F. R. PARKER.

TELEPHONE SYSTEM AND SIGNALING APPARATUS.

APPLICATION FILED NOV. 24, 1906.

1,000,340.

Patented Aug. 8, 1911.

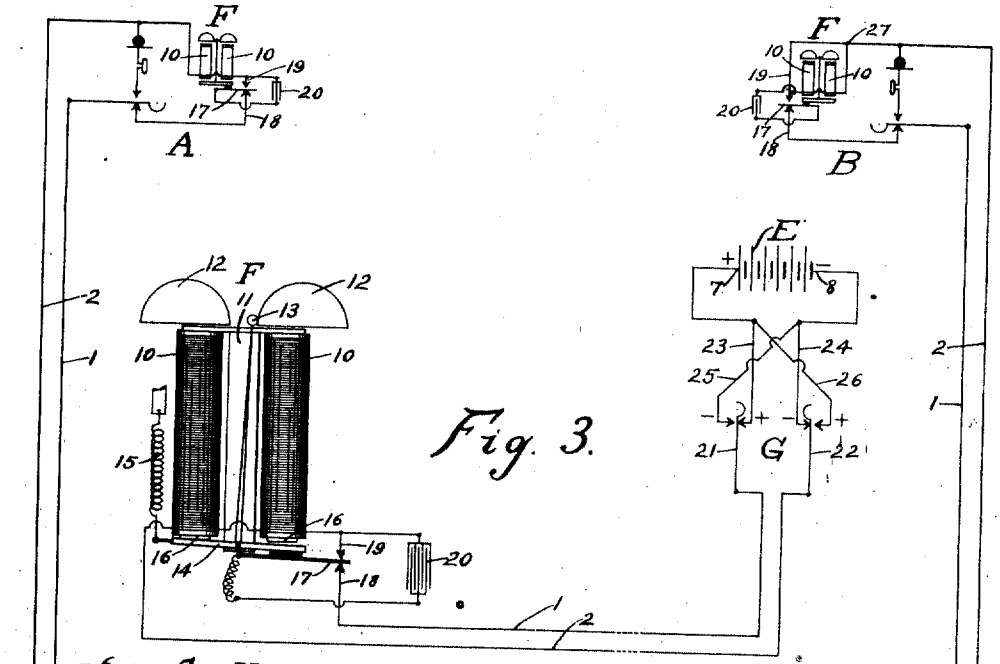

Fig. 3.

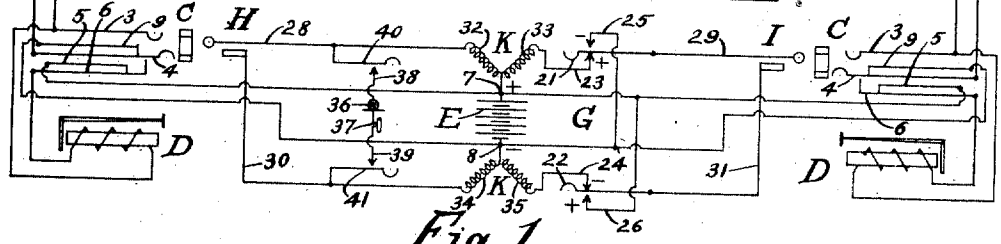

Fig. 1.

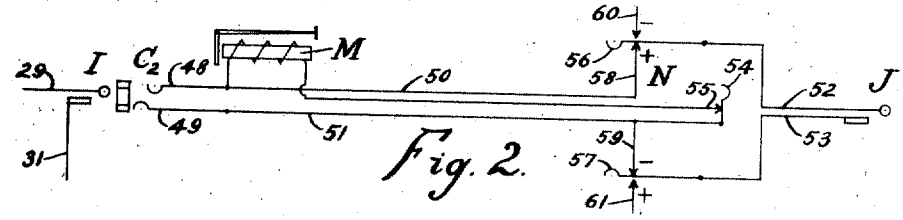

Fig. 2.

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UNITED STATES PATENT OFFICE.

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TELEPHONE SYSTEM AND SIGNALING APPARATUS.

1,000,340. Specification of Letters Patent. **Patented Aug. 8, 1911.**

Application filed November 24, 1906. Serial No. 344,894.

To all whom it may concern:

Be it known that I, FREDERICK R. PARKER, a citizen of the United States of America, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Telephone System and Signaling Apparatus, of which the following is a specification, reference being had to the accompanying drawings, illustrating the preferred form of the invention.

My invention relates in general to electrical systems for transmitting intelligence and for operating electrically-operable devices for various purposes, and will be hereinafter particularly described as applied to a telephone system, for signaling and talking purposes.

The principal objects of my invention are to provide improved arrangements of the line and supervisory signaling devices in an electrical transmitting system, and improved means for operating same; to provide improved means for using a single signaling device for both the line and supervisory signals; to provide an improved transfer circuit for transferring the connections from one switchboard to another, and improved means for supervising such connections; to provide improved apparatus at the substations of the system whereby the subscribers may be signaled by a direct current from the central station; to provide means whereby a source of direct current at the central station may be normally impressed upon the lines of the system to enable the subscribers to signal the central station when they so desire, and made to operate the substation signaling devices when desired; and to provide an electrically-operable device which may be operated continuously from a source of direct current supplied in a given direction, and which is incapable of operating when the polarity of the said source is reversed.

Other objects will be apparent from the following specification.

In this present invention I employ a signal-initiating device in connection with each of the lines of the electrical system, preferably a telephone system, and operate same in series with the line to give a predetermined signal, preferably a line signal, and then connect same as a bridge across the line to be shunted out by the line when the circuit of the latter is closed, and thereby rendered inoperative, and allowed to operate when the shunt of the line is removed, to give another predetermined signal, preferably a supervisory signal. Thus it will be seen that the circuit of the signaling device is changed from a series circuit to a bridging circuit, or vice versa, in relation to the line, for giving the different signals. Portions of the system herein shown form parts of my co-pending applications Serial Nos. 638,339 and 234,039. Then at each of the substations of such a system I employ a polarized electrically-operable device, preferably a ringer, and a condenser, and arrange the combination so that the ringer may be operated continuously by a direct current applied in a certain direction, and rendered inoperative and the circuit kept open by the condenser when the polarity of the impressed voltage is reversed. When the ringer is operated, it is operated by charging and discharging the condenser. This arrangement is very advantageous in certain electrical circuits, especially in telephone circuits, as it permits a voltage from a source of direct current to be normally impressed upon a line, to be used by the subscriber for signaling the central station, and for talking purposes, in a central-battery system, without allowing current to flow, and the current from the said source to operate the ringer to signal the subscriber, when the polarity of the source is reversed on the line. Among the advantages of this method of signaling is one which is very important, namely: eliminating the usual noise on the lines produced by alternating-current generators, or ringing apparatus, while ringing the subscribers. Then, too, the alternating-current ringing equipment usually employed is dispensed with. With alternating-current ringing generators used on some systems, ringing back through the central battery or the relays or other apparatus of the system is a great disadvantage. With my present invention this objectionable feature is removed. In operating my improved ringer I preferably reverse the polarity of the central source of electricity at the usual ringing key.

I will now more particularly describe the preferred form of my invention by reference to the accompanying drawings in which,—

Figure 1 is a diagram showing two subscribers' telephone lines extending from respective substations to a central station, and the central station circuits and apparatus,

the substations being supplied with my special signaling apparatus; Fig. 2 is a diagram showing a transfer circuit to be used in connection with the system of Fig. 1, for transferring the calls and connections from one switchboard to another; and Fig. 3 is a diagram showing one form of the improved ringing apparatus of my invention, with circuit connections for operating same.

Like characters refer to like parts in the several figures.

Substation A is connected with the central station by a suitable line circuit comprising limbs 1 and 2 which preferably terminate in contact springs 3 and 4, respectively, of a spring jack C. A signaling device D is normally connected from limb 1 of the line, through operable contacts 5 and 6 of jack C, to one pole 7 of the source of electricity E, the connection to limb 1 being preferably permanently made. The other pole 8 of source E is preferably connected through contact 9 and spring 4 to limb 2 of the line. These connections normally place the signaling device D and source of electricity E in a series circuit with the line.

At the substation A the talking apparatus may be utilized in the usual manner, which is well understood, the signaling apparatus employed hereat being the same as that illustrated in Fig. 3 which will now be described in detail.

In Fig. 3 the ringer F preferably comprises the actuating coils 10 10, permanent magnet 11, bells 12 12, clapper 13, armature 14, and a spring 15 to normally keep the armature 14 pulled up to one of the poles 16 16 of the cores of coils 10 10. Contact spring 17 is preferably arranged to operate with armature 14 and is preferably insulated therefrom. Contacts 18 and 19 are preferably arranged to alternately engage spring 17, one being out of contact with spring 17 while the other is in contact therewith, as armature 14 is operated, contact 18 being normally in contact with spring 17. Of course I wish it to be understood that these contact members 17, 18 and 19 may be given various adjustments as desired, so that they will make or break contact with each other at any desired part of the operation of the ringer armature 14. A condenser 20 is connected from contact 19 to spring 17, and also normally in a series circuit with the coils 10 10 of the ringer, contact spring 17, and limbs 1 and 2 of the line. The source of electricity E, preferably a battery, is normally connected through a key G to limbs 1 and 2 of the line, (in Fig. 1 when calling plug I is connected with a line) the positive pole 7 of E being preferably connected to limb 1, and the negative pole 8 to limb 2. Key G is adapted to reverse the poles of battery E on the line when depressed, springs 21 and 22 then disengaging contacts 23 and 24, respectively, and engaging contacts 25 and 26, respectively. Reversing the battery E on the line, as stated, operates the ringer F as will be hereinafter described.

The apparatus shown in connection with line B is the same as that shown in connection with line A, except for the ringing apparatus at the substation B which is another form of the ringing apparatus of my invention. In Fig. 3, when spring 17 engages contact 19 it opens the line circuit at contact 18 and short-circuits the condenser 20 on itself only, while with the apparatus shown at substation B, spring 17 engaging contact 19 opens the line circuit at contact 18 and short-circuits the condenser 20 through the ringer coils 10 10, contact 19 being connected between the ringer coils 10 10 and limb 2 of the line, at 27, to accomplish this result, instead of to the other side of the ringer coils 10 10 as shown in Fig. 3.

In the plug-cord connecting circuit of Fig. 1 the connecting plugs H and I are normally connected together through repeating coil K, in the usual manner, tip strands 28 and 29 being connected together through windings 32 and 33 of repeating coil K, and sleeve strands 30 and 31 being connected together through windings 34 and 35 of the coil K. The central source of electricity is bridged across the main strands of the plug-cord circuit between windings 32 and 33 and windings 34 and 35. The operator's transmitter 36 and receiver 37 may be bridged across the plug-cord circuit in the usual manner, by springs 40 and 41 of the listening key engaging contacts 38 and 39, respectively, when depressed. The ringing key G is constructed and connected to disconnect the main strands 29 and 31 of connecting plug I from the repeating coil K, and to reverse the poles of battery E on the strands 29 and 31, when depressed, springs 21 and 22 disengaging contacts 23 and 24, respectively, which are connected to poles 7 and 8, respectively, of battery E, and engaging contacts 25 and 26, respectively, which are connected to poles 8 and 7, respectively, of battery E.

In Fig. 2 I have shown a transfer circuit adapted to be used with the system of Fig. 1, for transferring the calls and connections from one switchboard to another, or between different sections of the same switchboard. The jack C_2 is provided with tip and sleeve contact springs 48 and 49, respectively, which are connected to limbs 50 and 51, respectively, of the transfer circuit, which limbs terminate in tip and sleeve strands 52 and 53, respectively, of transfer plug J. A transfer signaling device M is connected from tip spring 48 of jack C_2 through a plug-seat switch 54 55 at plug J, to limb 51

of the transfer circuit. Jack C_2 and plug I are at one operator's position and plug J and ringing key N are at another operator's position, or at another switchboard. Ringing key N is adapted to reverse the poles of battery E on the main strands 52 and 53 of transfer plug J when depressed, the same as key G reverses the poles of battery E on strands 29 and 31 of plug I, springs 56 and 57 disengaging contacts 58 and 59, respectively, and engaging contacts 60 and 61, respectively.

The operation of the system is as follows: If subscriber A desires to talk with subscriber B, he lifts his telephone receiver off of the switch-hook, in the usual manner, and thereby closes a circuit of battery E from pole 7 through contacts 5 and 6, signaling device D of line A, limb 1 of the line, substation A, limb 2 of the line, jack spring 4, and contact 9 to pole 8 of battery E, which causes current to flow over this circuit from battery E sufficiently to actuate the signaling device D and cause same to give a signal for connection. In answer to the line signal of signaling device D, the operator inserts answering plug H into jack C of line A, thereby disengaging jack spring 4 from contact 9, and engaging the spring 4 with contact 6 which is thereby disengaged from contact 5. Now the circuit of battery E is closed through winding 32 of repeating coil K, tip strand 28, jack spring 3, limb 1 of the line, substation A, limb 2 of the line, jack spring 4, sleeve strand 30, and winding 34 of repeating coil K, the signaling device D being bridged across this circuit from jack spring 3 through the device D and contact 6 to jack spring 4, and shunted by the relatively low resistance of the line so as to render it incapable of displaying a signal. The operator now depresses her listening key which connects her telephone set across the main strands of answering plug H in the usual manner, for conversation with subscriber A. When the operator learns from subscriber A that he wishes connection with subscriber B, she inserts the calling plug I into jack C of line B and thereby closes a circuit of battery E from pole 7, through winding 33 of repeating coil K, contact 23, spring 21, tip strand 29, jack spring 3, signaling device D of line B, contact 6, jack spring 4, sleeve strand 31, spring 22, contact 24, and winding 35 of repeating coil K, to pole 8 of battery E. The current now flowing through this circuit energizes the signaling device D and causes same to display a signal, the line circuit being open at substation B and therefore not shunting the device D to render same inoperative. When plug I is inserted into jack C of line B, it switches the circuits the same as described above in connection with plug H and jack C of line A, thus changing the circuit of signaling device D from a series circuit of the line to a bridging circuit of the line. The operator now depresses her ringing key G, causing springs 21 and 22 to disengage contacts 23 and 24, respectively, and to engage contacts 25 and 26, respectively, to reverse the poles of battery E on the line of subscriber B to ring the ringer F at his substation as his calling signal.

The operation of ringer F will now be described in detail, by reference more particularly to Fig. 3, as follows: The normal circuit from battery E to ringer F is from positive pole 7, through contact 23, spring 21, limb 1, contact 18, spring 17, condenser 20, ringer coils 10 10, limb 2, spring 22, and contact 24, to negative pole 8 of battery E, condenser 20 keeping this circuit open and thereby keeping current from battery E from flowing. When this circuit connection is first established, condenser 20 is charged, the impulse of current charging same tending to energize the ringer F. To keep the armature 14 of the ringer from operating, it is preferable to employ a spring 15 to keep the armature 14 pulled to the position to which the said impulse of current would operate same if it were not pulled over by spring 15, as shown in Fig. 3. This arrangement keeps the circuit of battery E open at the substation and does not allow the ringer to operate. When it is desirable to operate the ringer F from battery E, it is necessary simply to depress the ringing key G which reverses the poles of battery E on limbs 1 and 2 of the line, as above described, and thereby charges the condenser 20 by an impulse of current in the opposite direction, which impulse energizes the coils 10 10 of the ringer so that they act against the polarizing spring 15 and operate the armature 14 so that the clapper 13 strikes one of the bells 12. This operation of the armature 14 disengages spring 17 from contact 18 and engages it with contact 19. When spring 17 disengages contact 18 it opens the circuit of the line, and when it engages contact 19 it short-circuits the condenser 20 through spring 17 and contact 19, thereby discharging the condenser, immediately after which spring 15 pulls the armature 14 back to its original position, thus causing clapper 13 to strike the other bell 12. As spring 17 reëngages contact 18 the condenser 20 is again charged and the armature 14 is again operated as at first. Then the condenser is again discharged and the armature is again pulled back to its original position. This operation of the device continues until either the current is removed, or the poles of battery E reversed back to their original relation with the line. When it is desired to stop the ringing, the key G is restored to its normal position.

At substation B I have shown a circuit

arrangement whereby the condenser 20 is discharged back through the ringer coils 10 10, the discharge circuit being from the condenser 20, through coils 10 10, connection 27, contact 19, and spring 17, back to condenser 20. With this arrangement it will be seen that the ringer coils 10 10 are supplied with an alternating current, (instead of a pulsating current as in Fig. 3) from a source of direct current, which operates the ringer F practically the same as the ordinary alternating-current ringing generators do. It will also be seen that each charge of electricity in the condenser 20 gives the ringer two separate and complete operations, one operation being produced by the charge of electricity as it charges the condenser, and the other operation being produced by the same charge of electricity as it is discharged from the condenser 20 back through the ringer coils 10 10 in a reversed direction. In other words, each impulse of current over the line is utilized twice in the ringer F. In case the spring 15 is used on the ringer F of substation B, the discharge from the condenser 20 will act with it, or will assist it.

It will be seen that with the above-described ringing apparatus and circuit arrangements, either that shown in Fig. 3 or at substation B, the main line circuit is open while the condenser 20 is being discharged. This keeps the current consumption to a minimum and eliminates the waste of current which would necessarily be present if the line circuit were not opened. With my arrangement the only current necessary is that to charge the condenser, which is a very small amount in ordinary telephone ringing systems.

By the use of the apparatus and circuit arrangements of my present invention I am enabled to do away with the ordinary ringing apparatus at the central station of a telephone system and ring the subscribers' alternating-current ringers or pulsating-current ringers from the common source of direct current at the central station. It will also be seen that by the use of my invention I am enabled to keep the telephone lines of a system normally charged with a central source of direct current to enable the subscribers to signal the central station, and to signal the subscribers from the same source when desired, without normally losing any current from the source. I may also use this same source for supplying the substation transmitters with current for talking purposes.

With this improved ringing apparatus of my present invention, it will be seen that the noise on the lines of a telephone system, due to the induction of the ordinary alternating-current or pulsating-current ringing apparatus, is done away with. In ringing subscriber B, as just described above, the operator also restores her listening key to its normal position. After ringing subscriber B the ringing key G is also restored to its normal position. When subscriber B responds to his call and takes his receiver from the switch hook, he closes the circuit of battery E over his line and thereby causes the latter to shunt the signaling-device D which is now bridged across his line as described, and extinguish its signal. Now the subscribers A and B are connected for conversation with each other, both of the signals D D for the respective lines A and B being inactive. When the conversation is completed and subscriber A hangs his receiver upon its switch hook, he breaks the circuit of his line at his substation and thereby takes the line shunt away from his signaling device D and allows the latter to operate by means of current from battery E over the circuit 32, 28, 3, D, 6, 4, 30 and 34, to display a signal for disconnection. When subscriber B hangs his receiver upon its switch hook he causes his signaling device D to display a signal for disconnection, in a manner similar to that just described for subscriber A. If either subscriber A or B now desires to signal the operator for any purpose, he may operate his signal D intermittently by raising and lowering his switch hook in the usual manner. When the operator receives both disconnect signals, she withdraws the plugs H and I from their respective spring jacks and thereby extinguishes the supervisory or disconnect signals D D and restores all circuits and apparatus to their normal condition.

If subscriber A has called for subscriber B and the latter is on another switchboard, or his jack is out of reach of the A-line operator, then it is necessary to use the transfer circuit of Fig. 2 for making the connection. In this case the A-line operator inserts the calling plug I into the transfer jack C_2 which extends the cord circuit to transfer plug J at the B-line position. Then the A-line operator instructs the B-line operator (in any suitable manner) to insert the transfer plug J into jack C of line B. When plug I is inserted into jack C_2, a circuit is closed from pole 7 of battery E through winding 33, contact 23, spring 21, tip strand 29, jack spring 48, signaling device M at the A-line position, plug-seat switch contacts 55 54 at the B-line position, conductor 51, jack spring 49, sleeve strand 31, spring 22, contact 24, and winding 35, to pole 8 of battery E, which causes signaling device M to operate by current from battery E and thereby display a signal.

When the B-line operator inserts plug J into jack C of line B, she opens switch contacts 54 55, thereby opening the circuit through signaling device M and extinguish-

ing its signal to indicate to the A-line operator that the plug J has been removed from its seat for connection with line B, and also switches the circuits of line B as described in connection with line A when plug H is inserted into jack C thereof. The signaling device D of line B now operates and displays a signal, the circuit of line B being open at the substation. The B-line operator now depresses her ringing key N and thereby rings the ringer F at substation B, as fully described above. When subscriber B is rung sufficiently, the ringing key N is restored to its normal position. When subscriber B responds and lifts his receiver from the switch-hook, he closes the circuit of his line as a relatively low-resistance shunt around his signaling device D and thereby deënergizes D and extinguishes its signal which indicates to the B-line operator that subscriber B has answered his call. The talking circuit between subscribers A and B now includes line A, the cord circuit of Fig. 1, the main strands 50 and 51 of the transfer circuit of Fig. 2, and line B. When the conversation is completed and subscriber B hangs his receiver upon its switch hook, he breaks the circuit of his line at his substation and thereby takes the line shunt away from his signaling device D which now operates, due to the removal of the line shunt, by current from battery E over the circuit from pole 7, through winding 33, contact 23, spring 21, tip strand 29, jack spring 48, conductor 50, contact 58, spring 56, tip strand 52, jack spring 3 of line B, signaling device D, contact 6, jack spring 4, sleeve strand 53, spring 57, contact 59, conductor 51, jack spring 49, sleeve strand 31, spring 22, contact 24, and winding 35, to pole 8, and thereby conveys to the B-line operator the signal for disconnection. The B-line operator now withdraws plug J from jack C of line B and thereby breaks the circuit of battery E from signaling device D and extinguishes its signal, at the same time restoring the circuits of line B to their normal condition.

When the plug J is replaced to its plug seat, it closes the contacts 54 55 and thereby closes the circuit of battery E through signaling device M, over the circuit hereinbefore described, which thereupon displays a signal to indicate to the A-line operator that the plug J has been removed from its jack. When the A-line operator receives this signal she withdraws the plug I from the jack C, and thereby disconnects battery E from signaling device M and extinguishes its signal. The subscriber A gives his disconnect signal in the usual manner, whereupon the A-line operator withdraws the plug H from his jack C and thereby restores all circuits and apparatus to their normal condition.

If desired, the transfer circuit may be provided with a listening key similar to that of Fig. 1, to enable the B-line operator to cut in on the line and talk to the subscribers.

For the ringer F I may use any suitable "polarized" ringer. If desired I may use an ordinary alternating-current ringer and place it in such a position that gravity will hold the armature 14 to one of the poles 16 16. In this case the adjustment of the polarization will depend upon the position of the ringer.

For the signaling devices D, D and M, I may use an electric signal lamp in series with an impedance, a relay controlling a signal, or any suitable electrically operable device. For the battery E I may use a suitable direct-current generator if desired.

In this invention I do not wish to be limited to the exact details, nor to the particular apparatus, herein shown, as many modifications may be made therein without departing from the scope of the appended claims.

What I claim as my invention is:

1. A telephone line extending to a substation, a polarized alternating-current ringer at the substation, a source of direct current impressed upon the line, a condenser at the substation to normally keep current from flowing over the line, and switching mechanism whereby the condenser is alternately charged and discharged through the ringer when the polarity of the said source is reversed on the line, whereby the ringer is rung continuously, the said mechanism opening the circuit of the line while the condenser is being discharged.

2. A primary circuit comprising a polarized signaling device, a condenser and a source of direct current, a secondary circuit comprising the said device and the condenser, and switching mechanism operated by the said device when the proper polarity of the said source is impressed thereon, whereby the said primary and secondary circuits are opened and closed intermittently, to produce pulsations of current of opposite polarity through the said device.

3. A primary circuit comprising a polarized electrically-operable device, a condenser and a source of electricity, a secondary circuit comprising the said device and condenser, and switching mechanism operated by the said device when the proper polarity of the said source is impressed thereon, whereby the said primary and secondary circuits are opened and closed intermittently during the operation of the said device, the condenser being thereby alternately charged and discharged through the said device.

4. An electrical signaling line, a source of signaling current, switching mechanism for applying current of requisite polarity to

the line, and a substation on the line equipped with a polarized signaling device, a condenser, and switching mechanism adapted to be actuated by the said device to open the circuit of the line and close the condenser circuit through the said device, intermittently, substantially as set forth.

5. A telephone line circuit, a signaling battery at the central station, switching mechanism for applying battery current of requisite polarity to the line, a substation on the line equipped with a polarized signal bell and a condenser in circuit therewith, a local circuit for the condenser, and switch contacts controlling the circuit of the line and the local circuit of the condenser, alternately engaged to effect the actuation of said bell.

6. In a telephone system, the combination with a telephone line extending from a substation to a central station, of a polarized ringer and associated condenser at the substation, mechanism controlled by the ringer for opening the said line circuit and simultaneously effecting the discharge of the condenser, and means at the central station for applying current of requisite polarity to the line to effect the operation of the apparatus at the substation.

7. The combination with a telephone line, of a source of direct current, switching mechanism adapted to apply the current to the line, a substation on the line equipped with a polarized ringer and condenser normally connected to the line, and circuit-controlling mechanism adapted to be actuated by the ringer to sever the line and short-circuit the condenser through the ringer, intermittently, substantially as set forth.

8. A signaling circuit comprising a line, polarized signaling apparatus, and a condenser; and means for opening the said circuit and simultaneously causing the discharge of the condenser through the signaling apparatus, intermittently, under favorable electrical conditions.

9. An electrical circuit comprising polarized apparatus and a condenser, and mechanism controlled by the said apparatus for opening the said circuit and simultaneously causing the discharge of the condenser, intermittently, under favorable electrical conditions.

10. An electrical circuit comprising a polarized electrically-operable device and a condenser, and mechanism controlled by the said device for opening the said circuit and simultaneously causing the discharge of the condenser through the said device, intermittently, when a potential of proper polarity is impressed upon the circuit.

11. A series circuit comprising a line, a polarized electrically-operable device, and a condenser; a local circuit for the said device and condenser, and switch contacts controlled by the said device and adapted to control the circuit of the line and the local circuit of the said device and condenser, respectively, under favorable electrical conditions.

12. A polarized electrically-operable device and a condenser connected in circuit therewith, a local circuit for the condenser, and a plurality of switches controlled alternately by the said device when a potential of requisite polarity is impressed thereon, to control the main circuit and the local circuit of the condenser, respectively.

13. A line, a polarized electrically-operable device and a condenser associated therewith, automatically-actuated means controlled by the said device for opening the line and simultaneously effecting the discharge of the condenser, and means for applying current of requisite polarity to the line to effect the operation of the said device.

14. A series circuit comprising a source of direct current, an electrically-operable device, and a condenser; the condenser normally keeping the said circuit conductively-incomplete; and mechanism controlled by the said device whereby the latter may be operated continuously from the said source, and whereby the said series circuit is kept continuously conductively-incomplete during the operation of the said device.

15. A primary circuit including a polarized electrically-operable device and a condenser, a secondary circuit including the said device and condenser, and mechanism controlled by the said device whereby the said circuits are alternately closed, upon a current of requisite polarity in one of the said circuits.

16. A primary circuit including an electrically-operable device, a condenser and a source of electricity, a secondary circuit including the condenser, and mechanism under control of the said device whereby the said circuits are opened and closed intermittently during the operation of the said device, the condenser being thereby alternately charged and discharged.

17. A primary circuit including a polarized electrically-operable device, a condenser and a source of electricity, a secondary circuit including the condenser, and mechanism under control of the said device whereby the said circuits are opened and closed intermittently when the proper polarity of the said source is impressed upon the primary circuit, the condenser being thereby alternately charged and discharged.

18. A primary circuit including an electrically-operable device, a condenser and a source of electricity, a secondary circuit including the said device and condenser, and mechanism under control of the said device whereby the said circuits are opened and

closed intermittently during the operation of the said device, the condenser being thereby alternately charged and discharged through the said device.

19. In an electrical system having an electrically-operable device and a condenser arranged to be charged and discharged intermittently during the operation of the said device, and also a source of electrical supply, means whereby the circuit of the said source of supply is intermittently broken while the discharge circuit of the condenser is closed.

20. A telephone line extending to a substation, a polarized ringer at the substation, a source of direct current impressed upon the line, a condenser at the substation to normally keep current from flowing over the line, and switching mechanism whereby the condenser is alternately charged and discharged when the proper polarity of the said source is impressed upon the line, whereby the ringer is rung continuously, the said mechanism opening the circuit of the line as the condenser is being discharged.

21. An electrical signaling line, a source of signaling current, means for applying the current to the line, and a substation on the line equipped with a signal-initiating device, a condenser, and switching mechanism for opening the circuit of the line and simultaneously causing the discharge of the condenser, intermittently, substantially as set forth.

22. A signaling circuit comprising a line, polarized signaling apparatus, and a condenser; and means for opening the said circuit and simultaneously causing the discharge of the condenser, intermittently, under favorable electrical conditions.

23. A signaling circuit comprising a source of electricity, a signal-initiating device and a condenser, and mechanism for opening the said circuit and causing the discharge of the condenser, intermittently, during the operation of the said device.

24. A signaling circuit comprising a source of electricity, a signal-initiating device and a condenser, and mechanism for opening the said circuit and causing the discharge of the condenser through the said device, intermittently, during the operation of the latter.

25. The combination with an electrical circuit comprising a source of electricity, an electrically-operable device and a condenser, of mechanism for opening the said circuit and causing the discharge of the condenser, intermittently, during the operation of the said device.

26. The combination with an electrical circuit comprising a source of electricity, an electrically-operable device and a condenser, of mechanism for opening the said circuit and causing the discharge of the condenser through the said device, intermittently, during the operation of the latter.

27. A line circuit comprising a source of electricity, an electrically-operable device and a condenser; a local circuit for the condenser, and switching mechanism under control of the said device and arranged to control the said line circuit and the local circuit of the condenser.

28. A main circuit comprising a source of electricity, an electrically-operable device and a condenser, a local circuit for the condenser, and a plurality of switches controlled alternately by the said device for controlling the said main circuit and the local circuit of the condenser.

29. The combination with a source of direct current and an electrically-operable device to be operated thereby, of means for keeping the circuit of the said source continuously conductively-incomplete during the operation of the said device.

30. An electrical circuit comprising a source of direct current, an electrically-operable device and a condenser; and mechanism whereby the said device may be operated continuously from the said source, the condenser and the said mechanism coöperating to keep the circuit of the said source continuously conductively-incomplete during the operation of the said device.

31. In a signaling circuit having a signaling device and a condenser under control thereof to be charged and discharged intermittently, and also a source of electrical supply, means under control of the said device whereby the circuit of the said source of supply is intermittently broken while the discharge circuit of the condenser is closed.

As inventor of the foregoing I hereunto subscribe my name in the presence of two subscribing witnesses, this 19th day of November, 1906.

FREDERICK R. PARKER.

Witnesses:
ROBT. G. PARKER,
PATRICK J. POWERS.