(No Model.)

E. T. GILLILAND.

MULTIPLE CIRCUIT CHANGER.

No. 306,241. Patented Oct. 7, 1884.

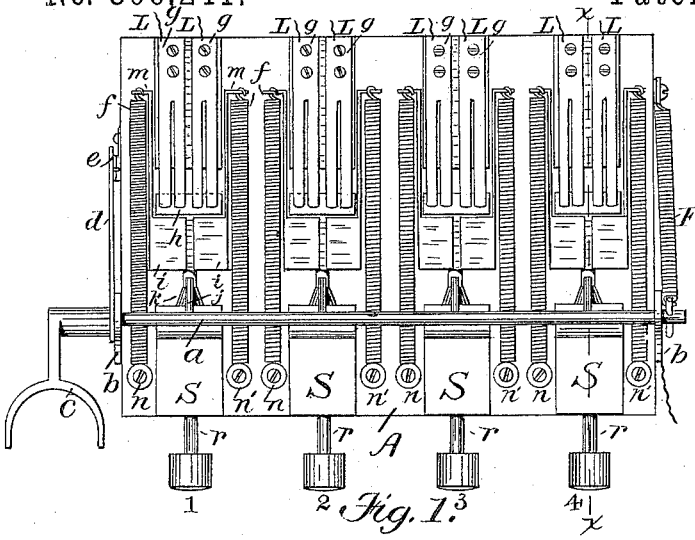

Fig. 1.

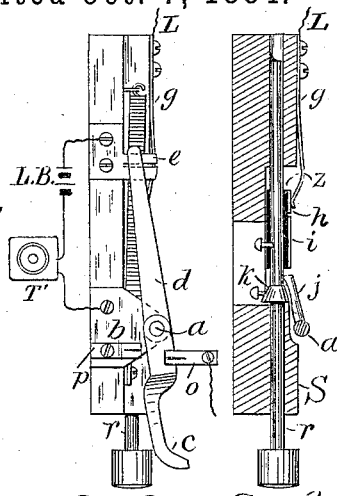

Fig. 2.

Fig. 3.

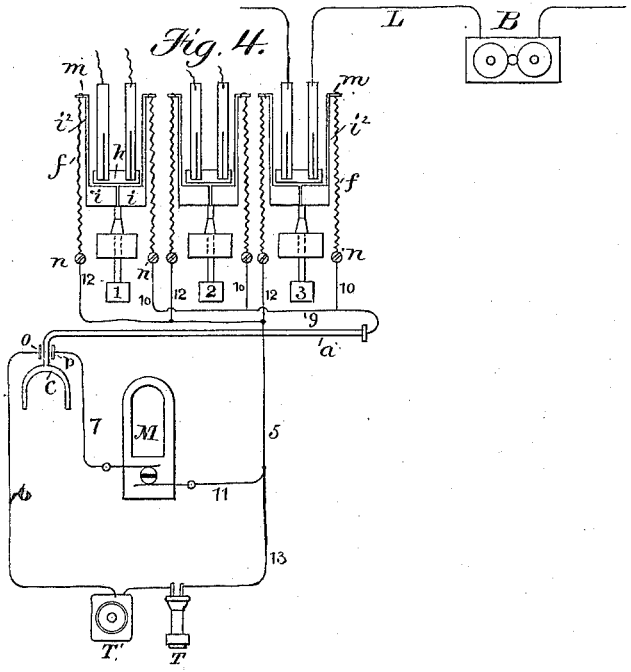

Fig. 4.

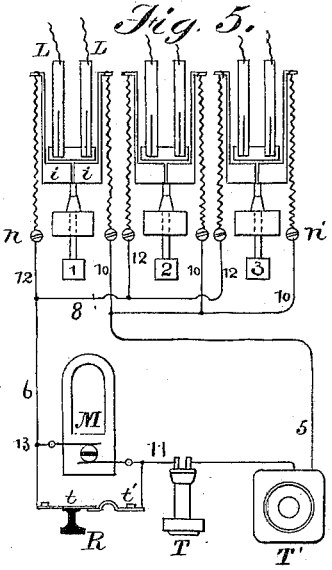

Fig. 5.

Witnesses.
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UNITED STATES PATENT OFFICE.

EZRA T. GILLILAND, OF BOSTON, MASSACHUSETTS, ASSIGNOR TO THE AMERICAN BELL TELEPHONE COMPANY, OF SAME PLACE.

MULTIPLE-CIRCUIT CHANGER.

SPECIFICATION forming part of Letters Patent No. 306,241, dated October 7, 1884.

Application filed June 26, 1884. (No model.)

To all whom it may concern:

Be it known that I, EZRA T. GILLILAND, of Boston, in the county of Suffolk and State of Massachusetts, have invented certain Improvements in Multiple-Circuit Changers, of which the following is a specification.

My invention relates to circuit changers or controllers, and particularly to that class known as "looping devices," by which telephones or other communicative or signaling instruments included in a normally-incomplete circuit at any station may be introduced at will into any one of a number of main circuits entering such station for the purpose of signaling or communicating with any other station on the same circuit, whereby one set of instruments may be utilized for a number of lines, a well-known illustration of such a device being the common spring-jack and double wedge long used in telegraphy, and described on pages 450 and 451 Prescott's Electricity and the Electric Telegraph, 1879.

The object of my present invention is to provide a circuit-changer whereby at a station where two or more wires enter the telephone and calling instruments may be placed in circuit with either.

In a prior application, filed April 21, 1884, I have shown and described a system of telephonic intercommunication in which a central station is dispensed with, and in which a number of main lines extend between and enter each of a number of stations, each of said stations being provided with looping-in switches or circuit-changers, whereby the telephones and signaling apparatus may be introduced at will into either of the lines, so that other stations on any of the said lines may be called and conversed with. I have found it convenient in practice to provide such apparatus with an actuating device by which the instrument may be withdrawn from any circuit upon the conclusion of a communication by the simple act of replacing the telephone. In the application which I have cited I have shown and described the circuit-changer which constitutes the subject-matter of my present invention; but it is therein expressly disclaimed for the purpose of embodying it in a separate specification as being a distinct invention.

My invention, then, consists in combining telephonic and signaling instruments, or either, with any number of normally-open or disconnected loop-terminals, each adapted to be inserted in a separate main-line circuit and to become part thereof, so that the same telephones may be used in connection with any number of lines; in providing each pair of loop-terminals with a controlling spindle or handle, whereby it may be pushed into position and held there; in combining with the said circuit-changers a bar constituting a telephone-support, and actuated automatically when the telephone is removed from its support, and carrying a suitable retaining device by which any circuit-changer, when pushed into position so that the telephones are included in a line, may be retained in such position independently of any positive action of the operator, and allowing any or all of the circuit-changers to resume their normal position and withdraw the instruments from connection with any main line when the telephone is replaced in its support, so as to make such withdrawal dependent on the replacement of the telephone; and, finally, in combining with the said supporting-bar and circuit auxiliary circuit-changers adapted to transfer the circuit of the instrument-loop from the calling-generator to the telephones, and vice versa, and likewise to open and close the circuit of the local transmitter-battery.

In the drawings which illustrate this specification, Figure 1 is a plan view of an instrument constructed according to the terms of my invention, and comprising four circuit-changing loops, with spindles and telephone-holding yoke. Fig. 2 is an end view of the said instrument, and Fig. 3 a vertical section on the line *x x* of Fig. 1. Figs. 4 and 5 are diagrams showing different ways in which the instruments of the loop may be connected.

The circuit-changer comprises a series of spindles capable of horizontal rectilinear motion, one for each line-circuit of the system, which, when in their normal position, act to maintain the main lines closed and the telephones disconnected therefrom, but which, when pushed in, introduce the telephones and signal-transmitting apparatus into the line-

circuit controlled by the particular spindle pushed. Any number of such spindle-switches may be employed, according to the number of the entering lines. I have shown four.

The entire device may be placed upon a non-conducting base, A, and the several spindles *r* are capable of sliding longitudinally when pushed in by their buttons 1, 2, 3, and 4, or when retracted by their several retracting-springs *f*. Each spindle carries a non-conducting block, *z*, Fig. 3, in which is let a single conducting-plate, *h*, crossing the said block, and two other conducting-plates, *i i*, insulated from one another and from the plate *h*, but each in electrical connection with one of the wires of the generator and telephone loop, as shown in the diagrams Figs. 4 and 5. The several spindles each slide in a guide-block, S, which also serves to limit their extent of travel.

Immediately inside of the guide-block each spindle has an offset, shoulder, or coil, *k*, which subserves a purpose which will hereinafter appear. A metal bar or rock-shaft, *a*, pivoted at its two ends in the standards *b* and adapted to rock easily therein, crosses all of the spindles, and opposite each one is provided with a projecting pin, *j*, adapted to engage with the collar *k* of any spindle which may be pushed in, and thus prevent its undesired withdrawal. This rock-shaft has a retracting-spring, F, attached to one end, which exercises a constant force to turn the rock-shaft in a backward direction. At its other end it is provided with a lever-yoke, *c*, adapted to support the receiving-telephone when not in use, and the said receiving-telephone, when thus placed, counterbalances the spring F and causes the cross-bar *a* to make a partial revolution in a forward direction, whereby the projecting pin *j* is disengaged from the collar *k*, and any spindle which has been previously pushed in is thus permitted to withdraw itself. The plates *i* have metallic extensions *i'*, provided with lugs *m*, to which the spiral springs *f* are at one end attached. These springs serve both as conductors and retractors, and are fastened at their other and opposite ends to the fixed points *n n'*, which points are likewise binding-screws for the reception of the connecting-wires. Thus each left-handed plate *i* is electrically connected with a binding-screw, *n*, and each of the right-hand plates *i* is connected with one of the binding-screws *n'*. An electrical generator, M, and transmitting and receiving telephones by means of the changer may be made to serve a number of lines. If it is desired that these instrumentalities should be in separate branch circuits, they may be arranged as in Figs. 4 and 2, where the generator branch circuit is adapted for operation only when the telephone is in its support, while the telephones only are operative when the receiving-telephone is removed from said support. To accomplish this arrangement, the cross-bar is electrically connected by wire 9 and branch wires 10 with the several right-hand binding-screws *n'*. (See Fig. 4.) A contact-spring, *p*, is placed so that the yoke-lever connects therewith when pressed down by the weight of the telephone, and a second spring, *o*, is arranged to make contact with the said lever when the telephone is removed and the lever drawn upward by the retracting-spring F. The contact-spring *p* is connected by wire 7 to the generator M, from whence the wire 11 leads by wire 5 and branch wires 12 to the several left-hand binding-screws *n*. Similarly the contact-spring *o* connects, by wire 6 through transmitting-telephone T' and receiver T and wire 13, to the same wire 5 and to the same binding-screws *n*, thus in either case completing the loop from the spindle-plates *i*, in the first case through the generator and in the second case through the telephones. If it be desired to dispense with this arrangement and to have the generator and telephones in the same circuit, as may be in some cases preferable, the modification shown in the diagram Fig. 5 may be adopted. In that arrangement the several left-hand screws *n* are all united by the various branch wires 12 to the wire 8. This connects with wire 6, which leads through the generator M, wire 11, the telephones T and T', wire 5, and branch wires 10 to the several right-hand screws *n'*. The generator is at all times, except when in use, shunted by the short-circuiting wire 7, and when it is to be operated the said shunt may be broken either automatically in a manner well understood or manually by means of a push-button, R, attached to the spring *t*, and adapted to push it away from the opposite spring, *t'*.

I attach to the cross-bar *a*, at one end thereof, a lever-plate, *d*, which in one position of the said bar is adapted to make contact with a spring, *e*, affixed to the side of the apparatus for the purpose of closing, when the telephones are to be used, the circuit of the battery L B through the primary coil of the transmitter T'. The several main-circuit loops L entering (as shown in Fig. 1) are normally closed or continuous by their contact-springs *g g*, which rest upon the cross conducting-plates *h*. When, however, the spindles are pushed in, the said springs are brought each in contact with one of the plates *i*, and, these being permanently in circuit with the telephone-loop, constitute that loop temporarily a part of that line-circuit. The several spindle-plates *i* are normally-open terminals of the telephone-loop until any given spindle is pushed in.

The bell B for receiving incoming signals may be connected in its proper circuit at a point external to the springs *g*, as shown in Fig. 4.

It will be understood that, in the operation of this device, if the arrangement shown in Fig. 4 be adopted, the generator must be actuated to send signals to line while the tel-

ephone remains in its support, as otherwise the generator-circuit would remain open. The required spindle must simultaneously be pushed in, and there held until the signal is sent.

If the plan illustrated in Fig. 5 be adopted, the telephone must first be removed from the yoke, after which the required spindle is to be pushed in, when the pin *j* will engage the lug or collar *k*, and prevent the withdrawal of said spindle, the signals being subsequently sent at the convenience of the operator.

I claim—

1. A multiple-circuit changer or looping device comprising a series of normally-closed main-line loops, and a normally-open loop including signaling and communicating instruments, and provided with a series of pairs of normally-open terminals equal in number to the said pairs of terminals with its corresponding main-line loop, and a stop mechanism whereby the instrument-loop may be retained in circuit with any main loop as long as may be desired, and may be automatically withdrawn therefrom upon the conclusion of a communication, substantially as described.

2. The combination, in a multiple-circuit changer, of a series of normally-closed loop-terminals, each adapted for connection with a separate circuit, a series of pairs of normally-open loop-terminals, all of which are connected with the same instruments, a spindle for each of the said pairs, whereby any pair may be introduced into its corresponding closed loop, a telephone-support, a retaining device controlled by said support for each spindle engaging therewith when the telephone is not in place and retaining it in place, but releasing the said spindle upon the replacement of the telephone, and a switching device also controlled by said telephone-support and operating to change the loop-circuit from a generator to a telephone, or vice versa, and simultaneously to close or open the local circuit of a transmitter, substantially as described.

3. The combination, substantially as hereinbefore described, in a multiple-circuit changer adapted to introduce an instrument-loop into any one of a number of main-line loops, of the spindles *r*, each carrying the circuit-closing plate *h* and the loop-terminals *i*, the said spindles being provided with handles and with the collars *k*, with the telephone-support and cross-bar *a*, the said cross-bar being furnished with a series of projecting pins, *j*, equal in number to the spindle-collars *k*, and adapted to engage the collar of any spindle when pushed in, for the purposes specified.

4. The combination, in a compound circuit-changing switch, of one or more pairs of contact-springs, each pair forming or adapted to form a loop of an electric circuit, a series of spindles capable of sliding longitudinally in guides and of assuming two positions, each spindle carrying a short-circuiting contact-plate normally connecting the said two contact-springs, and a pair of contact-plates constituting the normally-open terminals of an incomplete circuit, including an electrical generator and one or more telephones, and adapted to be manually actuated, so as to substitute the said contact-plates for the short-circuiting plate, whereby the said telephones and generator may be brought into any given electric circuit, a rocking bar adapted to serve as a telephone-support, pivoted transversely to the said spindles, and furnished with projecting arms adapted to engage a lug on each spindle for the purpose of holding the said spindles when pushed in while the telephone is not in place, but to release the same when the telephone is replaced, a circuit-changing switch controlled by said telephone-supporting bar, to change the circuit from the generator to the telephone, or vice versa, and a local-circuit closer controlled by the said support to close the transmitter-circuit when the telephone is removed from its normal position, substantially as specified.

5. The combination, substantially as hereinbefore specified, of one or more longitudinal sliding spindles, each constituting a looping-in mechanism whereby telephones and signaling apparatus may be introduced into the circuit of a main line, with a rocking bar serving as a telephone-holder and actuated by the removal or replacement of the telephone to retain the said spindles in position and the telephones in circuit, or to release the same and withdraw the telephones from the circuit, for the purposes described.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, this 24th day of June, 1884.

EZRA T. GILLILAND.

Witnesses:
FRED. J. F. SCHWARTZ,
GEO. WILLIS PIERCE.