

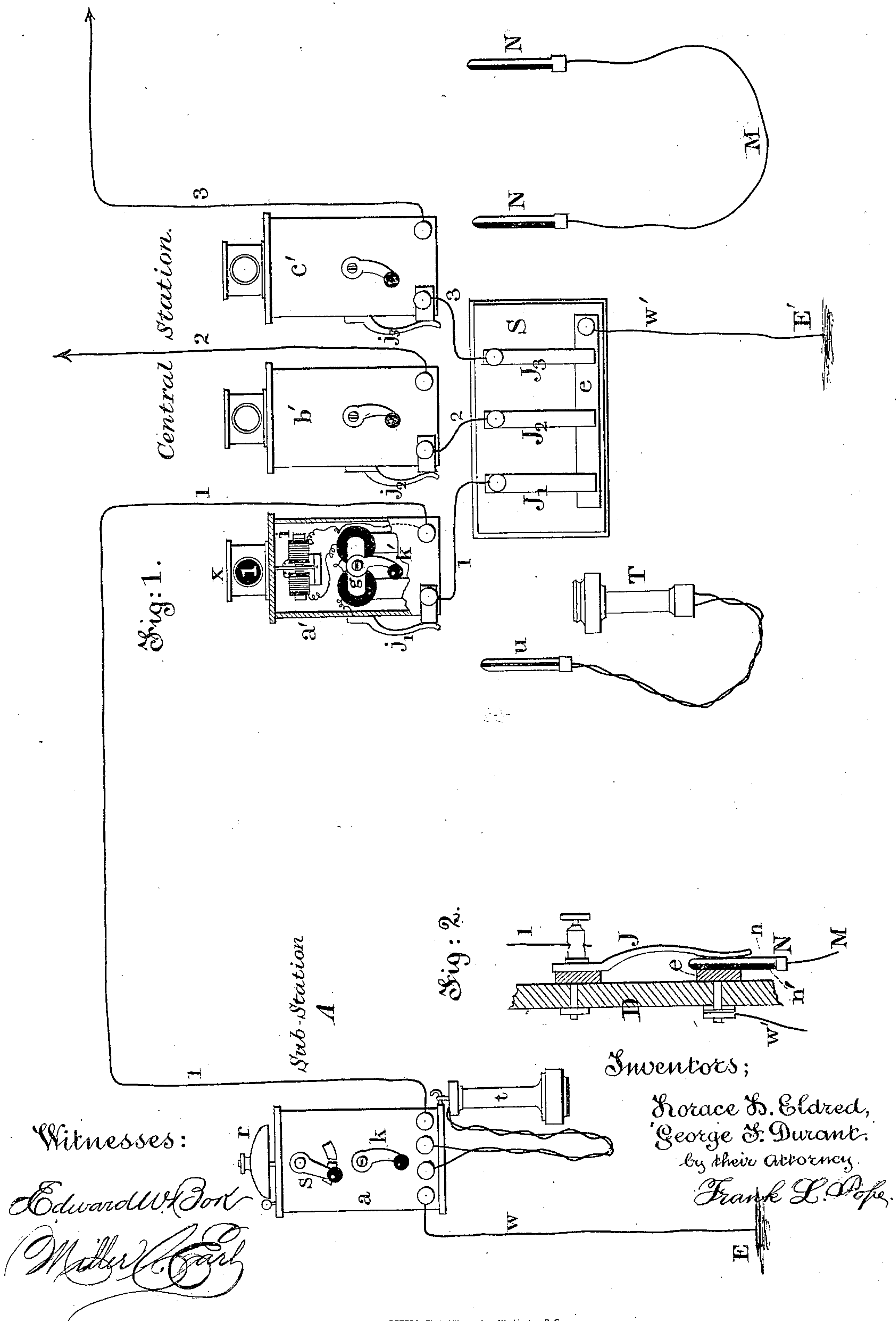
(No Model.)

H. H. ELDRED & G. F. DURANT.

TELEPHONE EXCHANGE SYSTEM AND APPARATUS.

No. 246,481.

Patented Aug. 30, 1881.



UNITED STATES PATENT OFFICE.

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TELEPHONE-EXCHANGE SYSTEM AND APPARATUS.

SPECIFICATION forming part of Letters Patent No. 246,481, dated August 30, 1881.

Application filed May 15, 1880. (No model.)

To all whom it may concern:

Be it known that we, HORACE H. ELDRED and GEORGE F. DURANT, citizens of the United States, residing, respectively, in the city, county, and State of New York, and in the city and county of St. Louis, in the State of Missouri, have invented certain new and useful Improvements in Telephone-Exchange Systems and Apparatus, of which the following is a specification.

Our invention relates to a method of intercommunication known as the "district" or "exchange" telephone system; and it consists, in general, of a central or exchange station which is connected with a number of sub-stations by means of telegraphic or telephonic lines radiating therefrom, these latter being so organized and arranged that any two of the sub-stations may be placed, at a moment's notice, in direct telegraphic or telephonic communication with each other by the act of an attendant at the central or exchange station, who, upon being notified to do so, connects together the two lines leading to the respective sub-stations, so that they are enabled thereafter to communicate with each other directly.

Our invention consists, first, in the combination of a series of telephone-lines radiating from a central station to a corresponding number of sub-stations with a series of spring-jacks, one for each line, which are all arranged to be normally in contact with an earth-plate common to all the said lines, and a flexible connecting conductor provided with wedges at its ends, which wedges are faced on their opposite sides with conducting and insulating material, respectively; second, in a flexible conductor for connecting two lines of the series together, each of the terminals of said conductor being provided with a wedge whose opposite sides are faced with conducting and insulating material, respectively; third, in the combination, with a series of telephone-lines, sub-stations, and a central or district station, of an additional series of spring-jacks, one for each line, whereby two lines may be coupled together and a telephone included in the coupled circuit at the central office at pleasure.

In the accompanying drawings, Figure 1 is a theoretical plan, showing the general arrangement of our improved system; and Fig. 2 is a sectional view of the device for making the connections at the switch.

In Fig. 1 I have shown, for illustration, a central exchange or station having three independent lines connecting with an equal number of sub-stations, one of which latter, designated as "sub-station A," is shown in the drawing. The others, whatever their number may be, are all arranged in precisely the same manner as the one shown.

It may be remarked that any convenient number of lines connecting with different sub-stations may be grouped together in one central or exchange station, according to the requirements of the service. At each sub-station—as, for example, at A—is placed a signal-box, *a*, which is provided with an ordinary magneto-electric generator, which may be operated by turning a crank, *k*, and alarm-bell *r*, operated by an electro-magnet, a telephone, *t*, which is preferably of such construction that it will serve equally well either for transmitting or for receiving, and a switch, *s*, for throwing the signaling apparatus or the telephone into connection with the line at pleasure. The construction and arrangement of this portion of the apparatus are well known, and therefore require no detailed description.

The apparatus at each sub-station is connected in the usual manner, by a wire, *w*, with the earth at *E*, and also, by means of a line-wire, *l*, with the central or exchange station. Upon entering the central station the circuit passes first through a signal-box, *a'*, the construction of which will be hereinafter more fully described, and thence to the switch *S*, which consists of a row of "spring-jacks," *J'*, *J*², and *J*³, which press firmly against a metallic bar or plate, *e*, the latter being connected by a wire, *w'*, with the earth at *E'*. Each spring-jack is connected with one of the lines leading to the several sub-stations, and the several spring-jacks may be conveniently designated by the number which serves to distinguish that line, as in the drawings.

The device which we prefer to employ for coupling the different lines together in pairs for direct communication, consists of a flexible insulated conductor or switch-cord, M, provided with wedges N N' at each extremity. The construction of these wedges and the manner in which they are applied to the switch may be best seen in Fig. 2, which represents a sectional view of one of the spring-jacks of the switch with the wedge inserted therein in order to make a connection between one of the lines and the connecting conductor.

D, Fig. 2, is a slab of wood or other non-conducting material, to which the parts of the switch are secured. The spring-jack J is fixed at its upper extremity to a metallic block mounted upon the slab D, and by means of a suitable binding-screw is electrically connected with the wire 1, coming from the line through the signal-box. The earth-plate *e* is common to all the spring-jacks in the series, and is connected with the earth by means of the wire *w*'.

The spring-jack J' is normally kept firmly in contact with the earth-plate *e* by its own resiliency, or by means of a spring.

The wedge N has one face, *n*, of metal, and the other face, *n*', of non-conducting material, the former being electrically connected with the flexible insulated conductor M. When, therefore, the wedge is inserted beneath the spring-jack, as shown in Fig. 2, the previously-existing connection between the line-wire 1 and the earth-wire *w*' is interrupted, and the former is placed in connection through the metallic face *n* of the wedge with the conductor M; but if the wedge be withdrawn the line is automatically and instantly restored to its normal connection with the earth.

The interior of one of the signal-boxes is shown at *a*' in Fig. 1, the front of the case being broken away for that purpose. An ordinary magneto-electric generator, *g*, is provided with a crank, *k*', by which it may be operated. In the upper part of the box is placed an electro-magnet, *i*, with a polarized armature, which is arranged to release a drop, *x*, and thus display the designating number of the line with which it is connected. The line-wire, entering the box at the binding-screw at the lower right corner, passes through the annunciator-magnet *i*, and then through the generator *g*, from which it goes to a spring-jack, *j*', and thence by a wire, 1, to the spring-jack J' of the switch S. The arrangement in the signal-boxes *b*' and *c*' is precisely the same as that just described, and may be repeated for any convenient number of lines.

T is a telephone for either transmitting or receiving oral messages, which is connected by flexible cords with the wedge *u*, which consists of two flat pieces of metal separated by a strip of insulating material, by inserting which into the spring-jack, *j*', *j*² or *j*³ the telephone T may be placed in the circuit of either one of the corresponding lines at pleasure.

The operation is as follows: If a person at sub-station A desires to speak with another sub-station—upon the wire 3, for example—he transmits a signal to the central station by turning the crank *k*, which operates the magneto-generator. The current produced by this operation traverses the line 1, and, passing through the magnet *i* at the central station, causes the numeral 1 to be exhibited, as shown in the drawings, and then goes to the earth at E' through the spring-jacks *j*' and J'. The appearance of the numeral 1 notifies the attendant that the sub-station on that wire desires to communicate, and he first answers the call by means of his magneto-transmitter *k*', which rings the bell *r* at the sub-station, and then inserts the wedge *u* in the spring-jack *j*', which puts the telephone T in circuit and enables him to converse with the person at A, who has meanwhile put his own telephone *t* into circuit by turning the switch S. Upon learning that a connection with No. 3 is desired, the attendant takes the flexible conductor M and inserts one of its terminal wedges in the spring-jack J', and then signals the sub-station upon line No. 3 in the usual manner. Upon receiving a response he inserts the other terminal wedge in the spring-jack J³, thus coupling the two lines together and disconnecting them from the earth. By means of his own telephone, T, which is, of course, still in circuit, he informs the person last called who his correspondent is, and may then withdraw his telephone, leaving the two sub-stations in direct communication with each other and wholly disconnected from the earth at the central station.

It is preferable, although not absolutely essential, that some device should be provided for shunting the magneto-generators out of the circuit, except at the time when they are in actual use. A simple spring cut out will serve the purpose perfectly well.

We claim as our invention—

1. The combination, substantially as herein set forth, of a series of telephone-lines radiating from a central or exchange station to and connecting with a corresponding number of sub-stations, a series of spring-jacks, one for each line, which are normally held in contact with an earth-plate common to all the said lines, and a flexible connecting conductor, provided at each end with a wedge, having one of its faces of conducting and the other of insulating material.

2. A flexible connecting conductor, constructed substantially as described, having each of its terminals provided with a wedge, each of said wedges having one face of conducting and the other of insulating material, as set forth.

3. The combination, substantially as herein set forth, of a series of telephone-lines radiating from a central or exchange station to a corresponding number of sub-stations, a series of spring-jacks, one in each line at the

central station, for the insertion of a telephone, and a second series of spring-jacks, one in each line, for the insertion of one terminal of a flexible connecting-cord, whereby any two lines may be coupled together and a telephone included in the circuit at the central station at the same time.

Signed by us this 14th day of April, A. D. 1880.

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Witnesses :

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WM. ARNOUX.