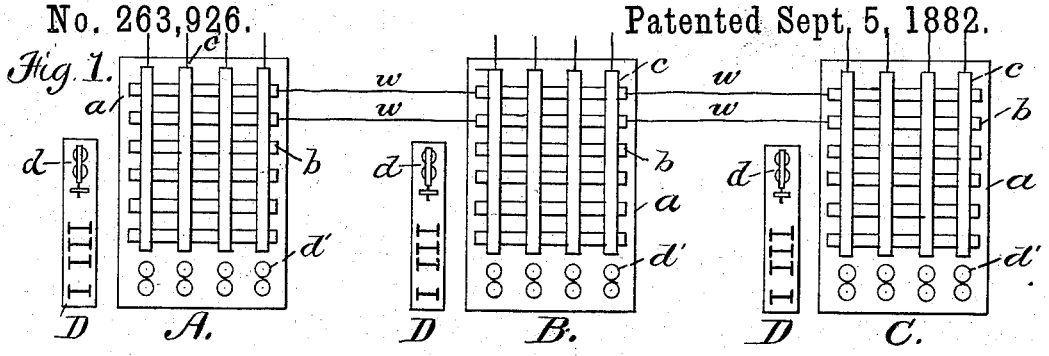
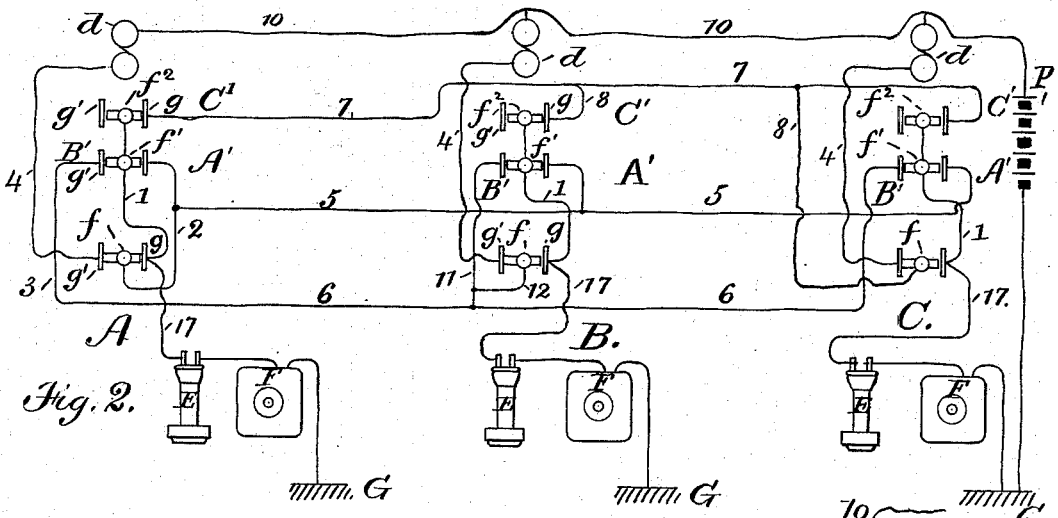
(No Model.)

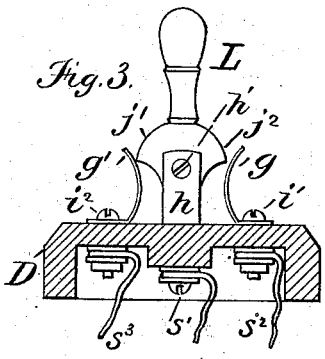
H. B. LYTLE.

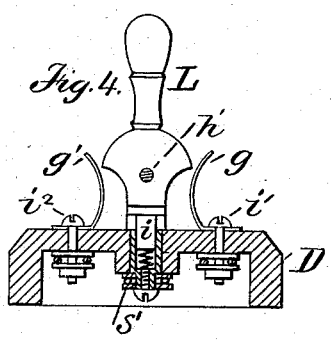
TELEPHONE SIGNALING APPARATUS.

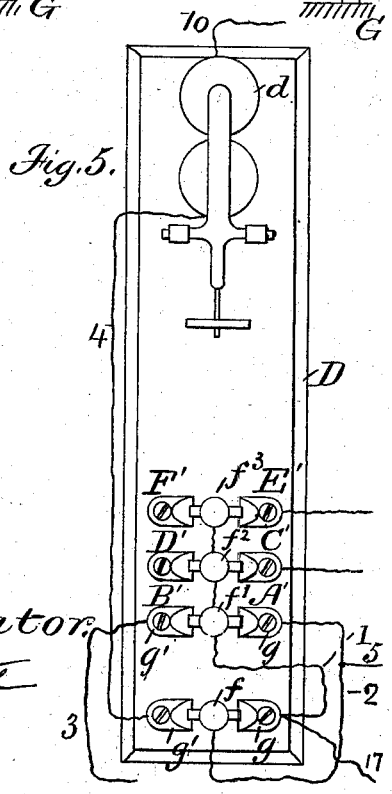
No. 263,926. Patented Sept. 5, 1882.











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UNITED STATES PATENT OFFICE.

HENRY B. LYTLE, OF BOSTON, MASSACHUSETTS.

TELEPHONE SIGNALING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 263,926, dated September 5, 1882.

Application filed June 2, 1882. (No model.)

To all whom it may concern:

Be it known that I, HENRY B. LYTLE, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Telephone Signaling Apparatus, of which the following is a specification.

My invention relates more particularly to improved methods and appliances to be used in the practical operation of a telephone-exchange or central office. It has been found generally convenient in operating such systems in large cities to divide the total number of incoming subscribers' lines into groups of any suitable number and to connect each group with a switch-board by itself and assign each individual group to the exclusive charge of an operator whose duty it is to receive calls, respond thereto, signal the desired subscribers, and connect one line with another for the purpose of intercommunication. If upon the occasion of any subscriber desiring to converse with another and making known his desire to the central station the desired subscriber is found to be in the same group, the operation is simple, being personally supervised by the operator who received the call, and who has the lines of both subscribers before him. If, on the contrary, the line of the desired subscriber be connected with a separate group, it is necessary that a common conductor shall be prepared between the two switch-boards with which both lines may be connected, and which thus furnishes a link of communication between them. It is also necessary to provide means whereby any operator in charge of a switch-board in a central office is enabled to communicate with any other operator stationed in charge of any other switch-board to designate to the said second operator which one of his lines is desired, and to request him to place such line in connection with the switch-board of the first operator by means of one of the common conductors extending between the two switch-boards. A number of these common conductors are usually provided in the shape of metal bars crossing all entering lines and extending to all switch-boards in the central office. To effect communication between the different operators it has been the practice heretofore upon the receipt of a call-signal from a subscriber requiring a line connected with another board to write the number of the required line and all other necessary information upon a ticket prepared for the purpose, which is then conveyed by a messenger to the operator in charge of the second board. This plan involved many messengers and great consequent confusion and noise, and hence is objectionable in practice.

The object of my present invention is to provide a thoroughly practical substitute for the ticket and messenger system of transfer which shall at the same time be noiseless and be completely under the control of the operators. I propose, also, so to extend the scope of such transfer that it may be also employed with an equal degree of success between the different central offices of a city or between central and branch offices as between the different groups of any individual office, since it is obvious that the difference between the conditions is merely one of degree and not of kind.

My invention consists in placing at each individual switch-board in a central office, or at each office in a series of offices, an annunciator capable of being operated from any other switch-board, and a series of circuit-closers adapted to close the circuit of a battery through the annunciator of any particular switch-board or office, thus notifying the operator of such switch-board that some other operator has a communication to make to him.

It further consists in combining the operator's telephones at each separate switch-board with the circuit-closers in such a manner that the act of signaling any special switch-board shall also place the telephones of the signaler in position for oral communication with the operator signaled.

It also consists in the combination, with the devices hereinbefore enumerated, of a separate circuit-closer at each switch-board normally arranged to guide any incoming signals from other switch-boards to the annunciator-magnet of the receiving-board, but capable of transferring the circuit conveying the said incoming signals from the annunciator-magnet branch to a second branch, including the telephones of the signaled switch-board.

In the drawings by which this specification

is illustrated, Figure 1 is an outline of the general external appearance of three switch-boards furnished with my improved appliances. Fig. 2 is a theoretical diagram of the arrangement of circuits. Fig. 3 is an elevation of the circuit-closer which controls the incoming signals, showing the left circuit-spring arranged to make contact when the circuit-closer is upright. Fig. 4 shows in section the arrangement of the circuit-closers controlling the outgoing signals, adapted to stand normally clear of the springs on each side and capable of being turned in either direction; and Fig. 5 is a plan view of the circuit-closers and annunciator with their respective connections.

The circuit-closer which I prefer to use is that patented by Adolphus G. Snell, May 18, 1880, No. 227,851, and although I have shown it in Figs. 3 and 4, I do not claim it as my invention.

In Fig. 1, A, B, and C are separate switch boards or tables in the same office, with which any desired number of subscribers' lines may be connected in groups. Each switch-board is composed of a series of vertical metallic strips, *c*, and a series of horizontal strips, *b*, crossing the vertical strips, but normally insulated therefrom, the two sets of strips being fixed upon a base-board, *a*. To the vertical strips the several line-wires entering are attached, and the line-circuits thus continue through the vertical strips and annunciator-magnets *d'* normally to the ground, in a manner well understood. The horizontal strips, or as many of them as may be required, are connected together seriatim throughout all the switch-boards by the wires *w*, or any suitable conductor, to form connection-strips, by which any line-strip in one switch-section may be united with any line-strip in any other switch-section by the attachment of connectors at the points of intersection between the horizontal connecting-strips and the desired line-circuit strips. At the side of each sectional switch-board I arrange upon a base-board, D, a series of circuit-closers, *f*, and an annunciator, *d*, which I will now specifically describe.

Referring to Figs. 3, 4, and 5, D is a base-board of suitable size to be easily placed at one side of the desk of each switch-board, and at its upper end is an annunciator, *d*, of any desired form, which is adapted to give a signal when an electrical current is passed through its coils. Arranged on the base-board D is a series of circuit-closers, f', f^2, and f^3, equal in number to half the number of the switch-boards to be served. At the lower end of the base-board is an additional circuit-closer, *f*, identical in character with the others, but having different electrical connections. I prefer to construct the circuit-closers as shown in the Figs. 3 and 4, in which the lever L is hung on a pivot, *h'*, in the standard *h*, and has a handle extending outward, by means of which the circuit-closer is operated. Below the pivot is a spring, *s*, which acts against the lower end of the lever through an interposed sliding piece, *i*, so as to force and hold the said lever to the central position, but yet allow it to be turned in either direction. By a screw, s', in metallic connection with the base of the lever a wire from any desired point may be attached thereto.

g and g' are flat springs, fixed to the base D by the bolts i' and i^2, and in permanent connection with the circuit-wires below, the said circuit-wires being fastened to the bolts by the compression of nuts and washers s^2 and s^3. The lowest circuit-closer, *f*, on each base-board D is placed some little space from the others, and its left-hand spring, g', for a purpose which will hereinafter appear, is bent inward, so that it is normally in contact with the side *j* of the circuit-closer, as shown in Fig. 3.

The arrangement shown in Fig. 4 is that of all the other circuit-closers f' f^2 f^3, in which the lever is normally out of contact with both plates *g* g'. It is evident that by using circuit-closers of this construction any wire permanently united to the lever may be put in connection with any other wire united to the spring-plate on either side by the simple act of turning the lever on the required side until it makes firm contact with the spring *g* or g'.

On each base-board D the flat springs on each of the circuit-closers, with the exception of the lower and separate circuit-closer, *f*, are designated by letters A' B' C', corresponding with the letters designating the several switch-board sections, and the letters at each base-board are similarly arranged. The same order of lettering is maintained upon all the base-boards irrespective of which switch-section in the system they are attached to.

All of the plate-springs, which upon any of the boards are designated by the same letter, are connected with one another and normally to one wire of the annunciator at the switch-section indicated by such letter. For example, all the plate-springs which, at each of three switch-sections, A, B, and C, are marked A' are in permanent contact by suitable wires with one another, and also in temporary and normal contact with one terminal of the annunciator at A switch-board, and, moreover, by the action of the operator at that switch-board, may be transferred from the annunciator-contact to a new contact connecting with the operators' telephones. The lowest circuit-closer, *f*, at each switch-board has its lever permanently united to that one of the springs of the upper set of circuit-closers which is represented by its own letter, and, by means of the left-hand plate, g', to its own annunciator *d*.

The instrument shown in Fig. 5 has a sufficient number of circuit-closers to admit of being operated in a central office having six separate switch-boards, designated respectively A, B, C, D, E, and F. It is provided consequently with but three circuit-closers, f', f^2, and f^3, each circuit-closer having two contact-springs, *g* g'. The lever of f' controls the springs marked A'

and B′, that of f^2 controls C′ and D′, and that of f^3, E′ and F′. It has a separate closer, *f*, also provided with two contact-springs, *g* and *g′*. The levers of the upper circuit-closers are all connected together and with the plate-spring *g* of the lower circuit-closer, *f*, by a wire, 1, and to the operators' telephones by another wire, 17. The contact-springs of each of the upper circuit-closers are each connected to similar springs at all of the switch-boards which are marked with the same letter, and also to the lever of the lower circuit-closer, *f*, of the board represented by that letter. Thus in the figure the spring marked A′, at switch-board A, is connected by wire 5 to the A plates on every board, and also by a wire, 2, to the lever *f*, at board A. The spring B′ has a wire, 3, leaving it, which, in the same way, extends to the springs B′ on each board and to the lever *f* on the B board, and so on *ad libitum*. The spring-plate *g′* of the lower circuit-closer is normally in contact with the lever of said circuit-closer, which thus forms the link between all the spring-plates designated by the letter A′, and its own annunciator *d* being connected to the latter by means of the wire 4, while the other wire, 10, of the annunciator is connected with a battery and ground. The circuit-closer *f*, being normally in contact with its left-hand spring, is capable of being moved to the right only. The object of bending the spring *g′* inward is to save time and motion by allowing the normal contact of the lever with the spring *g′* to be restored by a single movement to an upright position.

In further explanation of the method of disposition of each series of circuit-closers with their concomitant annunciators relatively to one another, I refer to Fig. 2. Three sets of my apparatus are therein represented, and the several instrumentalities, with their connecting-circuits, are theoretically shown. The connections are as indicated in the description given of Fig. 5, but are fully carried out. Thus, in the figure at the extreme left, which represents the annunciator and circuit-closers for A board, the levers of the two upper circuit-closers *f′* and f^2 are seen to stand upright, and do not touch the springs on either side. They are metallically connected with one another and to the spring *g* of the lower circuit-closers by the wire 1, which is continued by means of the wire 17 to the operator's telephone E and transmitter F and thence to the ground G. The levers of the apparatus at each switch-board are similarly connected by wires 1 and 17 with the springs *g* of their lower circuit-closers and the operators' telephones, and thence to the earth. The spring A′ of the apparatus on board A is connected by the wire 2 with the lever of the lower circuit-closer, *f*, and by the wire 5 and branch wires with the spring A′ at each of the other switch-boards. Similarly at B switch-board the spring B′ connects by wires 11 and 12 with the lever *f* of its lower circuit-closer, and by wires 6 and branch wires 3 with the springs B′ at the other switch-boards; also, at C switch-board the spring-plate C′ connects by wire 7 and branch wires 8 with the lower circuit-closer, *f*, on its own board, and with the spring-plates C′ upon each of the other boards. At each switch-board the spring-plate *g′* of the lower circuit-closer is seen to be connected by the wire 4 to its annunciator *d*, and the other terminals of all the annunciators are connected with the common return-wire 10, leading to battery P and to the ground. The annunciator *d* at every switch-board is thus in a normally-open circuit, extending from the ground and battery through the annunciator, and extending in open branches to all the other switch-boards in the system, at each of which, as also at its own, the said circuit may be closed, causing the annunciator to drop by making contact with a second ground-connection, which is in practice done by turning the requisite circuit-closer on its pivot. The switch-board thus signaled may transfer the circuit from the annunciator to its telephones, then by turning its lower circuit-closer and breaking contact with the spring *g* and making contact with the telephone-spring *g′*. For example, the normal route of the communicating-circuits of the middle switch-board, B, may be traced as follows: Starting from ground G, it leads through battery P, wire 10, annunciator *d*, wire 4, spring *g′*, circuit-closer *f*, wire 12, and by branch wire 11 to the spring B′ of the upper circuit-closer *f′* at B switch-board; also, from wire 12, by wires 6 in either direction, to the plates B′ of the circuit-closers *f′* at the switch-boards A and C, at all of which terminal points the said circuit is open. If, now, the circuit is so closed, by turning the necessary circuit-closer at any switch-board—for example, at C—the route of the completed circuit would be as follows: From ground and battery, as before, through annunciator *d* at B switch, wire 4, spring *g′*, circuit-closer *f*, branch wire 12, wire 6, spring B′ at C switch-board, circuit-closer *f′*, wire 1, wire 17, and the telephone and transmitter at the C switch-board to earth, thus completing the circuit of the battery through the annunciator at the B board and causing the said annunciator to fall. If B wishes to talk with C, on being thus signaled he turns his lower circuit-closer, *f*, till it makes contact with the plate *g*. The annunciator-circuit is thus cut off and a talking-circuit established from the ground at C through the C telephones, wire 17, wire 1, circuit-closer *f′*, spring-plate B′, wire 6, branch wire 12, circuit-closer *f* at B switch-board, spring *g*, wire 17, and the B telephones to ground. Each switch-board can by this apparatus thus signal any other and be responded to.

In actual service this system would be operated in the following manner: Suppose a subscriber connected with C switch-board desires to talk with a subscriber connected with

the A switch-board. He calls the central office and makes known his wish, thus: "371 with 29." C knows that 29 is connected with the board A, and it is necessary for him to communicate with A and request him to make the requisite changes. He turns the circuit-closer *f'* till it makes contact with the plate A'. This operation, as described, both puts his telephone in circuit and closes the battery-circuit, causing the A annunciator to drop. A then knows that some operator wishes to speak with him. It is not necessary that he should know which operator. He immediately turns his lower circuit-closer, *f*, to the right, which puts his telephones in connection with those of C, whereupon C transfers the order to A, and, after receiving the order, A makes the desired connection and puts up his annunciator for another call, while C straightens his circuit-closer once more.

I do not confine the application of my invention to the establishment of communication between different switch-boards in the same office, since it is obvious that it is equally applicable to communication between switch-boards located at different offices, its operation being independent of the element of distance.

It is also evident that, instead of connecting the battery P and the telephones E and F with the ground, I may, if I so desire, connect them with a metallic return-circuit, and such a construction will frequently be found convenient. The system of circuits, annunciators, telephones, &c., could also be used for general communication between, say, a number of persons in a building or a number of subscribers on a private line, or under other suitable conditions.

I claim—

1. In a telephone-exchange system, including two or more switch-boards from each of which run a group of subscribers' lines, the combination of an annunciator at each switch-board in a normally-open battery-circuit, a telephone or telephones, also in a normally-open circuit, means, as indicated, whereby the telephone-circuit at any switch-board may be caused to complete the annunciator-circuit at any other switch-board and thus give a signal, and other means whereby the annunciator-circuit may be severed from the completed circuit and a second telephone-circuit substituted therefor, for the purposes specified.

2. The combination, in a telephone-exchange system, including two or more telephone switch-boards, of an annunciator in a normally-open battery-circuit, a series of circuit-closers at each switch-board, the said circuit-closers being normally connected through a telephone with a ground or return circuit, a single circuit-closer normally connected with the annunciator, and a series of connecting-wires each permanently connected with the single circuit-closer at its own switch-board and extending in normally-open branches to one of the circuit-closers of the series at each of the other switch-boards, for the purpose specified.

3. At each of two or more switch-boards, the combination, substantially as hereinbefore described, of an annunciator in a normally-open battery-circuit, a telephone or telephones in a second normally-open circuit, a connecting-wire extending in normally-open branch wires to each switch-board of the series, a circuit closer or changer permanently attached to the said connecting-wire and normally uniting it with the annunciator-circuit but adapted to transfer it to the telephone-circuit, and a series of circuit-closers permanently in contact with the normally-open telephone-circuit and adapted to bring the same into contact with any desired one of the normally-open branch wires, and thus connect the apparatus at one switch-board with the apparatus at another.

4. The combination of a circuit having three or more branches leading into as many stations, a generator of electricity connected with said circuit, a signal device—such as an annunciator—in each branch, a circuit-closer at each station, and extensions of each branch to a circuit-closer at each of the other stations, substantially as described, whereby at any station the connections of said generator may be so altered by the circuit-closer thereat as to operate the signal device at any of the other stations, as set forth.

5. A circuit having branches entering the different stations, a generator of electricity connected with said circuit-signal devices—such as annunciators—in the branches, extensions of said branches to other stations, a local branch at each station, and a telephone or telephones in each local branch, in combination with a circuit-closer at each station for altering the connections of the generator so as to operate the signal device at another station, and for simultaneously connecting its own local branch with a conductor running to that station, substantially as described.

6. In a telephone system, a signal device or annunciator, and a telephone or telephones at each station, combined and electrically connected with circuit-closers, substantially as described, said circuit-closers comprising at each station a circuit-closer for simultaneously operating the signal device at a distant station and connecting in the telephone or telephones with a conductor running to that station, and a circuit-closer for breaking the signal-circuit established from a distant station and connecting in the telephone or telephones with a conductor coming from that station, as set forth.

7. A telephone apparatus comprising a signal device—such as an annunciator—a telephone or telephones, a circuit-closer, a conductor connecting one contact of said circuit-closer with the coils of the signal device, one or more additional circuit-closers, a conductor electrically connecting the levers of the additional circuit-closers with a second contact-plate of the first-named circuit-closer and with the telephone or telephones, and binding-posts for connecting conductors with the lever of the first-named circuit-closer and the contact-plates

of the additional circuit-closers, substantially as described.

8. The combination of a circuit, a signal device therein, a circuit-closer, a conductor normally connected with said circuit through said circuit-closer, and running to a circuit-closer at a distance, and a branch circuit containing a telephone or telephones, said first-named circuit-closer being constructed and arranged to break the circuit through the signal device established by the circuit-closer at the distant station and to make a connection between the telephone branch and the conductor running to said distant station, substantially as described.

9. In a telephone-exchange system, including a series of connected switch-boards from each of which radiate subscribers' lines, the combination of the small operators' switch-boards adjacent to the main switch-boards, the annunciators and circuit-closers on said operators' switch-boards, the generator of electricity, and the circuit-connections between the said generator, the annunciators, and the circuit-closers, substantially as described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 26th day of May, 1882.

HENRY B. LYTLE.

Witnesses:

GEO. WILLIS PIERCE,

C. H. M. HAZEL.