(No Model.) 2 Sheets—Sheet 1.

A. L. BOGART.

APPARATUS FOR OPERATING ELECTRICAL DEVICES.

No. 292,785. Patented Feb. 5, 1884.

Fig. 1.

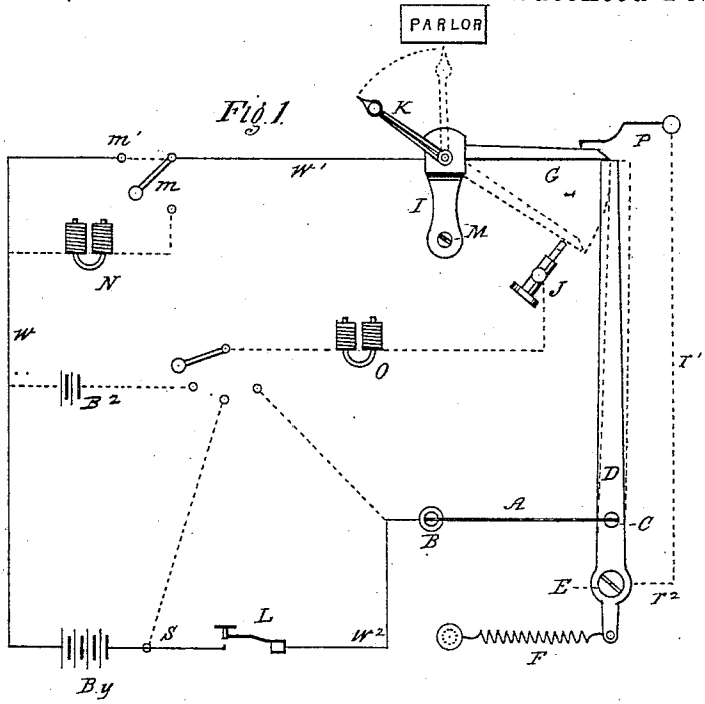


Fig. 2.

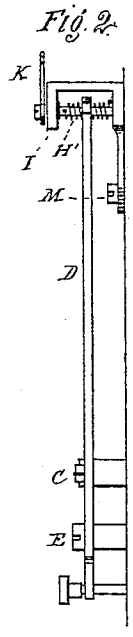


Fig. 3.

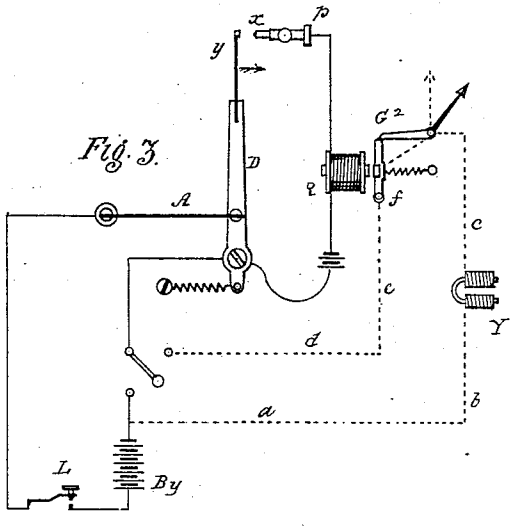
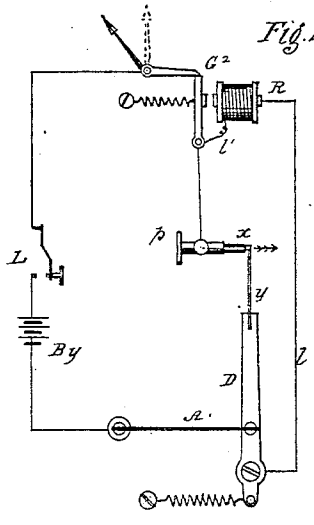


Fig. 4.



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(No Model.) 2 Sheets—Sheet 2.

A. L. BOGART.

APPARATUS FOR OPERATING ELECTRICAL DEVICES.

No. 292,785. Patented Feb. 5, 1884.

Fig. 5.

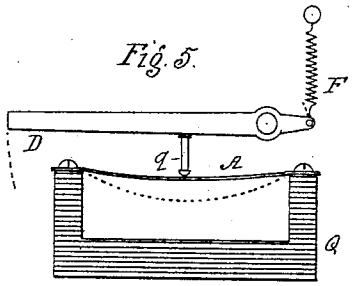


Fig. 6.

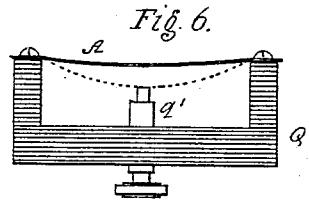


Fig. 7.

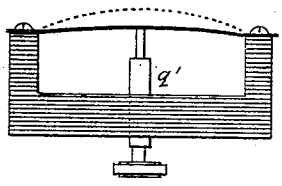
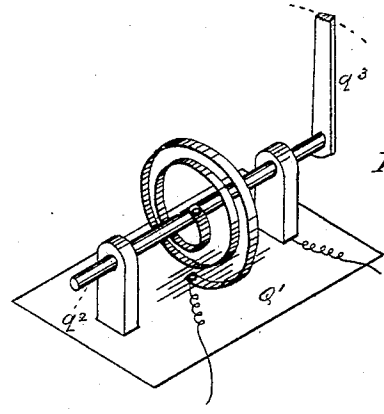


Fig. 8.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR OPERATING ELECTRICAL DEVICES.

SPECIFICATION forming part of Letters Patent No. 292,785, dated February 5, 1884.

Application filed August 18, 1883. (No model.)

To all whom it may concern:

Be it known that I, A. LIVINGSTON BOGART, of Jamaica, in the county of Queens and State of New York, have invented a new and useful Improvement in Apparatus for Operating Electric Devices; and I hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, (on two sheets,) which form a part of this specification.

This invention relates to an improvement in open-circuit electrical apparatus for operating annunciators or alarms, or other instruments where it is necessary or desirable that the circuit shall be closed for a given length of time before the annunciator or other instrument is actuated, and that said length of time elapsing between the closure of the circuit and the actuating said instrument can be regulated or adjusted at pleasure.

The invention consists in the combination, in open-circuit electrical apparatus, of a circuit-conducting resistance consisting of a thin ribbon or wire, with mechanism or devices constructed to be set in operation at and not before a prescribed and adjustable point of time after the closure of the circuit by the expansion of said resistance resulting from the passage of an electric current through the same, as is hereinafter particularly set forth.

In the accompanying drawings, Figure 1 represents a front view, and Fig. 2 a side view, of my improvement; and Figs. 3 to 8, inclusive, which are hereinafter explained, are modifications showing my improvement adapted to special purposes.

Similar letters of reference indicate the same parts or objects wherever they occur.

Referring to Figs. 1 and 2, Sheet 1, A is the circuit-conducting resistance, consisting of a thin ribbon or wire of metal or other electric conducting substance presenting resistance to the electric current passing through it. It is fixed at one end to any suitable support, B, and at its other end is attached to the lever D, which latter is pivoted at E, and is provided with a suitable device to bring a tension upon the ribbon A—as, for instance, an adjustable spring, F, said spring F and ribbon A thus holding the lever D firmly in its normal condition, with its upper end under the free end of the drop-lever G, as shown in Fig. 1. The drop-lever G is pivoted at H in a frame, I, and is held firmly upon the upper end of the lever D by means of a coiled spring, H′, (shown in Fig. 2,) or by other suitable means. The axis of the lever G carries a pointer or other indicator, K.

B *y* is a battery, and L is a circuit-closer of any suitable form or construction.

The parts above described being in their normal positions, as shown in Fig. 1, and the switch *m* upon the point *m′*, if the circuit be closed at L, a current will proceed from the battery B *y* through the wires *w w′* and levers G and D to C, thence through the ribbon or wire A and the wire *w²* back to the battery. Now, the ribbon or wire A, being constructed to present more resistance than any other portion of the circuit of equal length, will become heated throughout its length by the passage of the electric current through it, and will consequently expand, and thereby permit the spring F to act upon the lever D, so as to withdraw the upper end of said lever from under the end of the drop-lever G, which latter, being then unsupported, will fall into the position shown by the dotted lines G′, at the same time moving the indicator K, and also breaking the circuit through A.

The mode of adjusting or regulating the length of time which shall elapse between the closing of the circuit and the instrument or instruments being set in operation is as follows: The length of time elapsing between the closing of the circuit at L and its being broken at G will depend upon the distance the upper end of the lever D has to travel before it frees itself from the end of the drop-lever G, and the movement of said lever D is dependent upon the longitudinal expansion of the ribbon or wire A, which allows the spring F to draw the lower end of the lever inward, and thereby to withdraw the upper end thereof from under the end of G, and the extent and rapidity of the expansion of A will be proportionate to the strength of the current passing through it, and hence the distance which the upper end of D will travel in a given time with a given strength of battery may be readily determined by trial.

The adjustment of the distance to be traveled by D may be accomplished in various ways, one of which is shown in the drawings—

namely, the frame I, which carries the drop-lever G, is pivoted at M by means of a screw, so that said frame may be oscillated or moved toward or from the lever D, to increase or diminish the distance the said lever will have to travel to free itself from G.

Should it be desired to have a magnet operated by the current due to the closure of the circuit at L, for the purpose of ringing an alarm or performing other function, such magnet may be inserted anywhere in the main circuit—as, for instance, at N—and said magnet would record by its armature the length of time elapsing between the closure of L and the breaking circuit at G; or, by placing a magnet, O, in a branch wire, O B O J, such magnet would be operated from the time the break is made at G until the circuit-closer L is opened, the circuit in such case being from the battery B *y*, through *w w'* G J O B w^2, back to the battery.

In order to make a better connection between the levers G and D, a spring, P, may be employed, said spring being arranged to rest upon G when the latter is in its normal position, and connected to D by the wire $p' p^2$.

Should it be desirable to have a magnet operated continuously after the circuit is broken at G, whether the circuit-closer L remains closed or is opened—as, for instance, for the purpose of continuously ringing the bell in a burglar-alarm—then said magnet O may be inserted in a branch, J O O S, in which case the circuit, after the break at G, would be from B *y*, through *w w'* G' J O S, and back to the battery; or, again, said magnet may be inserted in a local circuit having its own battery, as shown by J O B^2 *w*.

In practice it may be found necessary, in some instances, to use a ribbon or wire A so thin or of so little resistance or a battery so weak that the movement of the lever D would be insufficient to be depended upon for operating the indicator. In such cases the modification shown in Fig. 3 may be employed. In this modification the drop-lever G is dispensed with, and the lever D is provided with a contact-spring, *y;* and *x* is an adjustable contact-point, which is made adjustable by means of the screw *p*, or similar device, and forms part of a local circuit. On closing the circuit at L, the expansion of A brings *y* and *x* in contact after the lapse of a certain interval of time, said interval of time depending upon the distance between *y* and *x*, to which they have been adjusted; and the contact of *y* with *x* closes the local circuit to operate a magnet, R, for any desired purpose—such, for instance, as causing a bell to be rung, (or an indicator to be operated,) the ringing of said bell commencing at the end of a prescribed interval of time after the circuit has been closed at L, and continuing so long as the main circuit remains closed at L; or, again, by running the main circuit through the wires *a b c d e f*, including the indicator and drop-lever circuit-breaker at G^2, an indication may be made by the circuit being broken at G^2, at the end of the prescribed interval of time after the circuit had been closed at L. A magnet introduced at Y would be operated from the time the circuit was closed at L until it was broken at G^2.

In the modification shown in Fig. 4 the main battery B *y* can be used to operate the magnet R. In this case there are two circuits from the ribbon or wire A—one through the lever D, contact-points *x* and *y*, to G^2, and the other through the wire *l*, magnet R, and wire *l'* to G^2; and when the circuit is broken at *x y* by the expansion of A, then the strengthened branch *l* operates the magnet R to break circuit at G^2.

In Figs. 5, 6, 7, and 8 are shown modified forms in which the circuit-conducting resistance A may be made. In the three first-named figures it is made in the form of a thin straight ribbon or wire fastened at each end to any suitable non-conducting support, Q, and operates by means of the curvature produced by its longitudinal expansion.

In Fig. 5 the lever D is held by the stop-pin *q*, attached thereto, which rests on A, the spring F keeping it in contact therewith, and as the curvature of A, due to its expansion, increases, the force of said spring is thereby allowed to swing the lever D forward, as shown by the dotted lines. This may be used as a substitute for the form shown in Fig. 1.

In Fig. 6 the increase of curvature due to its expansion causes the ribbon or wire A to make contact with a contact-point, *q'*. In Fig. 7 the ribbon or wire A is normally in contact with the point *q'*, and the increase of curvature causes it to break contact with the point *q';* and in Fig. 8 the said ribbon or wire A is made in the form of a spiral, one of its ends being secured to any suitable support, Q', and its other end attached to a shaft, q^2, carrying a lever or indicator, q^3, so that the expansion of A is made to operate said lever or indicator.

I am aware that the motion produced by the differences of linear expansion of a wire or ribbon conductor, due to its temperature varying by varying the quantity of electricity passing through said conductor, has been employed as a regulator for electric lamps, as described in Letters Patent of the United States Nos. 229,922 and 233,236; also, that the expansion of a platinum wire at a gas-jet, caused by a current of electricity being passed through it to heat it to incandescence to ignite the gas, has been employed to cut said wire out of circuit when the gas was lighted, first, to prevent said wire being destroyed by the combined force of heat from the current and the gas-flame, and, secondly, to shunt the current to the next burner-wire, as described in Letters Patent No. 235,979. I am further aware that the heat produced in a resistance by a current passed through it has been utilized to operate a thermometer or thermic circuit-closer by conduction, said circuit-closer being em-

ployed to close a branch or local circuit after a stated time, to cut off or break the main circuit and sound an alarm, as described in Letters Patent No. 276,286. But I do not use and do not claim as my invention any of the devices enumerated in or covered by any of said Letters Patent. Neither do I claim a metallic spring or ribbon for the purpose of breaking a circuit through an increase either in the resistance or the quantity of current in the circuit, as in Letters Patent No. 262,423 to Irwin.

What I claim as my invention is—

In an open-circuit electrical apparatus, a circuit-conducting resistance, A, consisting of a thin ribbon or wire, in combination with a drop-lever or equivalent device, as described, for permanently breaking the circuit, said resistance A and said circuit-breaking devices constructed and operating conjointly as described, to break the circuit at and not before the expiration of a prescribed and adjustable interval of time after the closure of the circuit by the expansion of said resistance A, resulting from the passage of the normal current through the same, as and for the purposes set forth.

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M. H. TOPPING.