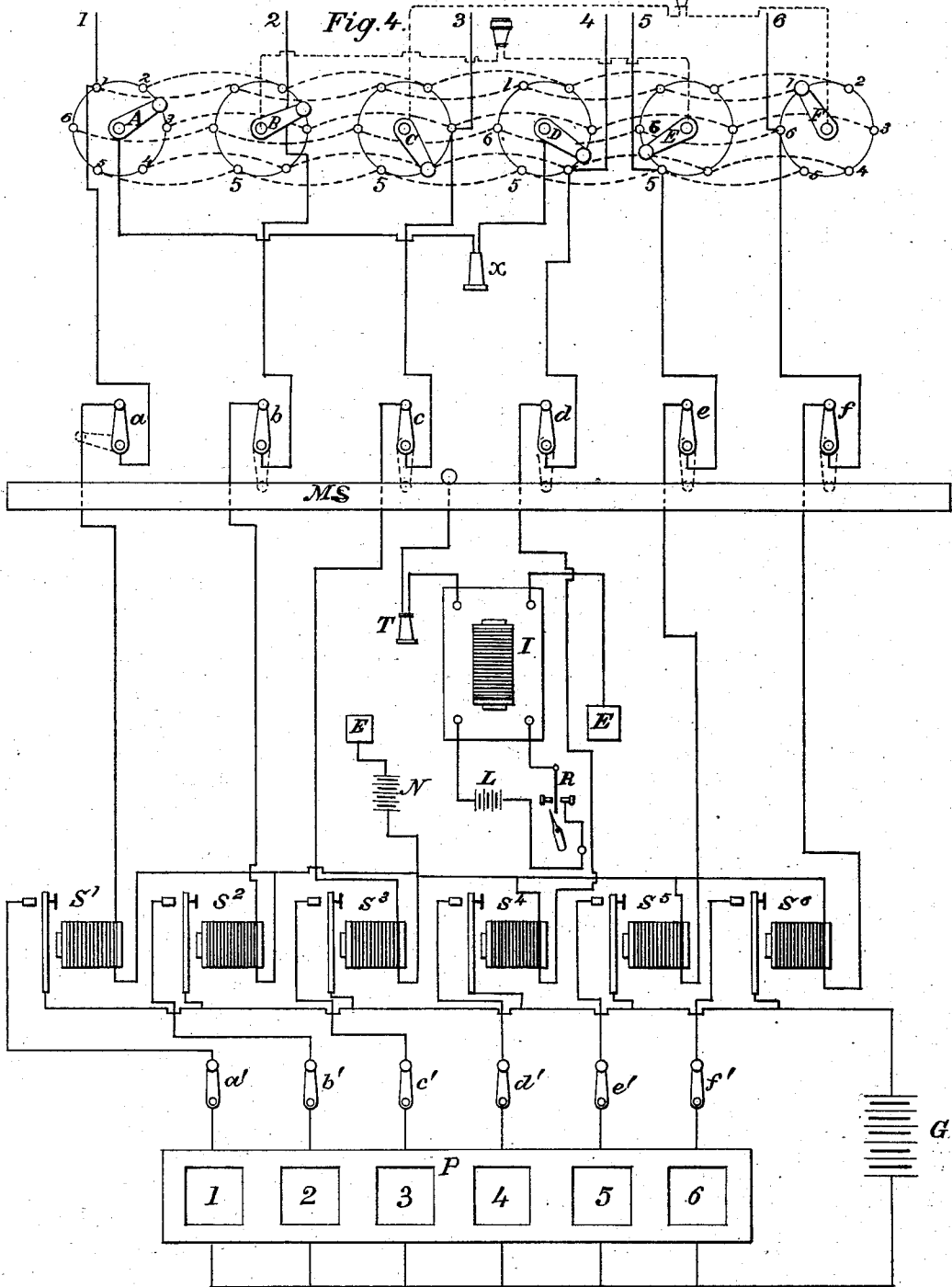
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# UNITED STATES PATENT OFFICE.

CHARLES E. BUELL, OF NEW HAVEN, CONNECTICUT, ASSIGNOR OF TWO-THIRDS TO JAMES G. SMITH, OF HACKENSACK, NEW JERSEY, AND GEORGE W. COY, OF MILFORD, CONNECTICUT.

## TELEPHONE-EXCHANGE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 248,134, dated October 11, 1881.

Application filed January 6, 1881. (No model.)

To all whom it may concern :

Be it known that I, CHARLES E. BUELL, a citizen of the United States, residing at New Haven, in the county of New Haven and State of Connecticut, have invented certain new and useful Improvements in Telephone-Exchange Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters or figures of reference marked thereon, which form a part of this specification.

My invention relates to the systems of telephonic intercommunication known as "exchange" systems.

Heretofore the stations remote from the central station have had but one wire for oral communication with the central station or other outlying stations of the system, and by such limited facilities it often occurs that the subscriber is debarred from the use of the system, when it is highly important that he should be able to employ the system for communication, either because the wire which includes one or both of the stations is broken, or open by neglect, or is in use by others.

The object of my invention is to increase the facilities for communicating between the various stations of a system. This object I accomplish by affording subscribers two or more wires, and means adapted to place the telephonic apparatus at each station in communication with the central station through either of said wires, and through the central station with other like subscribers' stations by either of the several wires thus afforded.

Figures 1 and 2 are diagram views of the apparatus at the subscribers' stations. Fig. 3 is a view of the switch for suspending the telephone, which automatically connects and disconnects the transmitter-battery. Fig. 4 is a diagram of central-office apparatus.

In Fig. 1 the several lines passing through the station are designated 1 2 3.

C' C<sup>2</sup> C<sup>3</sup> are call-bells, and K are ordinary circuit-breaking keys, one in each of the lines 1 2 3.

D' D<sup>2</sup> D<sup>3</sup> are switches adapted to break the lines to either side of the station and connect in the telephone, which is done by operating one of the switch-levers shown, so as to connect it with the dotted line common to D', D<sup>2</sup>, and D<sup>3</sup>, which passes through the wires 12 and the secondary of the transmitter induction-coil to the receiving-telephone T and to earth.

M is the case of a battery-transmitter, L a local battery, and 13 13 the wires connecting the battery to the primary of the induction-coil and the contacts in the transmitter. A telephone-hook, *h*, is also shown, the operation of which will be hereinafter described. Lightning-arresters *a a a*, one for each line, are connected by a wire, *g*, to the earth.

The operation of these devices can be readily seen from the drawings. Let it be supposed that wire 1 has been designated for ordinary use, and that a subscriber at a station upon depressing button K of that line fails to get a response. This may happen either because a subscriber at a station between the station calling and the central office is using the line, or because the outside line is broken or crossed, or because of the neglect of some subscriber to replace the switch at his station after using the line, or from other causes. Under these circumstances it is only necessary for the subscriber to depress the proper button of another line, 2, and by turning the proper switch D<sup>2</sup> to place his telephone in communication with the central office of that line, and afterward, if communication is desired with some subscriber on the same line with him, but farther away from the central office, to make the proper connection by a suitable manipulation of the switches D<sup>2</sup>. Should he find that line 2 is not in condition for use, which may sometimes happen in busy seasons, he can finally resort to line 3, and by a proper operation of the switches can secure the desired communication.

In Fig. 2 I have shown spring-jacks S *d*, one in each line, and a switch-plug, to which are connected the terminals from the receiving-telephone and the secondary of the induction-coil, as shown. By these means the telephone

can be interposed in any line without breaking its continuity. In other respects the apparatus is the same as in Fig. 1.

In Fig. 3 I have shown a telephone-hook, *h*, suspended from a spring, *S w*, which, when released from the weight of the telephone, will make contact with a stud, *b*, connected by wire 14 to one pole of the local transmitter-battery. The spring *S w* is connected with one terminal of the primary of the induction-coil, the other terminal of which connects with the contact-points of the transmitter, and so to the other pole of the battery.

It will be seen that when the telephone is taken from its support for the purpose of oral communication the circuit of the local battery is automatically established, and when the telephone is restored to its position the circuit is broken. This arrangement simplifies considerably the connections in the subscriber's station apparatus.

Other forms of switch may obviously be substituted for that shown without departing from the invention. It is only necessary that the switch, when relieved from the presence of the telephone, shall automatically complete the local circuit, and that the restoration of the telephone to its place shall automatically break the circuit by restoring the parts to their original position. There are many well-known and obvious ways of accomplishing this result. Other forms of switch besides those shown in Figs. 1 and 2 may, of course, be used for connecting the station-telephone apparatus to either of the wires 1 2 3.

Any ordinary form of call-bell or call-bells adapted to lock out the call-keys and telephones when not attracted may be used.

In Fig. 4 is shown the apparatus at a central station, adapted to signaling separately upon each of the wires 1 2 3 or 4 5 6 to the same station, or connecting a station through which pass wires 1 2 3, in the manner shown in Figs. 1 and 2, with a like station included in like manner in several wires, 4 5 6. Lines 1, 2, and 3 pass through the same subscribers' stations, and lines 4, 5, and 6 are similarly connected to another set of stations.

A B C, &c., are pivoted switch-levers, each pivoted at the center of a circular range of studs and adapted to connect with either of the studs. The studs are numbered consecutively to correspond with the number of connected wires, and, as shown by dotted lines, the corresponding studs of the several ranges are connected.

The lines 1 2 3, &c., are connected with the studs 1 2 3, &c., as shown, and with the pivots of the switch-levers *a b c d e f*. The circuit for each line, in the normal condition of the switch, is through the levers *a*, *b*, and *c* to the relays *S' S<sup>2</sup> S<sup>3</sup>*, and to a battery, *N*, and to the earth.

The back contacts of the relays connect, as shown, with the annunciator and one pole of a battery, *G*, whose other pole is connected to the armature-levers. Disconnecting-switches

*a'*, *b'*, and *c'* are interposed in the connections from the back contacts to the annunciator.

*M s* is a switch-bar common to the levers *a b c*, &c., either of which may be swung so as to connect with said bar *M*, and through the same with a magneto-telephone, *T*, the secondary of an induction-coil, *I*, and the earth. The induction-coil *I*, local battery *L*, connected to the primary, and the circuit-breaking reed *R* in the circuit of the local battery constitute a call apparatus operating after the manner shown in patent to T. A. Watson, No. 199,007, dated January 8, 1878. The pivots of *A* and *D* are connected to telephone *X*, as shown. The pivots of *B* and *E* and of *C* and *F* may be similarly connected to telephones.

The operation of these devices is as follows: A button, *K*, on, say, line 1, having been operated to break the circuit, the relay *S'* is demagnetized, and its armature-lever falls back, closing a local circuit of battery *G*, thereby indicating upon annunciator 1 a "call." The central-office operator thereupon turns the switch-lever *a* into contact with *M s*, thereby breaking the connection of the line with the relay and substituting the connection through the telephone *T*, through which he ascertains from subscriber on line 1 with whom communication is desired. If with a subscriber upon another line, as 4, the appropriate switch-lever *d* is connected to *M s*, (lever *a* having been first turned to an intermediate position, as shown in dotted lines,) thereby connecting the call apparatus *I* to line 4. The subscriber upon line 4 having been "called" by the predetermined signal, switch-lever *A* is placed on button 1, and *D* also upon its button 4, thereby connecting lines 1 and 4 through telephone *X*. Telephone *X* is for the purpose of enabling the central-office operator to ascertain when the subscribers have finished their communication. Should line 4 be in use and communication be desired with some other subscriber on that line, he may be called and communication established by line 5 or 6 through either pair of switch-levers *B E* or *C F*. Line 1 may be connected to line 5 through levers *A* and *D* by turning lever *A* to the button 1 and lever *D* to the button numbered 5 upon its dial, which, as before described, forms one of a series of buttons in the several dials, which buttons are connected together and to the line 5, as shown. The circuit is then through line 1 to button 1 of the dial to which *A* is connected, to switch-lever *A*, through telephone *X*, to switch-lever *D*, to button 5 of its dial, thence through the series of buttons 5 and their connecting-wires to the line 5. Lines 1 and 6 may be connected by placing lever *A* upon button 1 and lever *D* upon button numbered 6 in its dial, the circuit being to lever *D*, as before, and thence to button 6, to the connecting-wire of the series of buttons 6, and to line 6. Lines 1 and 6 might be connected by placing *A* on 6 and *D* on 1. Similarly any other two lines may be connected through the telephone *X*.

Levers *a' b'*, &c., serve to disconnect the annunciator-magnets, and are used when a station is to be called, in which operation the circuit of the main line, through its relay, is broken by turning one of the levers *a' b c*, &c. The latter operation would, of course, allow a corresponding relay-armature to drop back and close the local circuit, thereby ringing the annunciator-bell, and to prevent this the disconnecting-levers *a' b' c'*, &c., are provided. The switch shown is obviously of comparatively limited capacity. It is, however, only necessary to multiply the parts in a well known manner in order to extend its capabilities to any desired degree. Other forms of switches and connecting apparatus would be suitable for my purpose, and other well-known kinds of signaling devices may be substituted for that described.

20 What I claim is—

1. Two or more wires passing from a central office to the same subscribers' stations, each wire containing at the subscribers' stations signaling apparatus, whereby calls may be sent and received separately upon each circuit, combined with one branch circuit, which includes a telephone and switch devices, whereby said branch circuit can be switched to form a part of either of said circuits, as and for the purpose described.

2. In a telephone-station apparatus, the combination, with several main circuits, each passing from a central office to the same subscribers' stations, of signaling devices included in

each such circuit at the subscribers' stations, and independent switch devices for putting a fragment of either of said circuits to a common ground branch including a telephone.

3. In a telephone-station apparatus, the combination, with several main circuits, each passing from a central office to the same subscribers' stations, of switch devices located at the subscribers' stations and common to all of said circuits, and means for signaling upon each of such circuits separately.

4. The combination, with a telephone-transmitter and its local battery, of devices for closing and opening the circuit of the local battery by the removal and replacement of the telephone, substantially as described and shown, with independent devices for switching the telephone in and out of circuit.

5. In a telephone-exchange system, a series of main circuits at each subscriber's station, signaling apparatus for each circuit, and one telephone common to all the said circuits, with devices at a central station for signaling upon each circuit separately, and connecting devices whereby either of the main circuits can be connected with any other of the circuits, or to an earth-connection for oral communication.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES E. BUELL.

Witnesses:

JNO. DIFFLEY,  
THOMAS W. PEYTON.