

No. 765,768.

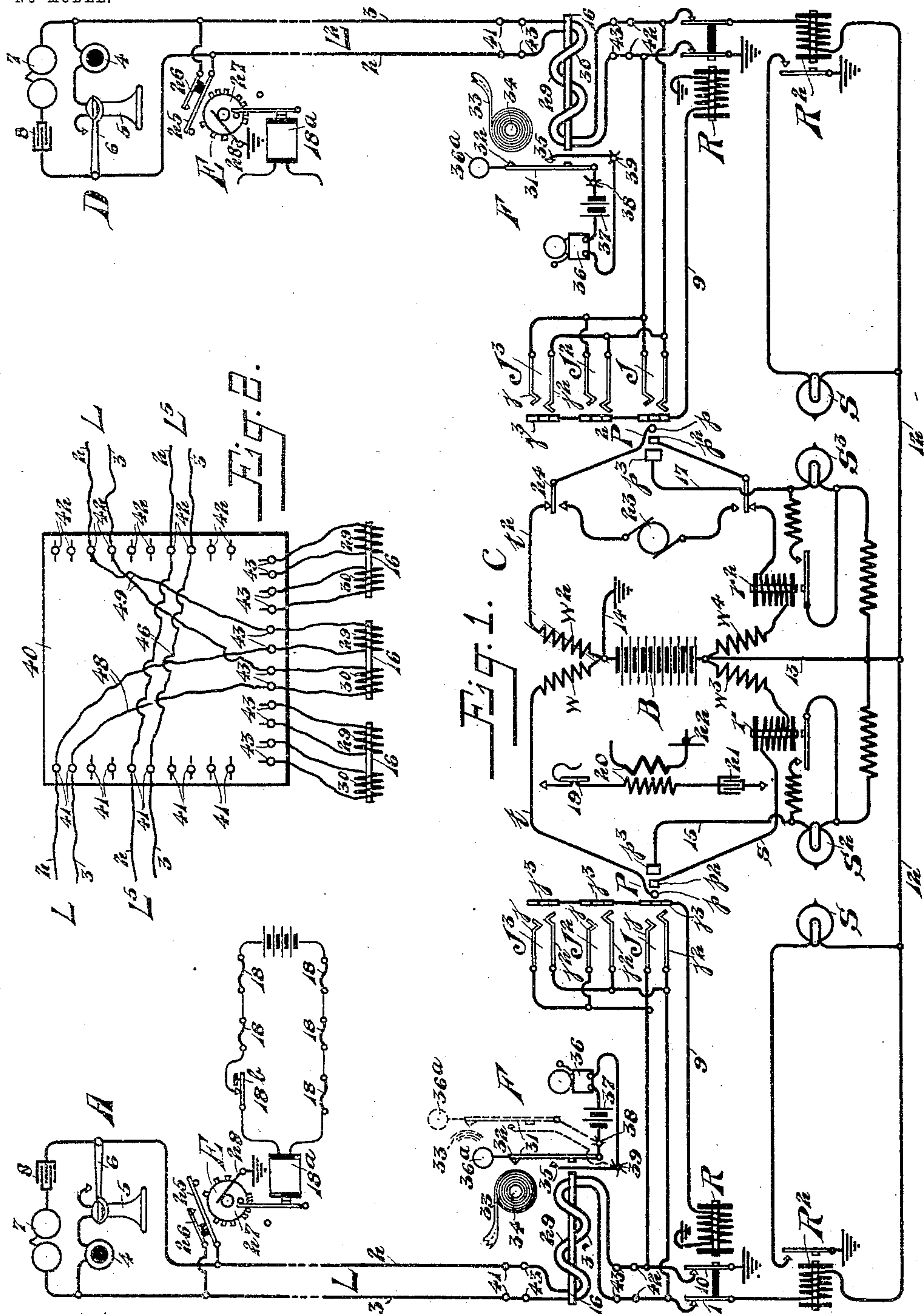
PATENTED JULY 26, 1904.

W. W. DEAN.

AUXILIARY APPARATUS FOR TELEPHONE SYSTEMS.

APPLICATION FILED OCT. 17, 1903.

NO MODEL.



Witnesses.

R. H. Burford  
E. A. Harlock

Inventor:  
William W. Dean,  
by Robert Lewis Ames,  
Attorney.



# UNITED STATES PATENT OFFICE.

WILLIAM W. DEAN, OF CHICAGO, ILLINOIS, ASSIGNOR TO WALTER S. McFARLAN, OF WASHINGTON, DISTRICT OF COLUMBIA.

## AUXILIARY APPARATUS FOR TELEPHONE SYSTEMS.

SPECIFICATION forming part of Letters Patent No. 765,768, dated July 26, 1904.

Application filed October 17, 1903. Serial No. 177,426. (No model.)

*To all whom it may concern:*

Be it known that I, WILLIAM W. DEAN, a citizen of the United States of America, and a resident of Chicago, county of Cook, and State of Illinois, have invented a new and useful Improvement for Connecting Auxiliary Apparatus to Telephone Systems, of which the following is a specification.

My invention relates to improvements for connecting or applying auxiliary apparatus to telephone-exchanges.

It is often desired to engraft an auxiliary service of some type upon a telephone system, so as to utilize the telephone-lines and other apparatus of the telephone-exchange for the auxiliary service. As is well known, the ordinary telephone-lines of an exchange are idle and useless a great part of the day and practically all of the night, and a large proportion of the capital invested in the telephone plant is therefore idle and incapable of earning any revenue; but by combining an auxiliary service of some type with the telephone service and by which the existing telephone apparatus is to some extent utilized without interruption or inconvenience to telephone service an additional earning capacity is thus imparted to the capital invested in the plant. In order to engraft such an auxiliary service upon telephone-lines, I provide means in connection with the distributing-frame of the telephone-exchange whereby the auxiliary apparatus may be applied to the lines without in any way, shape, or manner interfering with the usual methods of connecting the lines thereto and without disarrangement of the usual plans.

As is well known, a distributing-frame is provided for every telephone-exchange of any size, said frame consisting usually of a light metal open framework having line-terminals upon one side to which the wires of the street-cables which form the external telephone line-circuits are permanently secured and upon the other side switchboard-terminals to which the switchboard or jack sections of the telephone-lines are also permanently secured. The external sections of any of the lines may thus be connected with any of the

switchboard-sections by means of short twisted pairs of connecting-wires, commonly known as "jumper-wires" or "jumpers." These jumpers extend beyond the line-terminals on the one side of the distributing-frame to the switchboard-terminals upon the other side, so that any external line-circuit may be connected with any switchboard-section, a necessary expedient in a practically operative telephone-exchange.

In carrying out my invention I provide additional terminals upon the distributing-frame, with which the auxiliary apparatus belonging to the auxiliary service that it is desired to engraft upon the telephone system may be permanently connected in the same way that the street-cables and switchboard-sections of the lines are permanently connected with their terminals of the frame. By means of additional jumpers or connecting-wires it is thus possible to readily connect the auxiliary apparatus into any of the telephone-lines, and this without complication or disturbing the arrangement of the telephone apparatus. The auxiliary apparatus may thus be applied to the lines of an existing telephone-exchange without disturbing the present arrangement of the same, or provision may be made for it in a contemplated exchange without deviation from present lines of practice.

One usual form of distributing-frame is disclosed in the patent to Ford and Lenfest, No. 507,424, dated October 24, 1893, and to which my invention may be readily applied by placing the additional terminals upon either the vertical bars upon one side of the frame or upon the horizontal bars upon the other. In other forms of distributing-boards the extra terminals are located at convenient or desired points.

My invention is illustrated in the accompanying drawings, in which the same reference characters are employed throughout for like parts, and in which—

Figure 1 represents a telephone system having an auxiliary service applied thereto by my invention, and Fig. 2 is a diagram indicating a distributing-frame and the connec-



tions of the lines and the auxiliary apparatus therewith.

Referring to Fig. 1, L and L<sup>2</sup> indicate telephone-subscribers' lines extending in two limbs 2 and 3 from their respective substations A and D to the line-terminals 41 of the distributing board or frame at the central office C of the exchange. At the substations any usual or desired telephone outfit may be employed, that shown being adapted for use in connection with a common central source of current. It comprises a transmitter 4 and a receiver 5 in a bridge of the line conductors whose normal discontinuity is maintained by the switch-hook 6, while an ordinary polarized call-bell 7 and a condenser 8 are connected in a permanent bridge of the telephone-line.

At the central office the switchboard-section of the line extending from the terminals 42 of the distributing-frame is provided, as usual, with an answering-jack J and a plurality of multiple jacks J<sup>2</sup> and J<sup>3</sup>, each having tip and sleeve contact springs *j* and *j*<sup>2</sup> connected with the corresponding line conductors and with test-rings *j*<sup>3</sup>, which are all electrically connected and joined by conductor 9 with the winding of the cut-off relay R of the telephone-line, the opposite terminal of which is grounded. The line conductors of the switchboard or jack section are normally extended through contacts 10 and 11 of relay R, one of which is grounded and the other connected with line-relay R<sup>2</sup> of the telephone-line, which in turn is joined by conductors 12 and 13 with the live pole of the central and common battery B, the opposite pole of which is grounded by conductor 14. The relay R<sup>2</sup> controls the local circuit of the line-signal S, which is preferably a small incandescent lamp.

The operators, as usual, are provided with cord-circuits, each of which is provided with an answering-plug P and a calling-plug P<sup>2</sup>, provided with contact-surfaces *p*, *p*<sup>2</sup>, and *p*<sup>3</sup>, adapted to register with the corresponding contact-surfaces of the spring-jacks when inserted therein. The tip-contact *p* of the answering-plug P is connected by flexible strand *t* with the winding *w* of a suitable repeating-coil, while the corresponding contact of plug P<sup>2</sup> is joined by a similar strand *t*<sup>2</sup> with the repeating-coil winding *w*<sup>2</sup>, which is placed in inductive relation with said winding *w* and both of which are connected at their inner ends with the grounded pole of the battery B. A similar strand *s* joins the sleeve-contact *p*<sup>2</sup> of plug P with the winding *w*<sup>3</sup> of the repeating-coil, which includes the winding of the supervisory relay *r*, while the sleeve-strand of plug P<sup>2</sup> is connected by strand *t*<sup>2</sup> with the winding *w*<sup>4</sup> of said repeating-coil placed in inductive relation with the windings *w*<sup>3</sup>, said latter strand likewise including the coil of supervisory relay *r*<sup>2</sup>. The inner ends of said windings *w*<sup>3</sup> and *w*<sup>4</sup> are united to the live pole of battery

B. The ring-contact *p*<sup>3</sup> of the plug P is connected, by means of a third conductor 15, through a suitable supervisory signal S<sup>2</sup>, usually in the form of a small incandescent lamp, with the conductor 13 leading to the live pole of the battery B, while a similar third conductor 17 joins the contact *p*<sup>3</sup> of the plug P<sup>2</sup> through the supervisory signal S<sup>3</sup> with the said conductor 13. The relays *r* and *r*<sup>2</sup> control, respectively, the shunts of the supervisory signals S<sup>2</sup> and S<sup>3</sup>.

The operator's head-receiver 19, the secondary winding of her induction-coil 20, and a suitable condenser 21 are adapted to be connected across the answering end of the cord-circuit by means of any suitable listening-key switch, her transmitter 22 in circuit with the primary of her induction-coil being charged from any suitable source of current and which may be battery B. A ringing-generator 23, adapted to produce alternating or pulsating current, is arranged to be connected with the calling end of the cord-circuit by the depression of springs 24 24 of any suitable ringing-key, the strands *t*<sup>2</sup> and *s*<sup>2</sup> being at this time open to prevent the passage of ringing-current back to the repeating-coil windings *w*<sup>2</sup> and *w*<sup>4</sup>, and thus preventing disturbance in the calling-subscriber's telephone.

The apparatus so far described comprises one common type of telephone-exchange system, and its operation is well understood.

The distributing-frame is indicated by the terminals 41 42, which is all that is required in an ordinary exchange, suitable jumper-wires in the form of short twisted pairs of wires being ordinarily employed to connect the terminals 41 with the terminals 42, thus joining the two portions of the telephone-lines.

The auxiliary service which I show in connection with my present invention is for fire or other alarm service in which a signal-transmitter at the substation of the line is adapted to send distinctive signals over the telephone-line and a signal-receiver is interposed in the line at the central office to receive such distinctive signals, and it is this receiver that I show interposed at the distributing-frame of the exchange; but it will be understood that the invention is not to be limited in its broad aspects to the interposition at the distributing-frame of this particular apparatus, for I hold it to include the interposition at the distributing-frame of any auxiliary apparatus.

At the substations E represents the alarm-signal transmitter, which comprises suitable springs 25 and 26, connected, respectively, with the line conductors 2 and 3 and arranged to be normally isolated, but when the pin-wheel 27 is rotated to be thereby intermittently connected together and thence to ground through the brush 28. The particular alarm-signal-receiving device F at the central office comprises a magnet 16, having differential windings 29 and 30 interposed, respectively, in line



conductors connected permanently with the auxiliary terminals 43 of the distributing-board, so as to be neutral to current flowing in the metallic line. These coils are wound  
 5 side by side, as shown, or superimposed in such close relationship that the magnetic effects of the rapidly-varying voice-currents are neutralized and the voice-currents are unimpeded. When, however, current traverses  
 10 one winding only or both windings in parallel, the core is magnetized and the armature is attracted. The armature of the magnet is mounted upon the normally retracted spring or lever 31, provided with a printing-point  
 15 32, adapted to impress the tape or ribbon 33, wound upon a spool 34 and which may be automatically set in operation by the operation of the magnet 16. This device registers the signal received from the substation, and  
 20 in order that an audible alarm may be given to attract the attention of the attendant the said movable part 31 is arranged to close contact 35 in the circuit of the bell or other alarm 36 and battery 37. This battery may be the same  
 25 as battery B, and both battery and the alarm are preferably common to the exchange or to a large number of lines, as indicated by the dotted lines branching from the points 38 and 39. Each alarm-signal receiver may have a  
 30 visual signal associated therewith, as indicated by the target 36<sup>a</sup>.

It is apparent that the use of the telephone-line for telephonic purposes does not set in operation the alarm-signal-receiving devices.  
 35 For example, subscriber A in calling for a connection takes up his receiver and completes a path for current over the metallic line from the battery B, over conductors 13 and 12, through line-relay R<sup>2</sup>, contact 11 of  
 40 relay R, the winding 30 of relay 16, over line conductor 3 to the substation, and thence back to the central office over line conductor 2, through winding 29 of relay 16, and to ground through spring 10 of cut-off relay R. This  
 45 current flowing through the differential windings of the magnet 16 in series does not operate it, and the alarm-signal receiver remains irresponsive, but relay R<sup>2</sup> operates and causes lamp S to light. In response to the call the  
 50 operator inserts the plug P of her cord-circuit in the jack J and connects her instrument with the cord-circuit by means of the listening-key. The insertion of the plug P closes a path for current from battery B over  
 55 the third conductors 13 and 15, through contacts  $p^3$  and  $j^3$ , and thence by way of conductor 9 to the cut-off relay R, which operates to sever the line conductors at springs 10 and 11 thereof. Owing to the fact that the receiver  
 60 at the substation A is now removed from its hook, current from battery B will circulate over the two strands of the cord-circuit and in the metallic telephone-line in the same manner as before, thus again not affecting the  
 65 magnet 16 of the receiver. The supervisory

relay  $r$  is also actuated to close the shunt of the supervisory lamp S<sup>2</sup>, which is thus rendered inert. Upon learning the number of the party wanted the line is tested in the usual  
 70 way to determine its idle or busy condition. If idle, the test-rings  $j^3$  of the jacks are connected through the winding of the associated cut-off relay to ground, and since the tip of the calling-plug P<sup>2</sup> is likewise grounded by  
 75 branch 14 no flow of current results over said branch and no click is received in the operator's receiver. If the line is busy, on the other hand, the test-rings of the jacks are connected through a third conductor 15 or 17 of  
 80 the cord-circuit at the other section of the multiple board with the live pole of the battery B, so that when the tip-contact of the testing-plug is brought into contact with the test-ring a flow of current takes place through  
 85 the winding  $w^2$  of the repeating-coil, which inductively causes a click in the operator's receiver.

Assuming that the line wanted is found idle, the calling-plug P<sup>2</sup> is inserted in one of the multiple jacks of the line and the ringing-  
 90 generator 23 operated. This generator sends current over the metallic line in a manner similar to the battery B, though of different character, to operate call-bell 7 at the substation. Here, again, owing to the differential  
 95 coils of the magnet 16 in the called line, the alarm-register of the line is not actuated.

After the subscriber has been called and before his response the supervisory lamp S<sup>3</sup> is lighted over the said third conductors and  
 100 is extinguished only when the subscriber responds by the operation of supervisory relay  $r^2$ . During conversation the battery B is furnishing current over both metallic lines  
 105 L and L<sup>2</sup> for the operation of the microphones at the two substations, to which current the magnets 16 are, as stated, unresponsive, and the rapidly-varying voice-currents are transmitted over said metallic lines through said  
 110 magnets without retardation, as explained.

When the alarm-signal transmitter E is operated, the rotating wheel 27 intermittently closes the springs 25 and 26 together and to ground. The grounding of conductor 3 permits current from battery B to flow over con-  
 115 ductors 13 and 12 through the line-relay R<sup>2</sup>, winding 30 of magnet 16, over line conductor 3, thence to spring 25, wheel 27, and brush 28 to ground. This current in winding 30 energizes the magnet 16, which attracts its ar-  
 120 mature and accordingly registers the alarm-signal by means of the pencil or point 32 upon the tape 33, which is now being unreel from spool 34 by the register mechanism. At the  
 125 same time the contact 35 is closed and alarm 36 is operated, thus calling the attention of the attendant. Likewise the visual indicator 36<sup>a</sup> is exposed and serves to direct the attention of the attendant to the particular register operating. The line-relay R<sup>2</sup> may respond  
 130



to this current and the line-signal S may be flashed; but the operators at the exchange would be instructed to disregard such intermittent lighting or flashing of the lamps, so that the usual working of the exchange would not be interfered with. Should the alarm-signal transmitter be set in operation during the time that the cord-circuit is connected with the line, current will flow in the same manner over the sleeve conductor of the telephone-line, but through the sleeve-strand of the connected cord-circuit. This might interfere with any conversation going on at the time over the line, but would be less objectionable, considering the few times that it is likely to occur, than that the alarm should be delayed or not given at all.

I have indicated the alarm-signal transmitter as adapted for automatic operation by the opening of the local alarm-circuit through the melting of a fuse 18 or by the key-switch 18<sup>b</sup>, which deenergizes magnet 18<sup>a</sup> and releases the wheel 27 and its driving mechanism. The construction and operation of such transmitters is well understood in the art, and further description thereof is deemed unnecessary.

Fig. 2 represents diagrammatically the means for connecting the magnets 16 of the registers in the lines. As before stated, every telephone-exchange of any size is provided with a main distributing-frame having line-terminals upon one side to which the external line-circuits are permanently connected and switchboard-terminals upon the opposite side with which the sections leading to the switchboard are also permanently connected. The external sections of the lines are then connected with the switchboard-sections by means of short connecting-wires, commonly known as "jumper-wires," which extend between the line-terminals on the one side of the distributing-frame to the switchboard-terminals upon the other side. With this arrangement any external line-circuit can be connected with any switchboard-section—a necessary expedient in a telephone-exchange. Thus in Fig. 2, 40 represents the distributing-frame or a portion of the frame having pairs of line-terminals 41 upon one side and corresponding pairs of switchboard-terminals 42 upon the other. L<sup>5</sup> represents a telephone-line terminating at the third pair of line-terminals 41 and connected, by means of the ordinary jumper-wires 46, across the frame to the fourth pair of switchboard-terminals. It is thus possible by means of the jumpers 46 to connect the external line L<sup>5</sup> with any set of switchboard-terminals and without disturbing either the line-circuits or switchboard-circuits. It will be understood that the distributing-frame is thus only conventionally indicated and that in practice it may be of any desired type.

In order to accommodate the register-magnets without disarrangement of the other

parts of the exchange or the severing of the lines at any point, I arrange an additional set of terminals 43 upon the distributing-frame in any suitable manner. These are shown in the figure for clearness apart from the other terminals and along one of the other edges of the frame 40; but it will be understood that they may be located wherever most convenient or desirable. The coils 29 and 30 of the magnets 16 are connected with the said terminals 43 in suitable order, and jumper-wires or other connectors extend from the line-terminals 41 to the proper magnet-terminals 43, and still other jumper-wires may extend from said magnet-terminals to the switchboard-terminals 42. In case of the line L, for instance, jumpers 48 lead from the line-terminals 41 to suitable magnet-terminals 43, and other jumpers, 49, reach from the corresponding magnet-terminals 43 to the desired switchboard-terminals 42. The tip conductor 2 of the line L would therefore include one of the jumper-wires 48, the winding 29 of one of the magnets 16, and one of the jumper-wires 49, leading to the switchboard-terminals. The other line conductor 3 would include likewise winding 30 of magnet 16. With this arrangement the magnets 16 may be and preferably are placed in a separate room from the switchboard at the exchange and looked after by an entirely different set of attendants. In other words, the alarm apparatus may be separate and distinct and handled separately from the telephone-exchange apparatus. This method of interpolating the register-magnets or, in fact, any auxiliary apparatus in telephone-lines through the medium of the distributing-frame, and particularly for the purpose of some service ancillary to the telephone service, I believe to be new. It is very readily accomplished either in existing or contemplated exchanges without deviation from established practice in their installation and working. In Fig. 1 the contacts 43 are also shown, and the manner of thus engrafting the auxiliary service and apparatus upon the telephone-exchange is believed to be now made apparent. Of course many forms of distributing-frames are employed; but the manner of applying the invention thereto is readily apparent.

As above stated, I do not wish to be limited to the interposition in telephone-lines of the particular apparatus nor to apparatus for the particular purpose shown and described; but,

Having thus described the invention and one manner of carrying the same into effect, I claim—

1. In a telephone-exchange, the combination with a plurality of telephone-lines leading from the subscribers' stations to the central office, of telephone sets at the substations and telephonic apparatus at the said central office to cooperate with said lines for conversational purposes, a distributing-frame at the



central office to permit the external and switchboard sections of the lines to be variously connected together, auxiliary apparatus at the central office designed to be used in connection with the said telephone-lines, and means for inserting said apparatus in the said lines at the said distributing-frame, substantially as described.

2. In a telephone-exchange, the combination with a plurality of telephone-lines leading from subscribers' stations to the central office, of telephone sets at the substations and telephonic apparatus at the said central office to cooperate with said lines for conversational purposes, a distributing-frame at the central office to permit the external and switchboard sections of the lines to be variously connected together, auxiliary apparatus connected with the telephone-lines at outlying points, other auxiliary apparatus at the central office adapted to cooperate with said auxiliary apparatus at outlying points, and means for connecting said central-office auxiliary apparatus in the lines at the distributing-frame, substantially as described.

3. In a telephone-exchange, the combination with a plurality of telephone-lines leading from subscribers' stations to the central station, of telephone sets at the substation and telephonic apparatus at the central station to cooperate with said lines for conversational purposes, a distributing-frame for the exchange to permit variously connecting the external and switchboard sections of the lines, auxiliary transmitting devices upon the lines adapted to send special currents over the telephone-lines to the central station, auxiliary receptive devices for such special currents at the central station, and means for interposing such receptive devices in the telephone-lines at the distributing-frame of the exchange, substantially as described.

4. In a telephone-exchange, the combination with a plurality of telephone-lines leading from subscribers' stations to the central station, of telephone-sets at the substation and telephonic apparatus at the central station to cooperate with said lines for conversational purposes, a distributing-frame for the exchange to permit variously connecting the external and switchboard sections of the lines, alarm-signal-transmitting devices upon the lines adapted to send distinctive signaling-currents over the telephone-lines to the central station, alarm-signal-receiving devices responsive to said distinctive signaling-currents at the central station, and means for interposing said receiving devices in the telephone-lines at the distributing-frame of the exchange, substantially as described.

5. In a telephone-exchange, the combination with a plurality of telephone-lines leading from subscribers' stations to the central station, of telephone sets at the substation and telephonic apparatus at the central station to

coöperate with said lines for conversational purposes, a distributing-frame for the exchange to permit variously connecting the external and switchboard sections of the lines, auxiliary apparatus at the central office designed to be used in connection with the said telephone-lines, and additional terminals for the said distributing-frame to which said auxiliary apparatus is connected, whereby the said auxiliary apparatus may be readily interposed in any of the telephone-lines, substantially as described.

6. In a telephone-exchange, the combination with a plurality of telephone-lines leading from subscribers' stations to the central station, of telephone sets at the substation and telephonic apparatus at the central station to cooperate with said lines for conversational purposes, a distributing-frame for the exchange to permit variously connecting the external and switchboard sections of the lines, auxiliary apparatus connected with the telephone-lines at outlying points, other auxiliary apparatus at the central office adapted to cooperate with said auxiliary apparatus at outlying points, and additional terminals for the said frame to which the auxiliary apparatus at the central office is connected, whereby the said latter apparatus may be readily interposed in the telephone-lines, substantially as described.

7. In a telephone-exchange, the combination with a plurality of telephone-lines leading from the subscribers' stations to the central station, of telephone sets at the substations and telephone apparatus at the said central station to cooperate with said lines for conversational purposes, alarm-signal-transmitting apparatus upon the lines adapted to transmit distinctive signaling-currents over the telephone-lines, alarm-signal-receiving apparatus at the central station, a distributing-frame having line-terminals and switchboard-terminals to which the respective sections of the telephone-lines are connected and by which such sections of the lines may be variously connected together, additional terminals for the said frame to which the said receiving apparatus is connected, whereby the said receiving apparatus may be readily interposed in any of the telephone-lines, substantially as described.

8. In a telephone-exchange, the combination with a plurality of telephone-lines leading from subscribers' stations to the central station, of telephone sets at the substation and telephonic apparatus at the central station to cooperate with said lines for conversational purposes, a distributing-frame for the exchange to permit variously connecting the external and switchboard sections of the lines, auxiliary apparatus connected with the telephone-lines at said outlying points, other auxiliary apparatus at the central office adapted to cooperate with said auxiliary apparatus at



the outlying point, but unresponsive to the telephone signaling and talking currents, and means for connecting said central-office auxiliary apparatus in the lines at the distributing-frame, substantially as described.

9. In a telephone-exchange, the combination with a plurality of telephone-lines leading from the subscribers' stations to the central station, of telephone sets at the substations and telephonic apparatus at the said central station to cooperate with said lines for conversational purposes, a distributing-frame for the exchange to permit variously connecting the external and switchboard sections of the lines, auxiliary transmitting devices upon the lines adapted to send special currents over the telephone-lines to the central station, auxiliary receptive devices for said special currents at the central station, and means for interposing said receptive devices in the telephone-lines at the distributing-frame of the exchange, said receptive devices being responsive to said special currents and unresponsive to the telephone signaling and talking currents, substantially as described.

10. In a telephone-exchange, the combination with a plurality of telephone-lines leading from the subscribers' stations to the central station, of telephone sets at the substations and telephone apparatus at the said central station to cooperate with said lines for conversational purposes, alarm-transmitting apparatus

out upon the lines adapted to transmit distinctive signaling-currents over the telephone-lines, alarm-receiving apparatus at the central station, a distributing-frame having line-terminals and switchboard-terminals to which the respective sections of the telephone-lines are connected and by which such sections of the lines may be variously connected, additional terminals for the said frame to which the said receiving apparatus is connected, whereby the said receiving apparatus may be readily interposed in any of the telephone-lines, said receiving apparatus being responsive to said distinctive signaling-currents and unresponsive to the telephone signaling and talking currents, substantially as described.

11. In a telephone system, the combination with a plurality of telephone-lines, of telephone sets at the substations and telephonic apparatus at the said central station to cooperate with said lines for conversational purposes, and a distributing-frame having line-terminals for said lines at the central office, substantially as described.

Signed by me, at Chicago, county of Cook, State of Illinois, this 16th day of September, 1903.

WILLIAM W. DEAN.

Witnesses:

GAZELLE BEDER,

ROBERT LEWIS AMES.