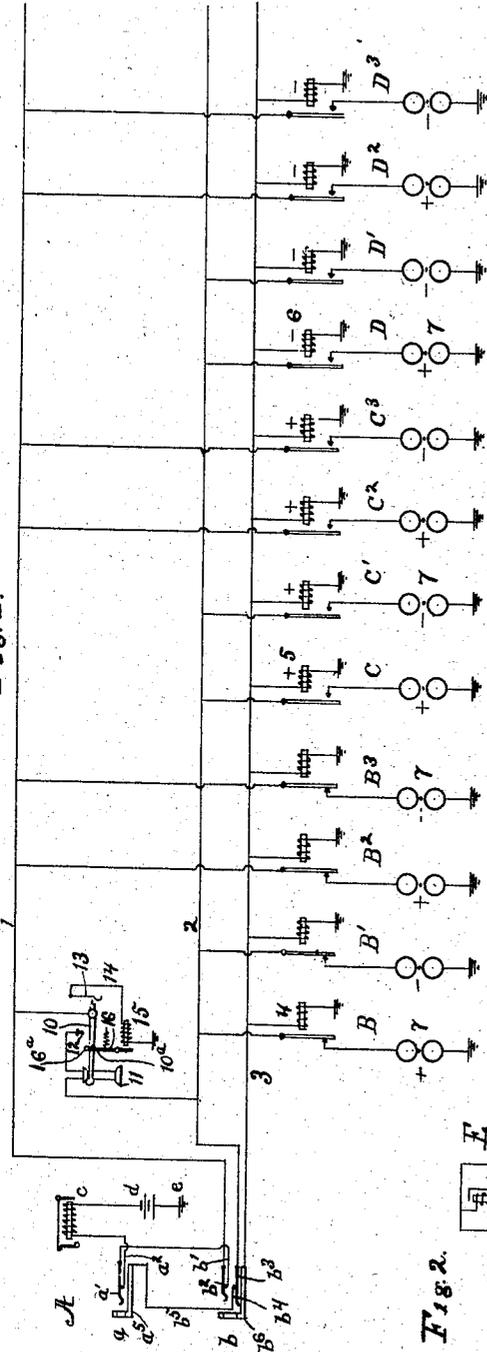


C. B. SMITH.  
TELEPHONE SYSTEM.

APPLICATION FILED FEB. 23, 1901. RENEWED OCT 22, 1902.

Fig. 1.



WITNESSES:

*M. Manning.*  
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Fig. 2.

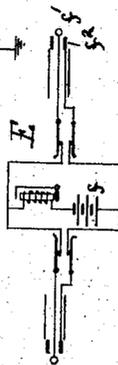
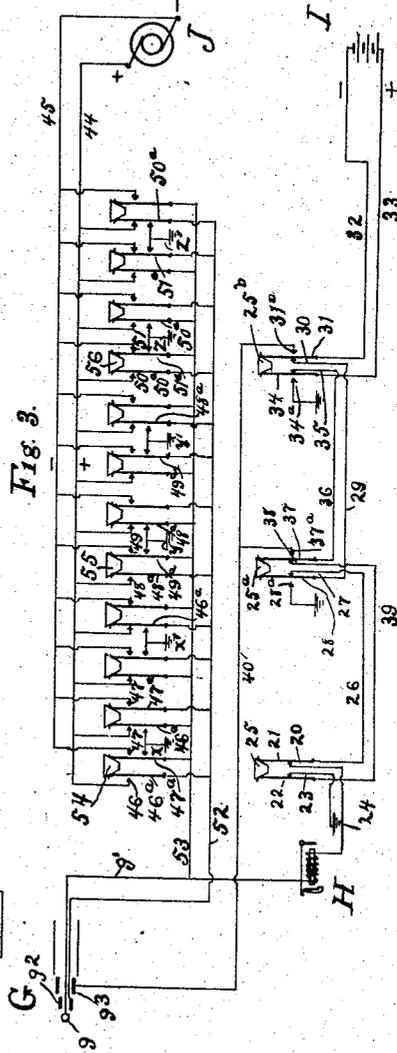


Fig. 3.



INVENTOR

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# UNITED STATES PATENT OFFICE.

CHARLES B. SMITH, OF NEW YORK, N. Y.

## TELEPHONE SYSTEM.

SPECIFICATION forming part of Letters Patent No. 781,237, dated January 31, 1905.

Application filed February 23, 1901. Renewed October 22, 1902. Serial No. 128,252.

*To all whom it may concern:*

Be it known that I, CHARLES B. SMITH, a citizen of the United States, residing in New York city, borough of Manhattan, State of New York, have invented certain new and useful Improvements in Telephone Systems, of which the following is a specification.

My invention relates to improvements in what are commonly called "telephone party-lines," and more particularly to that class of party-lines in which a plurality of subscribers are connected with two wires leading from central, over each of which currents of different sign are sent to operate a call in a desired station; and the object of my invention is to provide improved means whereby a relatively large number of subscribers can be called over the same pair of lines.

In carrying out my invention I utilize a pair of lines with which a plurality of subscribers' calling instruments are associated, some of which are adapted to be directly operated, respectively, by currents of opposite sign on said lines and other such instruments are normally out of circuit with said lines and adapted to be thrown in circuit therewith, and in conjunction with such lines and instruments I provide a separate circuit leading from central through the subscribers' stations, and in the stations I provide relays adapted to be operated by current over the separate circuit, said relays being arranged in sets or series in such manner that one set or series of relays will operate by a current of either sign to cut out one set of call-bells from the telephone-lines, another set by current of positive sign, and still another set by current of negative sign to connect the desired series of call-bells with the telephone-lines. I also provide at the central office means whereby a current of positive or negative sign may be sent over the selector-conductor, the arrangements being such that if a current of positive sign is transmitted the appropriate relays will operate to throw in circuit with the telephone-lines the corresponding set or series of calling instruments, while at the same time operating the series of non-polarized relays to cut out the corresponding calling instruments, and likewise by sending a current of

negative sign over the selector-line corresponding relays will operate to throw in circuit with the telephone-lines the corresponding calling instruments and also at the same time operating the non-polarized relays to cut out the corresponding call-bells. By this means any series of calling instruments may be readily selected and placed in condition for operation, and then the appropriate current may be sent over the telephone-lines in well-known manner to produce a call at the desired station. By preference I also utilize lock-out devices at the various subscribers' stations to prevent a subscriber from placing his telephone instruments in circuit with the telephone-lines if said lines are in use.

My invention also contemplates various details of improvement that will be more fully hereinafter set forth and then pointed out in the claims.

Reference is to be had to the accompanying drawings, forming part hereof, wherein—

Figure 1 is a diagrammatic view of a telephone system embodying my improvements. Fig. 2 is a similar view of a plug-cord circuit, and Fig. 3 is a similar view of a plug-circuit and switches adapted for use in selecting the desired series of subscribers and calling the desired subscriber of said series.

In the accompanying drawings, 1 2 indicate a pair of telephone-lines leading from a central station A, at which station I have indicated two jacks *a b*, both wires being in normal connection with the appropriate contacts of both jacks. At the jack *a* the contacts *a' a''* are in normal engagement and the contact *a''* leads by a conductor through an indicator or drop *c* and battery *d* to ground *e*. The contact *a'* is connected with the contact *b'* of jack *b*, which contact is in normal engagement with a contact *b''*, connected with line 1. The line 2 at central leads to a contact *b'''*, that is in normal engagement with a contact *b''''*, connected by conductor *b''''''* with a contact or frame *a''''''* of jack *a*. The contact or frame *b''''''* of jack *b* is connected with a selector line or conductor 3, that leads through the stations associated with lines 1 2. The stations on a party-line are arranged in series, as B B' B<sup>2</sup> B<sup>3</sup> and C C' C<sup>2</sup> C<sup>3</sup> and D D' D<sup>2</sup> D<sup>3</sup>. At said stations are re-

lays 4 5 6, one in each station connected with line 3 and with ground. The calling instruments of the various stations are connected with ground, and at one series of stations, B B' B<sup>2</sup> B<sup>3</sup>, the call-bells are normally connected with the lines 1 or 2, in the example shown the bells of stations B B' being normally connected with line 2 and the bells of stations B<sup>2</sup> B<sup>3</sup> normally connected with the line 1, the relays 4 being adapted to break the circuit of said call-bells. The magnets of the relays 4 are adapted to be operated by current of either positive or negative sign. The call-bells of the other series of stations are normally out of circuit with the lines 1 2; but the relays 5 6 of such stations are adapted to close the circuits of the corresponding call-bells. One series of relays, as 5, are polarized for a current of one sign—say plus—and the relays 6 are polarized for a current of opposite sign, as indicated in Fig. 1. A plurality of call-bells of each such series are arranged to be thrown in circuit with line 1 and the others in circuit with line 2, in the example illustrated the bells of stations C C' and D D' being adapted to be thrown in circuit with line 2 and the bells of station C<sup>2</sup> C<sup>3</sup> and D<sup>2</sup> D<sup>3</sup> adapted to be thrown in circuit with line 1. As the call-bells of stations B B' B<sup>2</sup> B<sup>3</sup> are normally in circuit to ground over the lines 1 2, as in the well-known four-station party-line, it is merely necessary to throw an appropriate current of the desired sign upon the line 1 or 2 to operate the desired bell in such series. When, however, it is desired to call a subscriber who is located in a different series, current of the desired sign will first be thrown upon line 3 to place the call-bells of the desired series in circuit with lines 1 2. For instance, if a station in the series C C<sup>3</sup> is desired current of, say, positive sign will first be thrown upon line 3, whereupon it will cause the relays of such series of stations to close the circuit for the corresponding call-bells and also cause the series of non-polarized relays to cut off their call-bells from lines 1 2, and then current of proper sign will be thrown upon line 1 or 2, as the case may be, to produce a call, and likewise if a subscriber is desired in a series of stations D D<sup>3</sup> current of minus sign will first be thrown on line 3 to cause the relays 6 of such series to close the circuits of such call-bells and relays 4 to cut off their call-bells from lines 1 2, and then the proper current will be thrown upon lines 1 or 2, as shown. The call-bells of the different series are indicated as adapted to be operated over line 1 or 2 by current of plus or minus sign.

To prevent a subscriber from placing his telephone instrument in circuit with the telephone-line, if the same is in use, I have shown in Fig. 1 lock-out devices arranged as follows: The hook or lever 10 of receiver 11 is connected with line 1 and the receiver is con-

nected with line 2 and with a contact 12, adapted to be engaged or placed in circuit with hook or lever 10. A contact 13 is normally out of engagement with hook 10 and is adapted to be temporarily engaged thereby as the receiver is lifted from the hook, and said contact is connected to ground by wire 14, which includes a magnet 15. The magnet 15 is adapted to operate a lock or lever 16, that is shown provided with a detent 16<sup>a</sup>, lying normally in the path of a pin or projection 10<sup>a</sup> of hook 10, thereby normally keeping said hook from engagement or making circuit with contact 12. The circuit for magnet 15 leads from ground through 13 10 1 and the jacks at central through drop *c* and battery *d* to ground *e*. If the line is not in use, when the receiver 11 is lifted from its hook the latter will close the circuit of magnet 15 at 13 as the hook passes the latter, and said magnet will operate the detent 16<sup>a</sup> to allow the hook to close the telephone-circuit at 12; but if the line is in use owing to a plug being in jack *a* at central the circuit for magnet 15 will be broken, and thus the detent 16<sup>a</sup> will prevent hook 10 from closing the telephone-circuit and a subscriber will be locked out or prevented from using the telephone-line. As the lock-out devices in all the stations shown in Fig. 1 may be similar to that just described, I have deemed it necessary to illustrate but one.

In Fig. 2 I have shown a plug cord-circuit, (marked generally F.) The battery *f* is bridged between the strands of said cord. The tip *f'* is adapted to engage the contact *a'* of jack *a* to break the circuit to ground *e* and establish circuit with line 1, and the sleeve *f''* is adapted to establish circuit through contacts *a''* of jack *a* to line 2.

While any suitable means may be provided for throwing the appropriate current upon the telephone-lines and upon line 3 to accomplish the selecting and calling of a desired subscriber, I have shown a plug-circuit for the purpose, arranged as follows: The tip *g* of a plug G is adapted to engage the contact *b''* of the jack *b* to establish circuit with line 1, and said tip is connected by a line *g'* with an annunciator or drop H, which is connected to a contact 20, normally engaging a contact 21, a corresponding contact 22, normally engaging a contact 23, that is connected with ground 24, a push-button or the like 25 being adapted to simultaneously operate contacts 21 and 22. The sleeve *g''* of plug G is adapted to engage contact *b''* of jack *b*, and the sleeve *g'''* of plug G is adapted to engage contact or frame *b'''* of jack *b*, so that a current of either sign may be passed over line 3. The arrangements for throwing currents upon the lines in conjunction with plug G are shown as follows: The contact 21 leads by a conductor 26 to a contact 27 in normal engagement with a contact 28, that leads by a conductor 29 to a contact 30, in normal engagement with a contact 31,

connected by a conductor 32 to one side of battery I, as to the negative pole, and a conductor 33 leads from the opposite pole of said battery to a contact 34 in normal engagement with a contact 35, connected by a conductor 36 with a contact 37, in normal engagement with a contact 38, that is connected by a conductor 39 with contact 22. Contact 28 is adapted to engage a contact 28<sup>a</sup>, leading to ground, and contact 34 is likewise adapted to engage a contact 34<sup>a</sup>, leading to ground. A push-button or the like 25<sup>a</sup> is adapted to operate contacts 28 and 37, and a push-button 25<sup>b</sup> is adapted to operate contacts 31 and 34. Contact 37 is adapted to engage a contact 37<sup>a</sup>, connected with a conductor 40, that leads to sleeve *g*<sup>3</sup> and contact 31 is adapted to engage a contact 31<sup>a</sup>, also connected with conductor 40. The normal circuit through these contacts is such that when plug G is in jack *b* a signal may be produced in the annunciator or drop H at central when a called subscriber lifts his receiver 11 from its hook, as in such cases the circuit passes over line 1 from ground at the subscriber's station, through tip *g* and line *g*<sup>1</sup>, to the drop H and thence to the lines and contacts connected with battery I to ground at 24. When push-button 25 is operated, current from battery I will be cut from the line. When a current of one sign—say plus—is to be sent over line 3, the push-button 25<sup>a</sup> is operated, (plug G being in jack *b*.) whereupon circuit will be broken at 27 28 and 37 38 and established at 28 28<sup>a</sup> and 37 37<sup>a</sup>, respectively, whereupon circuit will be established from ground through 28<sup>a</sup> 28 to the negative pole of the battery I and thence from the positive pole of the battery through 37 and 37<sup>a</sup> and over line 40, sleeve *g*<sup>3</sup>, contact *b*<sup>6</sup> of jack *b*, and line 3 and thence through the relays, whereupon relays 4 and 5 will operate to cut out the call-bells of stations B B<sup>3</sup> and close the circuits of the call-bells in stations C C<sup>3</sup> in connection with the telephone-lines 1 2. If a current of negative sign is to be passed over line 3, push-button 25<sup>b</sup> will be operated, breaking circuit at 34 35 and 30 31 and closing circuit at 34 34<sup>a</sup> and 31 31<sup>a</sup>, whereupon circuit will be established from ground, through 34 and 33, to the positive pole of battery I and thence from the negative pole through 32 31 31<sup>a</sup> and line 40, sleeve *g*<sup>3</sup>, and contact *b*<sup>6</sup> over line 3 and through the relays, whereupon relays 4 and 6 will operate to cut out the bells at stations B B<sup>3</sup> and close the circuits of the call-bells in stations D D<sup>3</sup> with lines 1 2. To operate the desired call-bell in any of the series of stations, I have provided arrangements as follows: I preferably utilize a generator J, producing a pulsating current, from the positive and negative poles of which generator lead conductors 44 45, past ringing-keys 54 55 56, respectively, associated with the several series of stations. The conductors 44 45 connect with contacts 46 47 48

49 50 51, respectively. The series of stations B B<sup>3</sup> have series of pairs of such contacts at central as 46 47, the series of stations C C<sup>3</sup> have pairs of contacts as 48 49, and the series of stations D D<sup>3</sup> have pairs of contacts 50 51, the contacts 46, 48, and 50 being normally out of engagement with contacts 46<sup>a</sup> 48<sup>a</sup> 50<sup>a</sup> and contacts 47, 49, and 51 normally out of engagement with contacts 47<sup>a</sup> 49<sup>a</sup> 51<sup>a</sup>. The pairs of contacts 46<sup>a</sup> 47<sup>a</sup> and 48<sup>a</sup> 49<sup>a</sup> and 50<sup>a</sup> 51<sup>a</sup> alternately are connected with conductors 52 and 53, as in Fig. 3. The conductor 52 leads to sleeve *g*<sup>2</sup> of plug G and conductor 53 leads to tip *g*. A key 54 55 56 is arranged for each pair of contacts corresponding to a station, and all the keys are respectively connected by any suitable connection with the buttons 25 25<sup>a</sup> 25<sup>b</sup>, respectively, to operate the latter simultaneously with the former. Certain of the contacts are to be connected to ground—as, for instance, the contacts 46<sup>a</sup> 47<sup>a</sup> and 48<sup>a</sup> 49<sup>a</sup> and 50<sup>a</sup> 51<sup>a</sup> of adjacent sets of contacts connected with line 53 are to be connected to ground, as *x y z*, respectively, and the similar contacts that are connected with line 52 are to be connected to ground *x' y' z'*, respectively, as in Fig. 3.

With the arrangement shown in Fig. 3 if it is desired to call a station in the series B B<sup>3</sup> one of the keys 54 will be operated. If the station B is to be called, whose bell is indicated as responding to a current of positive sign, the first button 54 at the left in Fig. 3 will be operated, whereupon circuit to ground *x* will be closed and the circuit will be from *x* through 47<sup>a</sup> 47 and over 45 to the negative pole of generator J, thence from the positive pole over conductor 44 through 46 46<sup>a</sup> 52, sleeve *g*<sup>2</sup> (plug G being in jack *b*) to contact *b*<sup>3</sup>, thence over line 2 through the bell at B to ground. If a bell of the series of stations B B<sup>3</sup>, which responds to a current of opposite polarity, is to be operated—say in station B—the next key 54 to the right in Fig. 3 will be operated, whereupon current of negative sign will be sent as follows: from ground *x* through 46<sup>a</sup> of that key to conductor 44 and the positive pole of generator J, thence from the negative pole over conductor 45 and through contacts 47 47<sup>a</sup> of that key to conductor 52, and thence to ground at B', as before described, over line 2. If current is to be sent over line 1 to stations B<sup>2</sup> or B<sup>2</sup>, key 54, corresponding to that station, will be operated to send the appropriate current over a circuit in the main substantially similar to that before described, as will be readily understood. Likewise if a station in a series C C<sup>3</sup> or D D<sup>3</sup> is to be called the appropriate key 55 or 56 will be operated, sending current in manner substantially similar to that above described. It will be understood, however, that when a key 54 is operated the button 25 will also be operated to cut battery I from line 3, but that when a key 55 or 56 is operated the button 25<sup>a</sup> or 25<sup>b</sup> will

also be operated to throw a current of appropriate sign on line 3 to first cut out the bells at stations B B<sup>3</sup> and to place in circuit with lines 1 and 2 the call-bells of either the series C C<sup>3</sup> or D D<sup>3</sup>, so that current from generator J can traverse line 1 or 2, according to which of the keys 55 or 56 is operated. Thus it will be seen that by merely placing plug G in jack b and operating the appropriate key 54 or 55 or 56 the desired subscriber on a party-line can be called.

It will be understood that by the use of selector-line 3 and the relays I am enabled to increase the number of stations on a party-line of two wires over the well-known number of four stations, as the series B B<sup>3</sup>.

I do not limit my invention to the details shown and described, as they may be varied without departing from the spirit thereof.

Having now described my invention, what I claim is—

1. A telephone system comprising a central office, telephone-lines leading therefrom, a series of calling instruments normally in circuit with said lines, a series of calling instruments normally out of circuit therewith, and means controlled by central for cutting the first-mentioned series of instruments out of circuit with said lines and for cutting in circuit therewith the second-mentioned series of instruments, substantially as described.

2. A telephone system comprising a central office, telephone-lines, a series of calling instruments normally in circuit with said lines and two series of calling instruments normally out of circuit with said lines, and means for cutting out of circuit with said lines the first-mentioned series of instruments and simultaneously cutting in circuit with said lines either of the second-mentioned series of instruments, substantially as described.

3. A telephone system comprising a central office, telephone-lines, a series of calling instruments normally in circuit with said lines, relays for breaking the circuit of said instruments, two series of calling instruments normally out of circuit with said lines, relays for cutting in circuit with said lines said last-mentioned instruments, the relays of one of the last-mentioned series being polarized to operate by a current of one sign and the relays of the other of such series polarized to operate by a current of opposite sign, a separate circuit for said relays, and means for throwing the appropriate current upon said circuit, substantially as described.

4. A telephone system comprising a central office, telephone-lines, a series of calling instruments normally in circuit therewith, relays for breaking the circuit of said instruments, two series of calling instruments normally out of circuit with said lines, relays for cutting in circuit with said lines said last-mentioned series of instruments, the relays of one of the last-mentioned series being polar-

ized to operate by a current of one sign and the relays of the other of such series being polarized to operate by a current of opposite sign, a separate circuit for said relays, a jack associated with the telephone-lines and with said circuit, and a plug-circuit having a battery and switches to throw current of either sign upon the relay-circuit and also having a generator and keys for throwing appropriate current on the telephone-lines to operate the calling instruments, substantially as described.

5. A telephone system comprising telephone-lines, a series of calling instruments normally in circuit therewith, relays for breaking the circuit of said instruments, two series of calling instruments normally out of circuit with said lines, relays for cutting in circuit with said lines said last-mentioned series of instruments, the relays of one of the last-mentioned series being polarized to operate by a current of one sign and the relays of the other of such series being polarized to operate by a current of opposite sign, a separate circuit for said relays, a jack associated with the telephone-lines and with the relay-circuit, and a plug-cord circuit having a battery and switches to throw a current of either sign upon said relay-circuit and also having a generator and keys arranged in series corresponding to the series of stations, each series of keys being arranged to operate the appropriate switches associated with the battery, one series of keys serving to operate switches to break the battery-circuit and also direct current of proper sign upon the telephone-lines, another series of keys being arranged to operate switches to throw current of one sign from the battery upon the relay-circuit and current of one sign from the generator on the telephone-lines, and the other series of keys being arranged to operate switches to throw current of opposite sign on the first-mentioned circuit and to throw current of proper sign on the telephone-lines, substantially as described.

6. A telephone system comprising telephone-lines, a series of calling instruments normally in circuit therewith, relays for breaking the circuit of said instruments, two series of calling instruments normally out of circuit with said lines, relays for cutting in circuit with said lines said last-mentioned series of instruments, the relays of one of the last-mentioned series being polarized to operate by a current of one sign and the relays of the other of such series being polarized to operate by a current of opposite sign, a separate circuit for said relays, a jack associated with the telephone-lines and with the relay-circuit, and a plug-cord circuit having a branch including an annunciator and a battery and normally leading to ground, contacts in said branch to break the ground-circuit and other contacts in said branch arranged in sets adapted to be connected to ground, one set being

arranged to cause current of one sign to flow from said battery over the relay-circuit and the other set arranged to direct current of opposite sign over said circuit, substantially as described.

7. A telephone system comprising a central office, telephone-lines, a series of calling instruments normally in circuit with said lines and two series of calling instruments normally out of circuit with said lines, and means for cutting out of circuit with said lines the first-mentioned series of instruments and simultaneously cutting in circuit with said lines either of the second-mentioned series of instruments, a jack associated with said telephone-lines and a plug-cord circuit having a generator, a series of keys and contacts controlling the circuit of said generator, the contacts of pairs of said keys being adapted to cause current of different signs to pass from said generator over the telephone-lines, substantially as described.

8. A telephone system comprising telephone-lines, a series of calling instruments normally in circuit therewith, relays for breaking the circuit of said instruments, two series of calling instruments normally out of circuit with said lines, relays for cutting in circuit with said lines said last-mentioned series of instruments, the relays of one of the last-mentioned series being polarized to operate by a current of one sign and the relays of the other of such series being polarized to operate by a current of opposite sign, a separate circuit for said relays, a jack associated with said telephone-lines and with the relay-circuit, and a plug-cord circuit having a generator and series of keys and contacts controlling the circuit of said generator, the contacts of pairs of said keys being adapted to cause current of different signs to pass from said generator over the telephone-lines, substantially as described.

9. A telephone system comprising a central office, telephone-lines leading therefrom, a series of calling instruments normally in circuit with one of said lines, a series of calling instruments normally out of circuit with one of said lines, and means controlled by central for cutting the first-mentioned series of instru-

ments out of circuit with their line and for cutting the second-mentioned series of instruments into circuit with their line.

10. A telephone system comprising a central office, telephone-lines leading therefrom, a series of calling instruments normally in circuit with said lines, a series of calling instruments normally out of circuit with one of said lines, and means controlled by central for cutting the first-mentioned series of instruments out of circuit with their lines and for cutting the second-mentioned series of instruments into circuit with their line.

11. A telephone system comprising a central office, telephone-lines leading therefrom, a series of calling instruments normally in circuit with one of said lines, two series of calling instruments normally out of circuit with said lines, and means for cutting the first-mentioned series of instruments out of circuit with their line and cutting in circuit with said lines either of the second-mentioned series of instruments.

12. A telephone system comprising a central office, a plurality of telephone-lines leading therefrom, two series of calling instruments respectively normally out of circuit with said lines, a line provided with relays arranged to close the circuit of said instruments with their respective lines, and means at central to cause said relays to close the circuits of either series of said instruments with their respective line as desired.

13. A telephone system comprising a central office, telephone-lines leading therefrom, a series of calling instruments normally in circuit with said lines, a series of calling instruments normally out of circuit therewith, a line provided with relays to control the circuits of said instruments, and means at central for causing said relays to cut the first-mentioned series of instruments out of circuit with their lines and to cut the second-mentioned series of instruments in circuit with their lines.

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Witnesses:

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