S. B. HESS.

ELECTRICAL ALARM SYSTEM.

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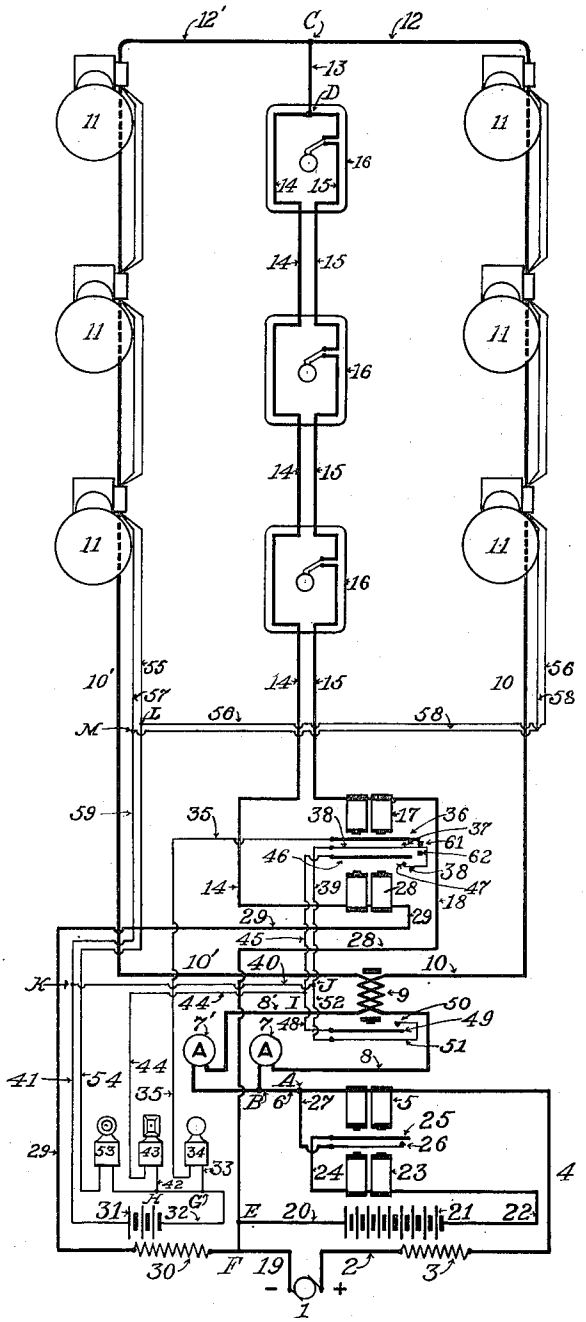
1,188,653. Patented June 27, 1916.



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ELECTRICAL ALARM SYSTEM.

1,188,653. Specification of Letters Patent. Patented June 27, 1916.

Continuation in part of application Serial No. 849,703, filed July 8, 1914. This application filed November 12, 1914. Serial No. 871,654.

To all whom it may concern:

Be it known that I, SIMON B. HESS, a citizen of the United States of America, and resident of the borough of Manhattan, in the county of New York and State of New York, have invented certain new and useful Improvements in Electrical Alarm Systems, of which the following is a specification.

My invention relates broadly to the operating of open and closed circuit signaling systems, such as fire alarms, burglar alarms and similar battery current operated apparatus, by means primarily of a supply of current obtained from high or low potential illuminating or power systems, such as is generated at a central station for distribution to consumers. An aim is to provide a system wherein a main source of supply is normally adapted to pass current through said circuit, to be active thereupon and therethrough and therein to perform all of the functions that are usual and normal to said circuit; a system wherein, in the event of the cessation or failure of the main current supply from any cause whatever, a second or reserve source of current supply shall be automatically and effectively connected with said circuit and become active thereupon and therethrough, and perform all of the functions that are usual and normal to said system. There is also provided means for establishing or sounding various trouble-alarms, which are preferably characteristically dissimilar.

As in large installations quite a number of transmitting and signaling devices are employed, it has been the practice heretofore to use for the operation of such systems battery sets having a large number of cells. These large battery sets require constant attention, aside from which they are a considerable source of expense and the cause of a number of unavoidable so-called "faults" in the system, such as a sudden failure of the battery due to any one of a number of causes, as well as considerable sparking at points of contact and consequent impairment or destruction of said contacts by the attendant arc.

It is an object of this invention to provide a system wherein there is eliminated all of the troublesome features of battery systems, and all the objectionable as well as the unsafe features connected with the operation of what may be termed low-tension apparatus from high-voltage or high-tension illuminating or power circuits, thereby making their utilization in this connection entirely economical and safe and an improvement over battery-current operation.

Objects and aims of this invention more or less broad than those stated above, together with their inherent advantages, will be in part obvious and in part specifically referred to in the course of the following description of the elements, combinations of means, arrangements of parts, and applications of principles constituting this invention, and the scope of protection contemplated will appear from the claims. I attain these objects and aims in the present embodiment by means of the circuits, devices, apparatus, resistances and sources of current supply illustrated in the accompanying drawing, which is to be taken as a part of these specifications, and constitutes a diagrammatic disclosure of the said embodiment.

Referring now to the accompanying drawing, there is shown a source of current, as a dynamo 1. Tracing what may be termed the main circuit as it begins at the positive terminal of the dynamo, said circuit passes through the wire 2, the resistance 3, the wire 4, the magnets 5 to the point A, the wire 6, to the point B, dividing at the point B into two branches which go through the ammeters 7 and 7′, the wires 8 and 8′, the neutral relay 9, the wires 10 and 10′, the electro-mechanical, vibrating or single-stroke, direct-acting gongs 11, 11, 11, etc., the wires 12 and 12′, to the point C, where the wires 12 and 12′ unite in the wire 13, said wire 13 at the point D dividing again into the wires 14 and 15.

The wire 15 passes through the usual stations, signaling boxes, or signal sending devices 16, 16, etc., through the magnets 17 and the wire 18, to the point E, then to the point F, and then through the wire 19, to the negative terminal of the dynamo 1.

The second or reverse source of current (here shown as battery 21) is connected to the point E on the wire 18 through the wire 20, and to the point A (located on the

drawing just below the ammeters 7, 7') through the wire 22, the magnets 23, the wire 24, the armature 25, the contact 26 (when the armature is maintained by the magnets 23 in touch with said contact, as would be the situation were said battery 21 functioning), and wire 27, the battery 21 being thus arranged to deliver current to the main circuit in the same direction as the main source of current 1.

Starting from the point D (located on the drawing at its middle top), a branch of the circuit passes through the wire 14, the magnets 28, the wire 29, the resistance 30, to the point F, and thence through the wire 19 to the negative terminal of the dynamo 1.

From the local or trouble battery 31, a first trouble circuit passes through the wire 32 to the point G, thence through the wire 33, the vibrating bell 34 and the wire 35 to the armature 36 of the magnets 17, thence to the contact 37 (when and only when, however, magnets 17 do not receive current), thence through the spring 38 and the wire 39 to the point J, thence through the wire 40 to the point K, and thence through the wire 41 to the battery 31. This constitutes the signal circuit to indicate by the functioning of bell 34 that there is no current at all being delivered from battery 21 or dynamo 1, due to broken wire, open fuses, or failure of both sources.

From the local or trouble battery 31, a second trouble circuit passes through the wire 32 to the point H, thence through the wire 42, the vibrating bell 43, and the wire 44 to the point I. At this point, the present circuit divides, one side passing by way of the wire 45 to the armature 46, the contact 47 on the extension of the spring 38 (when the magnets 28 are, as is abnormal, receiving current), thence through the wire 39 to the point J, thence through the wire 40, to the point K, thence through the wire 41 back to the battery 31. This constitutes the signal translating circuit, as well as the trouble signal, to indicate a fault on the signal sending device circuit or the circuit including the wire 15.

From the point I another circuit for vibrating bell 43 passes to and through the wire 48 and the armature 49 of the neutral relay 9, thence to the contact 50 on the spring 51 (when and only when, however, the said relay functions, in accordance with its design, upon a failure of current either in the circuit including the wire 10 or in the circuit including the wire 10'), thence through the wire 52 to the point J, thence through the wire 40 to the point K and thence through the wire 41 to the battery 31. This constitutes the signal circuit for indicating an open circuit on the gong circuit or other disturbance, as a ground or shunt thereon.

From the local or trouble battery 31, a third trouble circuit passes through the wire 32 to the vibrating bell 53, and thence through the wire 54 to the point L, where it divides into the wires 55 and 56. Both wires follow the gong wires 10' and 10 as shown and pass through the gongs 11, 11, etc., returning by way of the wires 57 and 58 to the point M, where said wires 57 and 58 join, thence through wire 59 to the point K, and thence through the wire 41 back to the battery 31. This constitutes the gong-system tell-tale, indicating by a ringing of the bell 53, a need to rewind the usual driving-spring in a gong or other trouble in connection therewith.

A "pilot lamp" 63 is provided, connected across the conductors leading to the main source of current, between the wires identified by the reference numerals 2 and 19, to indicate visually the occurrence of disturbance in said main source.

The signal sending devices 16 shown in the drawing are of standard design and may be of any suitable type, as the break-the-glass type, the pull-lever type or the magnet release type. Each of these devices is provided with mechanism, preferably a characteristically toothed digit wheel, by the operation of which the associated circuit will be opened and closed a predetermined number of times for each signaling box.

The opening of the conductor 15, by the operation of any signaling box 16, immediately reduces the amount of current flowing through the gongs 11, 11, etc., to the amount permitted by the limiting influence of the resistance 30 included in the parallel conductor 14; nevertheless the circuit is not at all interrupted, and therefore it will be seen that herein I obviate any sparking at any of the boxes 16.

The just-mentioned amount of current is insufficient to maintain energized the magnets of the gongs 11; therefore all said magnets release their armatures, thus permitting a blow to be sounded on the gongs. The opening of the conductor 15 also deënergizes the magnets 17 which permit the dropping of the armature 36 against contact 37, thereby to sound a tap on the code-signal bell 43. How this ringing of bell 43 occurs may be described as follows: The deënergizing of magnets 17 releases the armature 36 to yield to the attraction of the magnets 28, thus eliminating at this instrumentality the possibility of a spark due to arcing and eliminating any possibility of a poor contact due to vibration, dirt, &c., and in its downward path the armature 36 makes momentary touch with the contact 37, completing the circuit through the bell 34; but the armature 36 encounters the stop 61 while the spring 38 continues in its downward path under the influence of the magnets 28,

as a result of which the circuit including the wire 35 is opened at the contact 37 before said bell 34 can respond. The spring 38 is eventually halted by the stop 62, when the armature 46 closes the circuit including the wire 44, the vibrating bell 43 then responding to the opening and closing of the circuit caused by the operation of the signaling box 16 and so giving a recognizable alarm preferably located at a central headquarters. According to the characteristic teeth carried by the wheel aforesaid within any particular box 16, a predetermined number of said blows and taps will occur. The current flowing in the parallel conductor 14, when current is flowing within the conductor 15, is not sufficient to cause the attraction of the armature of the magnets 28; but when conductor 15 is opened as by the operation of a signal box 16, magnets 17 release their armature 36, and magnets 28 attract said armature 46, due not to a sudden initiation of current flow through said magnets 28, but merely to an increase of current therethrough.

In the event of failure of the main current supply for any cause whatever, the magnets 5 are deënergized to release their armature 25 and thus close at the contact 26 a branch including the reserve source of current or battery 21; the said branch, which may be described as extending between the points A and E, thereupon being substituted in this embodiment in place of the wires 19, 2 and 4, the dynamo 1, the resistance 3 and the magnets 5. As an incident of the substitution of said battery 21, as just described, the current from this battery is caused to pass through the magnets 23, which are thereby energized to attract the armature 25 and hold it firmly against the contact 26, thus eliminating at this instrumentality, too, the possibility of a spark due to arcing and eliminating the possibility of a poor contact due to vibration, dirt, &c.

Inasmuch as the second or reserve source of current (battery 21) is arranged to deliver its current into the system in the same direction as the main source of current (dynamo 1), the reserve source will be opposed by the main source when the main source is reëstablished after having been interrupted. This will result in a neutralization of the second or reserve source and in a consequent deënergization of the magnets 23 whereby they will offer no opposition to the armature 25 becoming attracted by the magnets 5 and thus disconnecting the second or reserve source from the system immediately upon the reëstablishment of the main current supply. If it is desired, the magnets 5 and 23, parts of the "relay" controlling the second or reserve source of current, may be adjusted to cause the giving of a trouble-signal at various points throughout the protected premises, as by causing an effective blow to be struck on all signal-sounding devices, and thus attract the attention of the proper supervisor of such system to give him notice of the existence of trouble on the system or of the connection of the second or reserve source of current.

In the event of a break in one of the gong wires 10 or 10′, the neutral relay 9 becomes unbalanced and attracts its armature 49, thus closing the circuit which includes the contact 50, spring 51, and the wires 52 and 40. Thereupon the vibrating bell 43 rings continuously until switched out or the gong wire 10 or 10′ is repaired, the operation being the same for either gong wire; the ammeters 7 and 7′ being examinable to indicate which of the wires is affected. Any disturbance whatever within the gong circuits whereby the current in one wire differs from the other, will cause this trouble signal 43 to sound.

Some of the alarm-giving functions of the present embodiment, aside from the important feature of the ability of battery 21 automatically to come into or withdraw from operative relation to the system according as dynamo 1 fails or becomes established as a source of supply, may be summed up as follows: Bell 34, included in what has been called the "first trouble circuit", gives its alarm when both dynamo 1 and battery 21 fail, or an entire failure of current occurs with reference to both magnets 17 and magnets 28 due to broken wire, open fuses, &c.; bell 43, included in what has been called the "second trouble circuit", gives its extraordinary alarm by a continuous ringing when either (*a*) there is trouble on wire 15 or (*b*) when there is trouble on wires 10 or 10′ (note neutral relay 9) and gives its ordinary or code-ring or its characteristic series of taps when any particular station 16 is disturbed; and bell 53, included in what has been called the "third trouble circuit", gives its alarm when any one of the gongs 11 is out of order or needs rewinding. More than this: With reference to the ringing of bell 34, which may be of the "sleigh-bell" type, an examination of the "pilot lamp" hereinbefore mentioned will show whether or not it is the dynamo 1 which has failed; with reference to the extraordinary or continuous ringing of bell 43, which may be of the "cow-bell" type, an examination of ammeters 7 and 7′ will show whether the trouble is on conductor 15 or on wires 10 or 10′, and if on the latter as to whether it is wire 10 or 10′; and with reference to an intermittent or ordinary ringing of said bell 43 (in unison with an actuation of one of the devices 16), the signal code gives a tell-tale of the particular station operating.

It will be seen that means have been provided for eliminating destructive sparking at the points of possible interruption of the current in the circuit-operated devices and apparatus, the operating current being conducted through paths of such resistance that the effect obtained relative to said devices and apparatus will be that of no current flow, whereas in reality the current still continues to flow but in a quantity insufficient to operate said devices and apparatus.

It will be obvious to one skilled in the art that it is possible to accomplish the same practical results without the use of all of the apparatus shown in the accompanying drawings. For example, the magnets 23 may be dispensed with, yet good results may be obtained; or the tell-tale trouble signal bell 53 and its connecting circuit may be eliminated; or the magnets 28, in series with the shunt circuit, may be left out, all without departing from the spirit of my invention.

It will similarly be obvious that there may be added to the system means for supervising other functions of said system should they be demanded. For example, there could be provided a means for supervising the current strength of the battery 31, where such battery is used as the second or reserve source of current, or for giving notice when the potential of said source of current falls below some predetermined point.

In the accompanying drawings, a battery at 21 is shown as the second or reserve source of current, but it will be seen that this second or reserve source of current may be of any suitable type. For example, if the system is installed in a building equipped to generate current by means of an "isolated" or "private plant", and if there is in the same buliding what is known as "break-down service", that is, a connection to some purveying company's mains, the "isolated plant" may be the main source of current supply and the "break-down service" may be the second or reserve supply, or, vice versa; or either may be established as the main source, to have as the reserve source any kind of battery, primary or secondary, wet or dry. Where secondary batteries are employed, overcharge and undercharge circuit breakers suitable to the nature of the batteries may of course be interposed.

Inasmuch as many changes could be made in the above construction, and many apparently widely different embodiments of my invention could be made without departing from the scope thereof, it is intended that all matter contained in the above description or shown in the accompanying drawings shall be interpreted as illustrative and not in a limiting sense.

It is also to be understood that the language used in the following claims is intended to cover all the generic and specific features of the invention herein described and all statements of the scope of the invention which, as a matter of language, might be said to fall therebetween.

The mechanical interrelation between the magnets 17 and 28 is not herein claimed, as same is described and claimed in my copending application, Serial No. 849,703, filed July 8, 1914.

Having described this invention, what I claim as new, and desire to secure by Letters Patent, is:

1. In an electrical alarm system, a source of current supply, a signal transmitter, a protective circuit in which is interposed said source and said signal transmitter, a normally energized electromagnet interposed in said protective circuit to supervise the circuit and initiate a distinctive and continuous signal upon the occurrence of a change of status in said protective circuit, a permanently closed parallel conductor of high resistance in said protective circuit, adapted to provide a substitute path for the current normally traversing the signal transmitter thereby to avoid sparking at the point of current interruption and including a normally deënergized electromagnet, and a resistance interposed in said parallel conductor, the resistance of said parallel conductor being sufficiently high to predetermine that during the integrity of said protective circuit a current of merely a comparatively small strength passes through said parallel conductor, the second mentioned electromagnet being adapted to function in coöperation with the electro-magnet first mentioned to operate an auxiliary circuit including an alarm, upon the occurrence of a change of status in that portion of the circuit bridged by said parallel conductor.

2. In an electrical alarm system, a source of current supply, a protective circuit, said protective circuit having interposed in a branch thereof a plurality of fire alarm stations, said fire alarm stations including a plurality of brushes normally closing said protective circuit, and a normally energized electro-magnet responsive to current interruptions by said brushes in series with said branch and adapted to control a plurality of auxiliary circuits, and a normally energized by-path including a resistance in said protective circuit cutting out said brushes.

3. In an electrical alarm system, a source of current supply, a protective circuit, said circuit having interposed therein a plurality of signal transmitters, and a plurality of normally energized electro-magnetic receiving devices, adapted to be operated when a signal transmitter is operated, a normally closed by-path in said protective circuit bridging said signal transmitters, and a normally inactive electro-magnet in series in

said by-path, adapted to influence an armature to transmit signals over an auxiliary circuit in unison with the fire alarm station operated.

4. In a system of the class described, in combination, a source of current supply, a conductor leading from said source of supply, a normally inactive signal-giving instrumentality, a normally energized electrical means in said instrumentality and interposed in said conductor, a plurality of branches into which said conductor divides beyond said means, a normally ineffective circuit-breaker interposed in one of said branches, and a predetermined resistance interposed in the other of said branches, adapted to remain permanently energized, said branches beyond said circuit-breaker and said resistance uniting into a conductor leading also from said source; said resistance being adapted, during the normally ineffective adjustment of said circuit breaker, to predetermine that a negligible amount of current flows through the branch wherein is interposed said resistance and therefore that enough current flows through said branch wherein is interposed said circuit-breaker to maintain normally energized said means, but said resistance being adapted, upon a functioning of said circuit-breaker, to increase the current flowing through the branch within which said resistance is interposed so that the current flowing through said means will be reduced to an amount insufficient to maintain energized said means and thereby to render active said instrumentality.

5. In a system of the class described, in combination, a source of current supply, a conductor leading from said source of supply, a normally inactive signal giving instrumentality, a normally energized electrical means in said instrumentality and interposed in said conductor, a plurality of branches into which said conductor divides beyond said means, a plurality of normally ineffective circuit-breakers interposed in series in one of said branches, and a predetermined resistance interposed in the other of said branches and adapted to remain permanently in circuit, said branches beyond said circuit-breaker and said resistance uniting into a conductor leading also from said source; said resistance being adapted, during the normally ineffective adjustment of said circuit-breaker, to predetermine that a negligible amount of current flows through the branch wherein is interposed said resistance and therefore that enough current flows through the branch wherein is interposed said circuit-breaker and also through the conductor wherein is interposed the said means to maintain normally energized said means, but said resistance being adapted, upon a functioning of said circuit-breaker, to increase the current flowing through the branch within which said resistance is interposed so that the current flowing through said means will be reduced to an amount insufficient to maintain energized said means and thereby to render active said instrumentality.

6. In a system of the class described, in combination, a source of current supply, a conductor leading from said source of supply, a normally inactive signal-giving instrumentality, a normally energized electrical means in said instrumentality and interposed in said conductor, a plurality of branches into which said conductor divides beyond said means, a plurality of normally ineffective circuit-breakers interposed in series in one of said branches, an alarm device interposed in the branch last-mentioned and in series with said circuit breaker, and a predetermined resistance interposed in the other of said branches and adapted to remain permanently in circuit, said branches beyond said circuit-breaker and said resistance uniting into a conductor leading also from said source; said resistance being adapted, during the normally ineffective adjustment of said circuit-breaker, to predetermine that a negligible amount of current flows through the branch wherein is interposed said resistance and therefore that enough current flows through the branch wherein is interposed said circuit-breaker and also through the conductor wherein is interposed said means to maintain normally energized said means, but said resistance being adapted, upon a functioning of said circuit-breaker, to increase the current flowing through the branch within which said resistance is interposed to an amount insufficient to maintain energized said means and thereby to render active said instrumentality.

7. In an electrical alarm system, a source of current supply, a circuit-breaker including contact brushes, a protective circuit within which is interposed said source and said circuit-breaker, a permanently closed shunt circuit around the contact brushes of said circuit-breaker, said shunt circuit having interposed therein a resistance sufficiently high to predetermine that during the integrity of said protective circuit a current of merely a comparatively small strength passes through said shunt-circuit, a functionable signal-giving instrumentality, and electrical means interposed in said protective circuit and adapted to be maintained energized thereby to prevent said instrumentality from functioning during the passage through said shunt circuit of said small strength current but said means being adapted to become deënergized upon a flow through said shunt-circuit of a current of greater strength.

8. In an electrical alarm system, a source of current supply, a signal transmitter, a protective circuit in which is interposed said source and said signal transmitter, a normally energized electromagnet interposed in said protective circuit to supervise the circuit and initiate a distinctive and continuous signal upon the occurrence of a change of status in said protective circuit, a permanently closed parallel conductor of high resistance in said protective circuit, adapted to provide a substitute path for the current normally traversing the signal transmitter thereby to avoid sparking at the point of current interruption and including a normally deënergized electro-magnet, and a resistance interposed in said parallel conductor, the resistance of said parallel conductor being sufficiently high to predetermine that during the integrity of said protective circuit a current of merely a comparatively small strength passes through said parallel conductor, the second mentioned electromagnet being adapted to maintain closed an auxiliary circuit including a signal, upon the occurrence of a change of status in that portion of the circuit bridged by said parallel conductor.

9. In an alarm signaling system including apparatus responsive to battery current, means including a circuit and adapted to operate said apparatus from a high tension direct current, means including a circuit and adapted to operate said apparatus from a low tension direct current, and means for eliminating the spark at the point of current interruption when one of said means is substituted for the other, said means including an electromagnet interposed in the circuit last mentioned.

10. In an alarm signaling system, an alarm station, and a trouble bell, a first circuit normally passing through said alarm station, an auxiliary circuit pssing through said trouble bell, means adapted to feed to said first circuit current generated at one source, means adapted automatically to feed to said first circuit current generated at a second source when and only when the first mentioned source fails, and means adapted to feed to said auxiliary circuit current generated at a third source irrespective of whether it is said first source or second source that is feeding current to said first circuit, said first mentioned circuit having a parallel shunt and the means-last-mentioned being maintained normally inoperative when said circuit and said shunt are both receiving current but becoming operative upon current flowing through said shunt and not through the part of said first circuit which is arranged in parallel with said shunt.

11. In an alarm signaling system, an alarm station and an alarm bell, a first circuit normally passing through said alarm station, an auxiliary circuit passing through said alarm bell, means adapted to feed to said first circuit current generated at one source, means adapted automatically to feed to said first circuit current generated at a second source when and only when the first mentioned source fails, and means adapted to feed to said auxiliary circuit current generated at a third source irrespective of whether it is said first source or second source that is feeding current to said first circuit, said first circuit having a parallel shunt and the means last-mentioned being maintained normally inoperative when current is flowing through both said shunt and the part of said first circuit which is arranged in parallel with said shunt but becoming operative when no current is flowing either through said shunt or through the part of said first circuit which is arranged in parallel with said shunt.

12. In an alarm signaling system, a circuit which passes through a circuit-breaker, an alarm associated with said circuit and adapted to be operated when said circuit-breaker is operated, said circuit having included therein an electro-magnet, a local circuit, said electro-magnet by means of its armature maintaining open said local circuit when the first mentioned circuit is closed but being adapted to close said local circuit when the first mentioned circuit is opened, a by-path in the first mentioned circuit and which shunts around the working parts of said circuit-breaker and in which is a resistance, a second electro-magnet in said by-path adapted to attract an armature upon the operation of said circuit-breaker, a second local circuit adapted thereupon to be closed by said armature, and a second signal adapted to be operated upon the closing of said second local circuit.

13. In an alarm signaling system, a first circuit, a main source of supply therefor, an electromagnet located in said circuit and energized when said circuit is receiving current from said main source; a second circuit, a reserve source of supply therefor, said second circuit being adapted to be closed by the armature of said electromagnet when the latter becomes deënergized, and an electromagnet arranged in series with the reserve source of supply and adapted during the closure of said second circuit positively to attract toward itself the same armature which is normally positively attracted by the first mentioned electromagnet.

14. In an alarm signaling system, a first circuit, a main source of supply therefor, an electromagnet located in said circuit and energized when said circuit is receiving current from said main source, a second circuit, a reserve source of supply therefor, said second

circuit being adapted to be closed by the armature of said electromagnet when the latter becomes deënergized, and an electromagnet arranged in series with the reserve source of supply and adapted during the closure of said second circuit positively to attract toward itself the same armature which is normally positively attracted by the first mentioned electromagnet, said first circuit having interposed therein a resistance which is so located in said system that current fed to said system from said main source of supply must pass through said resistance but current fed to said system from said reserve source of supply avoids passing through said resistance.

15. In an alarm signaling system, a first circuit, a main source of supply therefor, an electromagnet located in said circuit and energized when said circuit is receiving current from said main source, a second circuit, a reserve source of supply therefor, said second circuit being adapted to be closed by the armature of said electromagnet when the latter becomes deënergized, and an electromagnet arranged in series with the reserve source of supply and adapted during the closure of said second circuit positively to attract toward itself the same armature which is normally positively attracted by the first mentioned electromagnet, with such rapidity that upon the substitution of one source of supply for the other the instruments in said signaling system will be undisturbed.

16. In an alarm signaling system, a first circuit, a main source of supply therefor, an electromagnet located in said circuit and energized when said circuit is receiving current from said main current; a second circuit, a reserve source of supply therefor, said second circuit being adapted to be closed by the armature of said electromagnet when the latter becomes deënergized, and an electromagnet arranged in series with the reserve source of supply and adapted during the closure of said second circuit positively to attract toward itself the same armature which is normally positively attracted to the first mentioned electromagnet, said armature being adapted to be automatically attracted by the first mentioned electromagnet upon the restoration of said main source thereby to open the circuit within which is located said reserve source.

17. In an alarm signaling system, a first circuit, a main source of supply therefor, an electromagnet located in said circuit and energized when said circuit is receiving current from said main source; a second circuit, a reserve source of supply therefor, said second circuit being adapted to be closed by the armature of said electromagnet when the latter becomes deënergized, and an electromagnet arranged in series with the reserve source of supply and adapted during the closure of said second circuit positively to attract toward itself the same armature which is normally positively attracted by the first-mentioned electromagnet, said armature being adapted to be automatically attracted by the first-mentioned electromagnet upon the restoration of said main source thereby to open the circuit within which is located said reserve source, said circuits being so arranged with reference to said second electromagnet that upon the restoration of said main source the current fed to said second electromagnet from said reserve source will be opposed and neutralized by the current fed to said first electromagnet from said main source.

18. In an electrical alarm system, a source of current supply, a signal receiving device, a circuit-breaker having contact brushes, a protective circuit within which is interposed said source, signal receiving device and said circuit-breaker, a permanently closed shunt circuit around the brushes of said circuit-breaker, said shunt-circuit having interposed therein a resistance sufficiently high to predetermine that during the integrity of said protective circuit a current of merely a comparatively small strength passes through said shunt-circuit, and an electro-magnet adapted to control a circuit closing means interposed in said shunt-circuit, said signal receiving device being adapted to be operated upon the functioning of said shunt circuit responsive to current interruptions by said brushes.

19. In an electrical alarm system, a source of current supply, a circuit-breaker, a protective circuit within which is interposed said source and said circuit breaker, a shunt-circuit around said circuit-breaker, said shunt-circuit having interposed therein a resistance sufficiently high to predetermine that during the integrity of said protective circuit, a current of merely a comparatively small strength passes through said shunt-circuit, and a circuit closing means interposed in said shunt-circuit and adapted to remain functionless during the passage therethrough of said small strength current but adapted to function upon a flow therethrough of a current of greater strength, and an independent normally open circuit closable upon the functioning of said circuit closing means and including an auxiliary source of supply, and an alarm adapted to function upon the closing of said independent circuit, an auxiliary independent normally open circuit and an alarm, a source of supply and a circuit-closer interposed in said circuit, said circuit-closer being maintained inoperative during the integrity of either said protective circuit or said shunt circuit but being adapted to close said auxiliary independent circuit upon failure of

both said protective circuit and said shunt circuit thereby to actuate the second-mentioned alarm.

20. In an alarm signaling system, a plurality of gong circuits, a source of supply adapted normally to feed current to both said circuits, a neutral relay associated with both of said circuits whereby upon the occurrence of a change of status from normal in either circuit said relay becomes unbalanced, an armature adapted thereby to be attracted by said relay, a local circuit adapted thereupon to be closed, a signal adapted to be operated by the closing of said local circuit, and an indicating device as a milliampere meter, associated with each gong circuit to indicate upon the unbalancing of said relay which of said gong circuits is disturbed.

21. In an alarm signaling system, a circuit which passes through a circuit-breaker, an alarm associated with said circuit and adapted to be operated when said circuit-breaker is operated, said circuit having included therein an electromagnet, a local circuit, said electromagnet by means of its armature maintaining open said local circuit when the first mentioned circuit is closed but being adapted to close said local circuit when the first mentioned circuit is opened, a by path in the first mentioned circuit and which shunts around the working parts of said circuit-breaker and in which is a resistance, a second electromagnet in said by-path placed opposite the electromagnet first mentioned and influencing the armature above mentioned, said second electromagnet attracting said armature upon the deënergization of said first-mentioned electromagnet, a second local circuit adapted thereupon to be closed by said armature, and a second signal adapted to be operated upon the closing of said second local circuit.

22. In an alarm signaling system, a circuit, signal transmitting means interposed therein and normally so arranged as to close said circuit, a main source of current supply for said circuit, a permanently closed by path in said circuit cutting out said signal transmitting means, whereby upon normal adjustment of said means practically no current flows through said by path but upon an abnormal adjustment of said means practically all the current flows through said by path, said by path having included therein a properly designed resistance, a normally inactive reserve source for said circuit, a second by-path in said circuit within which is interposed said reserve source, and means adapted when said main source is effective to maintain open said by-path but adapted to close said by-path when said main source fails, said means functioning as aforesaid irrespective of the amount of current which is flowing through the by path first mentioned, said second by-path being so arranged that upon the establishment of the same as a part of said circuit said resistance is cut out of said circuit.

23. In an alarm signaling system, an alarm station, and a trouble bell, a first circuit normally passing through said alarm station, an auxiliary circuit passing through said trouble bell, means adapted to feed to said first circuit current generated at one source, means adapted to feed to said auxiliary circuit current generated at a different source, the first mentioned circuit having a parallel shunt, and the means last mentioned being maintained normally inoperative when said circuit and said shunt are both receiving current but becoming operative upon current flowing through said shunt and not through the part of said first circuit which is arranged in parallel with said shunt.

24. In an alarm signaling system, a circuit which passes through a circuit-breaker, said circuit having included therein an electromagnet, a local circuit, said electro-magnet by means of its armature maintaining open said local circuit when the first mentioned circuit is closed but being adapted to close said local circuit when the first mentioned circuit is opened, a by-path in the first mentioned circuit and which shunts around the working parts of said circuit-breaker and in which is a resistance, a second electromagnet in said by-path adapted to attract an armature, upon the operation of said circuit-breaker, a second local circuit adapted thereupon to be closed by said armature and a second signal adapted to be operated upon the closing of said second local circuit.

25. In an alarm system, in combination, an armature, an electro-magnet, a circuit normally closed and energizing said magnet to attract said armature, means for opening said circuit to effect the release of said armature, a normally open alarm circuit including an alarm device, and another circuit with an electro-magnet therein for attracting said armature to hold said alarm circuit closed if said first named magnet should release said armature.

26. A signaling circuit including signal transmitting and signal receiving devices, and an electro-magnet bridging said signal transmitting devices and adapted to be connected in series with said signal receiving devices upon the operation of a signal transmitting device.

27. A signaling circuit including signal transmitting and signal receiving devices, and a conducting means bridging said signal transmitting devices and adapted to be connected in series with said signal receiving devices upon the operation of a signal transmitting device.

28. A signaling circuit including signal transmitting and signal receiving devices,

and a conducting means bridging said signal transmitting devices and adapted to be connected in series with said signal receiving devices upon the operation of a signal transmitting device, said means including an electro-magnet adapted to control circuit closing means.

29. A signaling circuit including signal transmitting and signal receiving devices, and a conducting means bridging said signal transmitting devices and adapted to be connected in series with said signal receiving devices upon the operation of a signal transmitting device, said means including an electro-magnet adapted to control a plurality of circuit closing means.

30. In an alarm system, in combination, an armature, a normally closed circuit for energizing a magnet to attract said armature, a second normally closed circuit having a common source of current with said first circuit and including a magnet tending but normally ineffective to pull said armature away from said first named magnet, an alarm station in said first named circuit to open the same and thereby deënergize said first named magnet to release said armature, and permit said armature to be attracted by and moved toward said second named magnet, and an alarm circuit closed by said armature when moved over by said second named magnet.

31. In a signaling system, a circuit normally including a source of energy, signal receiving devices, and signal transmitting devices, a conductor in parallel with and bridging said transmitting devices, said parallel conductor including an electro-magnet adapted to be included in series with the signal receiving devices upon an interruption of the current flow in the circuit bridged by the parallel conductor, thereby to increase the current flow in the parallel conductor and decrease the current flow in the receiving devices to an amount insufficient to maintain said receiving devices inactive.

32. In a signaling system, a supervised circuit including a source of current supply, signal transmitting means, and signal receiving devices, said signal receiving devices being adapted to operate normally upon the occurrence of an interruption of the current flow in said circuit, a permanently closed conductor of relatively high resistance shunted around the signal transmitting means, whereby upon the operation of said signaling means, the shunt conductor will be automatically connected in series with said signal receiving means, thereby reducing the current flow in the signal receiving means to an amount insufficient to maintain said signal receiving means inactive.

In witness whereof I have hereunto signed my name in the presence of two witnesses.

SIMON B. HESS.

In the presence of—
SAMUEL RASCH,
MINNIE NEWMAN.