H. G. WEBSTER.

COMBINED TELEPHONE AND ALARM SYSTEM.

APPLICATION FILED SEPT. 17, 1904.

**1,025,347.**

Patented May 7, 1912.

2 SHEETS—SHEET 1.

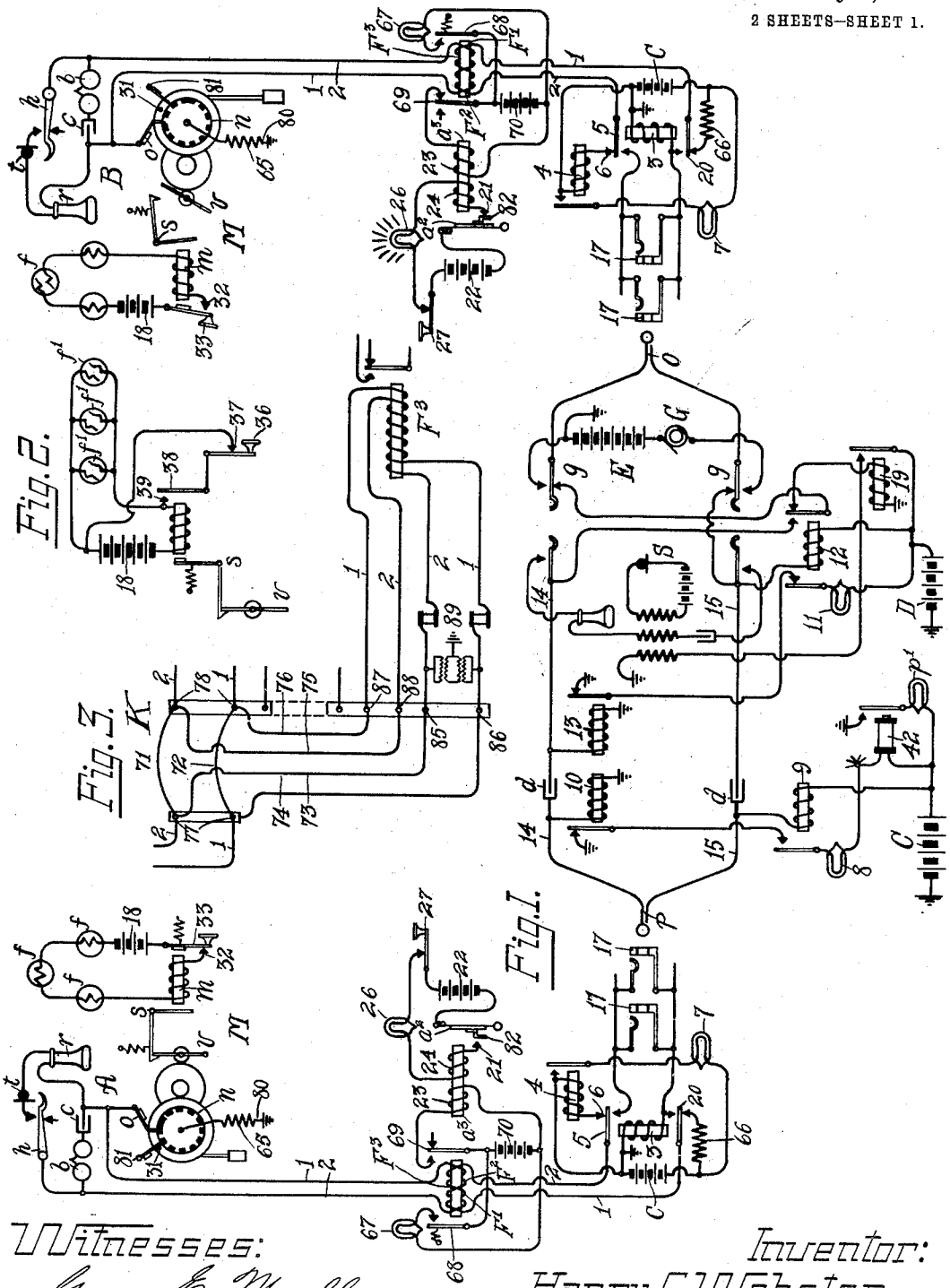

Fig. 2.



Fig. 3.



Fig. 1.

Witnesses:

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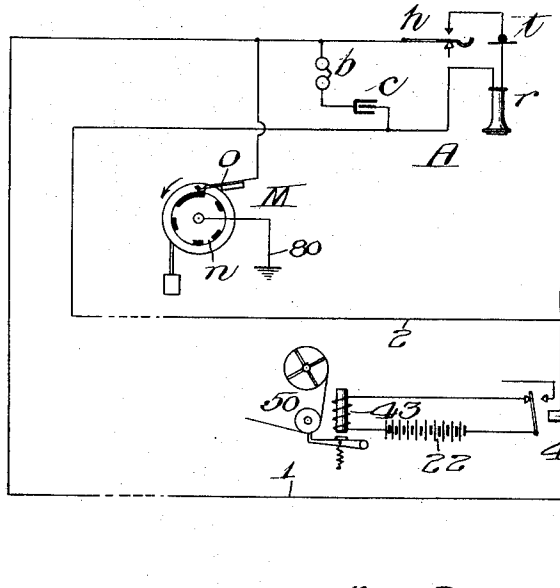



Fig. 4.




Fig. 5.

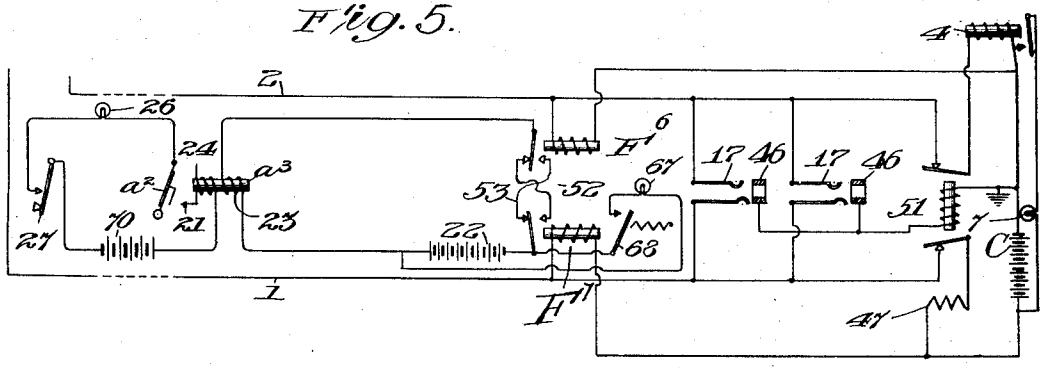
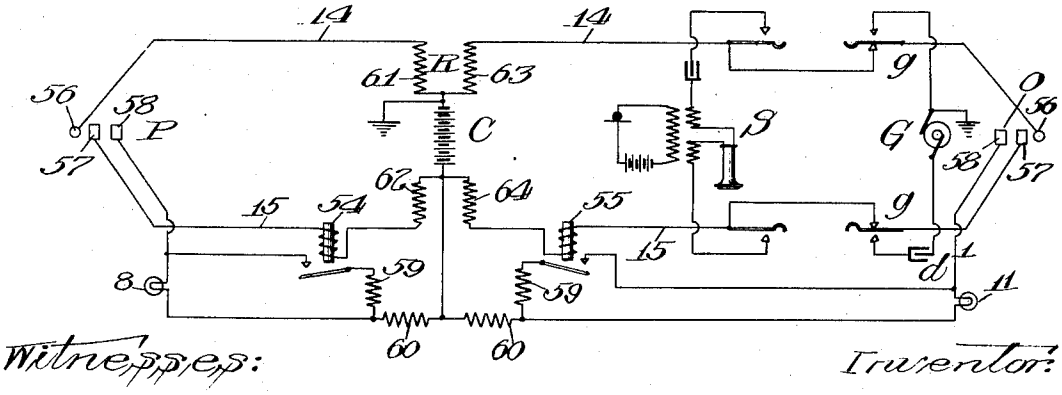



Fig. 6.

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# UNITED STATES PATENT OFFICE.

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## COMBINED TELEPHONE AND ALARM SYSTEM.

1,025,347. Specification of Letters Patent, Patented May 7, 1912.

Application filed September 17, 1904. Serial No. 224,869.

*To all whom it may concern:*

Be it known that I, HARRY G. WEBSTER, a citizen of the United States of America, and a resident of Chicago, county of Cook, and the State of Illinois, have invented certain new and useful Improvements in a Combined Telephone and Alarm System, of which the following is a full, clear, concise, and exact description, reference being had to the accompanying drawings, forming a part of this specification.

My invention relates to systems in which metallic telephone line circuits, extending from a telephone exchange to subscribers' stations and adapted to be inter-connected for conversation, are also utilized for the transmission of fire, burglar, or other alarm signals, distinct from the telephone signals. It is evident that when such telephone circuits can be successfully utilized for alarm signals, as well as for telephone exchange service, great economy in construction and maintenance may be effected over arrangements in which separate circuits are used for the two classes of service. In such combined systems, while the alarm circuits are seldom used for transmitting alarm signals, it is necessary that they should always be in readiness for such use; and such signals must be indicated at the alarm receiving station without error or loss of time. While the line circuit must be normally available for all requirements of telephone exchange service, it is necessary that an alarm signal shall have precedence and be instantly and successfully transmitted without regard to any telephonic use of the circuit at the time such signal is required. It is desirable that the alarm indication be displayed at a station separate from the telephone exchange switchboard and be permanently maintained until acted upon by the person in charge, in order to avoid delay and confusion; and means should be provided by which the accidental grounding of the circuit shall give an indication at the alarm receiving station distinguishable from that of an alarm signal. The alarm sending mechanism, when once started, must continue its operation until the signal is given at the alarm receiving station, and the signal receiving mechanism must be of such character that an alarm signal will only be indicated in response to the operation of the alarm sending mechanism. The indication itself should be positive in character and preferably of such a nature that the indicating devices for all circuits may be grouped together in a compact and easily observed arrangement. Under normal conditions, the alarm sending and alarm receiving mechanism must not interfere with telephonic transmission or signaling and must, therefore, be so arranged that the circuit conductors shall not include excessive resistance or impedance, and that their electrical balance may be maintained. It is also desirable that any alarm receiving mechanism may be associated with any line circuit of the telephone exchange system in a systematic and workmanlike manner and that such association may be made without disturbing the permanent wiring of the exchange system.

The object of my invention is to provide means by which certain or all of the line circuits of a telephone exchange system may be utilized for transmitting alarm signals, in an organization adapted to meet the conditions outlined in the preceding paragraph.

In accordance with my invention in its preferred form I associate with the regular line circuit of a central battery telephone exchange system, electro-magnetic mechanism controlled by two energizing windings, one for each limb of the line, and adapted to cause the display of an alarm signal indication. The arrangement of the windings and mechanism is such that when current, flowing through the line circuit, is of equal strength in its two limbs, the effect of the two windings will be opposing and equal, and the alarm indicating device remain in the same normal condition as when no current is flowing. If, however, all or a portion of the current in one line limb be diverted, the energizing effect of its corresponding winding will be lost and the mechanism will operate to cause an alarm indication. The alarm indicating device may be of the nature of an ordinary telegraphic register, or a mechanical signal or similar device, controlled directly or indirectly by the action of the electro-magnetic mechanism; but I preferably employ a small incandescent lamp in a local circuit, the lamp being illuminated to indicate an alarm. Alarm sending apparatus, located at the point at which protection is desired, is associated with the line circuit and may consist of the spring driven make and break

mechanism of the ordinary district messenger box, or other similar device, arranged to be released manually, or electrically through the opening or closing of a local circuit. Its construction and electrical connection is such that when released, one or both limbs of the line circuit will be intermittently connected in a pre-determined manner to ground, or to a return conductor from the central battery of the system, thus causing a flow of current in one limb of the line in excess of that in the other; and the sending mechanism, when once released, will continue to operate for a sufficient length of time to give the required signal.

I will describe my invention more particularly by reference to the accompanying drawings in which—Figure 1 is a diagram illustrating two subscribers' lines extending in metallic circuit from sub-stations to a central battery telephone exchange switchboard, with the connecting cord and accessory apparatus, the system being organized and equipped in accordance with a preferred form of my invention. Fig. 2 illustrates a modification, of the local circuit arrangement at the alarm sending station, by which the releasing apparatus is controlled. Fig. 3 indicates means for associating the alarm receiving mechanism with various telephone line circuits without disturbing the permanent wiring. Figs. 4 and 5 illustrate further modifications of my invention in a line circuit arrangement of the three-wire type, and Fig. 6 indicates well-known cord connecting apparatus used with such line circuits.

Like characters refer to corresponding parts in the several drawings.

Referring to Fig. 1, the subscribers' stations A and B are provided with the usual apparatus, adapted preferably for use with a central source of current supply and comprising a receiver $r$ and transmitter $t$, in a circuit which normally stands open at the hook switch $h$; the bell $b$ and condenser $c$ being in permanent bridge of the line. The limbs 1 and 2 of the line extend to the central office and are there connected, limb 2 through the contact 5—6 of the cut-off relay 3, the winding of line relay 4 and to the ground side of the battery C; and limb 1 through resistance 66, contact 20 of the relay 3 to the live side of battery C. The subscriber in calling raises his receiver and completes the low resistance circuit including his transmitter and hook switch contact, to actuate the relay 4, lighting his line lamp 7. Upon the insertion of an answering plug P, the operation of relay 3 cuts off the ground and the relay 4, extinguishing the line lamp and connecting the line limbs to the jacks 17, and thence to strands 14 and 15 of the cord circuit. Current is now supplied to the line A from battery C through relays 9 and 10, which control the circuit of the supervisory lamp 8, the lamp remaining dark as long as current flows through relay 10. The operator tests, plugs in and rings a wanted subscriber in the usual way, with calling plug O and ringing key $g$, $g$. While ringing, the relay 3 is energized by current from battery E and generator G, and after the ringing key is released, relay 12 and relay 3 of line B are energized by current from battery D. The relay 12, when thus actuated, cuts off the test relay 19, and completes the circuit of strand 14 through its contacts; and also completes the circuit of supervisory lamp 11. When a called subscriber answers, current is furnished his instrument through relays 12 and 13; and the energization of relay 13 opens the circuit of lamp 11, causing its effacement as long as the subscriber's hook switch contact remains closed. The subscribers are now able to converse over strands 14 and 15, which include the condensers $d$ $d$ of the cord circuit. The hanging up of both receivers deprives the relays 10 and 13 of current, thus allowing them to complete the circuits of lamps 8 and 11, which, being illuminated, constitute the disconnect signal. This is the regular telephonic operation of the system, and is not interfered with by the presence of the alarm apparatus associated with any of the lines.

Those lines which are to be utilized for alarm service, are provided with windings $F^1$ and $F^2$ of relay $F^3$, included in the two limbs respectively and so arranged as to present little or no impedance to currents therein in any well known manner. This relay controls by its contacts a secondary circuit which includes the winding 23 of the electromagnet $a^8$.

At the alarm sending station, make and break mechanism is provided, which may be controlled manually or automatically; in the structure indicated its release is determined by the circuit of battery 18. Normally this circuit is closed through fusible cut-outs or other thermostatic devices indicated at $f$ and includes the winding of magnet at $m$ and the contact 32 of key 33. The energization of this magnet holds the said contact closed and also causes the armature lever $s$ to engage the fan-governor $v$ of the make and break wheel, preventing its operation. In case an alarm is to be given, the opening of the circuit at the devices $f$ deënergizes the magnet $m$, the armature lever $s$ is retracted by its associated spring, releasing the mechanism and allowing the make and break wheel $n$ to revolve. The contact brush $o$ is connected with limb 1 of the line and normally rests upon an insulated portion or wheel $n$, but as this wheel revolves the brush is brought into intermittent contact with its uninsulated portion and a circuit of limb 1

is thus completed to ground 80. The de-energization of magnet *m* has also released the lever of key 33, causing another break in the local circuit at contact 32 and a subsequent closure of the circuit at *f* will not affect magnet *m*, and the make and break mechanism will thus continue to operate until brought to rest by the engagement of stop 31 with its associated arm 81.

Returning to the alarm indicating apparatus, the electromagnet or relay $F^3$ has two energizing windings, $F^1$, $F^2$, one included in each line limb respectively, and these windings are connected differentially as indicated, so that when no current flows through the line limbs or when the current in line limbs is of the same strength in which case the magnetic effect of one winding is neutralized by that of the other, the magnet remains deënergized. Magnet $F^3$ by its contact 69 directly controls the circuit of magnet $a^3$. Magnet $F^3$ has an additional armature 68 which may be so arranged or adjusted as to be only attracted when the relay is energized to a considerable extent. It will also be noted that a resistance 66 is included between battery C and limb 1, and that the relay 4 which controls the telephone line signal 7, is associated with limb 2 of the line and the grounded side of the battery, the purpose of the resistance 66 being to prevent an excessive flow of current to the line in case of an accidental ground.

If the telephone at the substation be not in use and the alarm sending device be actuated, the intermittent grounding of limb 1 through the contact maker *o* to ground 80 causes a preponderating energization of the winding associated with limb 1 and energizes the magnet $F^3$ sufficiently to actuate its armature 69, this circuit being traced from ground 80, resistance 65, through brush O, line limb 1 and its associated winding F of relay $F^3$, contact 20, resistance 66 to the live pole of battery C. Due to the intermittent closing of this circuit, magnet $F^3$ is sufficiently energized to vibrate its armature 69, thus opening and closing the circuit through winding 23 of magnet $a^3$. Owing, however, to the resistance of the ground circuit through resistance 65, the magnet $F^3$ is not at this time sufficiently energized to attract its armature 68. If, however, either during the use or disuse of the telephone A, limb 1 should become directly connected to earth as through an accidental ground, a comparatively strong current would then flow from battery C through the winding of relay $F^3$ associated with limb 1, and the direct earth connection, while, as will be well understood, little or no current would be present in limb 2 and its corresponding winding. Consequently, the magnet $F^3$ will be energized to a comparatively great extent. This energization would, therefore, cause the attraction of armature 68 completing the circuit of lamp 67 and causing its illumination, which would constitute a ground alarm signal. Such an accidental ground connection, would of course cause the attraction of armature 69, and even though it be of intermittent character it would not cause the illumination of lamp 26 unless the makes and breaks corresponded precisely to and continued for a period of a sufficient time to cause a complete attraction of armature $a^2$.

The magnet $a^3$ is provided with a vibrating armature $a^2$ arranged to respond to impulses of a frequency corresponding to those set up by the alarm sending apparatus but to no others. Arrangements of this character are well known and it has not been deemed necessary to illustrate the arrangement other than conventionally. The armature $a^2$, however, is provided with a contact 82, which when the armature has reached its full range of vibration, will engage contact 21 and complete a circuit of battery 22 through winding 24, lamp 26 and key 27, causing the illumination of the lamp and the permanent engagement of contacts 21, 82. The arrangement of this magnet $a^3$ with its vibrating armature is also such that a definite number of impulses is required before the armature will reach its full range of vibration, the number being that caused by the predetermined revolution or revolutions of the make and break wheel *n*.

The normal condition of substation A and its associated line circuit and apparatus is shown at the left hand of the drawing, while the operated condition of the same apparatus, as well as that of the alarm sending apparatus M, is indicated at the right of the drawing in connection with the line B, the assumption being in both cases that the subscriber's telephone is not in use during the sending of the alarm signal.

It is thus seen that the actuation of the alarm sending device N causes the illumination of lamp 26 indicating an alarm, while an accidental direct ground upon limb 1 (and this holds good of limb 2 as well, while the telephone is in use) causes the display of a special signal, the lamp 67, to indicate such ground. It will be further noted that by the association of the relay 4 with that line limb coming from the grounded side of the central battery, the operation of the alarm sending apparatus or an accidental grounding of the line circuit, will not cause the illumination of the telephone line lamp 7, and such a false signal is consequently prevented.

The windings of relay $F^3$ may be of the type known as twin windings or of superposed windings, and being differentially connected, the arrangement is one well known to the art whereby the magnet may

be introduced into a telephone circuit without presenting undue impedance to the rapidly alternating telephonic currents. Such an arrangement is also one which is desirable by reason of its freedom from tendency to unbalance the two line limbs.

In the operation of the alarm sending device as described it was assumed that the substation telephone was not in use. Assuming now that the substation telephone is in use when such an alarm is to be sent, the operation is somewhat different. With the telephone at A in use, a current is flowing from battery C, or from the cord circuit battery, or from the source of ringing current over both line limbs. This current, being substantially of equal strength in each limb, will energize the two windings of the magnet $F^3$ to an equal extent, and being differentially connected, the magnet will remain inert. If now the alarm sending apparatus at M be actuated, a circuit is intermittently closed from limb 1 to ground 80 through resistance 65, and this circuit will cause an increased flow of current through limb 1 and divert a portion of the current which was previously flowing from limb 2. That winding associated with limb 1 will therefore have a preponderating effect over the other winding and cause the energization of the magnet, thereby making or breaking the local circuit, each time, of battery 22 and causing an alarm indication as before.

By properly constructing the relay $F^3$, its operation will be effected whether the current in the line is that resulting from its normal connection with batteries C or D, or from its connection with generator G and battery E during the process of ringing; such construction being simply that which is necessary to adapt the armatures to respond to the fluctuating ringing current and being well known to those skilled in the art.

The display of signal 26 of course attracts the attention of the attendant who after recording the call, by opening the contact of key 27 interrupts the circuit of relay $a^3$ allowing it to deënergize and open the circuit of signal 26, at contacts 21, 82.

Fig. 2 illustrates a modification of the local circuit arrangement of Fig. 1 by which the alarm sending apparatus M is controlled. In this arrangement, the circuit of battery 18 which includes magnet $m$ is normally open at the thermostats or other circuit controlling devices indicated at $f^1$. If, through the operation of heat, the circuit is closed at either of these points, the magnet $m$ becomes energized, actuating the releasing lever $s$ and allowing the fan governor $v$ to revolve. At the same time, the armature 38 is attracted and completes another circuit of battery 18 and magnet $m$ through contact 37 of key 36, and it will be evident that through the continuing energization of magnet $m$, this circuit will remain closed and the releasing lever $s$ held out of engagement with the governor $v$ until the circuit is broken at the key 36. This arrangement will insure, therefore, the continued operation of the make and break device even though the device $f^1$ be only closed for an instant.

Fig. 3 indicates means by which any line of a telephone exchange system may be provided with the special alarm apparatus. The two limbs of the line enter the exchange, terminate in a customary manner upon the distributing rack K at terminals 77 and are ordinarily carried through this rack by jumper wires indicated at 71 and 72 to terminal 78 and thence by permanently connected wires to the other apparatus of the switchboard system. The energizing windings of the alarm receiving mechanism are permanently wired to terminals 85, 86, 87 and 88 of the same or an adjacent section of the distributing rack, and are provided with the customary protective apparatus indicated at 89. In case it is desired to associate these windings with any particular line, the flexible jumper wires are removed and the connections are made by two pairs of jumpers, as indicated at 73, 74, 75 and 76. In case it were desired to shift these energizing windings and their associated mechanism (in this case, the electromagnet $F^3$) to some other line, it would only be necessary to disconnect these removable jumpers from the terminals 77 and 78 and transfer them to the corresponding terminals of the line to which the apparatus is to be shifted, removing its jumpers 71 and 72, as previously described. It will thus be understood by those skilled in the art that this arrangement provides means whereby any set of alarm receiving mechanism with its associated alarm indicating device may be interchangeably connected with any telephone line circuit of the system in a neat and workmanlike manner and without disturbing any of the permanent wires.

In Figs. 4, 5 and 6 are indicated modifications of my invention embodied in a well known telephone exchange system of what is known as the three-wire type. This system differs from that of the previous drawings in that the cut-off relay 3, associated with one limb of the talking circuit, is replaced by a cut-off relay 51 which is included in a strictly local circuit having separate spring jack terminals 46 and corresponding plug terminals 58. In its telephonic operation, the subscriber calls in the usual manner by removing his receiver from its hook switch, thus completing a circuit of battery C through line relay 4, contacts of the cut-off relay 51, the line limbs, the hook switch contact and the resistance 47, thus energizing the relay 4 and lighting the telephone line lamp 7. When the opera-

tor inserts a plug, a circuit for the cut-off relay is completed from battery C through resistance 60, lamp 8, plug and jack contacts 58—46, through the winding of relay 51 to the return side of the battery, thus energizing the relay and under normal conditions causing the lamp 8 to light. Through the insertion of the plug, the current of battery C is now furnished to the line through the windings 61 and 62 of repeating coil R, cord strands 14 and 15 and plug contacts 56 and 57 which engage corresponding contact pieces of the jacks 17; and the subscriber being at his telephone, the relay 54, which is included in strand 15, is energized, and by its contacts completes a circuit in shunt of lamp 8 which includes the resistance 59 and causes the extinguishment of the lamp. The operator listens, tests and rings in the well known manner and, by plugging in, completes a similar circuit for the subscriber who is to be called, which includes the windings 63 and 64 of the repeating coil. The subscribers' circuits are thus inductively united for conversation by means of the repeating coil instead by condensers, as in the system of Fig. 1. Either subscriber can cause the illumination of his supervisory lamp 8 or 11 by actuating his hook switch, thus energizing or deenergizing the relay 54 or 55, the illumination of both lamps constituting the customary disconnect signal. The manipulations of the operator and subscriber and the action of the signals governed thereby are thus seen to be the same as in the system previously illustrated.

The action of the alarm apparatus corresponds as well, and while the two energizing windings might be serially included in the two line limbs; as indicated in the other drawings, the system under discussion differs in that it illustrates the windings as being in bridge of the two limbs, Fig. 4 showing the two windings controlling the same magnet and Fig. 5 showing them as controlling two separate magnets. Referring to Fig. 4, it will be seen that limb 1 is connected to the active side of battery C through winding 48 of magnet $F^5$ and through the winding of the line relay 4, and that limb 2 is connected to the grounded side of the battery by means of winding 49 of the magnet $F^5$ and also through resistance 47 which, in order to make the normal current through windings 48 and 49 of substantially equal value, must correspond to the resistance of relay 4. Upon the insertion of a plug, resistance 47 and relay 4 being now disconnected from the line limbs, current is furnished to the line through windings 61 and 62 of the repeating coil R of the cord circuit, and these windings being of substantially equal resistance, the normal current through windings 48 and 49 is still of substantially equal strength in each. During the process of ringing, the circuit of generator G includes the condenser $d^1$; and while such inclusion will not interfere with the actuation of the subscriber's bell $b$ in circuit with the condenser $c$, it will prevent a flow of current through the windings of the relay $F^5$ sufficient to actuate the relay. The windings 49 and 48 being in opposition, the magnet will remain unenergized under all of these conditions; and as will be readily understood from the foregoing descriptions, when the alarm sending mechanism at M is actuated, the intermittent grounding of limb 1 of the line will allow the passage of a current through winding 48 of the electromagnet of sufficient strength to cause the display of an alarm indication. While the conventional telegraph register is indicated at 50 in this figure, it is to be understood that other alarm indicating devices may be substituted therefor.

Fig. 5 differs from Fig. 4 in that the two energizing windings are associated with separate electromagnets $F^6$ and $F^7$, and it will be readily understood from the diagram that in case the current in both line limbs 1 and 2 is of the same value, the consequent energization of both magnets will keep the circuit controlling the alarm indicating device in its normal open condition. If, however, the circuit of limb 1 is intermittently closed, the consequent energization of magnet $F^7$ will control the local circuit in a manner to give the required alarm signal. Also, if current be flowing in both line limbs, as during the use of the telephone, the application of the ground 80 through the action of the alarm sending mechanism M will cause the intermittent deënergization of magnet $F^6$ to produce the corresponding alarm signal. Fig. 5 also differs from Fig. 4 in the character of the alarm indicating device. The latter is the same as that illustrated in Fig. 1, except that armature 68 is placed on the relay connected to limb 1, and the corresponding reference characters have been used. Its operation is the same so far as the alarm signal is concerned and therefore need not be redescribed.

It will be understood by those skilled in the art that the relays 54 and 55, included in strands 15 of the cord circuit, may be made of sufficiently low resistance to prevent unbalancing the windings 48 and 49 of relay $F^5$. It is to be understood that the various batteries, C, D, E, of the drawings may be one and the same battery, and that the various grounds indicated are, or may be, replaced by a common return wire, connected with the return side of the central office battery.

It will be evident to those skilled in the art that many modifications may be made which will embody all or some of the features of

my invention, and I, therefore, do not wish to be limited to the precise structures shown and described.

Where the term, "permanent indication," or "permanent alarm indication" occurs, it is to be understood as an indication which is not of a transient nature, but one which remains permanent until acted upon by the proper person.

I claim:—

1. A combined telephone and alarm system comprising a circuit extending from a substation to a central station, a central source of current having a grounded terminal, telephone signal receiving means having an energizing winding included in said circuit between said grounded terminal and said substation, means under the normal control of the subscriber for causing said telephone signal receiving means to display its signal, means for holding conversation over said circuit between said stations, alarm signal receiving means associated with said circuit, means for causing said alarm receiving means to display its signal in response to the grounding of said circuit at a point outside of the central station, whereby a false display of the telephone signal is prevented, and means associated with said alarm receiving means for indicating a ground on said circuit.

2. A combined telephone and alarm system comprising a circuit extending from a substation to a central station, a central source of current having a grounded terminal, telephone signal receiving means having an energizing winding included in said circuit between said grounded terminal and said substation, a resistance included in said circuit between the live pole of said source of current and said substation, means under the normal control of the subscriber for causing said telephone signal receiving means to display its signal, means for holding conversation over said circuit between said stations, alarm signal receiving means associated with said circuit, means for grounding said circuit at a point outside of the central station to cause the operation of said signal receiving means.

3. A combined telephone and alarm system comprising a circuit extending from a substation to a central station, a central source of current having a grounded terminal, telephone signal receiving means having an energizing winding included in said circuit between said grounded terminal and said substation, a resistance included in said circuit between the live pole of said source of current and said substation, means under the normal control of the subscriber for causing said telephone signal receiving means to display its signal, means for holding conversation over said circuit between said stations, alarm signal receiving means associated with said circuit, means for grounding said circuit at a point outside of the central station to cause the operation of said signal receiving means, and means associated with said alarm receiving means for indicating a ground on said circuit.

4. A combined telephone and alarm system comprising a circuit extending in two line limbs from a substation to a central station, a connection terminal in which said line limbs terminate, a link-circuit for establishing connection with said terminal, means for holding conversation over said line-and link-circuits, a central source of current, telephone signal receiving means having an energizing winding included between one pole of said source of current and one line limb, a resistance included between said other pole and line limb, alarm receiving apparatus having an energizing winding associated with each line limb, and means for causing the actuation of said telephone signal receiving means and said alarm receiving means.

5. A combined telephone and alarm system comprising a normally open circuit extending in two line limbs from a substation to a central station, a connection terminal in which said line limbs terminate, a link-circuit for establishing connection with said terminal, means for holding conversation over said line-and link-circuits, a central source of current, telephone signal receiving means having an energizing winding included between one pole of said source of current and one line limb, a resistance included between said other pole and line limb, alarm receiving apparatus having an energizing winding associated with each line limb, and means for causing the actuation of said telephone signal receiving means and said alarm receiving means.

6. A combined telephone and alarm system comprising a circuit extending in two limbs from a substation to a central station, a connection terminal in which said line limbs terminate, a link-circuit for establishing connection with said terminal, means for holding conversation over said line-and link-circuits, a central source of current, telephone signal receiving means having an energizing winding included between one pole of said source of current and one line limb, a resistance included between said other pole and line limb, alarm receiving apparatus having an energizing winding associated with each line limb, means for causing the actuation of said telephone signal receiving means and said alarm receiving means, and means associated with said alarm receiving means for indicating a ground on the line.

7. A combined telephone and alarm system comprising a normally open circuit extending in two line limbs from a substa-

tion to a central station, a connection terminal in which said line limbs terminate, a link-circuit for establishing connection with said terminal, means for holding conversation over said line-and link-circuits, a central source of current, telephone signal receiving means having an energizing winding included between one pole of said source of current and one line limb, a resistance included between said other pole and line limb, alarm receiving apparatus having an energizing winding associated with each line limb, means for causing the actuation of said telephone signal receiving means and said alarm receiving means, and means associated with said alarm receiving means for indicating a ground on the line.

8. A combined telephone and alarm system including a telephone line, an alarm receiving device, electromagnetic means for controlling said device including energizing windings connected each to a limb of the telephone line, telephone signal receiving mechanism including a line relay connected in parallel with one of said windings, alarm sending means for operating said electromagnetic means to actuate said alarm receiving device, and means for energizing said line relay and operating the telephone signal receiving mechanism.

9. A combined telephone and alarm system including a telephone line extending to an exchange, a central battery at said exchange, an alarm receiving device, electromagnetic means for controlling said device including energizing windings connected respectively between opposite poles of said battery and the limbs of said line, a line relay in circuit with said line and battery in parallel with one of said windings, alarm sending means for operating said electromagnetic means to actuate said alarm receiving means, means for operating said line relay and a signal controlled by said relay.

In witness whereof, I hereunto subscribe my name this 6th day of September, A. D. 1904.

HARRY G. WEBSTER.

Witnesses:
CAROLYN WEBER,
L. D. KELLOGG.