

No. 816,819.

PATENTED APR. 3, 1906.

H. M. POST.

TWO DIVISION TELEPHONE SYSTEM.

APPLICATION FILED OCT. 24, 1902.

2 SHEETS—SHEET 1.

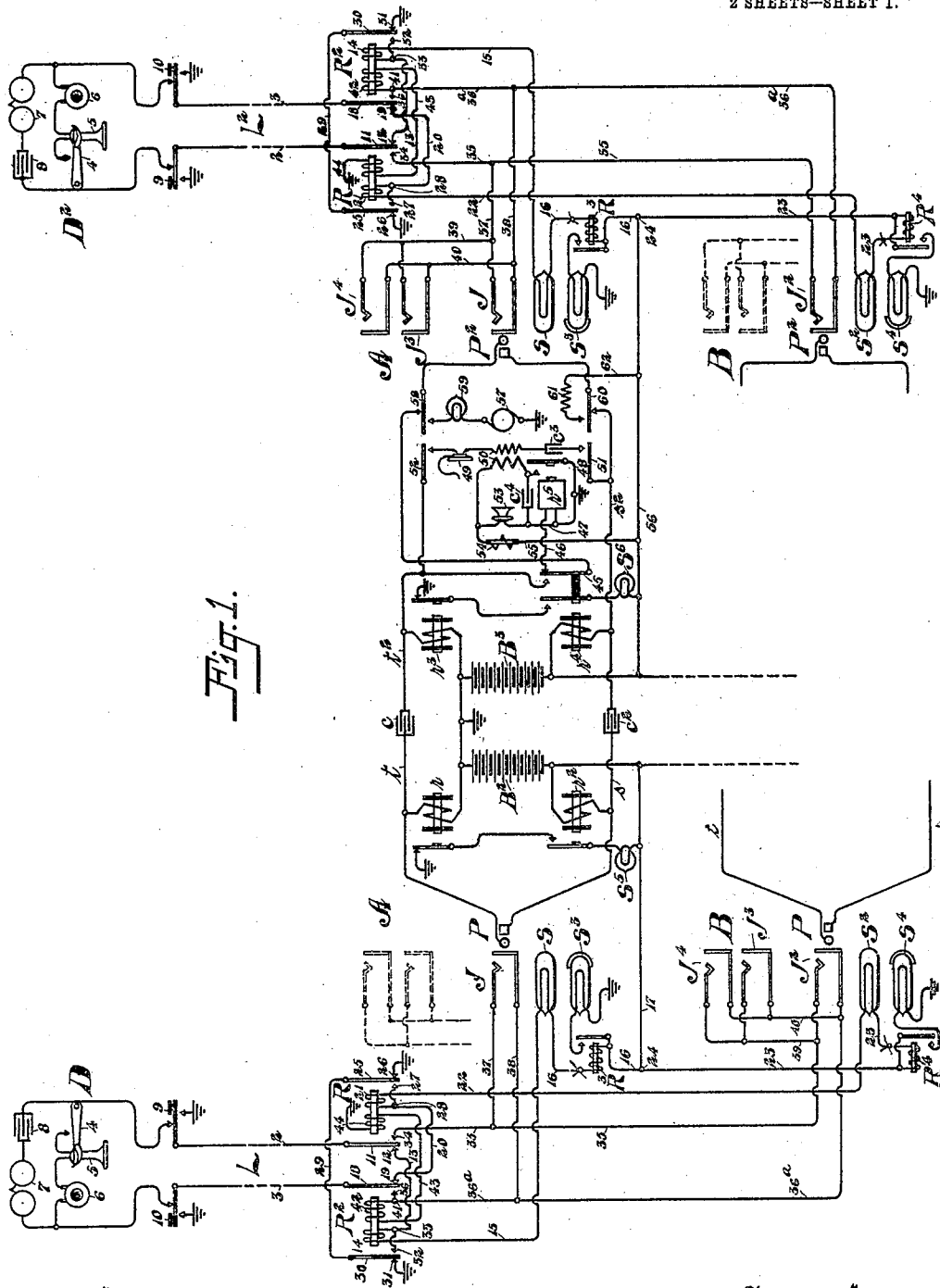


Fig. 1.

Witnesses.

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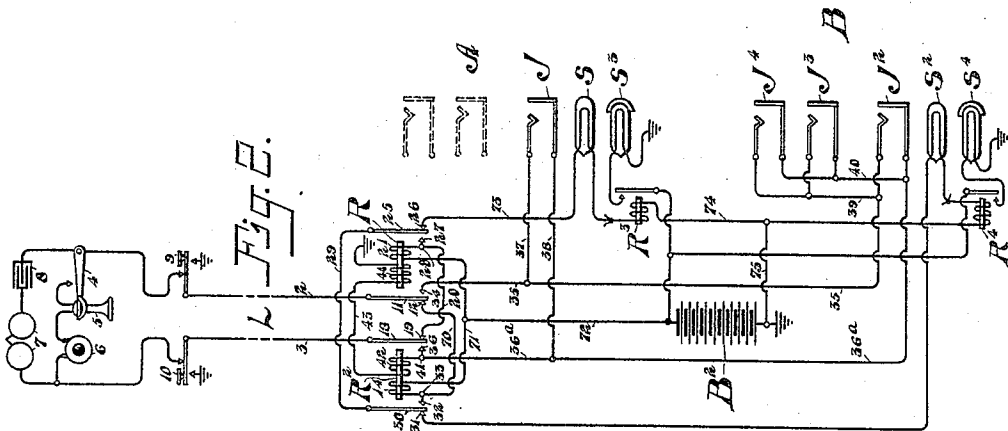
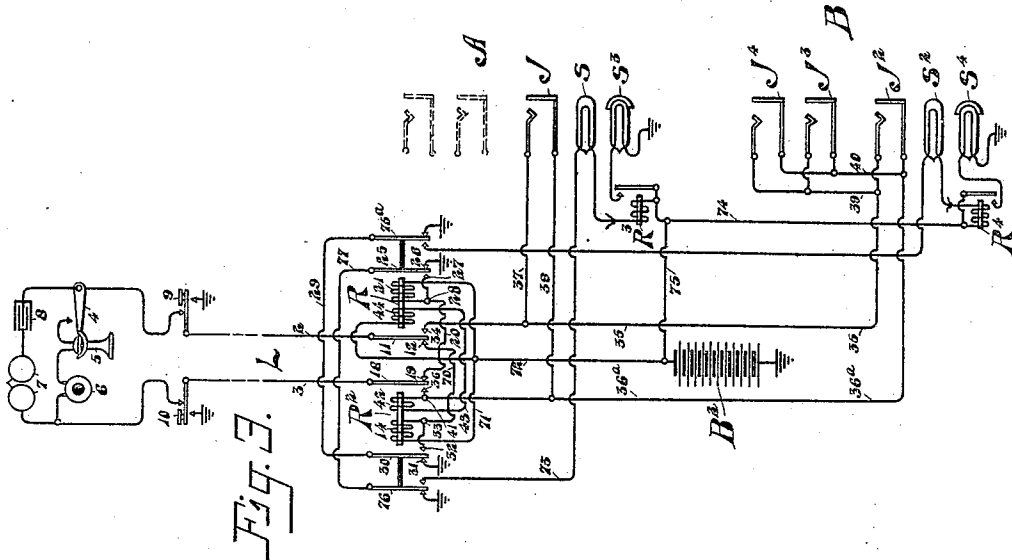
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2 SHEETS—SHEET 2.



Witnesses.
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UNITED STATES PATENT OFFICE.

HOWARD M. POST, OF CHICAGO, ILLINOIS, ASSIGNOR TO KELLOGG SWITCHBOARD AND SUPPLY COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS.

TWO-DIVISION TELEPHONE SYSTEM.

No. 816,819.

Specification of Letters Patent.

Patented April 3, 1906.

Application filed October 24, 1902. Serial No. 128,528.

To all whom it may concern:

Be it known that I, HOWARD M. POST, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented new and useful Improvements in Two-Division Telephone Systems, of which the following is a specification.

My invention relates to a divided multiple-switchboard system, my object being to provide a system of this type in which the sources of energy are all located at the central office, in which a minimum amount of apparatus for each line is required, and in which only two wires extending throughout the switchboard are employed for each line, and, further, to provide in such a system suitable apparatus for connecting the subscribers together and for properly supervising and attending the connections.

The advantage of the divided central system is well understood at the present date and chiefly resides in the fact that the multiple sections of the switchboard are greatly reduced at the expense of only a slight increase of other apparatus for the lines. The general plan is for each subscriber to be represented upon each division of the switchboard by means of an answering-jack and line-signal and to have only upon one of said divisions multiple jacks or connection terminals. The subscribers then instead of being known merely by a number, as in the ordinary system, are listed in the directories by means of numbers and in addition the division name or letter upon which their multiple-jacks are placed, whereby connections are always completed by the operator with the lines upon one division, but may be initiated by the subscriber at any of the divisions. My invention corresponds to this general type, but is designed more particularly for a two-division system. The apparatus is so arranged that but two relays are required for each line at the central office, whereby a great saving results in the cost of installation and maintenance. The subscribers have two push-buttons corresponding to the two divisions, whereby they are enabled to operate their signal upon either board. The signals are arranged to be locked in operating position as soon as the push-buttons are operated, whereby the signals remain exposed until the oper-

ator answers, even though the push-buttons be released. The circuits are arranged for the ready application of pilot-signals without complication of parts.

Other novel features and advantages will be brought out in connection with the detailed description and the claims.

My invention is illustrated in the accompanying drawings, in which the same reference characters are used throughout to designate like parts, and in which—

Figure 1 is a diagram of a telephone system embodying my invention. Fig. 2 is a diagram of a modification, and Fig. 3 is a diagram of still another modification.

The switchboard is shown as having two divisions, which may be termed "A" and "B" divisions. Two subscribers' lines L and L^2 are shown extending from their respective substations D and D^2 to the central office. At the substation the subscriber is provided with the usual common battery subscriber's set, the set shown in the drawings being intended merely to typify any of the usual or desired apparatus. A switch-hook 4, which normally carries the receiver 5, is adapted to open a bridge of the line containing said receiver and the transmitter 6. A call-bell 7 and condenser 8 are permanently connected between the two line-wires.

In the tip-conductor 2 a key or push-button switch 9 is provided, which is adapted, when depressed, to open said conductor and ground the same, and a similar push-button or key 10 is provided to open and ground the line conductor 3. The line conductor 2 is permanently connected with the spring 11 of a relay R , the normal contact 12 of which is connected, by means of conductor 13, with one winding 14 of relay R^2 , which winding is connected, by means of conductor 15, with the individual signal-lamp S for the line, located upon the A division of the switchboard. The circuit is then extended by conductor 16 from the other terminal of the lamp, a portion of said conductor being common to a plurality of lines and the common portion including the pilot-relay R^3 , to point 24, and thence by conductor 17 with the live pole of common battery B^2 , the opposite pole of which is grounded. The other line conductor 3 is permanently connected with the spring or movable contact 18 of the relay R^2 ,

the normal contact of which is connected by a conductor 20 with one winding 21 of the relay R and thence by conductor 22 to the signal-lamp S² for the line, located in the B division of the switchboard. The other terminal of the lamp is connected with the conductor 23 common to a plurality of lines and including the winding of the pilot-relay R⁴, this conductor being also joined at the point 24 with the conductor 17, leading to the battery B². The relay R is provided with a second movable contact 25, the normal contact 26 of which is grounded and the forward contact 27 of which is connected to the junction-point 28 upon the conductor 20. This movable contact is joined by conductor 29 to a similar movable contact 30 of the relay R³, the normal contact 31 of which is likewise grounded and the forward contact of which is connected to the junction 33 upon the conductor 13. The forward contact 34 of the spring 11 of relay R is joined by conductor 35 with the tip-spring of the answering-jack J², located upon the B division of the switchboard, while the normal contact 36 of the spring 18 of relay R² is connected by conductor 36^a with the sleeve-contact of said answering-jack J². Conductors 37 and 38 connect the conductors 35 and 36^a, respectively, with the tip and sleeve contacts of the answering-jack J, located upon the A division of the switchboard. The multiple jacks J³ and J⁴ for the said line are located upon the B division of the switchboard and are connected by conductors 39 and 40 to the conductors 35 and 36^a, whereby the tip and sleeve contacts of all the jacks upon all of the boards are connected in multiple with each other. The junction-point 41 upon the sleeve-conductor 36^a is connected with one terminal of the winding 42 of the relay R², which winding is connected through the intermediation of conductor 43 with a similar winding 44 of relay R, the other terminal of which winding is grounded. The pilot-relay R³, located in the A division of the switchboard, controls through its normally open contacts the circuit of the pilot-signal S³, said signal being common to a plurality of lines. Similarly, the pilot-relay R⁴, located upon the B division of the board, controls through its normally open contacts the pilot-lamp S⁴. The line L² is provided with exactly similar apparatus, except that the multiple jacks J³ and J⁴ for the line are shown located upon the A division of the switchboard. The construction and operation, however, remain the same.

The operator's apparatus, which is intended to be used at the various sections or divisions of the switchboard, is indicated in the diagram by the single apparatus at the A division. The cord-circuit comprises the answering-plug P and the calling-plug P², each provided with tip and sleeve contact-surfaces adapted to register with the like contact-surfaces of the spring-jacks or connection

terminals of the lines when the plugs are inserted therein. The tip-contacts of the plugs are connected together by the tip-strands *t* and *t*² and the interposed condenser *c*, while the sleeve-contacts are likewise connected together by the flexible strands *s* and *s*² and the interposed condenser *c*². A battery B² is bridged across the answering end of the cord-circuit upon that side of the condensers, the connection to the tip-strand including the winding of the supervisory relay *r*, while the similar connection to the sleeve-strand from the opposite pole of the battery includes the winding of the supervisory relay *r*². The relay *r* controls the normally closed contacts and the relay *r*² the normally open contacts of the local circuit of the supervisory signal S⁵, associated with the answering-plug P. A like arrangement exists for the calling end of the cord-circuit, a battery B³ being bridged thereacross and including upon one side the winding of supervisory relay *r*³ and upon the other that of supervisory relay *r*⁴. These relays, as before, control the local circuit of the supervisory signal-lamp S⁶, associated with the calling-plug.

For testing purposes the forward portion of the tip-strand of the cord-circuit is connected with the movable contact 45 of the sleeve supervisory relay *r*⁴, the forward contact of which is adapted to complete the said tip-strand *t*² when the relay is energized, but the normal contact of which is connected by a conductor 46 with the high-impedance and high-resistance test-relay *r*⁵, the opposite terminal of which is grounded by branch 47. This relay when energized closes a ground branch 48 from one side of the transmitter-circuit, which permits a flow of current from the battery B³ and inductively causes a busy-click in the operator's receiver. The operator's receiver 49, together with the secondary winding of her induction-coil 50 and a condenser *c*³, are adapted to be bridged across the calling end of the cord-circuit by means of the keys 51 and 52, these keys being merely diagrammatically intended to indicate any usual or desired form of listening-key and which is usually operated by means of a single lever. The operator's transmitter 53 is grounded upon one side by conductor 47 and is connected upon the other through the impedance-coil 54 and conductor 55 with the common conductor 56, leading to the live pole of battery B³. The primary of the operator's induction-coil and the condenser *c*⁴ are connected in shunt of the transmitter 53.

A ringing-generator 57 is adapted to be connected between the ground and the tip-strand of the cord-circuit by means of the ringing-key 58 60, a resistance-lamp 59 being included between the generator and tip-key 58 to cut down the current and the corresponding sleeve-key 60 being adapted when actuated to close a circuit through the re-

sistance 61 and the branch 62 and the common conductor 56 to the battery B^3 , whereby the relays R and R^2 are maintained operated during ringing.

5 The operation of my invention is as follows: The calling subscriber would first ascertain the division upon which the wanted subscriber is listed in the directory of the exchange and would then push the button corresponding to that division, the buttons being lettered in accordance with the names of the two divisions—as, for instance, A and B . If it be desired to operate the signal located upon the B division of the switchboard, the
10 button 10 is depressed, thus grounding the line conductor 3, and thereby completing a circuit from the live pole of the battery B^2 over conductor 17, point 24, conductor 23, including the winding of pilot-relay R^1 , the line-lamp S^2 , conductor 22, winding 21 of relay R , conductor 20, contacts 19 and 18 of relay R^2 , and over conductor 3 to ground at the substation. The current in this path is sufficient to actuate the relay R to close a
15 locking-circuit for itself, said locking-circuit being completed from point 28 or conductor 20, contacts 27 and 25 of the relay R , conductor 29, contacts 30 and 31 of the relay R^2 to ground, this locking branch being in parallel with the line conductor 3, and therefore replacing it in the further operation of the said signal and relay. If the resistance of the line conductor is so great as to prevent the full operation of the lamp S^2 over the path first completed, the substitute path over the locking-circuit being entirely local is of low enough resistance so that the current flowing brings the lamp up to full illumination and operates the pilot-relay R^1 . The pilot-signal S^4 , located
20 before the operator upon the B division, is also lighted by current from the battery B^2 . Assuming, however, that the wanted subscriber is listed upon the A division, the subscriber would depress the button 9 at the substation, which serves to ground the line conductor 2 at the substation, and thereby completes a path for current from the live pole of the battery B^2 over conductor 17, point 24, conductor 16, including the pilot-relay R^3 , the line-lamp S , conductor 15, winding 14 of relay R^2 , conductor 13, spring 11 of relay R , and conductor 2 to ground at the substation. The current flowing over this path is sufficient to operate the relay R^2 to cause it to
25 attract its spring 30, and thereby closes a locking-circuit for itself from point 33, contacts 32 and 30 of the relay R^2 , conductor 29, spring 25 of relay R , the contact 26 to ground, this portion of the locking-circuit being in parallel with the line conductor 2, whereby the button 9 may be released by the subscriber and the said relay remains actuated. The line-lamp S and the pilot-relay R^3 are included in the first-named circuit; but the local circuit is immediately completed by the

said locking branch and is of sufficiently low resistance to permit the lamp to be fully actuated. The pilot-lamp S^3 is also actuated by current from the battery B^2 . The operator attending the answering-jack of the line
70 L upon the A division upon seeing the signals exposed inserts the answering-plug P of her cord-circuit into the jack J and depresses the listening-keys 51 52 to connect her telephone with the cord-circuit and receives the order from the subscriber. The insertion of the plug P completes another path for current from the battery B^2 through the sleeve supervisory relay r^2 , the sleeve-strand s , sleeve-contacts of the plug and jack, conductors 38 and 36^a, winding 42 of relay R^2 , conductor 43, the winding 44 of relay R to ground over which path current flows to actuate relays R and R^3 , as well as supervisory relay r^2 . The actuation of the relay R
80 breaks the locking-circuit of the relay R^2 between the contacts 25 and 26, and therefore the local circuit of the line-lamp S and the pilot-relay R^3 , and the relay R^2 is also actuated to prevent any possible lighting of the line-lamp S^2 upon the other division of the switchboard. At the same time the spring 11 of relay R and spring 18 of relay R^2 engage their forward contacts 34 and 36 and complete the metallic talking-circuit from the
90 line conductors 2 and 3 to the conductors 35 and 36^a, leading to the jacks or connection-terminals upon both sections of the switchboard. The actuation of the supervisory relay r^2 at this time closes a circuit of the supervisory signal S^5 , associated with the answering-plug, but the subscriber's receiver being off the hook 4 at this time a path for current from the battery B^2 over the metallic line to the substation is now provided, which current finds a path through the tip supervisory relay r , which is actuated, and therefore opens the circuit of said supervisory signal S^5 to cause it to remain inert. Upon learning the number of the party wanted the operator
100 proceeds to test the condition of the wanted line. This is done by touching the tip of the calling-plug P^2 to the test-ring of one of the multiple jacks of the line. If the line is not busy, no path for current will be completed; but if connection has been established with the line at any division of the switchboard the sleeve-conductor 36^a will be connected with the live pole of the common battery B^3 or such other battery as may be connected
110 with the sleeve-strand of the cord-circuit used for established connections. When the line is tested, therefore, a complete path for current will be established from the sleeve-conductor of the line and the sleeve-contact of the jack, which is its test-ring, the tip of the testing-plug, the forward portion of the tip-strand t^2 thereof, spring 45 of sleeve supervisory relay r^4 , conductor 46, the high-resistance and high-impedance test-relay r^5 , and
120 125 130

conductor 47 to ground. This test-relay, owing to its impedance, builds up its current slowly, and therefore prevents a sudden variation of current upon the tested line, and owing to its high resistance prevents also a large variation of current thereon, whereby the effect of the test is practically unnoticeable to the subscriber or subscribers upon the tested line. The test-relay responding to this current closes a path for current from the live pole of the battery B^3 ; conductor 56, conductor 55, through the retardation-coil 54, the primary of the operator's induction-coil 50, the spring of said relay r^5 , and conductor 48 to ground. This will inductively produce a click in the operator's receiver, which click may be reduced to any desired extent by varying the resistance of this circuit. If the line is idle, the plug is inserted in the proper multiple jack and the ringing-key 58 60 actuated. The insertion of the plug closes a path for current from the battery B^3 over the sleeve of the cord-circuit, over conductors 40, 38, and 36^a, the winding 42 of relay R^2 , conductor 43, winding 44 of relay R to ground, thus actuating both relays and rendering the line-signals at both divisions of the board inoperative and also connecting the switchboard section or cables of the line to the external line conductors. The operation of the ringing-key does not effect any rearrangement of the relays R and R^2 for the reason that the key 60 closes a circuit from the battery B^3 over the conductor 56, conductor 62, and through the resistance 61 to the sleeve-conductor 40. The path for ringing-current is through the resistance-lamp 59, the tip side of the line to the substation, through the condenser and bell at said station, and back oversleeve-conductor 3, conductors 36^a, 38, and 40, and through the resistance 61, conductors 62 and 56 through the battery B^3 to ground. Upon releasing the ringing-key the supervisory relay r^4 is actuated over the sleeve side of the connection and serves through its spring 45 to disconnect the test-relay r^5 and to complete the tip-strand of the cord-circuit through its forward contact. It also closes the local circuit of the supervisory lamp S^6 , which is lighted before the subscriber D^2 responds, thus indicating to the operator that he has not yet responded. When the subscriber in answer to his call takes up his receiver, a path for current from the battery B^3 over the metallic line is provided and the tip supervisory relay r^3 is actuated to open the circuit of the supervisory lamp S^6 , thus rendering the same inoperative, which indicates to the operator that the subscribers are in communication. At the termination of the conversation the receivers are returned to their respective hooks, with the result that both tip supervisory relays in the cord-circuit are deenergized, the corresponding sleeve-relays remaining energized over the local cir-

cuits, and the lamps S^5 and S^6 are lighted to indicate to the operator that the conversation has terminated, when the plugs are withdrawn and all parts restored to normal condition.

Instead of a single station upon each line the lines may be of the polystation type, it being merely necessary to provide each station with a duplicate of the apparatus shown at stations B and B².

The ground connections referred to hereinbefore may be and in practice usually are the common office grounds or common office return. More than two sets of batteries may be employed, if desired, or all the apparatus at both offices may be operated from the same batteries, as is intended to be indicated in Fig. 1 of the drawings. The cord-circuit at the B division of the switchboard is not indicated in full, for the sake of clearness of illustration; but it will be understood that the same type shown at the A division is intended to be employed at both divisions. It is thus also seen that the operation of one line-relay opens the circuit of the other line-relay from the substation, so that it cannot be simultaneously operated.

In Fig. 2 substantially the same arrangement exists, except that the line-signals S and S^2 are not placed directly in the path for current over the line conductors when the subscriber is calling the central office. In this arrangement when the subscriber presses one of the calling-keys—for example, key 9—a path for current is provided over the line conductor 2, spring 11 of relay R , conductor 70, winding 14 of relay R^2 , and thence by conductors 71 and 72 to the live pole of the common battery B^2 . This suffices to operate the relay R^2 , which closes its spring 30 upon contact 32, thereby completing a path for current from the battery B^2 over conductors 72 and 71, the winding 14 of relay R^2 , point 33, contacts 32 and 30 of the said relay, conductor 29, spring 25 of relay R , its normal contact 26, and thence by conductor 73 to the line-signal S , and thence to the pilot-relay R^3 and by way of conductors 74 and 75 to ground. The line-signal S and the pilot-relay R^3 are therefore operated over this local circuit, which local circuit serves to lock the relay R^2 in actuated condition. The pilot-signal S^3 has its local circuit closed from the main battery B^2 through the normally open contacts of the said pilot-relay. Upon establishing a connection with the line a path for current is provided over the sleeve-conductor of the jacks, the conductor 36^a, winding 42 of relay R^2 , conductor 43, the winding 44 of relay R to ground, thus operating both relays R and R^2 to open the circuits of the signal-lamps and to render them inoperative and to connect the line conductors 2 and 3 with the jack-conductors. Upon operating the other key at the subscriber's station a similar path is es-

established over the other line conductor and results in operating the corresponding signals and relays.

Fig. 3 shows still another modification in which substantially the same arrangement exists, except that an additional set of contacts are provided upon the relays R and R², with the result that the locking-circuits for the calling-relays and the local circuits for the signals are entirely distinct. Operating the push-button 9 at the substation, for example, closes a path for current over conductor 2, the spring 11 of relay R, conductor 70, winding 14 of relay R², and over conductors 71 and 72 to the battery B². A spring 30 of the cut-off relay R² then closes upon its forward contact and completes the locking circuit of the aforesaid relay through the conductor 29 and the additional contact 75^a of the relay R to ground. The auxiliary contact 76 of relay R² closes upon its forward contact, and thereby completes the local circuit of the signaling-lamp S and the pilot-relay R³, the circuit being completed from the conductor 73, the forward contact of spring 76, and thence by conductor 77 and spring 25 of relay R to ground. This arrangement, as before stated, results in keeping the locking-circuits for the said relays and the local circuits for the lamps entirely separate. It is of advantage under certain conditions of use. Of course in this arrangement it will be necessary to reverse the ground connections in the cord-circuits.

While the proportions of the several parts used in my invention are not the essence of the same, I have found good results in the arrangement shown in Fig. 1 with the windings 14 and 21 of relays R and R² of one hundred ohms resistance, with ten-volt signal-lamps S and S², twenty-four-volt pilot-lamps S³ and S⁴, and batteries B² and B³ of twenty-four volts. The windings 44 and 42 of said relays may be two hundred and fifty ohms each. In Fig. 2 about the same dimensions may be employed, except that the lamps S and S² should be twenty-four-volt lamps. In Fig. 3 the same dimensions may also be employed, except that the windings 14 and 21 of the relays R and R² may be five hundred ohms resistance each.

While I have described only three methods for carrying out my invention, it will be obvious that many other variations may be made therein and still not depart from its scope or principle.

I claim—

1. In a telephone system, the combination with a telephone-line, of a plurality of relays therefor at the central office, parts controlled by said relays and means for causing the operation of said relays singly from the substation and simultaneously from the central office, substantially as described.

2. In a telephone system, the combination

with a telephone-line, of two relays only therefor at the central office, parts controlled by said relays and means for causing the operation of said relays singly from the substation and simultaneously from the central office, substantially as described.

3. In a telephone system, the combination with a telephone-line, of a plurality of relays therefor at the central office, means controlled from the substation for operating said relays singly to produce different signals at the central office and means controlled from the central office for simultaneously operating both said relays to render said signals inoperative, substantially as described.

4. In a telephone system, the combination with a telephone-line, of two relays therefor at the central office, means controlled from the substation for singly operating said relays to produce different calling signals at the central office, and further means controlled at the central office for operating both said relays to render said signals inoperative, substantially as described.

5. In a two-division exchange, the combination with a telephone-line extending from a substation to the central office, of a calling signal for the telephone-line in each division of the switchboard, two relays for the line each controlling one of said signals, means for singly operating either of said relays from the substation to actuate the corresponding signal, and means for operating both of said relays when connection is established with the line at either of said divisions to render said signals inoperative, substantially as described.

6. In a telephone system, the combination with a telephone-line extending from a substation to the central office, of two relays for the line at the central office, switches at the substation, one for each relay, adapted when actuated to close a circuit of the corresponding relay so as to operate the same, and means at the central office for causing and controlling the operation of both said relays, substantially as described.

7. In a telephone system, the combination with a telephone-line, of two line-signals for the line located at different places in the switchboard, a relay for each said signal associated with the line, means at the substation for closing the circuit of said relays individually so as to selectively operate the said signals, and further means for closing an operating-circuit of both said relays when a connection is established with the line at the central office to actuate both relays to thereby render said signals inoperative, substantially as described.

8. In a telephone system, the combination with a telephone-line, of a pair of relays therefor at the central office, telephonic apparatus controlled by said relays, a central source of current located at the said office, means at

the substation for closing a circuit from said source through either of said relays, and means for operating both said relays when a connection is established with the telephone-line, substantially as described.

9. In a telephone system, the combination with a telephone-line, of a pair of relays therefor at the central office, telephonic apparatus controlled by said relays, a central source of current at said office, means at the substation for closing a circuit from said source through either of said relays, and means at the central office for closing a circuit from said source through both said relays, substantially as described.

10. In a telephone system, the combination with a telephone-line, of a pair of relays therefor, each of said relays having two windings, telephonic apparatus controlled by said relays, means at the substation for closing a circuit for current through one winding of each of said relays so as to operate them singly, and means at the central office for simultaneously closing a circuit through the other windings of both said relays to operate them jointly, substantially as described.

11. In a telephone-exchange, the combination with a telephone-line, of a pair of relays therefor, telephonic apparatus controlled by said relays, means at the substation of the line for actuating either of said relays singly, a locking-circuit for each of said relays, and means for energizing both of said relays simultaneously when a connection is established with the line at the central office, substantially as described.

12. In a telephone-exchange, the combination with a telephone-line, of two relays therefor, telephonic apparatus controlled by said relays, means for energizing one of said relays over one line conductor and for energizing the other over the other line conductor, the energizing of one of said relays from the substation serving to open the path for current from the substation through the other relay, whereby the actuation of one relay prevents the simultaneous actuation of the other from the substation, and means for actuating both of said relays when a connection is established with the line at the central office, substantially as described.

13. In a telephone system, the combination with a telephone-line, of two relays therefor at the central office, telephonic apparatus controlled by said relays, means controlled from the substation for energizing one of said relays over one line conductor and the other relay over the other line conductor, said relays serving when so actuated to open the substation-circuit of the other relay, whereby both relays cannot be simultaneously actuated from the substation, a locking-circuit for each of said relays completed through normal contacts of the other relay, and means for operating both relays when a

connection is established with the line whereby said locking-circuits are opened, substantially as described.

14. In a telephone system, the combination with a metallic telephone-line, a relay and a signaling device in series in each of the line conductors, a source of current with which said line conductors are normally connected, a local locking-circuit for each of said relays adapted when closed to short-circuit the resistance of the line conductor, and means when a connection is established with the line for actuating both said relays to thereby render the locking-circuits and signaling devices inoperative, substantially as described.

15. In a telephone system, the combination with a metallic telephone-line, of a relay, a line-signaling device and a source of current in series in the order named in each line conductor; a portion of the conductor between the source of current and the signaling devices being common to a plurality of lines, and a pilot-signaling device located in said common portion, substantially as described.

16. In a telephone system, the combination with a metallic telephone-line, of two signals therefor at the central office located upon different divisions of the switchboard, two relays for the line adapted to be singly operated from the substation to actuate either of said signals selectively, and means when a connection is established with the line for operating both of said relays to render said signals inoperative during the connection, the path for current for said operation of the said relays including a portion of the talking-circuit, substantially as described.

17. In a telephone system, the combination with a metallic telephone-line, of line-signals therefor located upon different divisions of the switchboard, two line-relays for the line adapted to be singly operated from the substation, one of said relays controlling one of said signals and the other controlling the other signal, and means when a connection is established with the line for operating both of said relays over a local circuit including a portion of one side of the talking-circuit, substantially as described.

18. The combination with a telephone-line, of normally disconnected connection-terminals for the line at the central office, a pair of signals for the line at the central office, two relays also at the central office and adapted to be singly operated from the substation to control the operation of either of said signals, and means to operate both of said relays when connection is established with said lines to render said line-signals inoperative and to connect the normally disconnected connection-terminals with the line, substantially as described.

19. In a telephone-exchange, the combination

tion with a telephone-line, of two relays therefor, a signal controlled by each relay, means at the substation of the line for controlling the actuation of either of said relays singly, the actuation of one relay serving to prevent the simultaneous actuation of the other, and means for actuating both of said relays when a connection is established with the line at the central office, substantially as described.

20. In a telephone system, the combination with a telephone-line, of two relays therefor at the central office, a signal controlled by each relay, means controlled from the substation for energizing one of said relays over one line conductor and the other over the other line conductor, a locking-circuit for each of said relays completed through normal contacts of the other relay, and means for operating both relays when a connection is established with the line whereby said locking-circuits are opened, substantially as described.

21. In a telephone system, the combination with a telephone-line, of two signals therefor at the central office located upon different divisions of the switchboard, two relays for the line adapted to be singly operated from the substation to actuate each of said signals selectively, cord-circuits to establish connections with the line for conversation, a source of current associated with the cord-circuits, and means when a connection is established with the line by said cord-circuits for operating both of said relays by current from said source to render the signals inoperative during the connection, said source being included in the metallic talking-circuit to furnish current to the subscriber's station for the operation of the transmitter, substantially as described.

22. In a telephone system, the combination with a metallic telephone-line, of two signals therefor at the central office located upon different divisions of the switchboard, a central source of current with which said line is connected at the central office, two relays for the line adapted to be operated from said source, means at the substation to cause the operation of said relays singly, a cord-circuit at the central office to establish connections with the line for conversation, and means for including said source and both relays in a local circuit including a portion of the talking-circuit when a connection is established for conversation, whereby said relays are operated to render the signals inoperative during a connection and the said source is included

in the metallic circuit of the line to furnish current for conversation, substantially as described.

23. In a telephone system, the combination with a telephone-line of signals therefor located upon different divisions of the switchboard, a pair of relays for the line at the central office each controlling one of said signals, a central source of current at the central office adapted to operate said relays when the circuits thereof are closed at the substation, and a cord-circuit at the central office adapted when connected with the line for conversation to close a circuit from said source through both relays to simultaneously actuate them and thereby prevent the operation of said signals, said source being also connected with the telephone-line to furnish current to the substation for talking, substantially as described.

24. In a telephone system, the combination with a telephone-line, of a pair of signals therefor at the central office, a pair of relays for the line controlling said signals, each of said relays having two windings, means at the substations for closing a circuit for current through one winding of each of said relays to operate them singly, a cord-circuit to establish connections with the line for conversation at the central office, a source of current associated with the cord-circuit to furnish current to the substation for talking, and means for including said current source and the said other windings of both relays in a local circuit when a connection is established whereby both relays are actuated during the connection, substantially as described.

25. In a telephone system, the combination with a telephone-line, of a signal therefor upon the different divisions of a divided central switchboard, a relay associated with the line for each signal and adapted to be selectively operated from the substation, each said signal having a local circuit completed through normal contacts of the relay of the other signal, and means for operating both said relays when a connection is established with the line for conversation to open the local circuits of both said signals, substantially as described.

Signed by me at Chicago, in the county of Cook, State of Illinois, this 22d day of October, 1902.

HOWARD M. POST.

Witnesses:

ROBERT LEWIS AMES,
GAZELLE BEDER.