No. 627,054. Patented June 13, 1899.

C. COLEMAN.

ELECTRICAL BURGLAR ALARM SYSTEM.

(Application filed Oct. 18, 1897.)

(No Model.) 3 Sheets—Sheet 1.

Fig. 1.

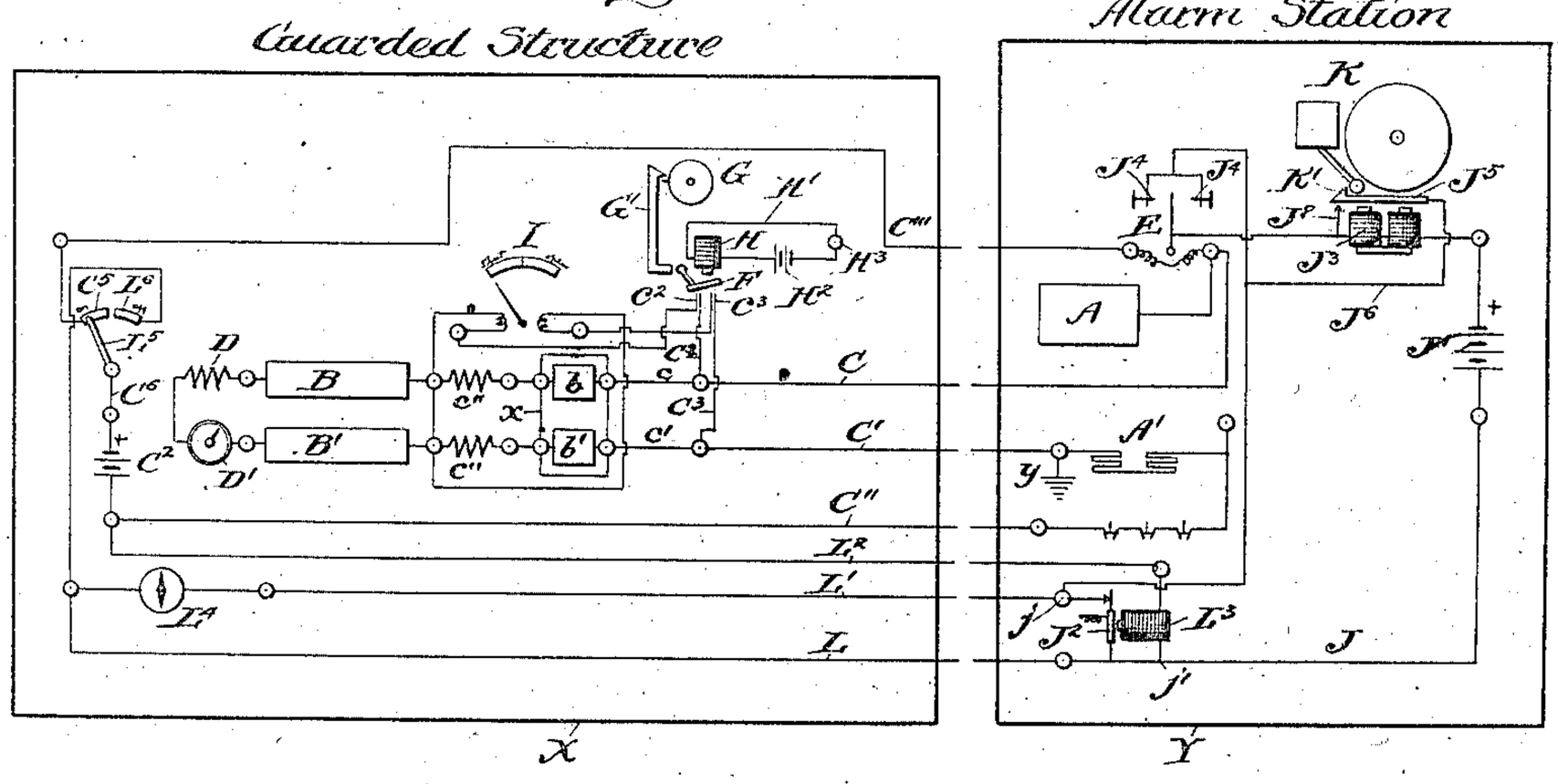
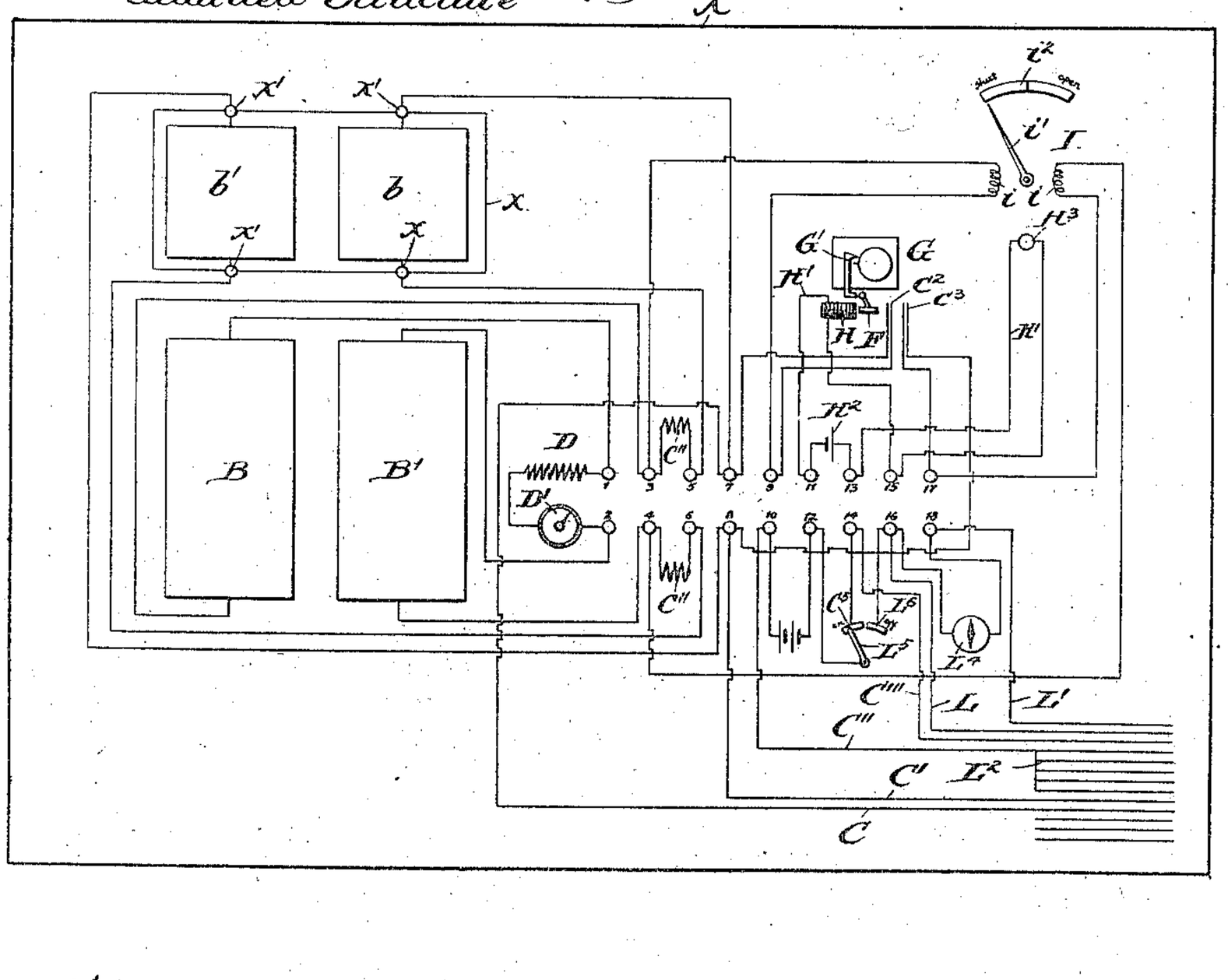


Fig. 2.



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No. 627,054. Patented June 13, 1899.

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ELECTRICAL BURGLAR ALARM SYSTEM.

(Application filed Oct. 18, 1897.)

(No Model.) 3 Sheets—Sheet 2.

Fig. 3.

Alarm Station

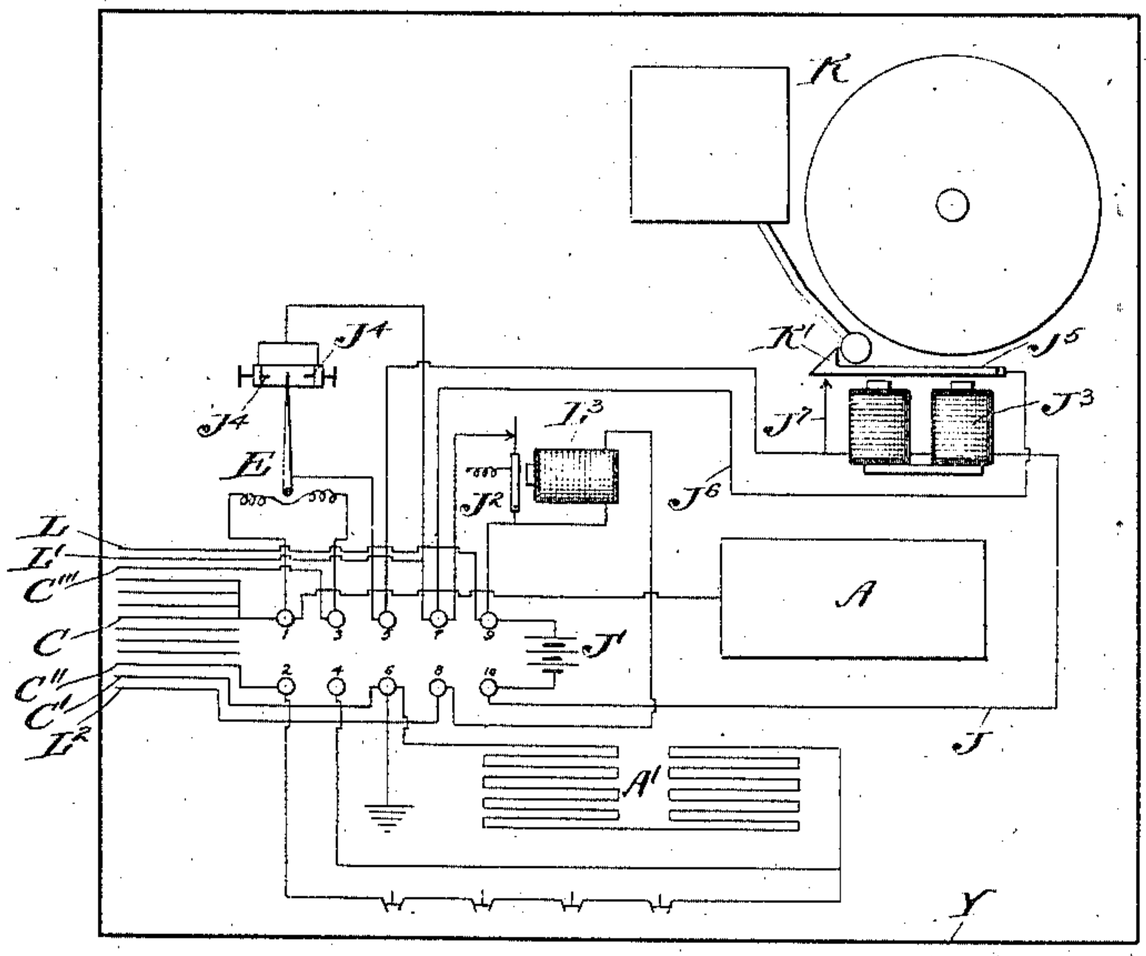


Fig. 4.

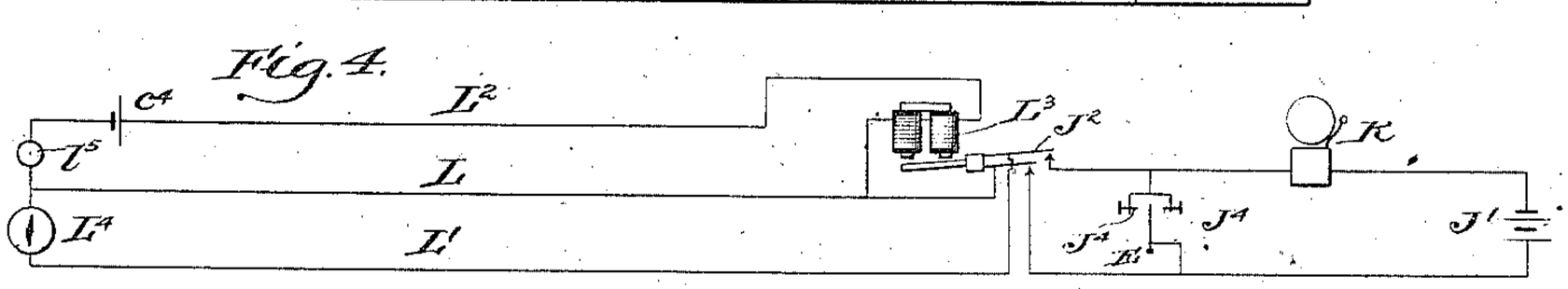


Fig. 4.a.

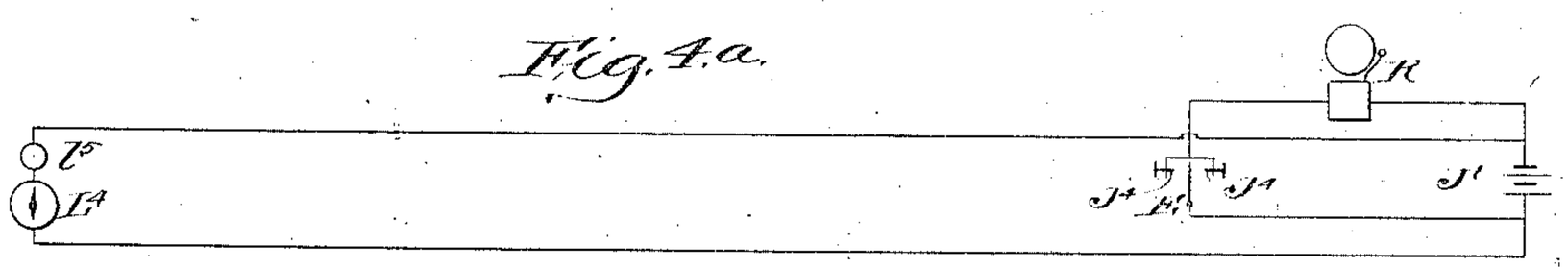
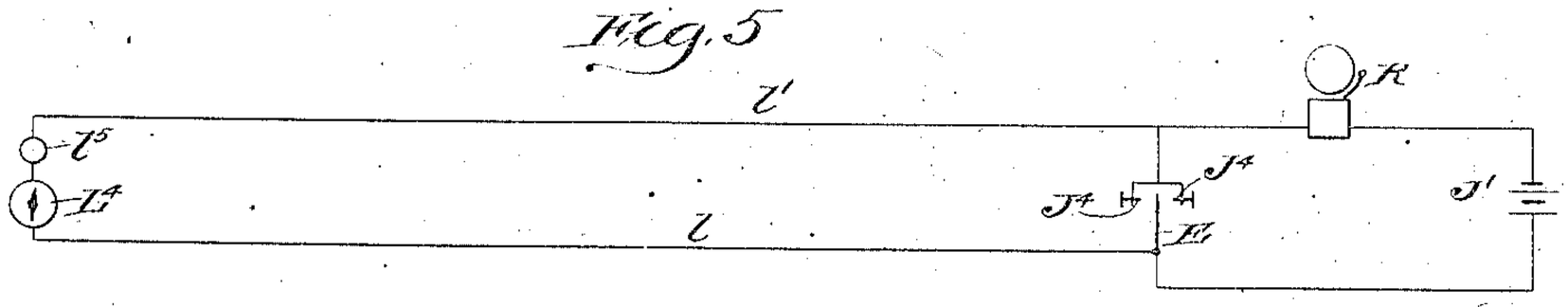


Fig. 5



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ELECTRICAL BURGLAR ALARM SYSTEM.

(Application filed Oct. 18, 1897.)

(No Model.) 3 Sheets—Sheet 3.

Fig. 6.

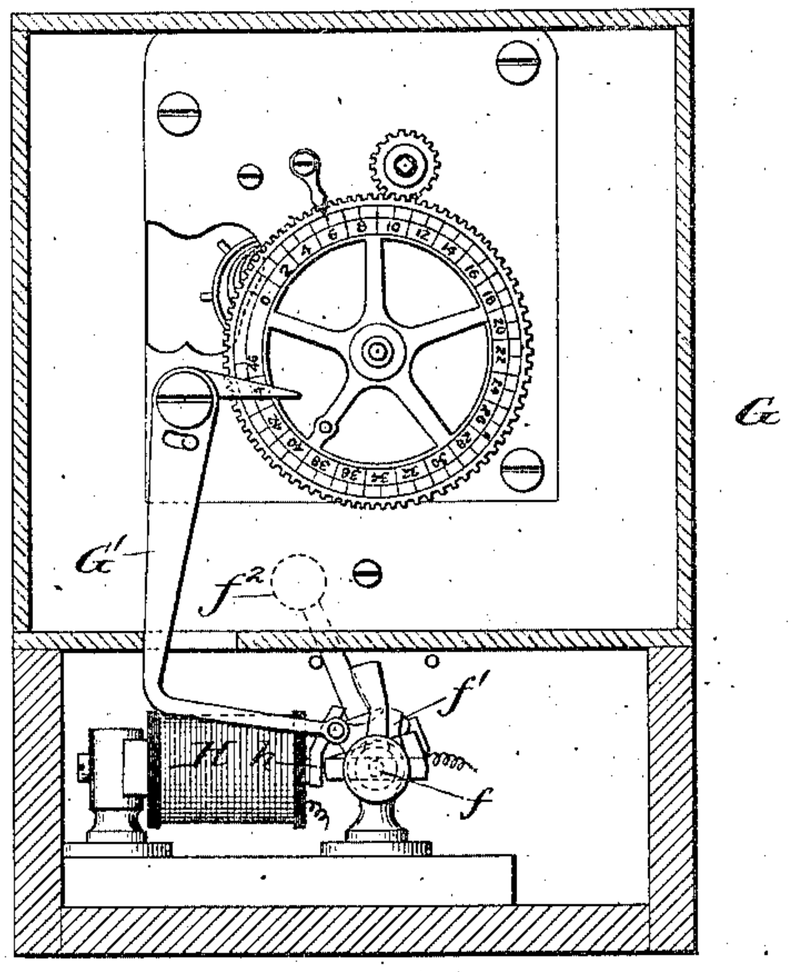


Fig. 6ª.

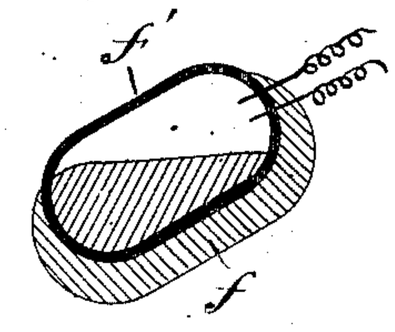


Fig. 7.

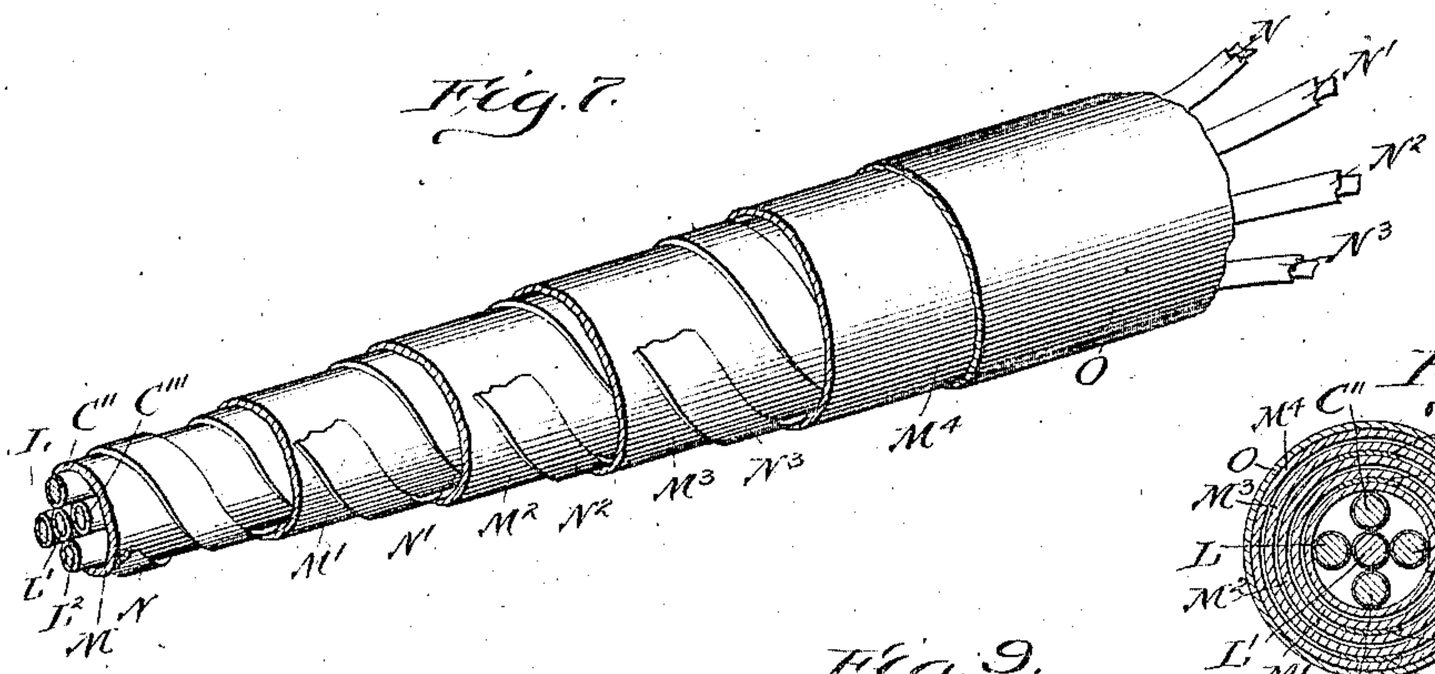


Fig. 8.

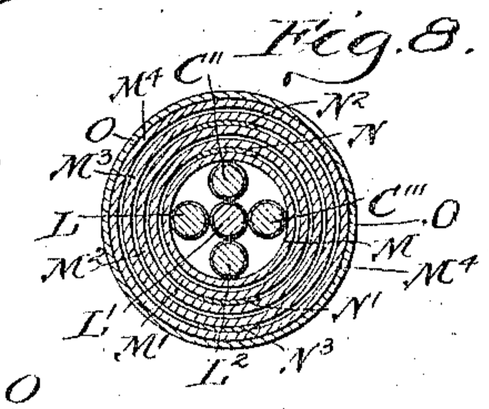


Fig. 9.

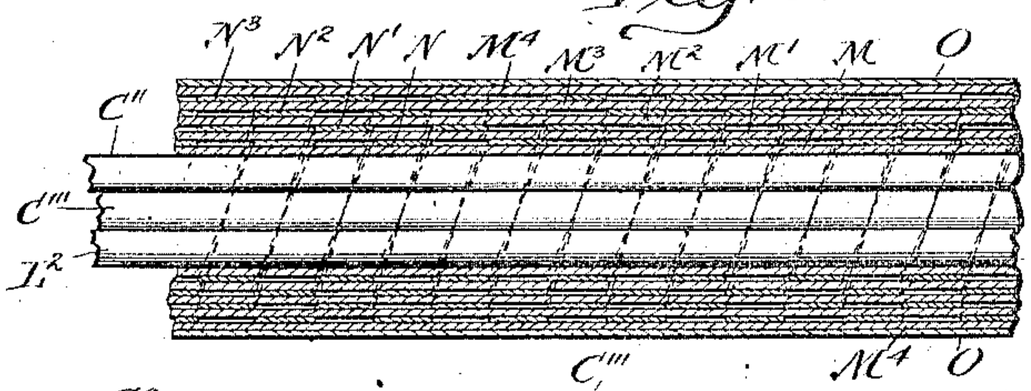
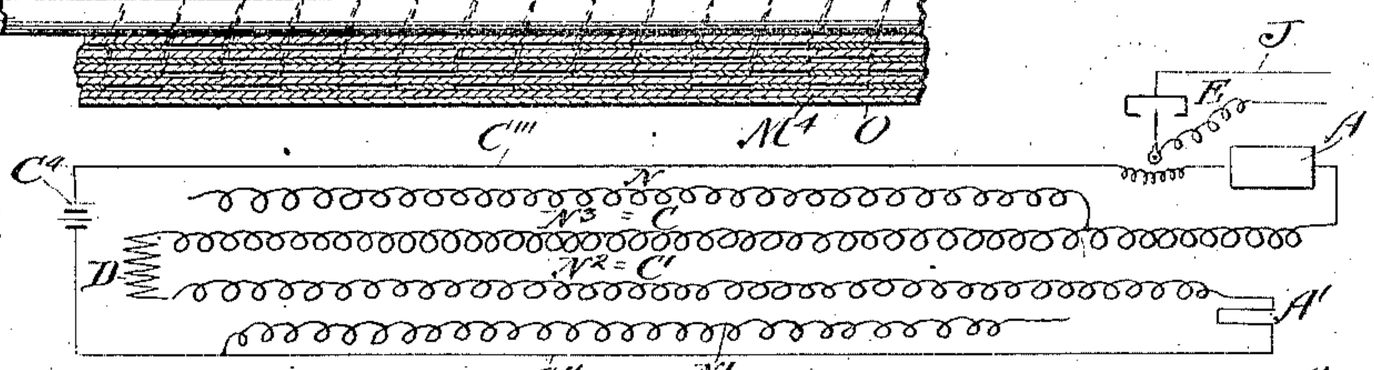


Fig. 10.



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UNITED STATES PATENT OFFICE.

CLYDE COLEMAN, OF CHICAGO, ILLINOIS, ASSIGNOR, BY MESNE ASSIGNMENTS, OF TWO-THIRDS TO THE BANKERS ELECTRIC PROTECTIVE COMPANY, OF SAME PLACE.

ELECTRICAL BURGLAR-ALARM SYSTEM.

SPECIFICATION forming part of Letters Patent No. 627,054, dated June 13, 1899.

Application filed October 18, 1897. Serial No. 655,526. (No model.)

To all whom it may concern:

Be it known that I, CLYDE COLEMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented certain new and useful Improvements in Electrical Burglar-Alarm Systems, of which the following is a specification.

The present invention relates to that class of burglar-alarm systems which have a closed main or controlling circuit, a balanced relay or galvanometer or some other electrical applicance which will respond to variations in the current passing through the controlling-circuit, all such appliances being comprehended by the term "responsive device" as used in this specification, and an alarm mechanism which is under the control of the responsive device.

One part of the invention relates to a system of the class described in which there is provision for permitting the door of the guarded structure to be open during business hours, while at the same time the main circuit is kept closed and the current on, to the end that current may be kept on the main circuit and on the responsive device and the latter kept normal during the daytime, when the door of the guarded structure is open. In such a system there are at the guarded structure two paths for the current of the main circuit. One includes the contacts that are controlled by the door and is herein called the "door-circuit," and the other passes around or shunts the door-contacts and is herein called the "door-shunt." The term "door-circuit" as used in this specification is intended to comprehend a circuit or circuits or part of a circuit in which the contacts which are controlled by the door or window or screen or curtain or any other closure or device for closing an opening to the guarded structure are located regardless of whether any part of this circuit or its contacts are actually mounted upon and carried by the door or not, albeit in the preferred form of the invention the door-circuit and some of its contacts are, in fact, carried by the door. The term "door-shunt" as used in this specification is intended to comprehend any path, of whatever character, through which the current of the main circuit may pass without passing through the door-circuit, to the end that current may be left on the main circuit or a portion of it and on the responsive device and the latter be kept normal during business hours, when the door is open. Means are provided whereby the main circuit may be completed through either or both of these two paths under the conditions hereinafter described without causing an alarm to be sounded. The means for switching the current from the door-shunt to the door-circuit may include an exposed push-button or switch adapted to be operated manually; but the means for switching the current from the door-circuit to the door-shunt is preferably disposed within the guarded structure, so as to be inaccessible, is automatic in its operation, and is so conditioned that it will switch the current only at the commencement of business hours, when the door of the guarded structure is to be opened. In a system of this description should the door be opened before the door-shunt is completed the responsive device would be influenced and an alarm given, and should the door-circuit not be completed by the act of closing the door, either because of the presence of dirt or corrosion at the contacts or from any other cause and the operator should manually open the door-shunt, the main circuit would be opened, the responsive device would be influenced, and an alarm would be given. To avoid this, according to the present invention means for indicating the conditions of the door-circuit and door-shunt are provided.

One object of the invention is to provide means for indicating during the day, when the door-circuit is open, the condition of the system, so that any variation of it from normal may be detected and remedied before the system is adjusted for the night. This object I accomplish by the use of an indicator so graduated that it will show all variations in the condition of the circuit. Preferably this indicator is located at the guarded structure, and preferably also its coils are included in the door-shunt, the advantage of this arrangement being that one and the same instrument may be used for giving all the indications above described—that is to say, dur-

ing business hours, when the door-circuit is open and the current is passing through the door-shunt, the indicator will show the condition of the system, when the door is closed the indicator will show whether or not the door-circuit is properly connected with the main circuit, and when the operator undertakes to open the shunt, so that the main circuit will be complete only through the door-circuit, the indicator will show whether or not the shunt is, in fact, opened.

The invention relates in part also to the means for automatically controlling the door-shunt, and the object of this part of the invention is to provide a simple and effective device which may be operated manually for opening the door-shunt and which will operate automatically for closing the door-shunt. This object I accomplish by the use of the mechanism hereinafter fully described.

Another part of the invention relates more particularly to that class of systems in which the alarm devices are disposed in a protected housing which is located at the "alarm-station," by which is meant the place where the alarm is given, or where the alarm-station itself is so disposed as to be not conveniently accessible. This protected housing may be located in an exposed place, or it may be located at a police or other station, or in an office, or at some other place external to the guarded structure, or even within the guarded structure itself. Where the alarm mechanism is located at a police or other station, if no means be provided to prevent it it would be possible for persons having authorized admittance to the station to in some way cripple the alarm mechanism, so that even upon a surreptitious disturbance of the system an alarm will not be given, and in order to avoid this it is desirable, even where the alarm mechanism is, as aforesaid, located at a station where a watchman is in attendance, to have the alarm mechanism disposed within a protected housing to which entrance cannot be had without giving an alarm. This is not new *per se*, and so far as my present invention relates to a system of this class its object is to provide means whereby the alarm mechanism, and especially the battery thereof, when the battery is located within the protected housing, may be tested from the guarded-structure end of the system, or at least from a point outside of the protected housing itself. This object I accomplish by the use of a test-circuit, which extends from within the protected housing to a point outside of the same and is provided with means for electrically connecting the alarm-circuit therewith, a suitable device being connected with the test-circuit, and preferably located at the guarded structure, for indicating the condition of the alarm-circuit. For this purpose I prefer to use a galvanometer; but any other instrument which will give the desired indication is within the scope of my invention, and hence in interpreting this specification and the claims this term "galvanometer" is not to be construed in a strict sense, but, on the contrary, it is to be construed as comprehending and including any instrument which will give the desired indication.

The invention relates in part also to the manner of disposing the alarm-circuit, and the object of this part of the invention is to provide means for continuing the operation of the alarm mechanism when once it is set in operation, even though the main or controlling circuit be restored to normal condition, and this object I accomplish by providing the alarm-circuit with a loop which shunts the contacts that are under the control of the responsive device and which is itself provided with contacts that are closed when an electromagnet disposed in the alarm-circuit is energized.

The invention consists in the features of novelty that are herein described, and in order that it may be more fully understood I will describe it with reference to the accompanying drawings, which are made a part of this specification, and in which—

Figure 1 is a diagrammatic representation of a burglar-alarm system embodying the invention in its preferred form. Fig. 2 is a diagrammatic representation of the parts thereof that are located at the guarded structure. Fig. 3 is a diagrammatic representation of the parts thereof that are located at the alarm-station. Figs. 2 and 3 differ from Fig. 1 only in that they show the disposition of the several parts more in detail. Figs. 4, 4ª, and 5 are diagrammatic representations of the alarm-circuit and its accessories and of means differing from each other and from the means shown in the preceding figures for testing it. Fig. 6 is an elevation of the means for controlling the door-shunt. Fig. 6ª is a detail view showing the mercury device, hereinafter described, for opening and closing one of the circuits. Fig. 7 is a perspective view of a casing or covering for inclosing an electric conductor or conductors. Fig. 8 is a transverse section thereof. Fig. 9 is a longitudinal section thereof. Fig. 10 is a diagrammatic representation of the casing or covering included in a burglar-alarm system such as is shown in Fig. 1.

The line X may represent the "guarded structure," which term is intended to comprehend any building or apartment in a building, a safe, a vault, a cabinet, or any other inclosure or district which it is desired to protect.

The line Y represents the protected housing within which the alarm mechanism is disposed. This protected housing may be constructed as shown and described in Letters Patent No. 570,906, which were issued to me on the 10th day of November, 1395, or it may be of any other desired or suitable construction. It is provided, as described in the patent aforesaid, with an electrical barrier, which is diagrammatically represented at A A', so

disposed that access cannot be had to the interior of the housing without causing an alarm to be given. The housing is preferably constructed of sheet-steel and is grounded, as shown at *y*, so that if it is penetrated by a metallic instrument and either of the two sides A A′ of the barrier is thereby electrically connected with it a short circuit will result, causing an alarm. This housing may be located at a police or other station or office distant from the guarded structure, or it may be located adjacent to or within the guarded structure itself, the requirements of the invention being answered if it be so located that the alarm when given will be heard by some one. The guarded structure also is provided with an electrical barrier, which may be of the construction described in the patent aforesaid or of any other desired construction. It is represented diagrammatically at B B′ *b b′*, the portions *b b′* being disposed upon the door of the structure, (represented diagrammatically by the line *x*,) while the portions B B′ are disposed over the other parts of the structure. These barriers at the protected housing and guarded structure are electrically connected with the main or controlling circuit C C′ C″ C‴, in which are included also a resistance D and rheostat D′, located at the guarded structure, and the coils of a responsive device E, located within the protected housing. At the guarded structure the main circuit has a loop or loops *c c′*, which include the contacts *x′*, that are controlled by the door, and this portion or these portions of the circuit, which also include the portions *b b′* of the barrier, are herein termed the "door-circuit." When the door is closed and its contacts *x′* are in proper condition, the main circuit will be completed through the door-circuit. The main circuit has also at the guarded structure a loop or loops C^2 C^3, which shunt the door-circuit, (which loop or loops are herein called the "door-shunt,") so that when the door-circuit is open and the door-shunt is closed the main circuit will be completed through the door-shunt. The loops C^2 C^3 are provided with terminals or contacts c^2 c^3, which are under the control of a device F for making and breaking the circuit at these points. As shown more clearly in Figs. 6 and 6ª, this device may consist of a rock-shaft *f*, carrying cups *f′*, each of which contains a drop of mercury and into each of which one pair of terminals extends, the arrangement being such that when the rock-shaft is at one extremity of its movement the mercury will connect the terminals, and when at the other extremity of its movement the mercury will be out of contact with the terminals and leave them disconnected. This rock-shaft is provided with a tumbler or counterbalance f^2, which will hold it at either extremity of its permitted movement until it is moved therefrom by a force. For moving it in one direction—*i. e.*, the direction which closes the shunt—I provide a chronometer or timepiece G, which, like a time-lock, may be set to run a definite length of time and will at the expiration of this time trip a dog G′, which will engage a part on the rock-shaft and move the weight past its center, thereby closing the shunt. For moving it in the opposite direction I prefer to use an electromagnet II, the armature *h* of which is carried by the rock-shaft, and to include this magnet in a local circuit II′, having a battery II^2 and an exposed device II^3, which is adapted to be manually operated for the purpose of closing the circuit. When this device is operated and the circuit closed, the magnet will attract the armature and move the rock-shaft to such position that the shunt will be opened.

The door-shunt includes the coils *i* of an indicator I, and this indicator is of such a character that it will give the indications above described. To this end it is provided with a needle or pointer *i′*, (preferably exposed,) which sweeps a scale i^2, (preferably exposed,) so graduated and marked that during the day, when the circuit is complete through the shunt and the door of the guarded structure is open, the indicator will show upon a graduated part of the scale the condition of the circuit—that is to say, it will show whether the resistance in circuit is normal or not. If the indicator shows only a slight variation from normal, indicating a slight leakage at some point, the error may be corrected by properly adjusting the rheostat D′, and if a greater variation is indicated other means must be taken to locate and correct it. The scale is also provided with a mark to which the needle will move when the main circuit is complete through both the door-circuit and through the shunt. At the time of closing the door of the guarded structure should the pointer not come up to this mark it will indicate that the contacts of the door-circuit are not in proper order, and this defect or obstruction should be removed before the current is thrown off of the shunt for the night. If the indicator gives the indication that the door-circuit is in full electrical connection with the main circuit, then the operator pushes the push-button h^3 for the purpose of throwing the current off of the shunt in the manner already described. If this result follows—*i. e.*, if the current is thrown off of the shunt by the act of pushing the button—the pointer moves to a mark on the scale, indicating the fact. If the pointer does not move to this mark, the operator knows that the shunt has not been opened, and this defect must be remedied before the structure is finally closed for the night. Thus this one indicator is made to indicate these various conditions of the door-circuit and door-shunt.

I prefer to make the two paths or loops of the main circuit of equal resistance, to the end that when the current is passing through both of them the indicator will stand at a central point on the scale and will move an equal distance upon one or the other side of said cen-

tral point, accordingly as all or none of the current is passing through that loop which includes the windings of the indicator. To this end I include in the door-circuit *a* suitable resistance, as shown at *c''*.

In this specification the main circuit is said to have a shunt around the door-circuit; but I desire to have it understood that in its broadest aspect the invention is not limited to a "shunt," strictly so called, but includes any path through which the main circuit may be completed without including the door-circuit, to the end that current may be left on the main circuit and on the responsive device during the day, when the door is open, so long as this auxiliary path is of such a character that it will maintain the responsive device in normal condition.

The alarm-circuit J has its own individual battery J', located within the protected housing Y, and includes a switch J^2, an electromagnet J^3, the needle or some other movable part of the responsive device E, and contacts J^4, located in the path of said needle and upon opposite sides thereof. The switch J^2 is under the influence of a spring, a weight, or gravity, by which it is held normally closed while the alarm-circuit is in normal condition. The alarm device proper is shown at K. It may be of any desired character, and in the drawings I have shown a bell with spring mechanism for ringing it, said mechanism being under the control of a detent K', which is carried by the armature J^5 of the electromagnet J^8. This arrangement is such that as soon as the alarm-circuit is completed at the responsive device E the armature J^5 will be attracted and the detent K' will release the mechanism for ringing the bell, after which the bell will continue to ring until said mechanism has run down or until the detent K' again engages it. In order to prevent this reëngagement of the detent K', and thereby permit the sounding of the alarm to be continued for a considerable length of time, notwithstanding the return of the responsive device E to normal condition, the alarm-circuit is provided with a loop J^6 J^7, which shunts the movable part of the responsive device E and the contacts J^4. This shunt includes as a part of it the armature J^5 or a part carried thereby, which is adapted to make contact at J^7 and close the shunt as soon as the armature is drawn down. When this take place, the current will continue to flow from the battery J' through the magnet J^8, through J^7 to the armature J^5, through the armature to the wire J^6, and back to the main wire J, through which it is returned to the battery.

As before stated, it is desirable to have the entire alarm mechanism included within a protected housing, so that access cannot be had to it without giving an alarm, and with this arrangement it is also desirable to provide means whereby the condition of the alarm mechanism may be tested from the outside of the protected housing and preferably from the guarded-structure end of the system. Otherwise there would be no convenient way of ascertaining the fact should the battery become exhausted or otherwise disabled. To this end I extend from the protected housing to a place convenient of access, and preferably to the guarded structure, a circuit, herein called a "testing-circuit," which is electrically connected with a galvanometer or other indicator L^4, located at the place from which the test is to be made, (preferably the guarded structure,) and I provide means whereby the current may be caused to pass through the alarm-circuit and through the galvanometer without causing an alarm to be given. In the drawings I have shown four different arrangements by which this object can be accomplished, the preferred arrangement being that shown in Figs. 1, 2, and 3. In this preferred arrangement the testing-circuit joins the alarm-circuit at *j j'* and includes a wire L', leading from the point *j* to the galvanometer L^4, and a wire L, leading from the galvanometer back to the point *j'*. When it is desired to test the alarm-battery, the switch L^5 is moved from the contact C^5 to the contact L^6. This opens the main circuit and causes the needle of the responsive device E to close the alarm-circuit at one or the other of the contacts J^4, and in order to prevent this from causing an alarm to be given the alarm-circuit is opened at the switch J^2, which is under the control of a magnet L^3, located in a circuit, herein called the "switching-circuit." This switching-circuit is made up of a wire C^6, leading from one pole of the battery C^4, the switch L^5, the contact L^6, the wire L, leading to the magnet L^3, and the wire L^2, leading from said magnet back to the battery. Thus it will be seen that the battery C^4 and the switch L^5 are common to both the main circuit and the switching-circuit. When the switch L^5 is on the contact L^6, the switching-circuit will be closed, the magnet L^3 energized, and the alarm-circuit opened at J^2, so that the simultaneous closing of the alarm-circuit at the responsive device E is prevented from giving an alarm. The current of the alarm-battery will then pass to the needle of the responsive device E, contact J^4, wire L', galvanometer L^4, wire L, and alarm-circuit J back to the battery, and in this way a reading may be had on the galvanometer L^4, showing the condition of the alarm-battery. It is true that in this condition of the system the magnet J^3 is energized, but by reason of the high resistance of the entire circuit and especially of the galvanometer L^4 the armature J^5 will not be attracted. With this arrangement while the test is being made the protective portion of the system is thrown off. This is not a serious objection, however, since it requires only a moment to make the test, but it may, if desired, be avoided by avoiding the use of any part of the main circuit or the responsive device for making the

test. In this case the testing-circuit may be so connected with the alarm-circuit that when the testing-circuit is closed the two will form practically one circuit, in which the galvanometer at the guarded structure and the contacts J^4 and needle of the responsive device at the alarm-station are arranged in multiple, or if only the battery of the alarm mechanism is to be tested I may use an entirely separate circuit connected with its poles and extending to the guarded structure and there provided with a galvanometer and a device for closing the circuit, as shown in Fig. 4^a. In Fig. 5, l l' represent the testing-circuit, and l^5 a device located at the guarded structure, at which the testing-circuit is normally open and by which it may be closed when the test is to be made. With this arrangement when the testing-circuit is closed at l^5 the current of the alarm-battery will pass through the alarm-circuit and the testing-circuit and an indication will be given at the galvanometer. Here also the magnet of the alarm-circuit is energized, but by reason of the high resistance of the galvanometer an alarm will not be sounded. These arrangements (shown in Figs. 4^a and 5) are open to the objection that by connecting the opposite sides of the testing-circuit at a point between the guarded structure and the station by a medium of high resistance the battery may be exhausted. In order to avoid this, the test may be made through the contact J^4, at which point the alarm-circuit is normally open, (and this is preferable, since it also tests the operativeness of the responsive device,) or the testing-circuit may be separate and normally disconnected from the alarm-circuit, as shown in Fig. 4, and a switching-circuit, with its own individual battery c^4, used for connecting the two sides of the switching testing-circuit with the two sides of the alarm-circuit by means of the switch J^2, operated by the electromagnet L^3, located in the switching-circuit. Here again, as in the form of the invention shown in Figs. 1, 2, and 3, one and the same wire enters into the construction of both the switching-circuit and the testing-circuit.

In order to inclose and protect those portions of the several conductors or any of them which extend from the guarded structure to the alarm-station, they are inclosed in a tubular casing or covering which has an electrical barrier, such as shown in Figs. 7, 8, and 9. This casing is made up of a plurality of superimposed electrical conductors insulated from each other and so disposed that if the casing be penetrated by a metallic instrument the superimposed conductors will be electrically connected, and being charged at adjacent points with electricity of different potentials a short circuit will thereby be produced, or if a rupture of sufficient size be made one or more of the superimposed conductors will be broken, and in either case a responsive device which is electrically connected with them will cause an alarm to be given. This casing or covering is in the nature of a conduit or tube, through which a conductor or a number of conductors may be run without being braided or twisted together, and this is a decided advantage over the heretofore-existing practice of braiding the conductors themselves. This casing is constructed as shown in Figs. 7, 8, and 9. M may represent an inner tube which is preferably of fabric and is treated with some insulating material. Through this tube may be passed any desired number of electrical conductors, which may or may not be twisted or braided together. Preferably they are disposed parallel, since twisting or braiding them will increase the cost and will not increase the effectiveness of the protection. Upon the outside of this inner insulating-tube is disposed a conductor N. This conductor preferably consists of a strip of tin-foil wound spirally around the tube M, or it may consist of a wire or a number of wires, and if wires are used they may or may not be woven or plaited or braided together. Around this conductor M is a second tube or layer of insulating material M', and around this is a second conductor N', constructed like the first. Preferably four of these conductors N N' N^2 N^3 are used, insulated from each other by the tubes M M' M^2; but a greater or a less number may be used, and preferably the separate convolutions of each conductor are separated by a space about equal to the width of the conductor, and the convolutions of one conductor alternate with the convolutions of the next. In other words, when the complete casing is cut longitudinally the exposed ends of the conductors will break joints or be staggered. Around the whole is a sleeve or jacket O, which is insulated from the outer conductor by a sleeve M^4 and which is preferably of some flexible material, so that the casing as a whole will be flexible. For this outer sleeve I may use canvas or lead, the latter being preferred.

Where a casing or covering of the character above described is used in an electrical burglar-alarm system, the several conductors forming its electrical barrier may be incorporated in and used as parts of the system. In Fig. 10, for example, I have shown diagrammatically a system in which the conductors N^2 and N^3 are used in lieu of the conductors C' and C, respectively, of the system shown in Figs. 1, 2, and 3, while the conductors N and N' are in the nature of open circuits which are laid in opposite directions. One end of the conductor N is connected with one of the conductors of the closed circuit at the alarm-station upon one side of the resistance D, while the conductor N' has one of its ends connected with one of the conductors of the closed circuit at the guarded structure upon the other side of the resistance D, so that if electrical connection is made between the conductor N and either of the conductors N' or N^2, or between the conductor N' and either of the conductors N or N^3, or between

the conductors N^2 and N^3 the resistance will be short-circuited and the responsive device E will be influenced, causing an alarm to be given. These several conductors forming the electrical barrier of the casing or covering are so disposed that conductors of different potentials will fall opposite each other, as shown clearly in Fig. 9.

In a burglar-alarm system which has conductors other than those of the main or controlling circuit extending between the alarm-station and the guarded structure, such as testing and switching circuits, they are disposed within the casing or covering, and the main circuit is completed through the conductors or some of the conductors forming the barrier of said casing or covering. For example, as shown in Figs. 7 and 9 the conductors C and C' of the main circuit enter into the construction of the electrical barrier, while the conductors C'' and C''' of the main circuit and the conductors L, L', and L^2 of the testing and switching circuits are disposed within the casing or covering.

Having thus described my invention, the following is what I claim as new therein and desire to secure by Letters Patent:

1. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station and having at the guarded structure two paths or loops, and a responsive device electrically connected with the main circuit, of automatically-operating means, protected by the system, for establishing one of said paths or loops and means for indicating to a person upon the outside of the guarded structure whether or not the said path or loop is established, substantially as set forth.

2. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station and having at the guarded structure two paths or loops, and a responsive device electrically connected with the main circuit, of means, including a part accessible from the outside of the guarded structure, adapted for manual operation, for opening one of said loops, and a single indicator having means for showing the strength of the main current and means for showing the open and closed condition of both loops, substantially as set forth.

3. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station and having at the guarded structure two paths or loops, and a responsive device electrically connected with the main circuit, of means, including a part accessible from the outside of the guarded structure, for opening one of said loops, automatically-operating means protected by the system for establishing said loop, and an indicator adapted to show its condition, substantially as set forth.

4. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station, and having at the guarded structure two paths or loops, one of which includes the door-contacts and the other of which shunts said contacts, of means for establishing the circuit through the door-contacts, means, including a part accessible from the outside of the guarded structure and adapted for manual operation, for opening the shunt, and a single indicator electrically connected with the shunt and adapted to indicate the establishing of the door-circuit and the opening of the shunt, substantially as set forth.

5. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station and having at the guarded structure a circuit, including the door-contacts and adapted to be electrically connected with the main circuit by the act of closing the door, and a circuit shunting the door-contacts, of automatically-operating means protected by the system for establishing the shunt, and means for indicating whether or not the shunt is established, substantially as set forth.

6. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station and having at the guarded structure two paths or loops, one of which includes the door-contacts and the other of which shunts said contacts, of means adapted to be operated manually for switching the current onto the door-contacts and opening the shunt, automatically-operating means disposed within the guarded structure for switching the current onto the shunt, and an indicator electrically connected with the shunt, substantially as set forth.

7. The combination with an electrical burglar-alarm system of means for throwing it on and off, said means having a movable part carrying means for establishing and breaking the electrical connection, electromagnetic appliances for moving said part and throwing the system on, said appliances including an electrical circuit and an exposed device for closing it, and a chronometer having means for moving said part and throwing the system off, said movable part and the means for operating it, except the exposed device aforesaid, being protected by the system and inaccessible while the system is on, substantially as set forth.

8. A device for opening and closing a circuit having, in combination, a rock-shaft, mercury-cups carried thereby, an armature, an electromagnet for moving the armature in one direction and thereby moving the rock-shaft with its cups, and an automatic mechanical device having a trip adapted to move said shaft in the opposite direction, substantially as set forth.

9. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station, alarm mechanism located at

the alarm-station and including a battery, and a protected housing inclosing the alarm mechanism, of means located at the guarded structure and upon the outside of the protected housings for testing the battery of the alarm mechanism from the outside of the protected housing, means for indicating to a person on the outside of the protected housing the result of the test, and means for preventing the giving of an alarm while the test is being made, substantially as set forth.

10. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station, alarm mechanism located at the alarm-station and including a circuit having contacts and a battery, and a protected housing inclosing the alarm mechanism, of means located at the guarded structure and on the outside of the protected housing for testing the contacts and battery of the alarm mechanism, said means including an electrical circuit extending from the alarm mechanism to the place from which the test is to be made, means for indicating to a person on the outside of the protected housing the result of the test, and means for preventing the giving of an alarm while the test is being made, substantially as set forth.

11. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station, alarm mechanism located at the alarm-station and including an electrical circuit and a battery, and a protected housing inclosing the alarm mechanism, of a galvanometer located at the guarded structure, means electrically connecting the galvanometer with the circuit of the alarm mechanism, whereby said galvanometer is adapted to show the condition of the alarm-battery, and means for preventing the giving of an alarm while the test is being made, substantially as set forth.

12. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station, alarm mechanism located at the alarm-station and including a circuit and a source of electricity, and a protected housing inclosing said alarm mechanism, of a galvanometer located at the guarded structure and outside of the protected housing, means for electrically connecting the galvanometer with the source of electricity of the alarm mechanism, and means for preventing the giving of an alarm while the test is being made, substantially as set forth.

13. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station, alarm mechanism located at the alarm-station and having a source of electricity, and a protected housing inclosing said alarm mechanism, of a galvanometer located at the guarded structure and upon the outside of the protected housing, a normally open circuit including said galvanometer, means located upon the outside of the protected housing for closing said circuit, means for electrically connecting said circuit with the source of electricity of the alarm mechanism, and means for preventing the giving of an alarm when the galvanometer-circuit is closed and connected with the source of electricity of the alarm mechanism, substantially as set forth.

14. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station, an alarm-circuit located at the alarm-station and including a battery, and a protected housing inclosing said battery, of a testing-circuit extending from the guarded structure to a point outside thereof and electrically connected with the alarm-circuit, a galvanometer electrically connected with the testing-circuit and located at the alarm-station, means for closing the testing-circuit and including therein the battery of the alarm-circuit, and means for preventing the giving of an alarm when the testing-circuit is closed, substantially as set forth.

15. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station, alarm mechanism located at the alarm-station and including a circuit having a battery, and a protected housing inclosing the alarm mechanism, of a testing-circuit extending from the guarded structure to the alarm-station and electrically connected with the alarm-circuit, a galvanometer disposed at the guarded structure and electrically connected with the testing-circuit, means for causing a current to pass through the alarm-circuit and testing-circuit, and means for preventing the alarm from operating during the passage of said current, substantially as set forth.

16. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station, alarm mechanism located at the alarm-station and including a circuit having a battery, a switch and means holding the switch normally closed, and a protected housing inclosing said alarm mechanism, of means for testing the alarm mechanism, means for opening said switch while the test is being made and means located at the guarded structure for indicating to a person upon the outside thereof the result of the test, substantially as set forth.

17. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station, and an alarm-circuit located at the alarm-station and having a switch and means for holding it normally closed, of an electromagnet for opening said switch, a circuit including it and extending to the guarded structure, and means for testing the alarm mechanism, substantially as set forth.

18. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station, a responsive device located at the alarm-station and electrically connected with the main circuit, an alarm-circuit having contacts adapted to be closed upon a disturbance of the responsive device and including a switch, a switching-circuit extending from the station to the guarded structure and having a magnet arranged in operative relation to the switch, a battery common to the main circuit and switching-circuit, means for switching the current of the battery from the main circuit to the switching-circuit whereby the alarm-circuit is closed at the responsive device and opened at the switch, and means located at the guarded structure for indicating the condition of the alarm-circuit, substantially as set forth.

19. In an electrical burglar-alarm system, the combination with a main circuit extending between the guarded structure and an alarm-station, a responsive device disposed at the alarm-station and electrically connected with the main circuit, an alarm-circuit disposed at the alarm-station and having contacts adapted to be closed by disturbance of the responsive device, a testing-circuit extending from the guarded structure and electrically connected with the alarm-circuit, a galvanometer located at the guarded structure and electrically connected with the testing-circuit, a switch in the alarm-circuit, an electromagnet disposed in operative relation thereto, a switching-circuit, a battery common to both the main circuit and the switching-circuit, and means located at the guarded structure for switching the current of the battery from the main circuit to the switching-circuit, substantially as set forth.

CLYDE COLEMAN.

Witnesses:
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