(No Model.)

E. T. STARR.

RHEOSTAT.

No. 266,911. Patented Oct. 31, 1882.

Fig. 1.

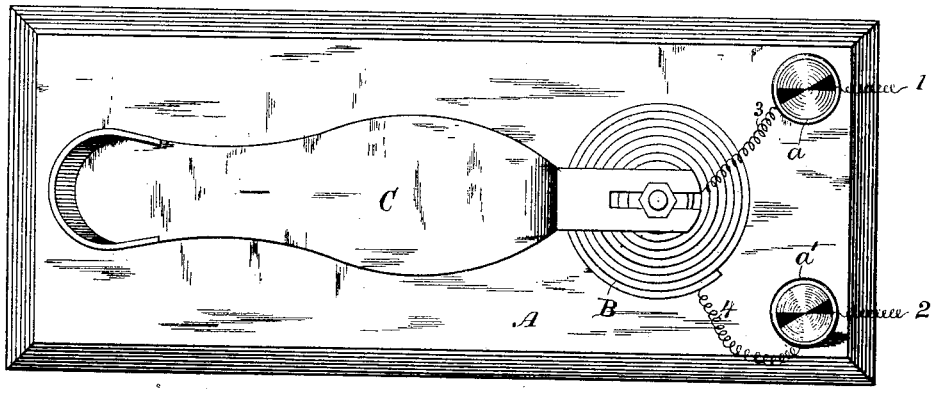


Fig. 2.

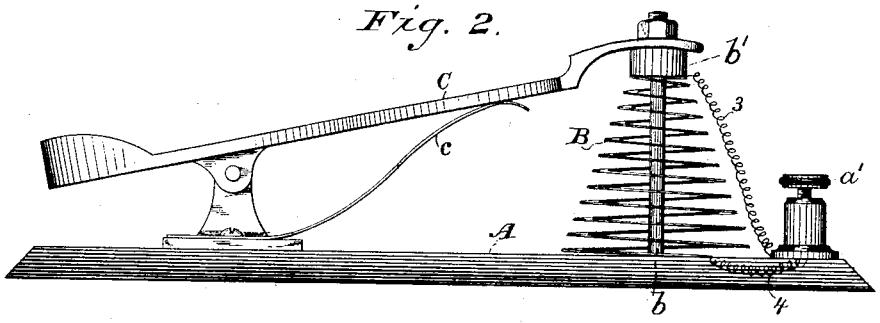
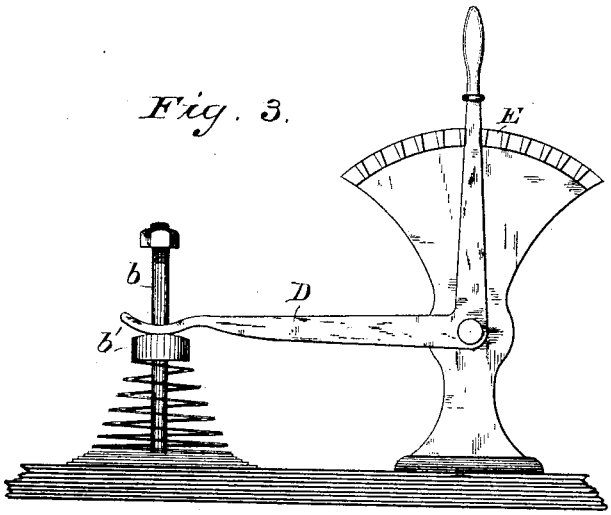


Fig. 3.



WITNESSES:

Wm A. Skinkle.

Eugene Starr

INVENTOR,

Eli T. Starr,

By his Attorney

Wm J. Peyton.

UNITED STATES PATENT OFFICE.

ELI T. STARR, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO WILLIAM J. PEYTON, OF WASHINGTON, D. C.

RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 266,911, dated October 31, 1882.

Application filed August 25, 1882. (No model.) Patented in England July 13, 1882, No. 3,330.

To all whom it may concern:

Be it known that I, ELI T. STARR, of the city and county of Philadelphia, in the State of Pennsylvania, have invented certain new and useful Improvements in Rheostats or Resistance Devices for Electric Circuits, of which the following is a specification, my said improvements having been patented in England July 13, 1882, as No. 3,330.

My invention relates to variable-resistance devices for electric circuits for governing more especially the action of electro-magnetic motors employed for driving light machinery—such as sewing-machines, lathes, &c.—whereby the speed and power of the machine or machines being driven by the motor may be readily controlled by the operator.

The object of my present invention is to provide an improved variable-resistance circuit-controlling device which is simple, inexpensive, and very efficient.

The subject-matter claimed is particularly pointed out at the close of the specification.

Some of my improvements may be used without the others; and my improvements may of course be used with electric circuits not including electric motors wherever applicable.

In the accompanying drawings, which illustrate my present improvements as embodied in the best way now known to me, Figure 1 is a plan or top view of my improved variable-resistance device organized for use with a pivoted treadle, and Fig. 2 is a side elevation thereof. Fig. 3 is a side elevation of the variable-resistance device organized for use with a detent or stop arrangement, whereby the resistance may be determined by adjustment, and the device then fixed so as to maintain the resistance as adjusted.

A base or stand, A, is provided with binding-screws *a a'* for connecting the ends of the circuit-wires 1 2, which lead to and from a battery or other generator of electricity, which circuit may include an electro-magnetic motor or motors when such is or are to be used. Said binding-screws are in electrical connection by wires 3 4, respectively, with the variable-resistance device, so as to constitute said device a part of the electric circuit. Said variable-resistance device consists of a coil, B—preferably a spring-coil—offering comparatively high resistance to the passage of the current when in its normal condition, and the resistance of the circuit is determined or varied by expanding or contracting the members of said coil, as will hereinafter appear. Said resistance-coil is preferably made in the tapering or conical form shown in the drawings, with the member of the coil of largest diameter next the base-board A, upon which the coil may be mounted, and the successive members of the coil gradually lessening in diameter to the apex or upper end of the coil, whereby upon pressure being applied to the smaller end of said coil to compact it its members will be compressed and be brought into surface contact from the larger to the smaller end of the coil in regular order, the members of the resistance-coil, in other words, gradually closing from its larger end to its smaller end, and thereby short-circuiting the current across the members of the coil, as will be obvious, instead of compelling it to traverse the coil in a spiral direction from end to end, as will be the case when the coil is in its normal condition of full expansion.

The wire 3, for instance, is connected with one end of the coil, while the wire 4, in such case, is connected with the opposite end of the coil. The upper end of the coil, in the organization shown in Figs. 1 and 2, is connected with the toe of an insulated treadle, C, pivoted to the base-board A, the foot of the operator being placed upon said treadle to compact the coil by downward pressure, so as to vary the resistance offered by the working-circuit to the passage of the current, and thereby, as will be obvious, affecting the action of the electric motor should one be included in the circuit. By removing the pressure the coil immediately expands, so as to offer the maximum resistance, the spring at the same time returning the treadle or lever to its normal position; or the return of the treadle may be effected by a separate or auxiliary spring, *c*, acting upon the treadle independently of the coil.

When my improved resistance device is used to govern the action of an electric motor the maximum resistance of the coil should be sufficient to permit the passage through the circuit of a current of just sufficient strength to drive the motor and machine operated thereby at a comparatively slow rate of speed. When

greater speed and power are required, downward pressure of the foot may be employed to throw out a part of the resistance, more or less, as required, so that the motor, and consequently the machine driven by it, may readily be driven at the required speed. When the resistance-coil is completely compacted or depressed the minimum resistance only is offered to the current, and the speed and power of the machine will consequently be at its maximum, and the extent of this range of resistance to be thrown in or cut out of the circuit will of course be determined to suit the particular circumstances under which it is required to work.

It will thus be seen that I have produced a resistance-coil for electric circuits which may be compressed by force in one direction to lessen its resistance gradually and to any desired extent, and by its own action or resilience return to its normal position to interpose its maximum resistance when the pressure is removed, this operation taking place without affecting the continuity of the current. This I believe to be a new and highly useful, while very simple, form of resistance device for electric circuits.

It will of course be understood that the expansible and contractible variable-resistance coil may be made in other forms than the tapering form shown, while preserving its novel characteristics. For example, the members of the coil may be made of substantially the same diameter throughout, but of different power as respects their capacity to resist compression, whereby upon the application of pressure to compact the coil its respective members will close gradually and in regular order. In some cases, also, the coil, instead of having the spring capacity in itself, may be made so as to be thrown outward after compression by a separate spring—for instance, an insulated spring inclosed by the coil. In some cases, also, the resistance-coil, with its members adapted to close gradually and in order to short-circuit the current across them, may lack the spring capacity, and be compressed and expanded positively, in order to vary the resistance of an electric circuit.

I prefer in some instances to guide the resistance-coil in the expansion and contraction of its members—as, for instance, by inserting within the coil a guide, *b*, on which an insulating ring or button, *b'*, is fitted to slide freely, and fit the toe end of the treadle C thereto, so as to bear upon said ring by a slotted connection, (clearly shown in Fig. 1,) which connection between the treadle and coil is a sliding or yielding one. Such an organization of parts insures the proper working and gradual orderly closing of the members of the coil, and avoids any rocking of said members relatively to each other, or lateral movement of said resistance-coil upon its base, due to the vibration of the treadle on its hinge or pivot.

In Fig. 3 I have shown my improved coil as a spring-coil, with the central guide, *b*, and with the insulating-ring *b'* movable on said guide, the coil being compacted by one end of a bell-crank lever, D, bearing upon said ring, said lever being rocked upon its pivot by the handle end thereof. This handle end may be locked at any desired point in its range of movement by means of a toothed sector, E, fixed upon the base-board and rising therefrom. This lever and toothed sector detent arrangement is a well-known mechanical expedient.

Before stating my claim I deem it proper to say that I am aware that resistance-coils forming part of an electric circuit have been suggested in order to vary the resistance of the circuit by bringing more or less of the members of the coil into surface contact by pressure; but in such cases there is no provision for preventing several members of the coil from coming into contact at the same instant, and consequently the coils are defective in that a gradual resistance or closing of the members of the coil in succession or order one after another is not attained. By constructing the coil in a tapering form (or with its members of gradually-decreasing diameter) or in equivalent ways a greatly superior coil is obtained, and one which permits the resistance of an electric circuit to be graduated or varied to a nice or slight degree.

I claim herein as of my invention—

1. The improved variable-resistance coil for electric circuits, constructed, substantially as hereinbefore set forth, of a tapering or equivalent form, whereby the respective members of the coil close in contact with each other gradually and in order one after another when subjected to pressure.

2. The combination, substantially as hereinbefore set forth, with an electric circuit, of a variable-resistance coil the members of which are constructed in a tapering or equivalent way, so as to close gradually and in order under pressure to short-circuit the current.

3. The combination, substantially as hereinbefore set forth, of an electric circuit, a resistance-coil the members of which are constructed in a tapering or equivalent way, so as to close gradually and in order under pressure to short-circuit the current, and mechanism to compact said coil.

4. The combination, substantially as hereinbefore set forth, with an electric circuit, of a spring resistance-coil constructed in a tapering form or equivalent way, so that its members close in order under pressure, and mechanism to compact said coil and permit it to return to its normal condition by its resiliency when the pressure is removed.

In testimony whereof I have hereunto subscribed my name this 19th day of July, A. D. 1882.

ELI T. STARR.

Witnesses:
WM. J. PEYTON,
E. EUGENE STARR.