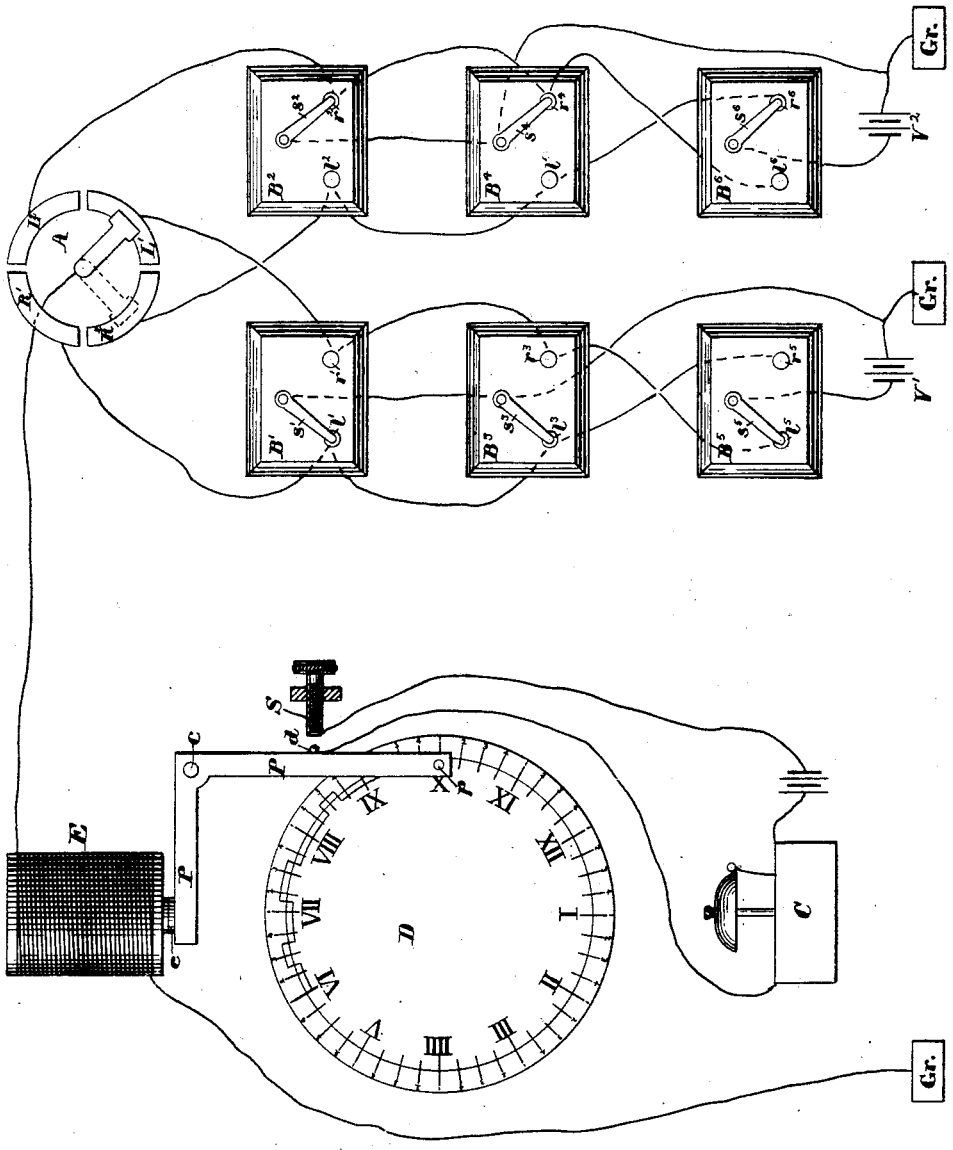
(No Model.)

C. W. HUBBARD.

ELECTRIC DETECTING APPARATUS FOR WATCHMEN.

No. 259,690. Patented June 20, 1882.



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ELECTRIC DETECTING APPARATUS FOR WATCHMEN.

SPECIFICATION forming part of Letters Patent No. 259,690, dated June 20, 1882.

Application filed March 22, 1882. (No model.)

To all whom it may concern:

Be it known that I, CHARLES W. HUBBARD, of Boston, in the State of Massachusetts, have invented a new and useful Improvement in Electric Detecting Apparatus for Watchmen, of which the following is a specification.

In my application No. 47,584 I have described a detective apparatus which is worked upon an open circuit, and which consists essentially of the said open circuit, a clock-work located in the office or other convenient part of the premises to be guarded, and which automatically and periodically closes the circuit, an alarm or recording instrument located near the clock-work or in any other suitable part of the premises, and a number of hand-switches, one for and in each apartment to be visited, the whole so arranged upon the open circuit that an alarm will be given or a record made periodically at each closing of the circuit by the clock-work, unless there has been a corresponding periodical shifting of all the hand-switches.

The detecting apparatus herein described, so far as the duties of the watchmen are concerned, is the same in its practical operation as that described in the said other application; but the present apparatus is worked upon a closed circuit.

One part of the present invention consists in the combination, with two or more battery-circuits, of a series of contact-points and hand-switches in each or either of the said battery-circuits, an automatic circuit-shifter so contrived as to alternately and periodically complete each battery-circuit through a common wire, unless said circuit has been short-circuited, and an alarm or recording instrument, or both, the whole arranged and operating as hereinafter described.

The invention consists, further, in certain subcombinations and details of construction, the most important of which have reference to the recording-instrument and to the employment of a single recording-instrument in connection with several series of hand-switches.

I have represented the present invention, for the most part, as contrived for two watchmen who have separate "beats," or who have each a separate series of hand-switches in charge; but it will hereinafter appear that the invention will answer for a greater number or one only. A separate battery is required for each beat, and at least two battery-circuits are required, even if but one of them is furnished with hand-switches.

The automatic circuit-shifter has for each series of hand-switches, or each watchman's beat with which it is connected, two contact-plates, with each of which a pointer revolved by clock-work or other suitable mechanism remains in contact through a portion of each revolution. This pointer is connected with a wire leading to ground, after passing through an electro-magnet in or controlling the alarm or recording instrument, or both.

Substantially as described in my said other application, there is in each apartment or place which a watchman is required to visit a switch-board containing a hand-switch and two contact-points, and each of these contact-points is connected by a wire with one of the two contact-plates of the automatic circuit-shifter, which are appropriated to the series or beat containing the switch-board. One hand-switch in each series is connected with one pole of the battery belonging to that series, and the others are grounded through the wire leading to ground from the other pole of said battery.

When the pointer of the automatic circuit-shifter comes in contact with one of the contact-plates belonging to either series of hand-switches and breaks contact with the preceding plate belonging to another series of hand-switches, and consequently breaks connection with the battery of the preceding series, it will fail to establish a connection with the new battery unless all the hand-switches of the new series are so turned as to maintain the connection through their respective switch-boards; but, on the contrary, the new battery will be short-circuited at any switch-board at which the hand-switch is not properly turned.

The distinctive feature of the recording-instrument consists in its adaptability to be used in combination with several series of hand-switches, the object being to show at a glance by one dial and one tracing-pencil whether any and what watchman has at any and at what time failed to shift all the hand-switches in his charge.

An alarm-bell also is so connected with the recording-instrument as to sound an alarm during the time the pointer of the automatic

circuit-shifter is upon the contact-plate appropriated to any series of hand-switches in which the watchman has failed to perform his duty.

In the drawings, A is the automatic commutator or circuit-shifter, *a* being a metallic hand thereof, revolved in any given time by clock-work, (not shown,) and R′ R² L′ L² being four contact-plates on the face of the commutator, with which the hand *a* comes successively in contact during each revolution.

B′, B³, and B⁵ are three switch-boards, supposed to be located one in each apartment which a single watchman is required to visit. In this specification they will be referred to as the "No. 1 series of switch-boards." Each contains a hand-switch, and the said switches are marked respectively s' s^3 s^5, and each contains two buttons or contact-points, (marked respectively r' and l', r^3 and l^3, r^5 and l^5.)

V′ is the battery appropriated to the No. 1 series of switch-boards. One of its poles is connected by a wire, as shown, with the hand-switch of the last switch-board of the No. 1 series. The other pole is grounded, and the remaining hand-switches of the series are grounded through the same wire.

As before stated, two contact-plates of the commutator A are appropriated to each series of hand-switches. The plates appropriated to the No. 1 series are marked R′ L′; the plates appropriated to the No. 2 series are R² L²; and it may be added that in actual practice it is convenient that these contact-plates should have distinctive marks. The plate L′ is connected by a wire with all the right-hand contact-points of the switch-boards in its series except the last, the wire crossing at this board and making a connection with the left-hand contact-point for a purpose which will appear hereinafter—that is, contact-plate L′ is joined by a wire with contact-points r', r^3, and l^5. In like manner R′ is joined with l', l^3, and r^5.

B², B⁴, and B⁶ are in like manner switch-boards belonging to the No. 2 series. V² is the battery of this series, and the connections are as shown. The hand-switches s^2 and s^4 are grounded through the wire grounding one pole of battery V². The other hand-switch is connected with the other pole of said battery, and the contact-plate L² of the automatic commutator A is connected by wire with contact-points r^2, r^4, and l^6, while contact-plate R² is connected with l^2, l^4, and r^6.

The hand *a* of the automatic commutator A is connected by a wire, as shown, with the electro-magnet E, which in turn is grounded, as shown.

It follows that in the condition of the apparatus represented there is an unbroken circuit from ground through battery V′, hand-switch s^5, contact-points r^3 r', contact-plate L′, hand *a*, and electro-magnet E to ground.

It is obvious, also, that if either of the hand-switches were upon a right-hand contact-point, r' r^3 r^5, the battery V′ would be short-circuited, and there would be no current through the electro-magnet E; and thus it is obvious that it is necessary that to maintain a current through the electro-magnet E the watchman shall take care that all the hand-switches of the No. 1 series are on their left-hand contact-buttons before the hand *a* comes upon the plate L′.

In like manner it may be observed that the condition of things is such in No. 2 series that when the hand *a* comes upon the plate R², as indicated in dotted lines, all the hand-switches of the No. 2 series must be upon right-hand contact-buttons in order to establish and maintain a current flowing from battery V² through the electro-magnet E; and it is obvious that, for a like purpose, before the hand *a* comes upon plate R′ all the hand-switches of No. 1 series must be shifted to the right.

The distance between two plates upon the commutator A is such that the hand *a* reaches one plate before it leaves the plate immediately preceding. There is accordingly a constant contact through the electro-magnet E if the hand-switches are shifted at the proper times.

It is now apparent that the wires leading to the contact-points of the last switch-board in both series are crossed in order that there may be no exceptions to the rule that the watchman in any series shall turn all his hand-switches to the left before the hand *a* reaches an L plate, and again all to the right before the hand *a* reaches an R plate.

Although but two series of hand-switches are shown in the drawings, a single automatic commutator might be used with a larger number, each series having, as before stated, two plates upon the commutator, and any watchman may shift his switches without regard to the doings of the other watchmen at any time when the hand *a* is upon neither of the contact-plates of the commutator appropriated to his own series. There must, however, be four contact-plates upon the commutator, and if there be but one series of hand-switches the two plates not belonging to that series must be connected with the poles of an independent battery.

In connection with the system or systems of switches above described, the electro-magnet E may be a part of any well-known alarm or recording instrument. I have, however, represented it as a part of a recording-instrument of novel construction.

A dial, D, has the hours marked upon it in the usual manner, and is revolved by an ordinary clock-work. Upon this dial, a little within its circumference, is drawn a circle, as shown, and the space between the hour-marks is divided by radial lines into as many smaller spaces as there are series of hand-switches in the system with which the recording-instrument is connected; but for convenience I have represented spaces or radial lines for four series of hand-switches upon the dial, although but two series are shown and have been described in connection with the automatic commutator.

P is an elbow-lever pivoted at *c* to the frame (not shown) of the clock-work belonging to the

dial D. One arm of this bell-crank lever carries the armature *e* of the said electro-magnet E. The other end carries a tracing-pencil, *p*, the butt-end of which is shown. In the normal condition of the elbow-lever, when there is a current through the electro-magnet E and the armature *e* is held up, the other end of the pencil rests upon the dial within the before-mentioned circle, and as the dial revolves marks a circle, or an arc of a circle, just within said permanent circle. When, however, there is no current through the electro-magnet, the weight of the long arm of the elbow-lever or a spring causes the end which carries the pencil to swing outward beyond the permanent circle, and the line traced by the pencil is an arc just outside of the permanent circle.

The commutator A is "timed" or adjusted with reference to the dial D. Accordingly when a current ceases through the electro-magnet E, owing to a break in one of the series of hand-switches, the tracer upon the dial not only records the fact of the break, but also records the series in which and the time at which the break occurred. Thus the dial in its present condition shows that it was started at six o'clock, and that from six to seven the watchman of No. 3 series was delinquent, that from seven to eight the watchmen of both No. 2 and No. 3 were delinquent, and No. 3 again from eight to nine.

C is a battery-bell, one wire of which is connected with a contact-point, *d*, on the elbow-lever P, while the other is connected through the bell-battery with a contact-screw, S. When the elbow-lever is released from the electro-magnet E contact is made between *d* and S, and the bell rings until a current is established through the electro-magnet.

It is evident that the time of an alarm will indicate in what series of hand-switches a break has occurred.

Further description of the mode of operation is unnecessary.

I here claim—

1. The combination, with a common ground-wire, an alarm or recording instrument in said common ground-wire, several electric circuits, and an automatic commutator causing the currents of said circuits to flow through said common ground-wire successively at regular intervals, of suitable contact-points and one or more series of hand switches, substantially as described, so that an alarm will be given or a record made periodically, unless the periodic action of the automatic commutator is counteracted by a corresponding periodic movement of hand-switches.

2. The combination, with two circuits, each containing a battery, and one or both containing a series of hand-switches and contact-points, of suitable wires, an alarm or recording instrument, and an automatic circuit-shifter adapted to periodically and alternately connect each circuit with a common ground through the alarm or recording instrument, substantially as described, for the purpose specified.

3. The recording-instrument herein described, consisting essentially of the automatically-revolving dial D, provided with a circular and radial lines, as shown, the electro-magnet E, the bell-crank lever P, armature *e*, and pencil *p*, in combination with an automatic commutator, suitable wires, and two branch circuits, substantially as described, to make records of the battery-circuit in which and of the time at which a break occurs.

4. The automatic commutator or circuit-shifter A, electro-magnet E, lever P, armature *e*, pencil *p*, and automatically-revolving dial D, in combination with two circuits, each provided with an independent battery, and one or both provided with hand-switches for short-circuiting the said battery or batteries, and the two normally making ground alternately through said commutator A and electro-magnet E, substantially as described.

5. The automatic commutator or circuit-shifter A, electro-magnet E, lever P, armature *e*, pencil *p*, automatically-revolving dial D, and relay-bell C, in combination with two circuits, each provided with an independent battery, and one or both provided with hand-switches for short-circuiting the said battery or batteries, and the two normally making ground alternately through said commutator A and electro-magnet E, substantially as described.

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