(No Model.)

C. J. STURGEON.

AUTOMATIC RHEOSTAT.

No. 513,626. Patented Jan. 30, 1894.

Fig. 2.

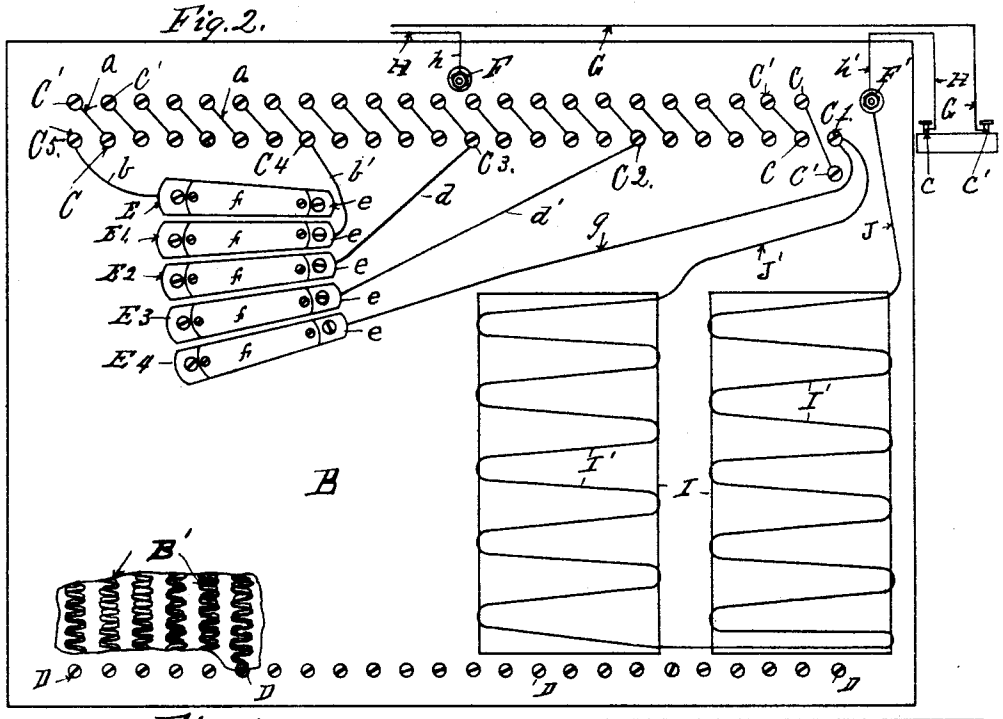
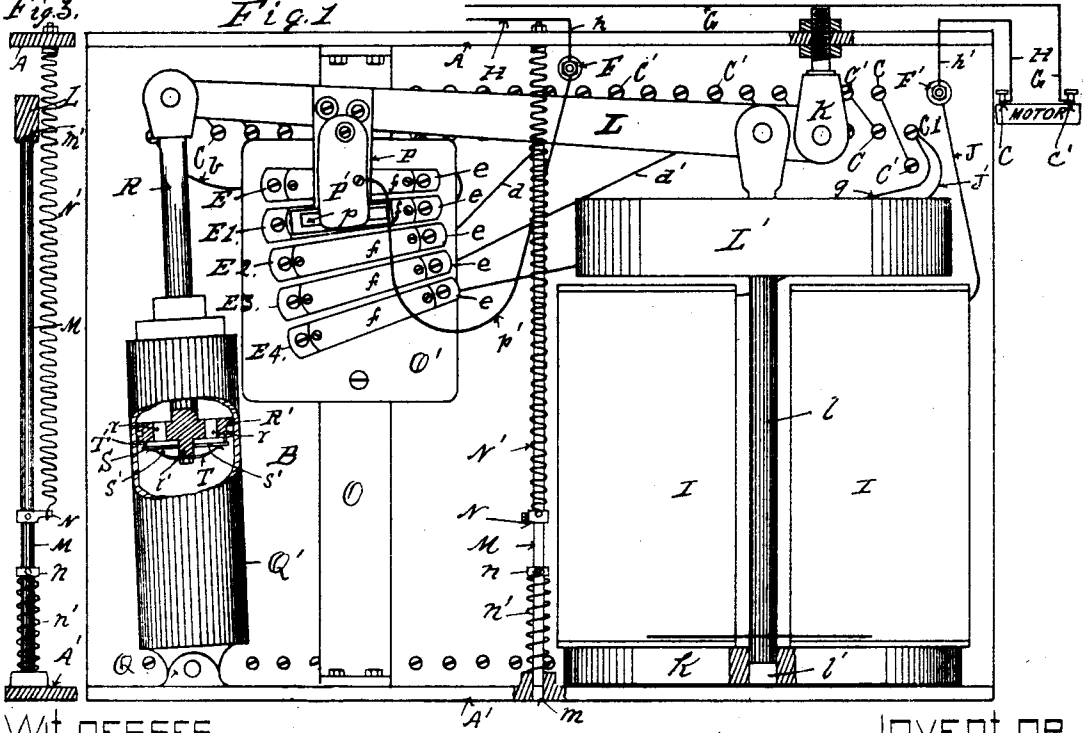


Fig. 3.

Fig. 1



WITNESSES

F. Einfeldt

A. L. Jackson

INVENTOR

Carson J. Sturgeon

By H. Sturgeon

Atty.

THE NATIONAL LITHOGRAPHING COMPANY,
WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

CARSON J. STURGEON, OF ERIE, PENNSYLVANIA, ASSIGNOR TO THE KEYSTONE ELECTRIC COMPANY, OF SAME PLACE.

AUTOMATIC RHEOSTAT.

SPECIFICATION forming part of Letters Patent No. 513,626, dated January 30, 1894.

Application filed March 31, 1893. Serial No. 468,597. (No model.)

To all whom it may concern:

Be it known that I, CARSON J. STURGEON, a citizen of the United States, residing at the city of Erie, in the county of Erie and State of Pennsylvania, have invented certain new and useful Improvements in Automatic Rheostats; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same, reference being had to the accompanying drawings, and to the letters of reference marked thereon, forming part of this specification.

My invention consists in the improvements in automatic rheostats, hereinafter set forth and described, and illustrated in the accompanying drawings in which—

Figure 1. is a front view in elevation of my improved automatic rheostat. Fig. 2. is a detail view in elevation of the same, with parts removed and parts broken away. Fig. 3. is a detail view of a portion of the same.

The object of my invention is to construct an automatic rheostat for starting electric motors in such a manner, that when it is connected in an electric circuit in series with an electric motor or other electric apparatus, and the current is turned into such circuit, the rheostat operates automatically to gradually cut out the resistance coils thereof, until the full volume of the current flows directly to such motor or other apparatus in circuit therewith. I accomplish this object by means of the combination of an electro magnet, in series circuit with resistance coils and with a motor or other electrical apparatus, a lever and brush moved over the contact plates of the rheostat in one direction by said electro magnet, and by spring mechanism in the opposite direction, and a dashpot connected with said lever, so as to greatly retard the movement of the lever when operated by the magnet in one direction, and offer little or no resistance to its movement when operated by the spring mechanism in the opposite direction; a detailed description of which is as follows:

Referring to the accompanying drawings illustrating my invention, A is the top, and A′ the base of the frame of the rheostat, between which I secure a plate of slate or other non-conducting material B; to the rear side of which I secure resistance coils B′ by means of studs C C′ at the top, and D at the bottom of the plate, each pair of said coils being connected to one of the studs D at the bottom of the plate and to studs C and C′ at the top of the plate, the studs C and C′ being connected up by means of short wires *a*, so that all of the resistance coils B′ are connected up in series from the stud C′ to the stud C^5, and thence by wire *b* to the contact plate E; from the stud C′ to the stud C^4, and thence by wire *b′* to the contact plate E′; from the stud C′ to the stud C^3, and thence by wire *d* to the contact plate E^2; from the stud C′ to the stud C^2 and thence by wire *d′* to the contact plate E^3, and from the stud C′ by wire *g* directly to the contact plate E^4.

To the plate B, I secure a binding post F to which the terminal *h* of one branch H of the circuit G H is secured, and from which binding post F the branch H of the circuit communicates with the resistance plates E, E′, E^2, E^3 and E^4, by means of connections hereinafter described.

To one side of the base A′ of the frame in front of the plate B, I secure an ordinary magnet I, the poles of which extend upward, one of the terminals of the magnet coils I′ being connected by a wire J′ with the stud C′ and the other terminal by a wire J, with a binding post F′ from which binding post the line H of the circuit G H, extends on to the binding post *c* of a motor or other electrical apparatus in circuit, so that the resistance coils B′, the coils I′ of the magnet I, and the motor or other apparatus in the circuit G H, are in series with each other; the other line G extending outward from the binding post *c′* of the motor or other electrical apparatus in circuit, in the usual manner.

To the top A of the frame above the magnet I, I secure an adjustable hanger K, to which I pivot the end of a lever L, and from this lever near its bearing in the hanger K, I suspend an armature L′ directly over the poles of the magnet I; to this armature L′ is secured a guide rod *l* which extends down between the coils of the magnet through a hole *l′* in the base *k* of the magnet I, which oper-

ates to retain the armature at all times parallel to the tops of the poles of the magnet I.

In the base A′ of the frame, immediately to the left of the magnet I, I make a vertical hole *m* in which the lower end of a vertically moving rod M operates, the upper end of this rod being stepped in a socket *m′* in the under side of the lever L; to this rod M, I secure a lateral arm N which is vertically adjustable on the rod M, and to this arm N, I secure the lower end of a spiral retracting spring N′, the upper end of this spring N′ being secured to the top A of the frame, so that the tension thereof operates through its connection with the rod M to raise the lever L; to the rod M below the arm N, I also secure an adjustable collar *n* and around the rod M below the collar *n*, I place a strong spiral spring *n′*, the lower end of which rests upon the base A′ of the frame.

Extending from the top A to the bottom A′ of the frame and secured thereto in the rear of the lever L is a vertical bar O, to which I secure a rectangular plate of slate or other non-conducting substance O′ so that the lever L will pass down in front of it, without contacting therewith; to this plate O′, I secure the contact plates E, E′, E^2, E^3 and E^4 hereinbefore referred to. I make each of these contact plates in two sections, a main plate *e* and a supplementary plate *f*, the sections *e* thereof being secured directly to the plate O′ and the sections *f* to these sections *e*. These sections *f* are made reversible, so that in case they become burned or worn by the contact of the brush hereinafter described therewith, they can be reversed, or replaced by new sections at pleasure. To the lever L at a point near the center longitudinally of the contact plates E, E′, &c., I secure a downwardly projected arm P, and to this arm P, I secure a brush holder P′, which is carefully insulated from the arm P to which it is secured; this brush holder P′ supports a brush *p* which contacts with the contact plates E, E′, E^2, &c., as it is carried over them by the movement of the lever L, and from the brush *p* a flexible wire or cable *p′* extends to the binding post F; to a lug Q on the base A′ below the outward end of the lever L, I pivot the base of a dash-pot Q′ containing oil or other suitable liquid; the piston rod R of which is pivoted to the end of the lever L, so that the piston R′ of said dash-pot Q′ is moved up and down by the lever L.

The piston R′ of the dash-pot is provided with one or more large openings *r* therein, and is provided with a downwardly projecting stem *r′*. Upon this stem *r′* is mounted a disk S of sufficient diameter to cover the openings *r* in the piston R′, and is adapted to slide up and down on the stem *r′*; this disk is also provided with one or more small openings S′. A light spring T is also secured to the lower end of the stem *r′* which operates to normally hold the disk S up into contact with the flange T′ on the under face of the piston R′, so that when in operation, the piston will travel very slowly as it moves downward, as the fluid displaced must all pass through the small holes S′ in the disk S, but when the piston moves upward, the fluid passes through the large holes *r* in the piston and forces the disk S downward, leaving a free passage around its edges for the fluid displaced, thus allowing the piston to move rapidly during its upward traverse.

In operation, when the current is first turned into the circuit G H, it passes from the line G through the motor or other electrical apparatus in circuit to the binding post F′ and thence through the wire J′ to and through the coils I′ of the magnet I, and through all of the resistance coils B′ and out through the contact plate E or E′, according to the position of the brush *p*, and out through the flexible cable *p′* to the binding post F and thence to the outgoing line H, or vice versa, as the case may be, according to the direction of the traverse of the current through the circuit. This operates to magnetize the magnet I, which attracts the armature L′ which operates to move the free end of the lever L downward; the dash-pot Q′ operating meanwhile at its maximum resistance in opposition to the downward movement of the lever L, it is forced to move very slowly until the brush *p* thereon contacts with and cuts out all of the plates except E^4, together with the resistance coils B′ connected therewith; this movement of the lever L has meanwhile operated to force the rod M downward putting great tension upon the retracting spring N′, and as the lever L has reached nearly its lowermost point of traverse, the collar *n* on the rod M has also contacted with and compressed the spring *n′*, in which position the parts of the mechanism remain so long as the current continues to flow through the circuit, but when the current is turned off, the magnet ceases to attract the armature L′, and the springs *n′* and N′ operating together quickly start the lever L and the brush *p* carried thereby back toward their normal positions, the retracting spring N′ completing their traverse after the collar *n* leaves the top of the spring *n′* during the upward traverse of the lever L; the dash-pot Q′ on account of the construction of the piston hereinbefore described, offers very little resistance thereto, so that the lever L moves upward rapidly.

In the foregoing description, I have shown and described convenient mechanism for utilizing my invention, many modifications of which can, however, be readily made by those skilled in the art to which my invention appertains without departing from the spirit of the invention. Therefore, I do not desire to be confined to the exact construction thereof shown and described, as

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination in an automatic rheostat, for starting electric motors of a series of resistance coils, contact plates connected with

said coils, a magnet wound in series with said resistance coils, and in series with such electric motor a pivoted lever supporting a brush adapted to be moved over said contact plates, and having an armature thereon adapted to be actuated by said magnet so as to move said lever and the brush thereon over said contact plates in one direction, spring mechanism communicating with said lever for moving it in the opposite direction, substantially as and for the purpose set forth.

2. In an automatic rheostat, for starting electric motors a set of resistance coils, a magnet, the coils of which are in series with said resistance coils, and in series with such electric motor a lever having an armature thereon adapted to be attracted by said magnet, spring mechanism operating to move said lever in opposition to the attraction of said magnet, contact plates connected with said resistance coils, a brush on said lever adapted to be moved over said contact plates, and a dash-pot connected with said lever and adapted to strongly retard the movement thereof when operated by the attraction of said magnet, and to weakly retard the movement of the lever when it is operated by said spring mechanism, substantially as and for the purpose set forth.

3. In an automatic rheostat, resistance coils, a magnet, the coils of which are in series with said resistance coils, an armature adapted to be attracted by said magnet, a lever connected with and operated in one direction by said armature, a spring for moving said lever in the opposite direction, and a supplementary spring for starting said lever in its said traverse, and a dash-pot connected with said lever and opposing a maximum resistance to the movement of said lever when actuated by the operation of the magnet, and a minimum resistance to the movement thereof when actuated by the spring mechanism, substantially as and for the purpose set forth.

In testimony whereof I affix my signature in presence of two witnesses.

CARSON J. STURGEON.

Witnesses:
F. EINFELDT,
CHARLES HEYDRICK.