

(No Model.)

G. L. ANDERS.
Telephone Exchange.

No. 239,132.

Patented March 22, 1881.

Fig:1.

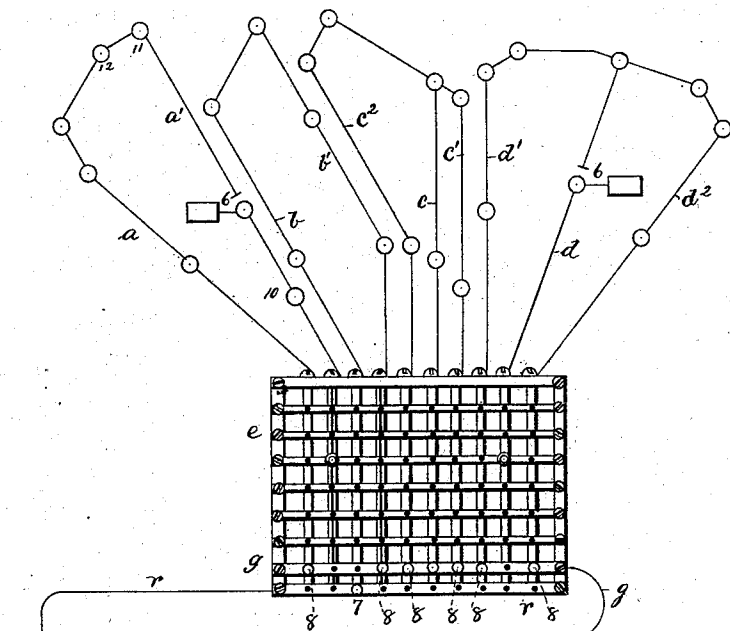
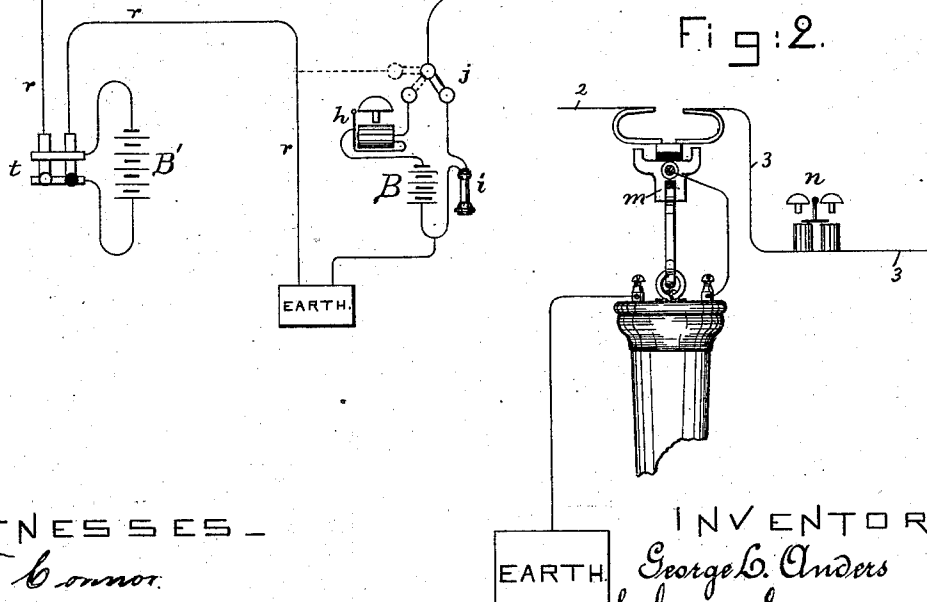


Fig:2.



WITNESSES -

L. F. Connor.

Arthur Reynolds

INVENTOR -

George L. Anders

by Crosby Gregory

Attys.

UNITED STATES PATENT OFFICE.

GEORGE LEE ANDERS, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO
AMERICAN BELL TELEPHONE COMPANY, OF SAME PLACE.

TELEPHONE-EXCHANGE.

SPECIFICATION forming part of Letters Patent No. 239,132, dated March 22, 1881.

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

To all whom it may concern:

Be it known that I, GEORGE L. ANDERS, of Boston, county of Suffolk, and State of Massachusetts, have invented Improvement in Telephone-Exchange Systems, of which the following description, in connection with the accompanying drawings, is a specification.

My invention relates to telephone-exchange systems, and has for its object to facilitate the operation of signaling and communicating between subscribers on different circuits and the operator at the central office of the exchange.

In a telephone-exchange system as now commonly arranged the subscribers' circuits radiate out from the central office, and are grounded at their extremities after passing through one or more subscribers' stations, the said circuits being also grounded at the central office after each passing through an independent indicating-instrument.

My invention consists in extending each circuit outward from the central office, and then back thereto by one or more return-branches, passing over a somewhat different path to include additional subscribers' stations, which are thus situated at different points throughout the entire length of the subscriber's circuit and its return-branches, which in my system is somewhat similar to two or three adjacent circuits in the ordinary systems connected together at their outward ends instead of being independently grounded there. The subscribers' circuits in my plan thus have both terminals in the central office under the control of the operator there, and one of these terminals may be left open while the other is connected with a conductor passing through certain signaling or telephonic instruments to the ground; or both terminals may be connected with the said conductor, which, with the said signaling or telephonic instruments, may be made common to a large number of the subscribers' circuits. By this arrangement the subscribers' circuits form a series of open branches or loops in the common or union circuit, according as it is connected with one or all of the terminals of each subscriber's circuit.

In operation, when any subscriber desires to communicate with another he signals the central office by forming a ground-connection

at his station, and thus closing the circuit from his station through the central instrument, and if the said instrument be a telephone he immediately makes known his wishes to the operator, who will be continually listening there. At such times as the operator does not remain listening at the central office a visual or audible signal will be placed in the circuit to attract his attention, the said signal being either operated by a magneto-current generated by the subscriber who has closed the circuit, or a battery may be placed in circuit with the said instrument, so that the mere operation of grounding any of the subscribers' circuits will cause the signal to operate.

When it is desired to call up or signal a subscriber from the central office the terminals of the portion or branch of the said circuit passing through the station in question are both grounded or connected with each other, so as to form a complete closed circuit, in which the signals at the different stations may be operated in any usual manner.

Figure 1 is a general diagram of an exchange system arranged in accordance with my invention, and Fig. 2 a diagram showing a convenient arrangement of the instruments at each subscriber's station.

The subscribers' circuits $a a' b b' c c' d d'$ are extended out from and back to the central office in a proper direction to include as many different subscribers' stations as may be desired, a complete wire circuit being formed in each instance having both its terminals in the central office, instead of the usual circuits extended out from the central office, and completed by the ground. The said circuits at the central office are connected with any convenient switch-board, e , or other means for making connections between the different pairs of circuits, and at least one terminal of each of the said circuits is connected with a conductor, g , common to all of them, passing through suitable signaling or telephonic instruments, h or i , to the ground, according to the position of the switch j , it being shown in full lines in position to cause the circuit to pass through the telephonic instruments i . It will be seen that there is thus formed a circuit having one terminal grounded and a series of open branches

or loops, according as one or all terminals of the subscribers' circuits are connected to the common or union circuit g , so that by grounding any point on any of the said branches or loops the circuit is closed from the point grounded to the normally-grounded terminal of the union-circuit, in which all the branches unite.

During the busier portion of the day the common or union circuit g will pass through a telephonic instrument, i , and an operator will be constantly listening there, so that when a subscriber desires a communication he has merely to make a ground-connection through his own telephonic instruments, which may be done by the usual automatic or secrecy switch, and his circuit is closed through the central instrument, i , at once enabling him to talk with the central operator and communicate his wishes without any switching or circuit-connecting operation being needed at the central office. A convenient arrangement of instruments at the subscribers' stations for performing this operation is illustrated in Fig. 2, where the line-wire 2 passes to the usual secrecy-switch m , which, when the telephone is hung thereon, as shown, continues the circuit to wire 3, which includes the signaling-instrument n , of any usual kind. When the telephone is taken from the hook and the latter turned to one side or the other it operates in the well-known manner to close the circuit from the line-wire 2 or 3, according to the side it is turned, through the telephone and secondary coil of the transmitter, if used, to the ground, at the same time breaking the circuit between the line 3 or 2 and switch m , the said line leading to the stations on the circuit beyond the part thereof thus connected with the central office being left open, as indicated at b , circuits a and d , Fig. 1. This operation of the switch m is sufficient to put the subscriber in communication with the central office if the switch j be properly placed to pass the circuit through the telephone i , and when the signal-bell h is in circuit will cause the current of the battery B to flow through it and cause it to operate, when the attendant will turn the switch j and bring the telephone i into circuit, as before described.

When desired to signal or call up a subscriber from the central office one terminal of his circuit is either grounded or connected through suitable signal-transmitting instruments to the other terminal, as illustrated in the circuit b , where the terminal of the portion b is connected by plug 7 with the circuit r , while the portion b' still remains connected with the circuit g and the ground. The circuit $b b'$ is thus closed through the subscriber's station, and the signaling-instrument, of any usual construction, at the said station may be operated in the usual manner, as by the battery B' and keys t . The circuit r through the signal-operating apparatus may either be grounded to thus complete the circuit to the grounded terminal of the wire g through the

instrument h or i , according to the position of the switch j , or, as shown in dotted lines, the said switch may have a third point connected directly with the circuit r , which will thus make the signaling-circuit wholly metallic.

The different circuits will be connected together for communication between the different subscribers' stations thereon in any usual manner, as my novel arrangement of the circuits will make no difference in this particular.

The subscribers' circuits may either have one end open and the other joined to the union-strip g , as indicated by the plugs 8 on the switch-board, Fig. 1, in connection with circuits $a a' b b'$, or all the terminals may be connected therewith, as shown in the circuits $c c' c^2 d d' d^2$, as in either case a complete circuit will not be formed until some point is grounded on some portion of a subscriber's circuit.

In case one terminal only is connected with the union-circuit g , the switch m must be properly turned to connect the ground with the branch or portion of the subscribers' circuits that is connected with the said union-circuit; but if all the terminals are connected with the said union-circuit, as shown at $c c' c^2$, the ground may be connected with any part of the said circuit, as the circuit may be closed from the subscriber's station to the central office over either branch. For example, the station at 6 on circuit $a a'$ might have been connected over the branch a instead of, as shown, over the branch a' . When no portion of the circuit is in use the subscriber will use that portion of the circuit passing through the least number of stations in its course to the central office.

When one terminal is to be left open it may be desirable to distinguish it from the one normally kept connected with the union-circuit g . This may be done by making the strips of the switch-board of different color, as indicated at the left thereof in Fig. 1, where the branch to be normally connected with the union-circuit g has a black stripe. In the circuit $a a'$ the branch a has been disconnected from and the one a' connected with the union-circuit g while the communication of the subscriber at station 6 is going on.

When two subscribers on different circuits are to be connected, as at the station 6 on circuits $d a'$, that portion of the circuit which passes through the smaller number of stations in reaching the central office should be disconnected at the central office from the union-circuit g and connected with the other subscriber's circuit, as shown, and if the plan of having only one terminal normally connected with the said union-circuit g is followed, and this terminal is disconnected therefrom, then another terminal should be connected, as shown, by the plug 8 on circuit a , so that at any time all the subscribers on a circuit except those lying between the station communicating and the central office on the branch connecting these points will have access to the central office—as, for example, on circuit $a a'$ only the sta-

tion 10 will be cut off while the one 6 is connected, all the others, as 11, 12, &c., having access to the central office over the branch *a*, now connected with the union-circuit *g*. By this arrangement of circuits the exchange is operated with much greater facility than by the arrangement now commonly in use, and the circuits are more completely in control of the central-office operator, so that any break or defect can be more readily detected.

Some of the subscribers' circuits are shown as having two branches, *c'* *c''* and *d'* *d''*, extended back to the central office and normally retained open there, or connected with the union-circuit, such an arrangement being the equivalent of the others, as by making a ground-connection at any station the said station is at once put in communication with the central operator. For calling up the subscribers the branch *c'* or *c''* will have to be grounded or connected with the branch *c*, according as the station to be called is on the former or latter of the said branches, and for calling a subscriber on the main branch *c* either of the branches *c'* or *c''* may be closed.

The circuits may be ramified out even farther without departing from my invention, provided that all the connected branches be brought back to the central office, and a complete circuit is afforded from any point in the said branches through the different subscribers' stations to the common circuit passing through the central instrument. It will be seen by this arrangement only one signal, *h*, is needed for a large number of circuits, while by the common plan a signal is needed for each circuit.

In the present plan two subscribers on the same circuit can communicate together over the portion of the circuit lying between their stations on the side away from the central office, or by connecting the terminals at the central office their circuit can be completed in the opposite direction from their stations through the central office.

I claim—

1. In a telephone-exchange system, a series of subscribers' circuits, each extended out from and back to the central office, thus forming

a complete wire circuit passing through subscribers' stations at different points throughout its entire length, and having its terminals in the said central office, in combination with a common or union circuit connected with each of the said circuits and grounded, and suitable signaling or telephonic instruments in the said union-circuit, whereby making a ground-connection at any point on any of the said subscribers' circuits will at once make a closed circuit from the said point through the instruments in the union-circuit at the central office, substantially as and for the purpose described.

2. In a telephone-exchange system, a subscriber's circuit having one terminal normally grounded at the central office and two or more branches extended back to the central office, whereby making a ground-connection at any point on the said circuit or its branches closes the circuit therefrom to the normally-grounded terminal at the central office, and by grounding or connecting any two of the said terminals a closed circuit is formed through the corresponding branch for signaling from the central office, substantially as described.

3. In a telephone-exchange system, a series of subscribers' circuits wholly metallic, and having all their terminals at the central office, combined with a receiving-signal or telephonic apparatus in a portion of a circuit grounded on one side of the said instruments and normally connected with one or all the terminals of each of the said subscribers' circuits, but adapted to be readily disconnected therefrom, and signal-operating mechanism in a portion of a circuit grounded or connected with the circuit containing the receiving-instruments, and adapted to be connected with any of the terminals of the said subscribers' circuits, the whole to operate for signaling and communicating between the subscribers' stations and central office, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGE LEE ANDERS.

Witnesses:

JOS. P. LIVERMORE,
ARTHUR REYNOLDS.