No. 814,478. PATENTED MAR. 6, 1906.

G. RITTER.

TELEPHONE OR TELEGRAPH SYSTEM.

APPLICATION FILED JUNE 16, 1904.

Fig. 1.

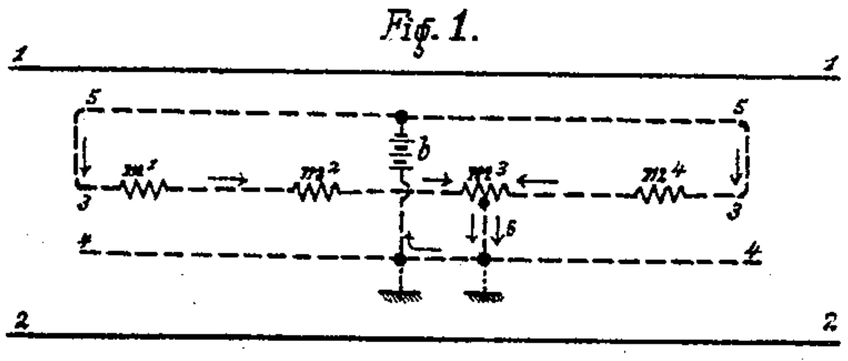


Fig. 2.

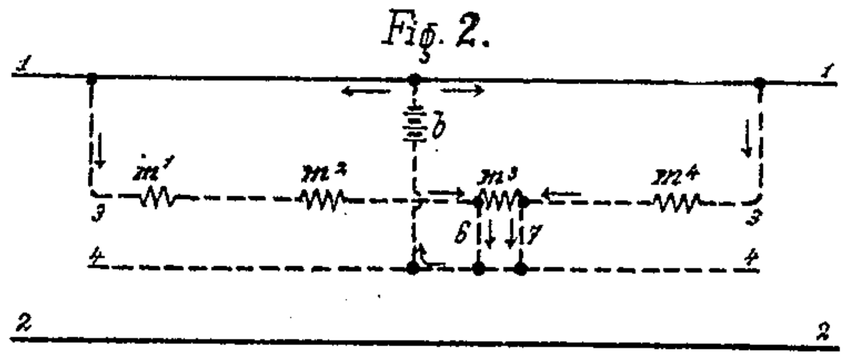


Fig. 3.

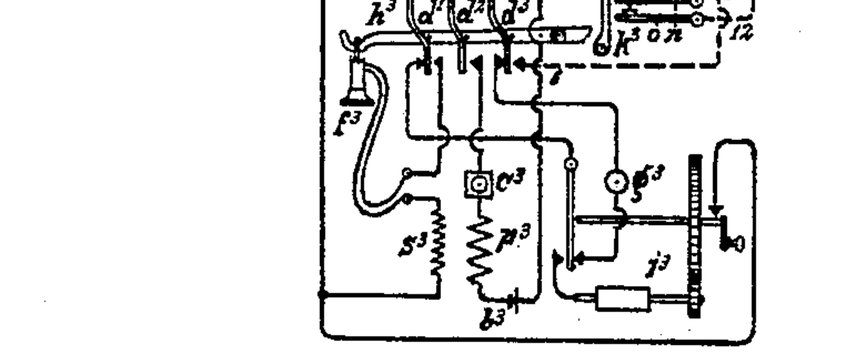


Fig. 4.

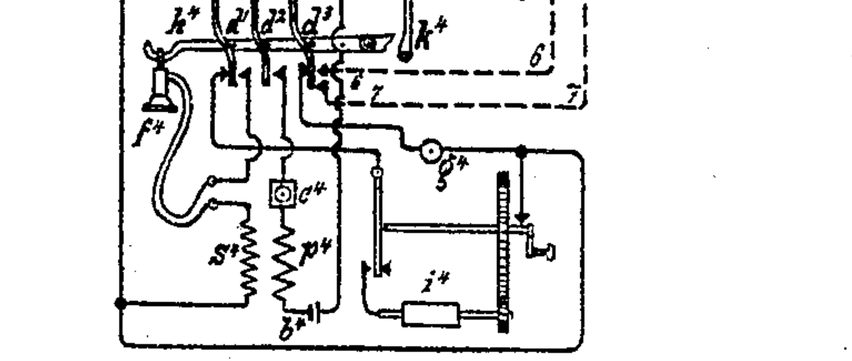


Fig. 6.

Fig. 7.

Fig. 5.

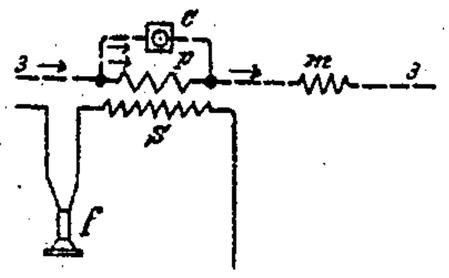
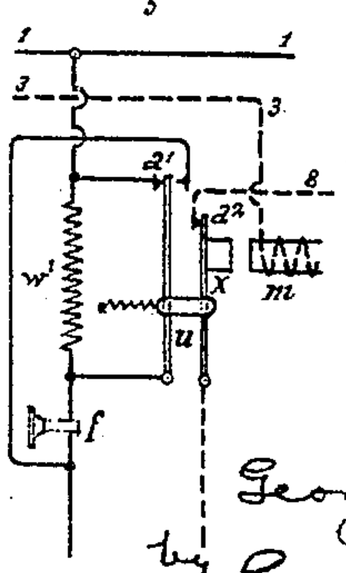


Fig. 8.



Witnesses:
E. O. Hildebrand
M. F. Anderson

Inventor
Georg Ritter,
by Georgii Massied.
his attorneys

UNITED STATES PATENT OFFICE.

GEORG RITTER, OF STUTTGART, GERMANY.

TELEPHONE OR TELEGRAPH SYSTEM.

No. 814,478. Specification of Letters Patent. Patented March 6, 1906.

Application filed June 16, 1904. Serial No. 212,805.

To all whom it may concern:

Be it known that I, GEORG RITTER, a citizen of the German Empire, residing at Stuttgart, in the Kingdom of Würtemberg, Germany, have invented certain new and useful Improvements in and Connected with Telephone or Telegraph Systems; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

In connecting several telephone subscribers or telegraph stations with one wire common to all an apparatus is necessary which cuts off from the common wire the stations or subscribers not interested in the communications in the event of a message or conversation being exchanged between one of the stations or subscribers and any one of the other stations or subscribers and prevents during the duration of the communication or conversation any connection with said common wire. Such an arrangement will now be hereinafter described. It is shown diagrammatically in Figures 1 to 8 of the accompanying drawings and consists of switches operated by magnets, which latter are switched into an auxiliary circuit extending over the various stations and provided with the necessary sources of current. When the telephone is lifted off the hook at a subscriber's telephone or the key of a telegraph apparatus is operated, the circuit is closed in the auxiliary circuit in such a way that the magnets located at the other stations or places are excited, and thereby the switches operated.

The arrangement adopted for telephone call-stations will now be described, as the apparatus is preferably employed for them.

Figs. 1 to 4 show various forms of construction of the whole arrangement, while Figs. 6 and 7 show arrangements of the separate stations or places, and Figs. 5 and 8 are details of modified forms of construction.

In Fig. 1, 1 and 2 are the branches of a double conductor which connects the four stations or telephone installations connected with said conductor with a main station, (head office or exchange.) The arrangement of the separate stations or telephones is not shown so far as they do not refer to the improvement itself, as they have no influence on the arrangement is a whole of the blocking mechanism. For each station or telephone the electromagnet-windings operating the switches are indicated by m' m^2 m^3 m^4, which are connected in series by a wire 3. The ends of this wire are connected with the + pole of the source of current b by a wire 5, the − pole being connected with a wire 4, connecting all the stations. If two suitable points of the wires 3 and 4 are conductingly connected with one another, the battery b will send current over the wires 5 and 3, connecting-wire 6, and also wire 4, so that the electromagnets m' m^2 m^3 m^4 on the wire 3 will be traversed by the current. If one of the stations wishes to communicate, it makes connection between the wires 3 and 4, preferably in such a way that the electromagnet of the communicating station itself is not thereby excited. Fig. 1 shows the connection between the wires 3 and 4 at the electromagnet m^3. It passes from the middle of the winding of the magnet m^3 over the wire 6 to the wire 4, whereby the battery b despatches currents which travel in the direction indicated by the arrows. As the half-windings of the electromagnet m^3 are traversed by currents of approximately equal strength in opposite directions, these magnets are only slightly excited; but the excitement in the other magnets takes place to the full extent, so that the switches are operated. The wire 4 may, as shown in Fig. 1 with dotted lines, be also replaced by the earth, and similarly, as shown in Fig. 2, a branch of the double wire 1 2 may be employed in place of the wire 5. In place of the connection of the wires 3 and 4 (shown in Fig. 1) in the middle of the coil or winding of one of the electromagnets this connection is in Fig. 2 effected at each of the two ends of the winding of the magnet of the communicating place or station in such a way that the former is short-circuited, and thus receives no current at all. The course of the current from the battery b is also indicated in this case by arrows.

Should the wire for connecting the ends of the wire 3 with the + pole of the battery b be dispensed with, two batteries of uniform size with similarly-named poles may be connected to the ends of the wire 3 in order to convey uniform potential to the said ends of the wire 3, the other poles of which batteries are then connected to the wire 4. This arrangement is shown in Fig. 3. b' and b^2 are two similar batteries, the + poles of which are connected to the ends of the wire 3 and their − poles to the wire 4. In the circuit thus formed no current can travel,

as the batteries b' and b^2 are opposed to one another, while if at a suitable point a bridge is made between the wires 3 and 4 the current in each of the two circuits thereby formed will travel in the direction indicated by the arrows. In Fig. 3 the bridge 6 extends between the wires 3 and 4 from the middle of the winding of the magnet m^3, so that, as shown in Fig. 1, only the other magnets are fully excited and the respective switches operated. As indicated in Fig. 3 by dotted lines, in this application the wire 4 may also be replaced by the earth or (see Fig. 4) be replaced by a branch of the double wire 1 2. In the latter figure the winding of the magnet m^3 is short-circuited by the bridges 6 and 7 laid thereon. The action of the currents which are thus caused to circulate on the magnets exactly corresponds to that described in connection with Fig. 2.

The current traveling during the continuation of the conversation from one of the four places in the wire 3 and in the auxiliary circuit may be utilized for feeding the microphone by coils being switched into the wire 3 in addition to the windings of the block-magnets m' m^2 m^3 m^4 at each place or station. These coils p, Fig. 5, serve as primary coils of the induction-coils of the microphone, and parallel to them the microphones c are switched on. The current traveling in the wire 3 is distributed in reverse proportion to the resistances over p and c. The resistance of c, and therewith the current distribution between p and c, is altered by speaking into the microphone c. The alterations of current on p are transmitted by induction to the secondary coils, and thus to the speaking-circuit. The microphone c may also be switched on in series with the coils p in the wire 3; but the arrangement hereinbefore described is preferable by reason of the resistances of the magnets contained in the wire 3.

The courses of the current of two speaking places provided with the blocking mechanism is shown in Figs. 6 and 7. They are provided with the usual arrangement of the microphone-circuit and not with the one shown in Fig. 5. The full lines correspond to the wires for the speaking and signaling currents. The dotted lines and broken lines belong to the auxiliary circuit for the block mechanism. It is assumed in the arrangement shown that two call-bells g^3 g^4, which at one end are connected with the earth, are provided on each of the two branches of the double wire 1 2, each of which bells answers to a current of different direction, so that the exchange has at disposal four different calls corresponding to the four places. This calling arrangement has no influence on the formation of the stop mechanism and can therefore remain out of consideration of the following specification equally with the arrangement for the actual speaking, which is similar to the arrangements usually employed. The lock mechanism shown corresponds to the arrangement described in connection with Fig. 3, the earth being used in place of the wire 4.

In Fig. 6 the locking device by making an earth-circuit is operated in the middle of the winding of the magnet m^3. By lifting the telephone-receiver f^3 from off the hook h^3 the latter rises, and thereby releases three springs d' d^2 d^3. The two former close the speaking and microphone circuits. The latter bears against the end of the wire 6, whereby this connects with the earth e^3 over the wire 9, arm a^2 of the switch u^3, and wire 8. A wire 6, in which is inserted a key t^3, the object of which will be described hereinafter, is in connection with the center of the winding of the magnet m^3, and thus the current of the battery b^2, Fig. 3, can travel to the earth through the right half of the winding of m^3 over the wires 6, 9, and 8. Similarly the current of the battery b', Fig. 3, can travel over the wire 3, and the left half-winding of m^3 also over the wires 6 9 8 to the earth, the lock-magnets of the other places or stations being excited and the corresponding switches operated. These switches consist, like u^3, of three arms a' a^2 a^3, connected with one another, and these arms are so connected with the armature x^3 of the magnet m^3 that when the armature is attracted the three arms a' a^2 a^3 are drawn away from their respective contacts. Thereby the respective stations are disconnected from the branch 1 of the double wire 1 2 and the way to the earth for the auxiliary circuit is interrupted. The consequence of this is that during the continuance of a conversation at a station or place the other places can neither hear nor be disturbed by being called, nor are they able to interfere with the locking. The locking which has taken place may be indicated to the locked places by a suitable visible signal being connected or combined with the interrupters u, which signal becomes visible when the locking takes place. In order to facilitate conversation between the speaking-places on the wire common to all, the following arrangement is adopted: The interrupter-key t^3 is inserted in the wire 6 and two springs o and n so connected with it that when the key t^3 is depressed o and n come in contact. The spring n is connected by a wire 11, in which the arm a^3 of the switch u^3 is inserted, with one end of the winding of the magnet m^3 and the spring o by wire 12 with the other end, so that on contact being made between o and n a short circuit of the magnet-winding results. A lock-pawl k^3 is also arranged on the key t^3, which pawl when the telephone-receiver is lifted off the hook is pressed against the key t^3 by a bevel-face formed on the rear end of the hook h^3, so that the key when depressed is retained by the nose of the pawl k^3. If one station or place on the wire common to all wishes to

have a conversation with another place on the same wire, the former communicates to the central his wish, and the telephone-receiver is again hung up and the person waits at the apparatus. The exchange calls up the desired subscriber and informs him that the calling subscriber desires to communicate with him. By lifting his receiver from the hook the called subscriber locked out all the other party-stations, including that of the calling subscriber. In order to enable the latter again to connect his telephone to the line, the called subscriber presses on his key corresponding to the key t^3. He thereby opens the party-circuit by disconnecting the wire 6 and his key t^3, whereby the instruments of all the subscribers are unlocked. This is the signal for the person waiting at the apparatus at the calling-place to now again lift off the receiver, and thereby in turn to again cause the locking or blocking of the other places. By the depression of the key t^3 at the called place the lock or block magnet m^3 belonging thereto will also be short-circuited, whereby the repeated blocking caused by the calling subscriber again lifting his receiver from off the hook has no effect on the first called place, so that conversation may take place between the two subscribers. On completion of the conversation the locking is released or removed by the suspension of the two receivers on the hooks in the ordinary manner. By depressing its key corresponding to the key t^3 each station or place can short-circuit its locking-magnet and therewith release its own locking or blocking. This is prevented by suitable means—as, for example, by interrupting one of the wires 11 or 12, whereby the short-circuiting of the magnet-winding is prevented. For this purpose an arm a^3, included in the circuit 11 n o 12, is mounted on the switch u^3, which breaks said circuit when the party-circuit is closed at one of the substations. In order not to interfere with the clearness of Fig. 6, the first-mentioned auxiliary means is not shown in the drawing.

Fig. 7 shows the course of the current of one station-place in which by the removal of the receiver f^4 from the hook h^4 the winding of the magnet m^4 is short-circuited and simultaneously connected to earth, whereby the lock mechanism comes into action at the other places. The spring d^3, released by the hook h^4, bears against the ends of the wires 6 and 7, which in turn are connected with the ends of the winding of the magnet m^4, and thereby, on the one hand, the said winding is short-circuited and, on the other hand, an earth connection is formed over spring d^3, wire 10, key t^4, wire 9, arm a^2, and wire 8 to the earth e^4. In consequence of this earth-circuit the current of the battery b' will flow over the magnets of the stations m' to m^3, exciting the former and also locking the latter. (See Fig. 4.) The current from the battery b^2 is short-circuited in this case over the wires 7, 10, 9, and 8, wherefore it is advisable to introduce a resistance w in the wire 7, which protects the battery b^2 from too strong a discharge. As in this case the current from the battery b^2 branches in reverse proportion to the resistances of w and m^4 over the latter, it is advisable to make the resistance w equal to those of the winding m^4 and to wind the former also on the magnet m^4, so that the two branch currents flow in opposite directions round the magnet, whereby the action of the same is destroyed, so that the magnet m^4 remains unexcited. This arrangement is shown in dotted lines in Fig. 7. It is only necessary for the first and last stations, but not for the intermediate ones, because between the battery and the intermediate station lie the magnet-windings of the outer stations, whereby a short circuit of the battery b^2 is avoided, which only comes into use when the said stations are in conversation one with another.

If in the method of switching shown in Fig. 7 one place wishes to speak to another which is connected with the wire common to all, the proceeding is exactly the same as was hereinbefore described in connection with Fig. 6. The short-circuit mechanism o and n, connected with the key t^3, is unnecessary in this arrangement, as the lock-magnet of the station to be called up is short-circuited by the wires 6 and 7 and also by the spring d^3, so that the locking-current exerts no action on it. As each subscriber short-circuits its magnets by lifting the receiver f^4 off the hook, and thereby can remove its blocking, the switch u^4 is here provided (in order to prevent this) with another arm corresponding to the arm a^3 in Fig. 6, which other arm when the armature x^4, Fig. 7, is attracted would interrupt the wire 6 or the hook h^4 were it not so locked by the attracted armature x^4 that it does not rise in spite of the removal of the receiver f^4 from the hook and cannot cause the short-circuiting of the magnet m^4.

In Figs. 6 and 7 it is assumed for the sake of simplicity that the blocking of the places which are not sharing in the conversation is effected by the switching off of the receiver from the wire 1 to the office. In telephone technology, however, a point is made of avoiding interruption contacts as far as possible. In the present case this is possible by operating the short-circuiting of the receiver through the switch of the locking device instead of switching off the receiver. A simple short circuit of the receiver has, however, the drawback that when the receiver is lifted off the suspension-hook at one of the places which are not sharing in the conversation a short circuit results between the branches 1 and 2 of the wire to the exchange, thus impeding the conversation of the conversing-places. This may be avoided by a resistance

w' being switched into the wire to the receiver f, (see Fig. 8,) which resistance is short-circuited by the arm a' of the switch u in alternation with the receiver f by the receiver at the blocked place being short-circuited and the resistance at the unblocked place.

Having thus fully described my invention, what I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination, with a main-line circuit, and a plurality of substation instruments connected to said main-line circuit, of a controlling device at each substation operating directly to render its substation instrument inoperative, an electric circuit including the controlling devices, mechanism at each substation arranged to regulate the admission of electric current to the circuit connecting said electric devices, and to render its own disconnecting device inoperative, and means at each substation arranged to prevent the operation of its own controlling device.

2. The combination, with a main-line circuit, and a plurality of substation instruments normally connected to said main line, of disconnecting devices at each substation arranged to disconnect said substation from the main-line circuit, mechanism at each substation arranged to operate the disconnecting devices of the other substations, means at each substation arranged to prevent the operation of its own disconnecting device, and connections intermediate said means and its disconnecting device for rendering said means inoperative upon the operation of its disconnecting device.

3. The combination, with a main-line circuit, a plurality of substation instruments normally connected to said circuit, a normally open party-circuit connecting said substations, and a source of electricity for energizing said party-circuit, of a disconnecting device at each substation arranged to disconnect its substation instrument from the main-line circuit, said disconnecting devices being arranged in series in said party-circuit, mechanism at each substation arranged to close the party-circuit and simultaneously to render its own disconnecting device inoperative, and independent means at each substation arranged to prevent the operation of its disconnecting device upon closure of the party-circuit at another substation.

4. The combination, with a main-line circuit, a plurality of substation instruments normally connected to said circuit, a normally open party-circuit connecting said substations, and a source of electricity for energizing said party-circuit, of a disconnecting device at each substation arranged to disconnect its substation from the main-line circuit, said disconnecting devices being arranged in series in said party-circuit, mechanism at each substation arranged to close the party-circuit and simultaneously to render its own disconnecting devices inoperative, independent means at each substation arranged to prevent the operation of the disconnecting device upon closure of the party-circuit at another substation, and connections between the said independent means and the corresponding disconnecting device of the respective substations whereby the said means is rendered inoperative upon the operation of its disconnecting device.

5. The combination, with a main-line circuit, a plurality of substation signal-receiving instruments normally connected to said main line, a normally open party-circuit connecting said substations and a source of electricity for energizing said party-circuit, of a disconnecting device at each substation arranged to disconnect its signal-receiving instrument, said disconnecting devices being included in the party-circuit, a telephone transmitting and receiving instrument at each substation, whose microphones are included in the party-circuit, and mechanism at each substation for connecting said transmitting and receiving instrument to the main-line circuit, closing the party-circuit and simultaneously rendering its disconnecting device inoperative.

6. The combination with a main-line circuit, and a plurality of substation instruments normally connected to said circuit, of a normally open party-circuit connecting said substations, a source of electricity arranged to send currents of different direction through different sections of the party-circuit, a disconnecting device at each substation arranged to disconnect its substation instrument from the main-line circuit, said disconnecting devices being included in series in the said party-circuit, and mechanism at each substation arranged to close the party-circuit and to render its own disconnecting device inoperative, whereby all the disconnecting devices except its own are operated to disconnect their respective substation instruments from the main-line circuit.

7. The combination, with a main-line circuit, and a plurality of substation instruments normally connected to said circuit, of a normally open party-circuit connecting said substations, a source of electricity connected to the main-line circuit and arranged to send currents of different direction through different sections of the party-circuit, a disconnecting device at each substation arranged to disconnect its substation instrument from the main-line circuit, said disconnecting devices being included in series in the said party-circuit, and mechanism at each substation arranged to close the party-circuit and to render its own disconnecting device inoperative, whereby all the disconnecting devices except its own are operated to disconnect their respective substation instruments from the main-line circuit.

8. The combination, with a main-line circuit, and a plurality of substation instruments normally connected to said circuit, of a normally open party-circuit connecting said substations, a source of electricity connected to the main-line circuit and arranged to send currents of different direction through different sections of the party-circuit, a disconnecting device at each substation arranged to disconnect its substation instrument from the main-line circuit, said disconnecting devices being included in series in the said party-circuit, and means at each substation to close the party-circuit and to render its own disconnecting device inoperative by connecting its disconnecting device to the main-line circuit.

9. The combination, with a main-line circuit, and a plurality of substation instruments normally connected to said circuit, of a normally open party-circuit connecting said substations, a source of electricity arranged to send currents of different direction through different sections of the party-circuit, a disconnecting device at each substation arranged to disconnect its substation instrument from the main-line circuit, an electromagnet for each disconnecting device and included in series in said party-circuit, and means at each substation to close the party-circuit and to render its own electromagnet inoperative, whereby all the disconnecting devices except its own are operated to disconnect their respective substation instruments from the main-line circuit.

10. The combination, with a main-line circuit, a plurality of substation instruments normally connected to said circuit, a normally open party-circuit connecting said substations, and a source of electricity for energizing said party-circuit, of a disconnecting device at each substation arranged to disconnect its substation instrument from the main-line circuit, said disconnecting devices being arranged in series in said party-circuit, mechanism at each substation arranged to close the party-circuit and simultaneously to render its own disconnecting device inoperative, and independent means at each substation arranged to reopen the party-circuit closed by said mechanism, whereby said disconnecting devices are again put into their normal non-operating position.

11. The combination, with a main-line circuit, a plurality of substation instruments normally connected to said circuit, a normally open party-circuit connecting said substations, and a source of electricity for energizing said party-circuit, of a disconnecting device at each substation arranged to disconnect its substation instrument from the main-line circuit, said disconnecting devices being arranged in series in said party-circuit, mechanism at each substation arranged to close the party-circuit and simultaneously to render its own disconnecting device inoperative, and independent means at each substation arranged to bridge its disconnecting device and to reopen the party-circuit closed by said mechanism, whereby the operation of its disconnecting device upon closure of the party-circuit at another substation is prevented and the disconnecting devices at the substations are again put into their normal non-operating position.

12. The combination, with a main-line circuit, a plurality of substation instruments normally connected to said circuit, a normally open party-circuit connecting said substations, and a source of electricity for energizing said party-circuit, of a disconnecting device at each substation arranged to disconnect its substation instrument from the main-line circuit, said disconnecting devices being arranged in series in said party-circuit, mechanism at each substation arranged to close the party-circuit and simultaneously to render its own disconnecting device inoperative, independent means at each substation arranged to bridge its disconnecting device and to reopen the party-circuit closed by said mechanism, and a key included in the bridging connection and operated by said disconnecting means to prevent the same from being bridged.

13. The combination, with a main-line circuit, and a plurality of substation instruments normally connected to said circuit, of a normally open party-circuit connecting said substations, a source of electricity included in said party-circuit, a disconnecting device at each substation arranged to disconnect its substation instrument from the main-line circuit, said disconnecting devices being included in series in the said party-circuit, mechanism at each substation arranged to close the party-circuit and to render its own disconnecting device inoperative, and means at each substation to prevent the operation of said mechanism after closure of the party-circuit at another station.

14. The combination, with a main-line circuit and a plurality of substation instruments normally connected to said main-line circuit, of a disconnecting device at each substation and arranged to disconnect said substation from the main-line circuit, said disconnecting device including a resistance and means to insert said resistance between the receiver and the main-line circuit, and mechanism at each substation arranged to operate the disconnecting devices of the other substations.

In testimony whereof I affix my signature to this specification in the presence of two witnesses.

GEORG RITTER.

Witnesses:

RUDOLF BRECHT,

WALTER SCHWAEBSCH.