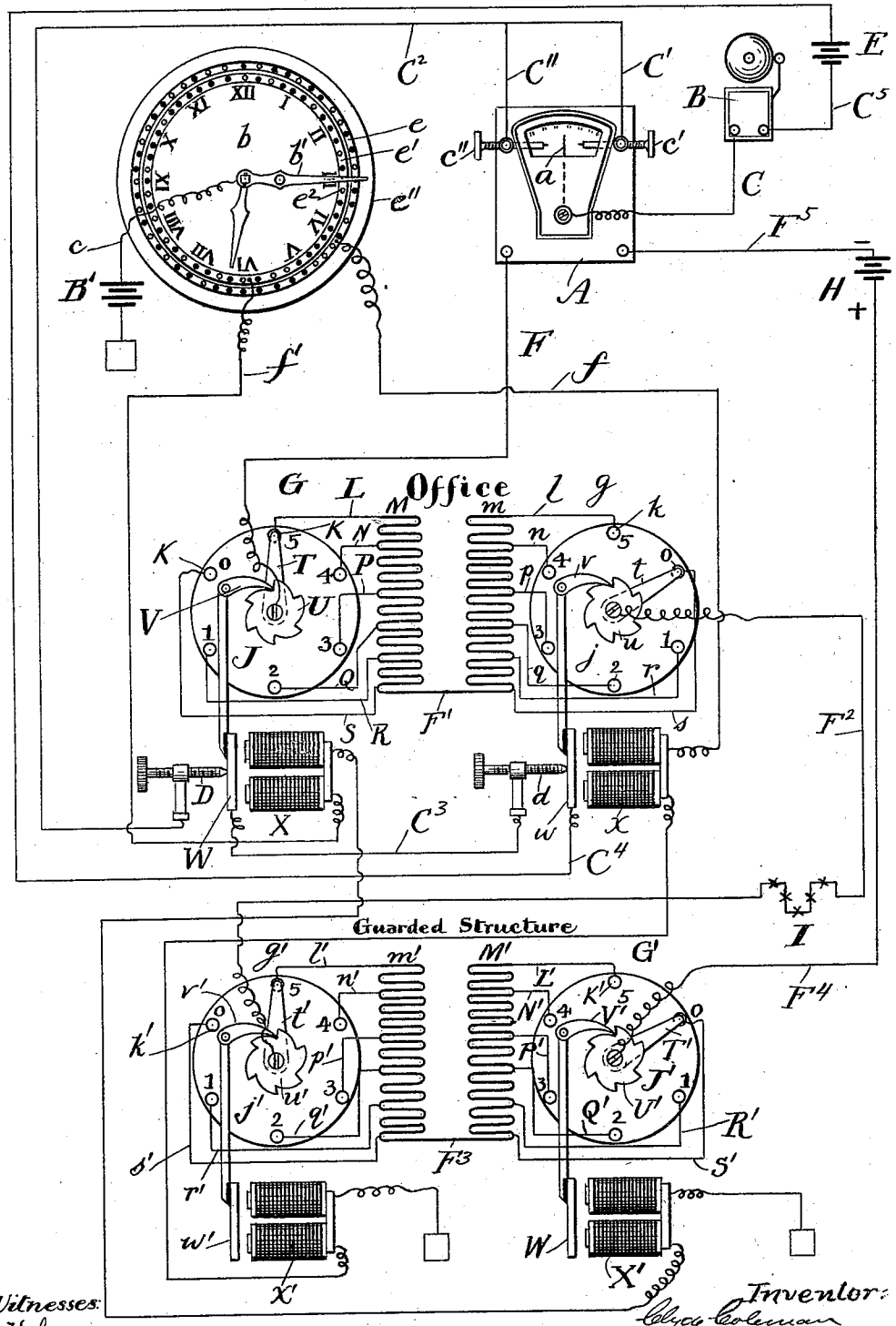
(No Model.)

# C. COLEMAN.

## ELECTRICAL BURGLAR ALARM.

No. 554,505. Patented Feb. 11, 1896.

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# UNITED STATES PATENT OFFICE.

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## ELECTRICAL BURGLAR-ALARM.

SPECIFICATION forming part of Letters Patent No. 554,505, dated February 11, 1896.

Application filed November 20, 1895. Serial No. 569,492. (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-Alarms, of which the following is a specification.

The present invention relates to that class of burglar-alarms having a main electrical circuit extending from the guarded structure to the watchman's office and an electrical device that is influenced by variations in the electrical current passing through said main circuit and adapted when influenced by such variations to close a local-alarm circuit.

In this specification I shall refer to the device which is arranged in the main circuit and which closes the local-alarm circuit upon a variation in the condition of the main circuit as a "meter;" but I desire to have it understood that the invention is not limited to a "meter" strictly so called, this term being intended to comprehend any device that will be affected by a variation in the current passing through it.

The term "guarded structure," as used in this specification, is intended to comprehend a safe, a building, or any part of a building or other structure which is equipped with the alarm, and the term "office" comprehends any place where it is desired to give the alarm when the system is tampered with.

The drawing shows a system of apparatus adapted for application to only one structure to be guarded; but the invention is not limited thereto, and to provide a system for guarding any desired number of structures it is only necessary to duplicate those parts that are hereinafter said to be located at the guarded structure and to extend the main circuit.

I am aware that it has been proposed to arrange at the guarded structure and in the main circuit mechanism whereby a number of different resistances may be successively thrown into said circuit and to arrange at the office, in a local branch of the main circuit, similar mechanism whereby a number of similar different resistances may be successively thrown into said local branch, said mechanisms being operated synchronously by increasing the current in the main circuit, whereby equal resistance is maintained in the two branches of the circuit, between which the "meter," so called, is arranged. In this apparatus the variation upon which the operation of the meter inclosing the alarm-circuit depends is not a variation in the total resistance in the entire circuit, but a variation in the resistance in a local portion of said circuit, while in an apparatus constructed in accordance with the present invention the variation upon which the corresponding operation of the meter depends is a variation in the total resistance in the entire circuit and not a variation in the resistance in a local portion thereof. In the one case the element of safety depends upon varying from time to time the total resistance in the entire circuit, and in the other case it depends upon varying from time to time the resistance in local portions of the circuit. This variation in the resistance in local portions of the circuit I accomplish by using permutating rheostats at the office and at the guarded structure.

By "permutating rheostats," as used in this specification, are meant synchronously-operating mechanisms, of whatever construction, one of which increases and the other of which decreases the resistance in the circuit, the increase and decrease being alike in amount, so that the resistance in localized portions of the circuit is varied while the total resistance in the entire circuit is not. In order to increase the number of possible variations, I prefer to use two sets of these permutating rheostats, one rheostat of each set being located at the guarded structure and the other at the office, and I provide means whereby the two sets may be operated independently and at different times, while the two rheostats of each set are operated synchronously.

In alarms of the class to which the present invention belongs, as heretofore constructed, the rheostats depended for their operation upon an increase in the current in the main circuit; but where two sets of rheostats are used and are to be operated at different times it is preferred to provide a separate circuit for operating each set.

The invention consists in the features of novelty that are particularly pointed out in

the claims hereinafter, and in order that it may be fully understood I will describe it with reference to the accompanying drawing, which is made a part of this specification, and which shows diagrammatically a burglar-alarm system embodying the invention and adapted for application to a single-guarded structure.

A represents the device hereinbefore termed the "meter," which is arranged in the main circuit and also in the alarm-circuit and so associated with both that upon a variation in the current in the main circuit it will close the alarm-circuit and cause an alarm to be given. As shown in the drawing, this alarm is a magneto-electric bell B; but any other form of signaling device may be used if desired. The alarm-circuit comprises a wire C extending from one of the binding-posts of the alarm to the shaft of the needle *a* of the meter, two wires C' C'' connected with the binding-posts, in which are arranged two contact-screws *c' c''*, whose points are located upon opposite sides of the needle *a*, and in the path traveled thereby when in motion, a wire $C^2$ leading to the binding-post of a contact-screw D, against which the armature of an electromagnet bears when said magnet is not energized, a wire $C^3$ extending from said armature to the binding-post of a contact-screw *d*, against which the armature of a second electromagnet bears when said magnet is not energized, a wire $C^4$ extending from said armature to one pole of a battery E, and a wire $C^5$ extending from the other pole of said battery to the other binding-post of the alarm. When the current in the main circuit is normal, the needle *a* will remain in a central position out of contact with either of the contact-screws *c' c''*; but when its condition is varied the needle will be deflected and come in contact with one or the other of said screws, according to the nature of the disturbance, and with whichever one of said screws the needle has contact the alarm-circuit will be closed. The present invention is not limited to this particular mechanism for closing the alarm-circuit upon a variation in the condition of the main circuit, and, as before intimated, a device of any other construction that will do this work may be substituted for what is shown in the drawing; but whatever its construction it is the intention that the word "meter" as used in this specification shall comprehend it.

The main circuit consists of a wire F leading from one of the binding-posts of the meter A to a rheostat G, a wire F' leading from the rheostat G to a rheostat *g*, both of which rheostats are located at the office, a wire $F^2$ leading from the rheostat *g* to a rheostat *g'*, a wire $F^3$ leading from the rheostat *g'* to a rheostat G', both of which latter rheostats are located at the guarded structure, a wire $F^4$ leading from the rheostat G' to one pole of the battery H, and a wire $F^5$ leading from the other pole of said battery to the other binding-post of the meter. The wires $F^2$ and $F^4$ are those that extend from the office to the guarded structure and one or both of them is so disposed that entrance cannot be had to the guarded structure without interfering with the wire. The present invention is not limited to any particular manner of disposing the wire or wires, upon the disturbance of which the alarm is given, and I have therefore simply shown this feature of the device by an arbitrary symbol at I.

The several rheostats are of similar construction and similar parts in all of them are indicated by similar letters of reference, capital letters being used to indicate the parts of the rheostat G, capital letters with the prime-mark added being used to indicate the parts of the rheostat G', small letters being used to indicate the parts of the rheostat *g*, and small letters with the prime-mark added being used to indicate the parts of the rheostat *g'*. With this explanation of the lettering, a description confined to the rheostat G is sufficient. It consists of a disk J of insulating material, upon which are arranged, in a circular series, a number of contact-points K. As shown in the drawing, six of these contact-points are provided, and in addition to the reference-letters they are in each instance numbered in succession 0 1 2 3 4 5. The contact-point 5 is connected by a wire L with one extremity of a resistance-coil M, with the opposite extremity of which the division F' of the main circuit is connected, and the contact-points 4, 3, 2, and 1 are connected by wires N P Q R, respectively, to points in the resistance-coil M, successively nearer said branch of the main circuit, the contact-point 0 being connected by a wire S directly with said branch, so as to entirely shunt the resistance-coil. T is an arm pivoted centrally to the disk J and adapted to have contact at its outer end with any one of said contact-points, and U is a ratchet-wheel fixedly associated with said arm and engaged by a pawl V carried by an insulated arm which projects from the armature W of an electromagnet X.

Arranged in the office is a clock *b*, one of the hands, *b'*, of which is connected by a wire *c* with a battery B'. This clock is provided with two metallic rings *e e'*, which are insulated from each other and arranged one within the other concentrically with the hand-arbor. Each of them is provided with a series of perforations, (represented by the round black dots *e''*,) adapted to receive pins, (represented by the circles $e^2$,) with which pins the hand has contact as it reaches them in succession. Electrically connected with the ring *e* is a wire *f*, upon which the electromagnets *x* and *x'* are arranged in series, the wire being grounded after passing the magnet *x'*. With the ring *e'* is electrically connected a wire *f'*, upon which the magnets X and X' are arranged in series, the wire being grounded after passing the magnet X'.

The operation of the apparatus thus con-

structed is as follows: As the hand $b'$ of the clock reaches the pins of the rings $e$ and $e'$ in succession electrical connection is made between the battery B' and one or the other of the wires $f f'$ accordingly as the pin reached is in one or the other of the rings $e$ $e'$. As the parts are shown in the drawing the pin that will be reached next is in the ring $e'$, and when this pin is reached electrical connection will be established between the battery and the wire $f'$, and the current flowing through this wire will energize the magnets X and X'. When so energized the armatures W W' will be attracted and the pawls V V' in engagement with the ratchets U U' will cause a partial rotation of the shaft on which said ratchets are secured and cause the arms T T' to move from the contact-points with which they are shown to be in engagement to the contact-points next in succession. It will be seen that as they are shown in the drawing the arm T is in contact with point 5, which is connected with that end of the resistance-coil M which is remote from the division F' of the main circuit, while the arm T' is in contact with that contact-point 0 which is in direct connection with the division $F^3$ of the main circuit, so that the current flowing through this much of the main circuit will have to pass through the entire resistance-coil M, but will pass by the entire resistance-coil M'. Assuming for the sake of this description that the resistance of each of the coils M is five hundred ohms the resistance to the current passing through the portion aforesaid of the main circuit will be five hundred ohms, since it passes through the entire coil M, but shunts the entire coil M'. When, however, the movement above described has taken place the current will pass from contact-point 4 through wire N to the coil M and thus shunt a portion (one-fifth) of the coil, so that this coil will offer a resistance of four hundred ohms, but at the same time the arm T' will have been moved into contact with the point 1, which is connected to the coil M' at a distance from the division $F^3$ of the main circuit representing a resistance of one hundred ohms, so that taken together the resistance of the coils M and M', even after the change has taken place, remains in the aggregate the same. These operations are repeated as the hand $b'$ of the clock reaches the pins in the ring $e'$ in succession, and at each operation the effect is to cut out resistance at one and throw in resistance at the other of the two coils M M', the amount cut out and the amount thrown in in each instance being the same, so that the aggregate resistance of the two coils never varies. The next pin that will be reached by the hand $b'$, as shown in the drawing, is a pin in the outer ring, $e$, and when this pin is reached electrical connection will be established between the battery B' and the wire $f$, and the magnets $x$ and $x'$ will be energized. This will attract their armatures $w$ $w'$ and cause the pawls $v$ $v'$, which are in engagement with the ratchets $u$ $u'$, to shift the positions of the arms $t$ $t'$ and cause them to synchronously advance from the contact-points with which they are shown to be in engagement to the contact-points next in succession. The effect of this operation is to throw in resistance at the coil $m$ and cut out resistance at the coil $m'$, and in this way the total resistance of the two coils $m$ $m'$ is prevented from varying. The resistance of all of the coils according to the arbitrary assumption that each of the coils represents a resistance of five hundred ohms will be two thousand ohms; but with the arrangement shown in the drawing, only one-half of this resistance is in circuit at any one time. With the parts as indicated in full lines this resistance is equally divided between the rheostats at the office and the rheostats at the guarded structure; but as soon as either one of the changes already described takes place the resistance will change. For example, after the first change above described has taken place there will be a resistance of only four hundred ohms in the office, while there will be a resistance of six hundred ohms in the rheostats of the guarded structure, five hundred in the rheostat $g'$, and one hundred in the rheostat G'. When the second change above described takes place, this division of the resistance will be changed and there will again be an equal resistance in the office and at the guarded structure. It will be seen, however, that after the second change has taken place, as the pins are arranged in the drawing there will be three changes in the rheostats that are controlled by the circuit $f$ before there is any change in the rheostats that are controlled by the circuit $f'$, so that when the third change takes place the resistance will be six hundred ohms at the office and four hundred ohms at the guarded structure. When the fourth change takes place the resistance will be seven hundred ohms at the office and three hundred at the guarded structure, and when the fifth change takes place the resistance will be eight hundred ohms at the office and two hundred ohms at the guarded structure.

It is the intention that the pins $e^2$ shall be removable from the perforated rings, so that they may be placed arbitrarily and thus arbitrarily determine the intervals at which the variations in the resistance shall be brought about.

It will be seen that unless means be provided for preventing it, as the arm of the rheostats pass from one point of contact to the other, there will be intervals during which they will not have contact with either the points from which they passing or the points to which they are passing, and consequently there will be at this instant a break in the circuit and this break will cause a disturbance of the needle of the meter A and a consequent closing of the alarm-circuit. This closing of the circuit will, of course, be only mo-

mentary, and the character of the alarm would be such that it could be readily distinguished by the watchman from an alarm which resulted from a surreptitious meddling with the circuit, and while it is therefore not essential that this opening of the circuit be prevented, still I prefer to do so. It is for this reason that the armatures W and *w* of the magnets X and *x* at the office are included in the alarm-circuit. By so including them, the instant they begin to approach their magnets, and before the arms of the rheostats have moved far enough to break the main circuit, the operating-armature will be out of contact with the corresponding screw D or *d*, as the case may be, and thus the alarm-circuit will be opened, so that the momentary variation in the condition of the main circuit will not cause an alarm to be sounded.

As shown in the drawing, the two magnets of each set are arranged in series, but I desire to have it understood that my invention is not limited in this respect, and if desired they may be arranged in multiple.

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

1. In a burglar-alarm, the combination with a signaling device and a meter adapted to control it, of an electrical circuit including said meter and extending from the office to the guarded structure, and permutating rheostats arranged in said circuit and located at distant points, substantially as set forth.

2. In a burglar-alarm, the combination with an alarm-circuit and a meter arranged therein and adapted to control it, of a main circuit electrically connected with said meter and extending from the office to the guarded structure, and permutating rheostats arranged in said main circuit and located at the office and at the guarded structure, substantially as set forth.

3. In a burglar-alarm the combination with an alarm-circuit and a meter arranged therein, of a main circuit electrically connected with said meter and extending from the office to the guarded structure, permutating rheostats arranged in said main circuit and located at the office and at the guarded structure, a circuit independent of the main circuit and electromagnetic mechanism arranged in said circuit for synchronously operating the rheostats, substantially as set forth.

4. In a burglar-alarm the combination with an alarm-circuit and a meter arranged therein, of a main circuit electrically connected with said meter and extending from the office to the guarded structure, permutating rheostats arranged in said main circuit and located at the office and at the guarded structure, electromagnetic mechanism for synchronously operating said rheostats, a circuit separate from the main circuit including said operating mechanism and a clock having its hand included in said circuit, and a series of contact-points arranged in the path of the hand and included in said circuit, substantially as set forth.

5. In a burglar-alarm the combination with an alarm-circuit and a meter arranged therein, of a main circuit electrically connected with said meter and extending from the office to the guarded structure, permutating rheostats arranged in the main circuit and located at the office and at the guarded structure, electromagnetic mechanism for synchronously operating said rheostats, a circuit separate from the main circuit including said operating mechanism, a clock having one of its hands included in said circuit, a ring included in said circuit and arranged concentrically with the arbor of the hand, and a series of contact-points on said ring, substantially as set forth.

6. In a burglar-alarm, the combination with an alarm-circuit, and a meter arranged therein, of a main circuit electrically connected with said meter and extending from the office to the guarded structure, permutating rheostats arranged in the main circuit and located at the office and at the guarded structure, electromagnetic mechanism for synchronously operating said rheostats, a circuit independent of the main circuit including said electromagnetic operating mechanism, means for opening and closing said circuit, the armature of one of the electromagnets for operating the rheostats being included in the alarm-circuit, and a contact-point also included in said circuit arranged in proximity to said armature, substantially as set forth.

7. In a burglar-alarm the combination with an alarm-circuit, and a meter arranged therein, of a main circuit electrically connected with said meter and extending from the office to the guarded structure, two sets of permutating rheostats arranged in the main circuit, one rheostat of each set being located at the office and the other at the guarded structure, and means for synchronously operating the rheostats of each set, substantially as set forth.

8. In a burglar-alarm, the combination with an alarm-circuit and a meter arranged therein, of a main circuit electrically connected with said meter and extending from the office to the guarded structure, two sets of permutating rheostats arranged in the main circuit, one rheostat of each set being located at the office and the other at the guarded structure, means for synchronously operating the two rheostats of one set, and separate means for synchronously operating the two rheostats of the other set, substantially as set forth.

9. In a burglar-alarm, the combination with an alarm-circuit and a meter arranged therein, of a main circuit electrically connected with the meter and extending from the office to the guarded structure, two sets of permutating rheostats arranged in the main circuit, one rheostat of each set being located at the office and the other at the guarded structure, electromagnetic apparatus for synchronously

operating the rheostats of one set, and separate electromagnetic apparatus for synchronously operating the rheostats of the other set, substantially as set forth.

10. In a burglar-alarm, the combination with an alarm-circuit and a meter arranged therein, of a main circuit electrically connected with the meter and extending from the office to the guarded structure, two sets of permutating rheostats arranged in the main circuit, one rheostat of each set being located at the office and the other at the guarded structure, electromagnetic apparatus for synchronously operating one set of rheostats, a circuit including the magnets of said apparatus, electromagnetic apparatus for synchronously operating the rheostats of the other set, a circuit including the magnets of said apparatus, and means for opening and closing the circuits of the electromagnetic operating mechanism, substantially as set forth.

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