

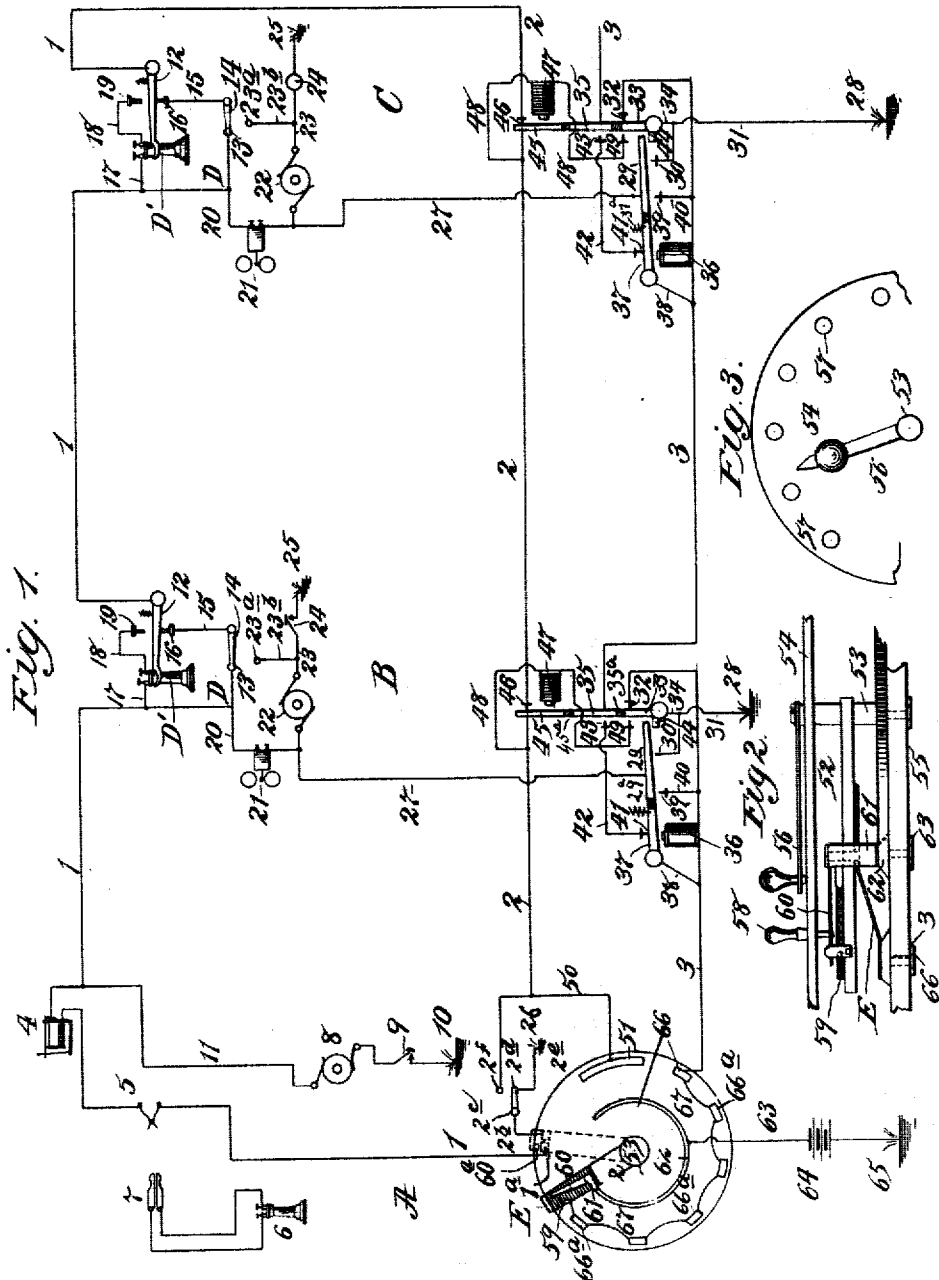
No. 816,132.

PATENTED MAR. 27, 1906.

C. B. SMITH.  
TELEPHONE SYSTEM.

APPLICATION FILED NOV. 28, 1898. RENEWED OCT. 22, 1902.

2 SHEETS-SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 5.

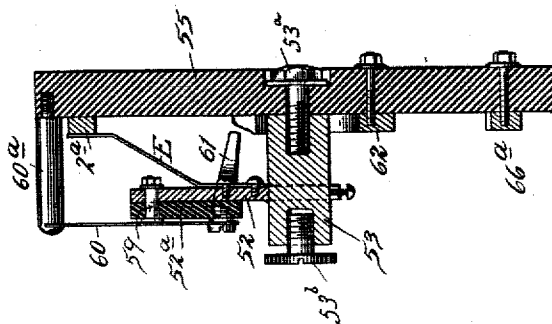
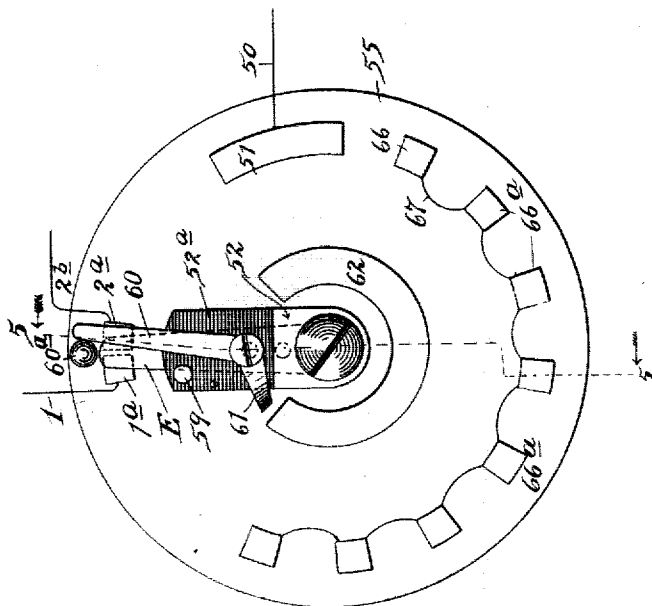


Fig. 4.



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# UNITED STATES PATENT OFFICE.

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## TELEPHONE SYSTEM.

No. 816,132.

Specification of Letters Patent.

Patented March 27, 1906.

Application filed November 28, 1898. Renewed October 22, 1902. Serial No. 128,244.

*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, county and State of New York, have invented certain new and useful Improvements in Telephone and Calling Systems, of which the following is a specification.

My invention relates more particularly to the class of telephone and calling systems in which is embraced a "central office" and circuits leading therefrom, which are commonly known as "party-lines" and on which circuits are located a plurality of subscribers or stations; and one of the objects of my invention is to provide party-line circuits on which any subscriber can call "central" and central can call any subscriber or station without producing a call in any other station. In carrying out this portion of my invention I provide improved circuit-changing devices at a central office, from which extend conductors, with certain of which conductors are connected in each station suitable telephone and calling instruments to enable a subscriber to call central and to communicate telephonically therewith and with any other subscriber or station on the same circuit or any other circuit, and with certain other of said conductors at each station are connected means for making and breaking a calling-circuit, which means are controlled and operated at the central office by the first-mentioned improved circuit-changing devices to enable central to call any subscriber or station as desired without signaling in any other station on the same circuit. Suitable means are provided at central to enable one party-line to be connected with the other circuits leading into the central office.

A further object of the invention is to so arrange the telephone-circuit that when two telephone instruments are in telephonic communication another subscriber cannot interfere or produce a call in the stations that are so connected.

The invention also consists in the novel 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 and calling system embodying my invention, the local circuits for the telephones being omitted for the sake of clearness. Fig.

2 is an enlarged sectional view of part of the circuit-changing device at the central office. Fig. 3 is a detail face view of part thereof. Fig. 4 is a plan view, enlarged, of the improved circuit-changing devices at central; and Fig. 5 is a section on the line 5 5 in Fig. 4.

In the accompanying drawings, in which similar letters and numerals of reference indicate corresponding parts in the several views, 1, 2, and 3 indicate conductors or wires forming the circuits for a party-line which leads from a central office A and on which party-line are a plurality of stations, as B C, having appropriate telephone, calling, and circuit regulating or changing devices. At central A the line is shown provided with a suitable or usual "drop" or annunciator 4 and a spring-jack 5 to enable the operator thereat to connect his telephone 6 by means of a plug 7 with line 1 in well-known manner. The jack 5 also serves to enable the operator at central to connect one subscriber's line with another (not shown) in well-known manner. At central A the line 1 connects with a contact 1<sup>a</sup>, and 2<sup>a</sup> is a contact for electrical connection with line 2, the contacts 1<sup>a</sup> 2<sup>a</sup> being adapted to be electrically connected for certain purposes hereinafter explained. At central A are located an electric generator or magneto 8 and a normally open push-button or switch 9, which connects with ground 10 and with a conductor 11 that leads to line 1. The connection of conductor 11 with line 1 is between the annunciator or drop 4 and the outlying stations B C, so that when generator 8 is operated at central to call a station on the corresponding circuit the annunciator 4 connected with said circuit will not be operated.

At each station B C, &c., on the party-line circuit suitable telephone instruments (indicated generally by the letter D) are located and properly connected with the line 1. I have shown the line 1 as normally closed through a contact lever or hook 12 when the receiver D' is hung upon it, the circuit through line 1 in each station being arranged to be broken and reestablished in several ways for purposes to be explained. The normal arrangement of the circuit through line 1 in each station is shown as follows: Line 1 between central and the various stations is divided or made in sections, each division or section leading to a contact 13, that is normally engaged by a switch or contact 14, which is connected by a conductor 15 and a contact 16 with hook 12 when the receiver

D' is hung upon the latter. Thus when switch 14 is moved from contact 13 the circuit just described will be broken. The receiver D' is connected with line 1 by a conductor 17 and by a conductor 18 with a contact 19, that is normally out of engagement with hook or lever 12, but adapted to be engaged thereby when the receiver is removed from the hook for telephonic purposes.

Line 1 is utilized for enabling a subscriber or attendant at stations B, C, &c., to call central as follows: In each station a conductor 20 is connected with line 1 and leads through a signaling instrument 21 to an electric generator or magneto 22, from which a conductor 23 leads through a normally open push-button or contacts 24 to ground 25. Now if a subscriber at station B desires to call central he first closes the circuit at 24 and operates his generator 22. His calling-circuit will then be established as follows: from ground 25 through 24, 23, 22, 21, and 20 to line 1, thence through the annunciator 4 and jack 5 (at central) to contact 1<sup>a</sup>, and thence to contact 2<sup>a</sup> through a contact E, which at this time connects 1<sup>a</sup> and 2<sup>a</sup>, (as will be explained hereinafter,) thence through a wire 2<sup>b</sup>, switch 2<sup>c</sup>, contact 2<sup>d</sup>, and wire 2<sup>e</sup> to ground 26. If a subscriber at station C desires to call central, his calling-circuit will be as follows: from 25 through 24, 23, 22, 21, and 20 to line 1 in his station, thence along line 1 to hook 12 at station B, thence through 16, 15, 14, and 13 to line 1 at B, and thence along line 1 to ground 26 at central, as before explained. So also with any stations on the circuit beyond C the circuit through each intermediate station will be through its respective parts 12, 16, 15, 14, and 13. The line 1 not only serves as a calling-circuit from the subscribers to central, but also as a part of a closed metallic telephoning-circuit, as will be explained hereinafter.

The complete calling-circuit from central to each of the stations on a party-line is as follows: from ground 10 through parts 9, 8, and 11 to line 1, thence (at the first station next to central, as B,) through conductor 20 and instrument 21 to a conductor 27, which leads from 20 or 21, and thence to ground 28 at said station; but the circuit through 27 to ground 28 is normally broken and must be closed by the operator at central before the corresponding calling instrument 21 can be operated, as hereinafter explained. The circuit through 27 to ground 28 is made and broken as follows: Conductor 27 leads to a movable contact 29, (operated as hereinafter explained,) which is adapted to engage a contact 30, that connects by a conductor 31 with ground 28, so that the complete closed circuit from 20 and 21 to ground 28 is through 27, 29, 30, and 31. When central is to call any station beyond B, as C, the calling-circuit will be from 10, through 9, 8, and 11 to

line 1, thence to wire 20 at B and through 13, 14, 15, 16, and 12 to line 1, thence to 20 at C and through 21, 27, 29, 30, (after 29 and 30 have been brought together,) and 31 to ground 28. Thus it will be seen that when an operator at a station, as C, calls central the signaling instruments 21 in the other station or stations will not be operated.

To enable central to produce a call only in the station desired, the circuit through 27 to ground 28 in the station must be closed and held closed at 29 30 while a call is being sent, and the corresponding circuits through 27 to ground 28 in the other stations on the party-line must be kept broken at that time to prevent a call from being produced thereat. The arrangements I have shown for this purpose are as follows: In each station the line 3 is normally broken, or, in other words, is divided into sections, which lead from one station to another and are capable of being joined together in each station. Each section of line 3 is normally grounded in one station and normally open in the station from which it leads, or, in other words, the first section of line 3 leads from central normally to ground in the first outlying station, as B. The next section leads from B to normal ground at the next station, and so on for as many stations as are on a circuit. For this purpose I have shown each section of line 3 in each station as leading to a contact 32, that is in normal engagement with a movable contact 33, that leads to ground, as by a wire 34, connecting with wire 31 and thence to ground 28. At central the corresponding section of line 3 leads to a circuit-controlling device—such as a switchboard, key, or push-button; but at the stations the corresponding section of line 3 leads from a movable contact 35 to ground at the next station. The contacts 33 35 are shown connected together, so as to move simultaneously; but they are insulated from each other, as by insulation 35<sup>a</sup>.

In each station on the corresponding section of line 3 is located a magnet 36, whose armature 37 is arranged to operate contact 29 to close the circuit through 27 to ground 28, contact 29 being insulated from armature 37, as by insulation 29<sup>a</sup>. Each armature 37 is connected by a conductor 38 with the corresponding section of line 3, and the same section of line 3 beyond magnet 36 is connected with a contact 39, as by a spur-wire 40. Armature 37 (or a contact carried thereby and connected with wire 38) is normally in connection with a contact 41, that connects by a conductor 42 with a contact 43, normally out of engagement with contact 35, but adapted to be engaged thereby. Contacts 33 and 35 are adapted to be moved through the medium of armature 37 to break circuit at 32 33 and to electrically connect two sections of line 3 at 35 43, the circuit thus being from one section of line 3 through

38, 37, 41, 42, 43, and 35 to the next section of line 3. I have shown contact 29 as adapted to engage an arm 44, connected with contact 33, (parts 33 44 being pivotally supported and adapted to remain in any position set,) so that when armature 37 is attracted by magnet 36 the contacts 33 35 will be moved to break circuit at 32 33 and to make circuit at 35 43, respectively.

With the arrangement above described if central desires to call the first station on a party-line, as B, he first sends current over line 3 (by means hereinafter set forth) which traverses the first section of line 3, through magnet 36 to ground 28, as before explained, whereupon magnet 36 attracts armature 37. Thereupon contact 29 engages contact 39 and also engages contact 30, thus establishing the calling-circuit through 27, 29, 30, and 31 to ground 28 for calling instrument 21, (all at station B,) while at the same time arm 44 moves contacts 33 and 35 to break circuit at 32 33 and establish circuit at 35 43. Of course the disengagement of contacts 32 33 breaks the normal ground of the section of line 3; but a temporary ground is established from 3 through 40, 39, 29, 30, and 31 to ground 28, keeping magnet 36 energized to hold contact at 39 29 30. The operator thereupon sends a call to station B over the circuit so selected from ground 10 through 9, 8, 11, and 1 to conductor 20 at B, thence through 21, 27, 29, 30, and 31 to ground 28, (all at B.) By next discontinuing the circuit through 3 and 36 to ground 28 the armature 37 is restored to its normal position by its spring 37<sup>a</sup>, thus breaking the circuits at 30 and 39; but the circuit through 43 35 still remains closed. (The manner of restoring the contact 35 to its normal position will be explained hereinafter.) Should the operator at central have desired to call station C instead of B, he would have sent an impulse over line 3 to B, as just explained, to cause armature 37 to bring contacts 43 35 together. Then he would break the current thus sent to cut the ground 28 from the circuits through 36 27, &c., to cut out the bell at that station and restore armature 37 to its normal position, and the next impulse he would send would pass along line 3 to 38 at B, thence through 37, 41, 42, 43, and 35 to the section of line 3 leading from B to C, thence at C through magnet 36 to 32, 33, 34, and 31 to ground 28 at C. Magnet 36 at C will now cause armature 37 to close the temporary ground-circuit at 29 39 and the bell-circuit at 29 30 and to break circuit at 32 33 and establish circuit at 35 43 to the next station beyond, (if there be one,) whereby the bell at C is brought into circuit and so held until operated by current sent from central over line 1, as before explained. Thus it will be seen that for each impulse sent by central over line 3, &c., the calling-circuit through 27 will

be closed and the sections of the line 3 connected in a station and that the closing and breaking of these calling-circuits in the stations are successive until the circuit of the desired bell is reached. Thereby only the bell or signaling instrument in the station desired will be in circuit at one time, as it is not possible to have circuits in two stations through 27 closed at one time. Any suitable means may be provided for sending the desired impulses over line 3; but I have shown a special arrangement for performing this and other functions which will be described hereinafter.

It now remains to be explained how the contacts 33 and 35 are restored to their normal positions, how a closed metallic circuit is established for the telephones, and the means I have shown for enabling the operator at central to perform all the operations required.

At the central station A the line 2 is connected with a contact 2<sup>c</sup>, that is adapted to be engaged by switch 2<sup>c</sup>, and in each station the line 2 is divided or arranged in normally connected sections—that is to say, the line is provided with a movable contact 45, connected to one part, and a stationary contact 46, connected to the other part, which contacts are normally engaged but adapted to be disengaged. Contact 45 is shown mechanically connected with the corresponding contact 35, but insulated therefrom, as by insulation 45<sup>a</sup>, and arranged to be moved therewith, or, in other words, contacts 33, 35, and 45 are so connected as to move together. Each contact 45 is shown in the nature of an armature, (or it may have an armature connected with it,) adapted to be attracted by a magnet 47 in each station, and each magnet 47 is connected with a conductor 48, that leads from the part of line 2 that is between the corresponding contact 45 and the station next on the line nearest central, and each conductor 48 leads to a contact 49, that is adapted to be engaged by the corresponding contact 33 when the latter is actuated through the medium of magnet 36. It will thus be seen that when contacts 45 and 46 in any station are not in circuit contacts 49 and 33 are in circuit and the corresponding part of line 2 next toward central will be grounded from 2, through 48, magnet 47, wire 49, 33, 34, and 31 to ground 28. Now if the operator at central has called a station, say B, so that contacts 33, 35, and 45 have been left out of their normal positions, he can restore said contacts to their normal positions by sending current along line 2, whereupon it will pass from 2, through 48, 47, 49, 33, 34, and 31, to ground 28, thus energizing magnet 47 and causing it to return contacts 33, 35, and 45 to their normal positions at B. If contacts 33, 35, and 45 in more than one station have been operated by central in calling

a station, said contacts in the first station on the line from central will be first restored, as above stated, and thus the line 2 in that station will be connected into a through-line by the corresponding contacts 45 46, and a prolonged impulse on line 2 will cause a like operation in the next station, as C, and so on through any station in which contacts 33 35 45 have been operated by central in selecting the signaling instrument in a desired station. Any suitable means may be provided at central for sending current over line 2. I have shown a wire 50 at central leading from line 2 to a contact 51, which is to be connected with a battery and ground, as hereinafter explained. At the last station on a circuit or party-line the lines 1 and 2 are connected together; but a metallic circuit through them is normally broken at switch 2<sup>c</sup> and contact 2<sup>f</sup> at central. When two subscribers are to communicate telephonically, the operator at central turns switch 2<sup>c</sup> to contact 2<sup>f</sup> to join lines 1 and 2 electrically and restores the annunciator or drop 4 to its normal position, and as contact or spring E normally engages contacts 1<sup>a</sup> 2<sup>a</sup>, Fig. 5, a metallic circuit for two telephones is thus established at central, it being of course required that the two subscribers remove their receivers D' from the hooks 12 to allow the latter to engage contacts 19 to include the telephones in the closed metallic circuit. This closed metallic circuit may be traced as follows: from contact 1<sup>a</sup> at central through line 1, including jack 5 and annunciator 4, to 17 at the first station, B, thence through receiver D' and 18, 19, 12, and line 1 to wire 17 at the next station, C, thence through receiver D' and 18, 19, and 12, back to line 1; (but if there are other stations on the circuit between or beyond the calling and the called stations the circuit in those stations will be from line 1 through 20, 13, 14, 15, 16, and 12 to line 1.) The circuit leads from line 1 to line 2, thence through contacts 46 and 45 in the various stations to contact 2<sup>f</sup> at central, thence through 2<sup>c</sup>, 2<sup>b</sup>, 2<sup>a</sup>, and E to 1<sup>a</sup> again.

Means to inform the operator at central that the subscribers have finished talking are arranged as follows: 23<sup>a</sup> is a contact connected with conductor 23, as by a wire 23<sup>b</sup>, which contact is adapted to be engaged by switch or contact 14. Now while the telephones are in the closed metallic circuit described a subscriber desiring to "ring off" hangs up his receiver D' and causes contact 14 to engage contact 23<sup>a</sup>, thus breaking connection at contacts 13 14 and establishing a circuit from 1, through 12, 16, 15, 14, 23<sup>a</sup>, 23<sup>b</sup>, 23, 22, 21, and 20 back to line 1. He now operates generator 22, which causes current to traverse the closed metallic circuit described, causing annunciator 4 to operate, thus notifying the operator at central to disconnect the lines. The operator at central moves switch 2<sup>c</sup> from

contact 2<sup>f</sup> back to 2<sup>d</sup>, its normal position. If a subscriber on a party-line desires to communicate with a subscriber on another line, the operator at central will connect said lines through their spring-jacks 5 in well-known manner, thus connecting line 1 of one subscriber with line 1 of the other and likewise connecting line 2 of one subscriber with line 2 of the other, and as the closed metallic circuit thus formed between the two lines will be obvious it need not be further detailed here.

It is of course desirable to give the operator at central as little work to do as possible in answering a call and in calling a subscriber and connecting him with the subscriber he desires. The devices I have provided for these purposes are as follows: The contact or spring E in its normal or "home" position rests upon contacts 1<sup>a</sup> 2<sup>a</sup> to connect them electrically, (see Fig. 4,) and said contact E is carried by and in electrical connection with an arm 52, that is carried by a shaft 53, so that said contact and arm can be moved around in a circular direction. The shaft 53 is preferably journaled in the front and back plates 54 55, respectively, of a suitable box or casing, being shown connected therewith by screws 53<sup>a</sup> 53<sup>b</sup>, and it may be insulated from said plates, or either said shaft or said plates may be made of insulating material. The shaft 53 carries a handle 56, by which it may be rotated, (see Fig. 2,) and the plate 54 is provided with a circular row of apertures 57, Fig. 3, to receive a plug or pin 58, which is of sufficient length to pass through plate 54, as shown in Fig. 2. The arm 52 carries a contact 59, which is thus electrically connected with contact E; but it is evident that contacts 59 and E could be in one piece, if preferred. The arm 52 also carries a movable contact 60, which is adapted to move in a plane parallel with the movement of said arm. The contact 60 is normally out of engagement with contact 59, but is adapted to engage the latter when properly moved. The plug or pin 58 is adapted to intercept the movement of contact 60 when the latter is carried around by arm 52 and to thus cause contact 60 to engage contact 59 and also arrest the movement of arm 52 at the proper place, Fig. 2, and a stop 60<sup>a</sup> is provided at the home point to be engaged by contact 60 when arm 52 is returned to home to move 60 out of engagement with 59. Contact 60 is insulated from arm 52, being shown mounted on insulation 52<sup>a</sup>, carried thereby, Fig. 5, and is electrically connected with a contact 61, also carried by and insulated from the arm 52. The contact 61 is adapted to engage a contact 62, carried by plate 55, when the arm 52 is swung around; but the contact 62 is so arranged that when arm 52 is at the home point contact 61 will be out of engagement therewith, Fig. 4. Contact 62 is shown in the form of an arc of a

circle. The contact 62 is connected by a conductor 63 through a battery 64 to ground 65. Contact or spring E is adapted to engage the contact 51, that connects the line 2, which contact 51 is shown carried by plate 55. The line 3 at central connects with a series of contacts 66 66<sup>a</sup>, that are connected together, as by wires 67, and carried by plate 55, being so arranged as to be engaged successively by contact E when arm 52 is carried around. The arrangement is such that contact E will make and break circuit with the contacts 66 66<sup>a</sup>, and said contacts correspond with the different stations on line 3, and these contacts furthermore correspond with the apertures 57 in plate 55. The circuit through line 3 and contacts 66 66<sup>a</sup> is established from ground 65, through battery 64, wire 63, and contact 62, thence to contacts 61 and 60, thence to contact 59, (when plug 58 has caused 60 to engage 59,) thence through arm 52, contact E, contacts 66 and 66<sup>a</sup> to line 3. To select a desired signaling instrument, the operator at central places plug 58 in the aperture 57 corresponding to the desired instrument and turns handle 56 to the right in the drawings until contact 60 engages plug 58, which moves said contact into engagement with contact 59, thus closing circuit to ground 65. Handle 56 is next moved toward home, and as contact E passes over contacts 66 66<sup>a</sup> the required number of impulses will be sent over line 3; but contact E remains on 66 until the call is sent. After a call has been sent from central to the selected signaling instrument the contact E is returned to the home point at 1<sup>a</sup> 2<sup>a</sup>, and in passing over contact 51 a prolonged impulse is sent over line 2, acting successively on magnets 47 to restore that line and the parts operated thereby to their normal conditions. When contact 60 reaches the home point, it engages stops 60<sup>a</sup> and is moved out of engagement with contact 59, thus preventing any normal circuit from being formed to ground at 65. It will be seen that when contact E is away from contact 1<sup>a</sup> no call can be received at central over line 1, as contacts 1<sup>a</sup> 2<sup>a</sup> are then disconnected.

From the foregoing description it will be apparent that by means of the circuit changing or closing devices set forth the operator at central by merely moving handle 56 to and fro can break the normal calling-circuit over line 1, can establish a calling-circuit from central to the station desired, and can then restore the calling-circuits in the various stations, all without giving a call in any station on the party-line but the one desired. Of course the devices shown can be modified or other circuit-controlling means substituted, if desired.

The complete operation of calling and telephoning with all the devices before described may be summarized as follows: Suppose,

first, that a subscriber at station C desires to telephone to station B, (contact E at central being normally on contacts 1<sup>a</sup> 2<sup>a</sup>.) he first closes his calling-circuit at 24 and operates his generator 22, whereupon current will flow from ground 25 over line 1, through annunciator 4, to ground 28, as before traced. He then removes his receiver D' from its hook 12 (whose spring causes it to engage contact 19) and the operator at central places plug 7 in jack 5, turns switch 2<sup>c</sup> to contact 2<sup>f</sup> (thus completing the closed metallic circuit through the telephones at C and central, as before traced) and inquires what is wanted. When the subscriber tells him the number of the station wanted—say B—the operator at central then places plug 58 in the aperture 57 in plate 54, corresponding to the station desired, and turns handle 56 to the right (thus breaking the subscriber's calling-circuit at 1<sup>a</sup>) until contact 60 engages plug 58, which arrests the movement of said handle and also causes contact 60 to move into engagement with contact 59, and as contact E thus comes to rest on contact 66 the battery 64 is put in circuit with the line 3. (As station B is the first station on the line from central, contact E will of course stop on contact 66.) Current will now flow from ground 65 and battery 64 through 63, contact 62, thence through 61, 60, 59, 52, and contact E to contact 66, thence over line 3, through magnet 36 at station B, to ground 28. Magnet 36 (at B) now becomes energized and attracts armature 37, which immediately closes the temporary ground-circuit at 30 39 29, likewise closing the calling-circuit through 27 at 29 30 and also breaking circuit at 32 33 and at 45 46 and establishing circuit at 35 43 and at 33 49. Contacts E and 66 are now left in engagement to hold the various circuits in the conditions specified, and the operator at central next closes his circuit for generator 8 at 9 and sends current from ground 10 to line 1 and wire 20 and thence through calling instrument 21 and through 27 to ground 28 at B, as before set forth. The operator at central next returns the handle 56 to home, during which movement contact E leaves contact 66, thus cutting off the current from magnet 36, whereupon armature 37 at B is released, which under the influence of its spring moves back and breaks the circuits at 29, 39, and 30, and when contact E engages contact 51 current flows from ground 65 and battery 64, as before described, to line 2, thence through wire 48, (at B,) through magnet 47, contact 49, 33, 34, and 31, to ground 28. Magnet 47 (at B) now attracts armature 45, thus closing the line 2 at 45 46, breaking circuit at 43 35 and at 49 33 and restoring circuit at 32 33. The various circuits at B will now all be normal, and when contact E reaches contacts 1<sup>a</sup> 2<sup>a</sup>, coming to rest thereon, contact 60 strikes 60<sup>a</sup> and is disengaged from contact 59. The

operator at central next moves switch 2° to contact 2<sup>r</sup>. The called subscriber (at B) next removes his receiver from the hook 12, which latter then engages contact 19, and thus completes the closed metallic circuit through the two communicating telephones. When the subscribers ring off, as before explained, the operator at central turns the corresponding switch 2° back to its normal point on contact 2<sup>d</sup>, thus breaking the closed metallic telephoning-circuit and reestablishing the subscriber's calling-circuit to ground at 26. If the subscriber at station B had desired to call station C, (instead of C calling B,) he would have called central over line 1 to ground 26, as before explained; but then when the operator at central started to call station C he would have carried contact E beyond contact 66 and around to the contact corresponding to station C, as 66<sup>a</sup>, whereupon plug 58 would then cause contact 60 to engage 59. Current flows to ground 28 at station B where E engages 66<sup>a</sup>, changing the various circuits, as before explained, and when contact E leaves contact 66<sup>a</sup> armature 37 at B moves back, thus breaking the ground-circuit to 28, but leaving the circuit between stations B and C through line 3 closed at 37 41 and 43 35 over line 3 and broken at 45 46 over line 2. When contact E engages contact 66, current will flow again along line 3, through 38 37 41 42 43 35 at B, through magnet 36 to ground 28 at C, and change the circuits there, as before described with reference to the operation at station B. Current now being kept on line 3 holds the circuit through 27 to ground 28 closed at C, so a call can be sent from central to C, as before explained, over line 1. When contact E is next moved to contact 51, prolonged current will flow over line 2 through 48 to ground 28 at B and cause magnet 47 to close the circuit at 45 46, whereupon the current will flow to ground 28 at C, and magnet 47 at C will cause contacts 45 46 to completely restore the line 2, the other changes in the circuits at B and C influenced over line 2 likewise taking place. If there were more than two stations on a circuit, corresponding actions would take place in the various stations between central and the called station, being regulated by the number of impulses sent from central over line 3 by the number of contacts 66 and 66<sup>a</sup> which contact E passes over. It will be apparent that any desired number of stations can be located on a party-line and that only the station desired will be called, as only one calling-circuit from central through 27 to ground 28 can be established at one time and that when a subscriber calls central no call is given in any subscriber's station. If a subscriber on a party-line or circuit desires to telephone to a subscriber on another similar party-line or on another ordinary metallic telephone-circuit leading to central, it is

merely necessary for the operator at central to connect the lines or circuits through their jacks 5 in well-known manner and call the station.

It will be understood that a subscriber attempting to call over the lines while the line is in use will be unable to obtain a circuit for his generator and bell, and as his bell does not operate he will know that the line is in use.

I do not limit my invention to the precise details of construction 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 and a party-line leading therefrom having a plurality of conductors, telephone and signaling instruments for connection with one conductor, and electrically-operating devices adapted to operate one at a time and successively for selecting and placing in circuit the signaling instrument desired and for restoring the circuits to their normal conditions, means at central for sending the appropriate impulses over the conductors to select and operate the signaling instrument desired and for restoring the circuits, means at central for joining two of said conductors in a closed metallic circuit through the telephone instruments, and means corresponding with each telephone for signaling to central over such closed metallic circuit to notify central to disconnect the circuits.

2. A signaling system comprising a central office and conductors leading therefrom to a plurality of stations, connected in one of which conductors in each station are selecting devices to enable an operator at central to select any desired station, signaling devices at each station connected with another of said conductors, and restoring devices at each station connected to another conductor to restore the selecting devices to their normal conditions.

3. A telephone system comprising a central office, a party-line leading therefrom and having a conductor, a plurality of telephone and signaling instruments for connection with one conductor, and means to enable a subscriber to call central, a conductor having electrically-operating devices to be operated by current sent from the central office to select and place in circuit the desired signaling instrument, and a conductor having electrically-operating devices to restore the selecting and signaling instrument circuits to their normal conditions by current thrown on the circuit at the central office.

4. A telephone system comprising a central office and a party-line leading therefrom having main conductors to one of which are to be connected telephone instruments and signaling instruments on a normally open line,

and call-producing instruments also connected with said conductor to signal to central, another of said conductors having electrically-operating devices to select and close the circuit of the desired signaling instrument by current sent from central, and another of said conductors having electrically-operating devices for each of said signaling instruments adapted to restore the selecting devices and the signaling-instrument circuits to their normal conditions by current sent from central.

5. A signaling system comprising a central office, and a party-line leading therefrom having main conductors to one of which are connected signaling instruments and means for each signaling instrument for producing a call at central, another of said conductors being divided into sections, each section corresponding to one of the signaling instruments and having electrically-operating devices to select the desired signaling instrument and to connect two of said sections together to form a through-line all by current sent over the line from central, and another conductor having electrically-operating devices connected with it corresponding to each signaling instrument to restore the corresponding selecting instruments to their normal conditions by current sent over the circuit from central.

6. A telephone system comprising a central office and a party-line leading therefrom having a plurality of conductors, telephone and signaling instruments for connection with one conductor, and means for each telephone to send a call to central, and means at central to operate said signaling instruments, said signaling instruments being located on a normally open line, electrically-operating devices connected with another of said conductors for selecting and closing the line of the desired signaling instrument and for holding it closed by current sent from central while a signal is produced, and means connected with another of said conductors for restoring the selecting devices and the line of the selected signaling instrument to their normal conditions.

7. A telephone system comprising a central office and a party-line leading therefrom having a plurality of conductors, telephone and signaling instruments for connection with one conductor, and means for each telephone instrument to send a call to central, and means at central to operate said signaling instruments, said signaling instruments being located on a normally open line, electrically-operating devices connected with another of said conductors for selecting and closing the line of the desired signaling instrument and for holding it closed by current sent from central while a signal is produced, means connected with another of said conductors for restoring said selecting devices and the line

of the selected signaling instrument to their normal conditions, and means at the central office for joining two of said conductors in a closed metallic circuit through the telephone instruments.

8. A telephone system comprising a central office and a party-line leading therefrom having a plurality of conductors, telephone and signaling instruments for connection with one conductor and means for each signaling instrument to send a call to central, and means at central to operate said signaling instruments, said signaling instruments being located on a normally open line, electrically-operating devices connected with another of said conductors for selecting and closing the line of the desired signaling instrument and for holding it closed by current sent from central while a signal is produced, means connected with another of said conductors for restoring said selecting devices and the line of the selected signaling instrument to their normal conditions, means at the central office for joining two of said conductors in a closed metallic circuit through the telephone instruments, and means corresponding to each telephone for sending a signal to central over a closed metallic circuit to indicate that the closed metallic circuit should be broken.

9. A telephone system comprising a conductor, telephone instruments normally out of circuit therewith and means for including them in said circuit, a signaling instrument for each telephone normally out of circuit, another conductor having electrically-operating devices arranged to select the signaling instrument desired and to connect it in circuit with the first-mentioned conductor, and another conductor having electrically-operating devices to restore the signaling-instrument line and the first-mentioned electrically-operating devices to their normal conditions.

10. A telephone system comprising a conductor, telephone instruments normally out of circuit therewith and means for including them in the circuit, a signaling instrument for each telephone normally out of circuit, another conductor having electrically-operating devices arranged to select the signaling instrument desired and to connect it in circuit with the first-mentioned conductor, another conductor and electrically-operating devices to be operated thereby to restore the signaling-instrument circuit and the first-mentioned electrically-operating devices to their normal conditions, and means for joining the first and last mentioned conductors together in a closed metallic circuit for the telephones.

11. A telephone system comprising a conductor having telephone instruments normally disconnected therefrom, means to connect them therewith, a signaling instrument for each telephone, means for operating the

same, another conductor connected with the first-mentioned conductor at one part and normally disconnected therefrom at another part, means for joining said conductors in a closed metallic circuit, means corresponding to each telephone for breaking the first-mentioned conductor and connecting it through the devices that operate the corresponding signaling instrument, and a circuit having electrically-operating devices for selecting the signaling instrument desired.

12. A telephone system comprising a main line including hooks or contacts 12, and switches or contacts 14, telephone instruments located on branch lines connected with said main line adapted to be electrically connected therewith by said hooks or contacts 12, signaling instruments for each telephone connected with said main line, current-producing devices connected with said signaling instruments and a contact connected with said current-producing devices to be engaged by the contact 14, another line adapted to be connected in a closed metallic circuit with the first-mentioned line, an indicating instrument to be operated by current on said closed metallic circuit, and another line having electrically-operating devices to select the signaling instrument desired and connect it with the first-mentioned line in condition to be operated by current sent thereover.

13. An electrical circuit comprising a main line including contacts 13, 14, 16, and 12, branch lines extending from said conductor including telephone instruments and each having a contact to be engaged by the corresponding contact 12, normally open branch lines corresponding to each telephone instrument extending from said main line and each having a signaling instrument, current-producing devices connected with each of said branch lines and having a contact to be engaged by the contact 14, another line to be joined with said main line to form a closed metallic circuit, and a line having electrically-operating devices to select and close the branch line of the signaling instrument desired.

14. An electrical circuit comprising a main line including contacts 13, 14, 16, and 12, branch lines extending from said main line including telephone instruments and each having a contact to be engaged by the corresponding contact 12, normally open branch lines for each telephone instrument extending from said main line and each having a signaling instrument, current-producing devices connected with each of said branch lines and having a contact to be engaged by the contact 14, another line to be joined with said main line to form a closed metallic circuit, a line having electrically-operating devices to select and close the branch line of the signaling instrument desired, and electrically-

operating devices connected with the second mentioned line to restore said selecting devices and the branch lines to their normal conditions.

15. A circuit divided into normally grounded sections, electrically-operating devices for breaking said grounds and joining two sections together, another normally closed circuit having contacts to break it into sections, and electrically-operating devices connected in normally open circuits extending from the sections of the second-mentioned circuit to restore the sections of said circuit to their normal condition, the first-mentioned electrically-operating devices being arranged to close the circuits for the electrically-operating devices of the second-mentioned circuit.

16. An electrical circuit divided into normally grounded sections, electrically-operating devices connected with each section to break the ground of said section and to join two sections together, contacts to form a temporary ground for said sections, another normally closed circuit having contacts to break it into sections, branch lines extending from the sections of said circuit and each having a contact to be engaged by a contact of said electrically-operating devices to establish a ground for the section of the second-mentioned circuit, and electrically-operating devices connected with said branch line to restore the first-mentioned electrically-operating devices and to join the sections of the second-mentioned circuit.

17. A telephone system comprising a conductor, telephone instruments, and normally open branch lines connected with said conductor for each telephone, a signaling instrument connected with each branch line, contacts in each branch line to make and break the same, another circuit divided into normally grounded sections, electrically-operating devices to break the grounds of said sections and join two sections together and to operate the contacts of the signaling-instrument branch lines to make and break said lines, and means for restoring said circuits to their normal conditions.

18. A telephone system comprising a conductor, telephone instruments, and normally open branch lines connected with said conductor for each telephone, a signaling instrument connected with each branch line, contacts in each branch line to make and break the same, another circuit divided into normally grounded sections, electrically-operating devices to break the grounds of said sections and join two sections together and to operate the contacts of the signaling-instrument branch lines to make and break said lines, and another circuit having electrically-operating devices to restore said circuits to their normal conditions.

19. A telephone system comprising a central office, a conductor leading therefrom,

telephone and signaling instruments there-  
for, means for operating the latter, and an  
indicating instrument at central on said con-  
ductor, contacts and conductors connecting  
5 said conductor with ground and adapted to  
break the circuit of said conductor, another  
conductor connected with the first-men-  
tioned conductor and leading to central, con-  
tacts to connect said conductors at central in  
10 a closed metallic circuit, another conductor  
having electrically-operating devices to se-  
lect the desired signaling instrument, the sec-  
ond-mentioned conductor having electrically-  
operating devices to restore said selecting de-  
15 vices, and means at central for operating the  
devices connected with the second and third  
mentioned conductors.

20. A telephone system comprising a cen-  
tral office and a party-line leading therefrom  
20 having two conductors together at one part  
and normally disconnected at central, tele-  
phone and signaling instruments for one of  
said conductors, and an indicating instru-  
ment at central on said conductor, means for  
25 operating said signaling instruments and the  
indicating instrument, a pair of contacts one  
of which is connected with said conductor  
and the other being connected with ground  
through a switch, a contact to connect said  
30 two contacts, a contact connected with the  
second-mentioned conductor to be engaged  
by said switch to join said conductors in a  
closed metallic circuit through the telephone  
instruments, another conductor having elec-  
35 trically-operating devices to select the de-  
sired signaling instrument, and means at cen-  
tral for operating said selecting devices.

21. A telephone system comprising a cen-  
tral office and a party-line leading therefrom  
40 and having two conductors connected to-  
gether at one part and normally disconnected  
at central, telephone and signaling instru-  
ments for one of said conductors, and an in-  
dicating instrument at central on said con-  
45 ductor, means for operating said signaling in-  
struments and the indicating instrument, a  
pair of contacts one of which is connected

with said conductor and the other being con-  
nected with ground through a switch, a con-  
tact to connect said two contacts, a contact  
50 connected with the second-mentioned con-  
ductor to be engaged by said switch to join  
said conductors in a closed metallic circuit  
through the telephone instruments, another  
circuit having electrically-operating devices  
55 to select the desired signaling instrument,  
electrically-operating devices connected with  
the second-mentioned conductor for restor-  
ing said selecting devices, and means at cen-  
tral for operating said selecting and restoring  
60 devices.

22. A central station, a continuous me-  
tallic line extending therefrom, a second me-  
tallic line extending therefrom and broken at  
a series of stations, a third line arranged to  
55 complete the circuit from each station to the  
central, and switch mechanism at each sta-  
tion arranged to successively and automat-  
ically break the third circuit connection from  
each station to central and build up the  
70 broken line through each station.

23. In combination, a central station,  
three lines leading therefrom to a series of  
substations, and electromagnetic selective  
apparatus at each of said substations adapt-  
75 ed to be connected in series with one of said  
lines, and adapted to be connected in multi-  
ple with either of the other two lines.

24. In combination, a central station,  
three lines leading therefrom to a series of  
80 substations, electromagnetic selective appa-  
ratus at each of said substations adapted to  
connect said selective apparatus in series  
with one of said lines and to make or break  
a multiple connection with each of the other  
85 two lines when actuated by suitable electric  
impulses, and means for causing suitable im-  
pulses to flow through said electromagnetic  
selective apparatus.

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Witnesses:

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T. F. BOURNE