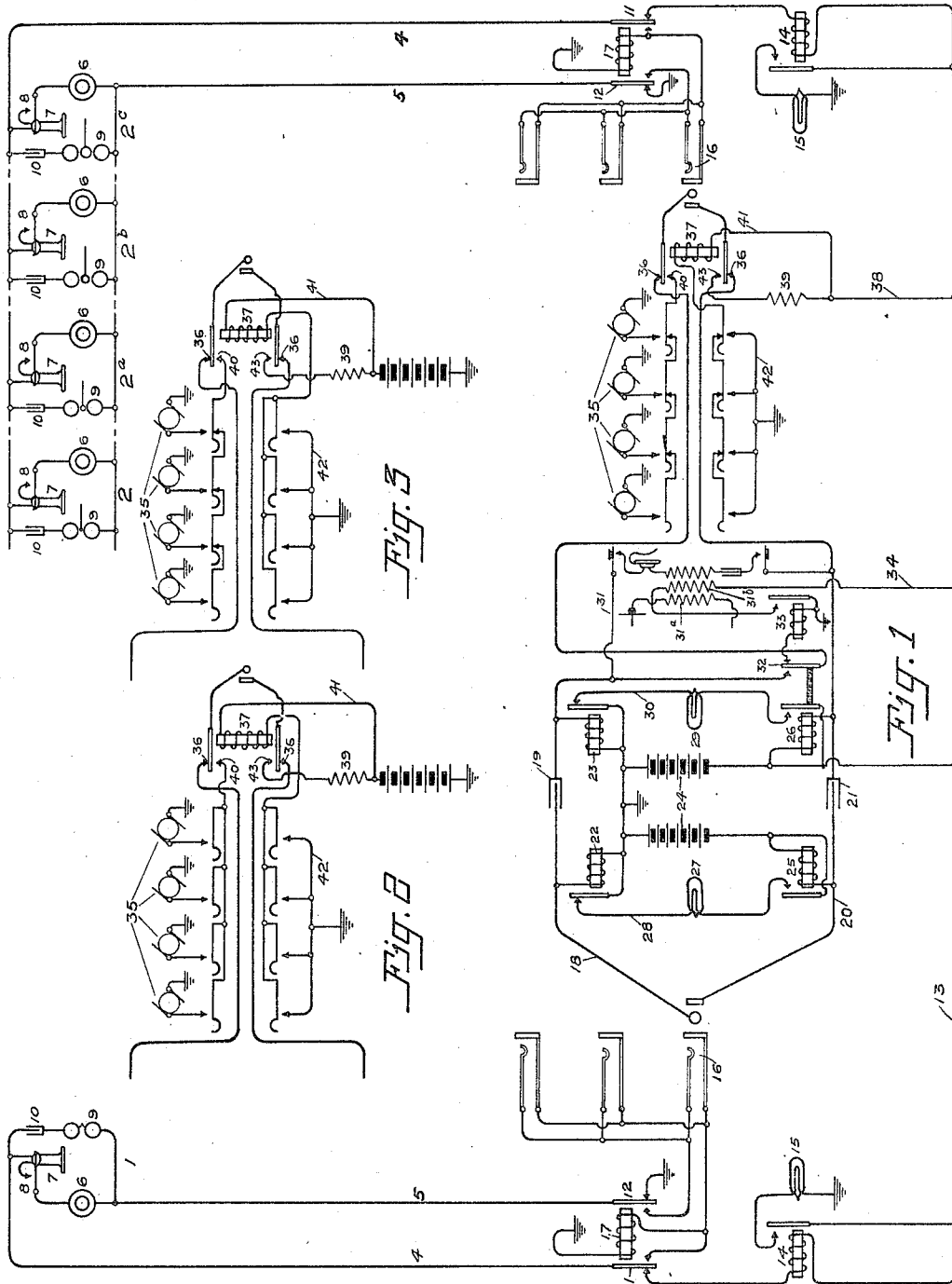


A. H. WEISS.
FOUR PARTY LINE RINGING KEY.
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Patented Oct. 4, 1910.



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FOUR-PARTY-LINE RINGING-KEY.

971,650.

Specification of Letters Patent.

Patented Oct. 4, 1910.

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To all whom it may concern:

Be it known that I, ALFRED H. WEISS, a citizen of the United States, residing in Chicago, county of Cook, and State of Illinois, have invented a new Improvement in Four-Party-Line Ringing-Keys, of which the following is a specification.

My invention relates to party line ringing systems and to improved means for removing the ringing contacts from the talking circuit.

It has been customary in the past to arrange the contacts of party line ringing keys in series in the cord circuit, in such a manner that the actuation of any particular key opens the cord circuit at that point back of the ringing generator, and the ringing current is obliged to flow out over the line. In this arrangement there is included in the talking circuit a plurality of contacts in series, which due to imperfect adjustment of the contact springs, particles of dust or other causes, interfere or are apt to interfere with the talking current and produce poor transmission.

In the present invention the ringing key contacts are normally removed from the talking circuit, and electro-magnetic means is provided adapted to connect said contacts with the talking circuit during the operation of ringing, said means preferably being also employed for opening the strands of the cord circuit back of the ringing generator.

My invention is illustrated in the accompanying drawings in which—

Figure 1 shows my invention in combination with one form of telephone systems with which it is adapted to operate. Fig. 2 represents another form of my invention, and Fig. 3 represents still another modification.

In the several figures the same reference numerals have been used to designate like parts.

Referring to Fig. 1, a central office equipment is shown and two telephone lines extending from the central office to the substations 1 and 2, party line service being indicated in connection with the telephone line upon the right of the figure, the additional stations being numbered 2^a, 2^b and 2^c. Telephone lines extend from the central office to the substations in two limbs 4 and 5. The substation apparatus shown consists of a

transmitter 6 and receiver 7 connected in a bridge of the line conductors and normally open at the switch hook 8 when the apparatus is not in use. A call bell 9 and condenser 10 are shown in a permanent bridge of the line conductors. This substation apparatus is intended to typify any suitable common battery substation equipment. The telephone lines terminate in contact springs 11 and 12, contact spring 12 being normally connected with ground and contact spring 11 being connected with the central office battery over a conductor 13 which includes the winding of the line relay 14. A line signal 15 consisting of an incandescent lamp, is connected between ground and the normally-open contacts of the line relay. An answering jack 16, having tip and sleeve contacts is provided for each line, said jack contacts being multiplied at each section of the switchboard as shown. The jack contacts are normally disconnected from the limbs of the telephone line at the front contacts of a cut-off relay 17, one side of the coil of this relay being connected to ground, the other side being preferably connected with the sleeve contact of the answering jack 16. The usual operator's cord circuit is provided, consisting of the tip strand 18 having an interposed condenser 19 and a sleeve strand 20 having a similar interposed condenser 21. A pair of supervisory relays 22 and 23 are connected with the tip strand of the cord circuit upon either side of the condenser 19, the opposite side of the winding of said relays being connected with the grounded pole of the central office battery 24. A second pair of supervisory relays 25 and 26 are similarly connected with the sleeve strand of the cord circuit upon either side of the condenser 21 and the non-grounded pole of the central office battery. The tip supervisory relay 22 and the sleeve supervisory relay 25—the former through its normally-closed contacts and the latter through its normally-open contacts—are adapted to jointly control the circuit of the supervisory signal 27, said signal being connected in a local circuit between the poles of the battery 24 by means of said contacts and a conductor 28. Supervisory relays 23 and 26 in a similar manner jointly control the operation of the supervisory signal 29 which is connected in a local circuit from the battery 24 by means of conductor 30. An op-

erator's listening key 31 is provided, adapted to bridge her head receiver and the secondary of her induction coil in series with a condenser across the cord circuit in the usual manner. The primary winding 31^a of the operator's set is indicated in series with the transmitter, which may be supplied with current from the battery 24 or from any suitable source. The contact spring 32 of the relay 26 is adapted to normally connect the winding of a test relay 33 with the tip strand of the cord circuit, said contact spring being adapted to sever said connection and complete the continuity of the tip side of the cord circuit when the relay 26 is energized. The armature of the test relay when attracted is adapted to connect the tertiary of the operator's induction coil with ground through conductor 34 which is connected with the battery 24. A plurality of ringing generators 35 is shown although any suitable ringing outfit may be provided, said generators being shown with one side connected to ground, the other side of said generators being connected with the contacts of a party line ringing key, four of the contacts being shown. The ringing key contacts in this form of the invention are connected in series, and are normally disconnected from the cord circuit, so that the ringing key contacts do not in any way affect the efficiency of transmission. The ringing key contacts upon one side of the cord circuit are connected with the front contact 40 of the small relay 37, the corresponding front contact of said relay being connected with the central office battery by means of conductor 38 through a suitable resistance 39. The continuity of the tip and sleeve strands of the cord circuit is maintained through the normally-closed back contacts 36 of said relay. The ringing key contacts upon the opposite side of the cord circuit are connected with one side of the winding of the relay 37, the opposite side of said winding being connected with battery through conductors 41 and 38. A ground connection 42 is provided for the ringing key contacts upon this side of the cord circuit.

In Figs. 2 and 3 the general arrangement of the ringing key contacts with reference to the talking circuit is similar to that shown in Fig. 1. In Fig. 2, however, the contacts upon both the tip and sleeve sides of the cord circuit are arranged in multiples so that upon the operation of any of the keys the contacts of that key only are included in the path of the ringing current. In Fig. 3 the contacts upon the tip side of the line are shown in series relation while the contacts upon the sleeve side of the line are connected in multiple. The other general features of these drawings are the same as shown in Fig. 1 and the operation of these figures will be

obvious from the description of the operation of Fig. 1.

Assuming that subscriber 1 wishes a connection with one of the subscribers upon the party line shown at the right hand of Fig. 1, he will remove his receiver from the hook, thus closing a path for current from battery 24 over conductor 13 through the coil of the line relay 14, the limbs of the telephone line and the substation apparatus to ground through contact 12 of the cut-off relay 17. This flow of current will cause the operation of the line relay 14, lighting the line lamp 15. The operator will then insert her answering plug in the jack 16 of the calling line, causing the operation of the cut-off relay 17 by current from the battery 24 through the supervisory relay 25, the sleeve strand of the cord circuit 20, and the corresponding contact of the jack through the winding of said relay. The operation of the cut-off relay attracts the contact springs 11 and 12, disconnecting the line relay 14 and retiring the line signal, and at the same time breaking the ground connection of the line and connecting both external limbs with the jack section thereof. Part of the current flowing through the cut-off relay will flow over the line conductor 4 and through the substation apparatus, line conductor 5, tip cord strand 18 and through the winding of the supervisory relay 22 to battery. Due to the fact that the subscriber's receiver is off its hook the circuit of the supervisory lamp 27 will be opened at the normally-closed contacts of supervisory relay 22 and said signal will not be illuminated. The operator will then connect her head telephone with the calling subscriber by means of her listening key 31 to ascertain the number of the subscriber desired. The idle or busy condition of the desired line will then be ascertained by touching the tip of the calling plug to the sleeve of the jack of said line. If the line wanted is in use at some other section of the switchboard the multiple jack at the section tested will be raised to a potential above that of earth due to the flow of battery from the sleeve of the cord circuit through the cut-off relay at that section. Upon testing the condition of such a line, a flow of battery will result from the test terminal of the line through the tip strand of the cord circuit, normally-closed contact 32 of the supervisory relay 26, and through the coil of the preferably high resistance and high impedance test relay 33. The operation of the test relay will close a path for current through the tertiary winding 31^b of the operator's telephone set from battery 24, over conductor 34, thus producing an inductive click in the operator's head receiver. If the desired line is not in use no electromotive force will exist at the sleeve contact of the line and no flow of current will result

through the grounded tip strand of the cord circuit. Upon finding the line idle the operator will insert a plug into the jack of the line and operate one of the ringing keys to signal the subscriber. The insertion of the plug in the jack of the desired line closes a path for current from the battery 24 through supervisory relay 26, the sleeve strand of the cord circuit, and the winding of the cut-off relay 17 to ground, actuating this relay and connecting the telephone line with the jack section thereof, as heretofore described, thus preventing the operation of the line relay 14. The operation of the sleeve supervisory relay 26 closes the normally-open back contacts of said relay, the contact 32 disconnecting the test relay 33 from the tip strand of the cord circuit and re-uniting said strand which is normally severed at said contact. The circuit of the supervisory signal 29 is closed at the front contacts of the relay 26, but due to the fact that the subscriber's receiver is upon its hook no current flows over the telephone line and through the relay 23 as previously described, to break the continuity of said circuit and the supervisory lamp 29 is lighted. Upon the operation of the supervisory relay 23, due to the response of the called subscriber, the circuit of the signal 29 will be opened at the contacts of said relay and the supervisory lamp 29 extinguished.

The four generators shown are adapted to impress preferably alternating current upon the line of characteristic frequencies, and the ringers 9 at the four substations are preferably provided with tuned reeds having characteristic rates of vibration corresponding to the frequencies impressed upon the line by the generators. The bell at any given station will therefore respond to ringing current from the generator adapted to impress ringing current upon the line corresponding in frequency to the operative pitch or rate of vibration of the reed associated with that bell, and will not respond to ringing current impressed upon the line by the other generators and which is not sent with the characteristic rate of vibration of said reed. It will be understood that this selective ringing apparatus is typical of any of the well-known systems of selective signaling and forms no part of the present invention.

Upon the operation of any one of the ringing keys to selectively signal the corresponding substation upon the line a path for current will be closed through the relay 37 associated with the ringing key from battery 24, over the common lead 13 and conductor 38, conductor 41, the coil of said relay and to ground through the back contact 42 of the key operated. The flow of current in this path will cause the operation of relay 37 which will attract its armatures, breaking the connection between the con-

tacts of the plug and the tip and sleeve strands of the cord circuit at the back contacts 36 of said relay and connecting the source of ringing current with the tip side of the line at the front contact 40. The relay 37 also connects the conductor 38 with the sleeve side of the plug and jack by means of front contact 43, thus providing a flow of battery current through the coil of the cut-off relay 17 to maintain said relay actuated during the operation of ringing, and while the sleeve strand of the cord circuit is broken at the contact 36. The ringing current will flow from the generator connected with the line through contact 40, tip of the plug and jack, line conductor 5, through the substation bells, line conductor 4, sleeve contacts of the jack and plug, front contact 43 of relay 37, conductor 38, and to ground through battery 24. It will be seen that all of the ringing key contacts are normally removed from the talking circuit and that the normal continuity of said circuit is automatically broken back of the source of ringing current and said source connected with the line by the actuation of a single ringing key. Upon the release of the ringing key the armatures of the relay 37 return to normal position, thus isolating the source of the ringing current and the contacts of the ringing keys from all connection with the talking circuit and reestablishing the connection of said circuit with the called line, so that when the subscriber responds and removes his receiver from its hook the two subscribers will be in communication for conversation. Either subscriber by hanging up his receiver will interrupt the flow of current through the telephone line and through the supervisory relays 22 and 23, respectively, which will allow the armatures of said relays to drop back, thus closing the circuit of the supervisory lamp associated with that side of the cord circuit and notifying the operator that the conversation has terminated. The removal of the plugs from the jacks will restore all parts to normal condition.

What I claim as new and desire to secure by Letters Patent is:

1. In a telephone system, the combination with a telephone line, of a plurality of substations on said line, each substation having an annunciator, of a cord circuit adapted to be connected to said line, a plurality of ringing key contacts, each adapted to impress ringing current upon the line for the operation of said annunciators, said ringing key contacts being connected in series and being normally isolated from the talking circuit, and magnetic means operated by current through the contacts of the ringing key for temporarily connecting the contacts of said key with the talking circuit, said magnetic means being restored after said ringing key

contacts have been restored, substantially as described.

2. In a telephone system, the combination with a telephone line, of a plurality of substations on said line, each having an annunciator, of a cord circuit adapted to be connected to said line, a plurality of ringing key contacts normally disconnected from the talking circuit, and electro-magnetic means operated by current through the contacts of said key, adapted to connect the contacts of said key with said circuit only while a signal is being sent, and independent of the condition of said line, substantially as described.

3. In a telephone system, the combination with a telephone line, of a plurality of substations on said line, each having an annunciator, of a cord circuit adapted to be connected to said line, a plurality of ringing key contacts normally isolated from the talking circuit, a suitable source of ringing current and an electro-magnetic device associated with said contacts, said device being operated to open the talking circuit back of said source, and thereafter to connect said contacts therewith, when any one of said contacts is operated to call a subscriber, and means controlled by said contacts to restore said device when said contacts are restored, substantially as described.

4. In a telephone system, the combination with a telephone line, of a plurality of substations on said line, each having an annunciator, of a cord circuit adapted to be connected to said line, a suitable source of ringing current, a ringing key to connect said source with the cord circuit, a plurality of contact springs for said key normally connected in series but disconnected from the talking circuit, and means for automatically connecting one or more of said springs with the talking circuit by the operation of said ringing key, and means for automatically disconnecting said springs from the talking circuit by the restoration of said key, substantially as described.

5. In a telephone system, the combination with a telephone line, of a plurality of substations on said line, each having an annunciator, of a cord circuit adapted to be connected to said line, a plurality of selective ringing contacts associated with said cord circuit each adapted to selectively signal one of said line annunciators, a path for voice currents around said contacts, and an electro-magnetic device having its circuit completed through said contacts, said device being adapted to be energized by the actuation of the ringing key to connect said contacts with the talking circuit when any one of said contacts is operated to call a subscriber, the restoration of said device being under the control of said ringing key, substantially as described.

6. In a telephone system, the combination with a telephone line, of a cut-off relay for the line, a plurality of substations on said line, each having an annunciator, of a cord circuit adapted to be connected to said line, a plurality of ringing contacts associated with said cord circuit, each adapted to selectively signal one of said annunciators, said contacts being normally isolated from the talking circuit, a second relay having its circuit normally open at said contacts, said second relay being adapted to sever both sides of the cord circuit when any one of said contacts is operated, and to connect one or more of said contacts with the talking circuit, and means also operated by said second relay to maintain said cut-off relay operated during the operation of ringing, the restoration of the said second relay being effected by the restoration of said contacts, substantially as described.

7. In a telephone system, the combination with a telephone line, of a plurality of substations on said line, each having an annunciator, of a cord circuit adapted to be connected to said line, a plurality of selective ringing contacts associated with said cord circuit each adapted to selectively signal one of said line annunciators, said ringing contacts being normally disconnected from the talking circuit, and a relay actuated by current through contacts of said ringing key to break the continuity of the talking circuit and connect said ringing contacts therewith, the restoration of said continuity of the talking circuit and disconnection of said ringing contacts therefrom being controlled by said contacts, substantially as described.

8. In a telephone system, the combination with a telephone line, of a plurality of substations on said line, each having an annunciator, of a cord circuit adapted to be connected to said line, a plurality of selective ringing contacts associated with said cord circuit, each adapted to selectively signal one of said annunciators, said contacts being normally isolated from the talking circuit, and a relay energized over a local circuit closed by the actuation of any one of said contacts to prevent the ringing current from flowing on but one end of said cord circuit, said contacts also serving to open said circuit to deenergize said relay, substantially as described.

9. In a telephone system, the combination with a telephone line, of a plurality of substations on said line, each having an annunciator, a cord circuit adapted to be connected to said line, a plurality of sets of selective ringing contacts associated with said cord circuit, the actuation of each being adapted to selectively signal one of the annunciators, electro-magnetic means for controlling the connection of said ringing contacts with the cord circuit, the circuit for the energization

of said electro-magnetic means, being completed by the actuation of the ringing key contacts, the said ringing key contacts also serving to open said circuit for the deenergization of said electromagnetic means, substantially as described.

10. In a telephone system, the combination with a telephone line, of a plurality of substations on said line each having an annunciator, a cord circuit adapted to be connected to said line, a plurality of sets of selective ringing contacts for said cord circuit, the actuation of each being adapted to selectively signal one of said annunciators, electro-magnetic means adapted under one condition to isolate said contacts from the cord circuit, and under the other condition to connect said contacts with the cord circuit, and means depending upon the actuation of said contacts for placing the electro-magnetic device in the latter condition, said contacts also serving to restore said electromagnetic device to its former condition, substantially as described.

11. In a telephone system, the combination with a telephone line, of a substation on the line having an annunciator, a cord circuit adapted to be connected to said line, ringing contacts for said cord circuit removed from the talking circuit during conversation, an electromagnet actuated by current through said contacts, said magnet being adapted to connect said contacts with the talking circuit for signaling purposes when the contacts are operated, said magnet being

entirely under the control of said contacts, substantially as described.

12. In a telephone system, the combination with a telephone line, of a substation on the line having an annunciator, a cord circuit adapted to be connected to said line, ringing contacts for said cord circuit removed from the talking circuit during conversation, an electromagnet having its circuit entirely controlled by said contacts, said magnet being adapted to open the telephone circuit back of said contacts and thereafter connect said contacts therewith for signaling purposes, substantially as described.

13. In a telephone system, the combination with a telephone line, of a plurality of substations on said line each having an annunciator, a selective current-sending key at the central office, all of the contacts of which are normally disconnected from the talking circuit, and means actuated by the operation of any of the springs of said key for automatically connecting said springs with the telephone line, said means also being controlled by said springs for automatically disconnecting said spring from said line, substantially as described.

Signed by me at Chicago, county of Cook, and State of Illinois, in the presence of two witnesses.

ALFRED H. WEISS.

Witnesses:

C. C. BRADBURY,
EDITH F. GRIER.