

(No Model.)

G. H. WHITTINGHAM.

CENTRIFUGAL RESISTANCE CONTROLLING DEVICE.

No. 600,051.

Patented Mar. 1, 1898.

FIG. I.

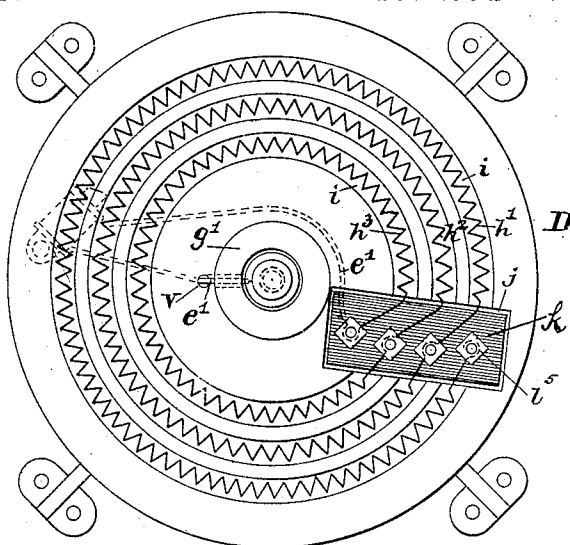


FIG. II.

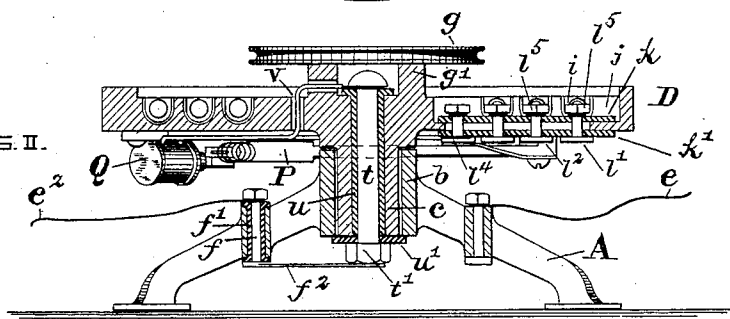
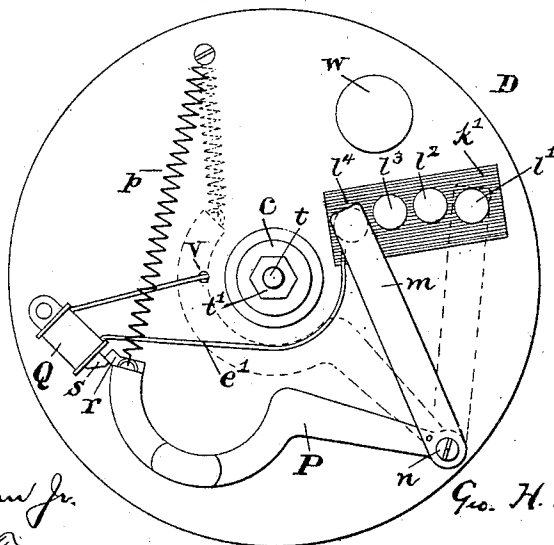


FIG. III.



WITNESSES:

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UNITED STATES PATENT OFFICE.

GEORGE H. WHITTINGHAM, OF BALTIMORE, MARYLAND, ASSIGNOR TO THE
AUTOMATIC SWITCH COMPANY OF BALTIMORE CITY, OF MARYLAND.

CENTRIFUGAL RESISTANCE-CONTROLLING DEVICE.

SPECIFICATION forming part of Letters Patent No. 600,051, dated March 1, 1898.

Application filed July 29, 1897. Serial No. 646,325. (No model.)

To all whom it may concern:

Be it known that I, GEORGE H. WHITTINGHAM, a citizen of the United States, residing at Baltimore, in the State of Maryland, have
5 invented certain new and useful Improvements in Centrifugal Resistance-Controlling Devices, of which the following is a specification.

This invention relates to a rheostat for automatically removing resistance in starting electric motors; and the object of the invention is to provide a revoluble device by means of which centrifugal force may be utilized in a way that is different from any attempt heretofore made to gradually reduce the resistance
15 in the motor-circuit automatically when the current is turned on and the motor starting by cutting out the coils of resistance one after the other from that of the greatest resistance to that of the least resistance.

By my invention the starting resistance is attached to a revoluble head which also carries the mechanism controlled by centrifugal force developed as the motor speeds up. An
25 important feature is also shown in the small retaining-magnet, which engages the switch-lever at its full movement. This magnet overcomes a serious defect in the centrifugal type of starter, as it prevents the restoration
30 of the resistance should the speed of the motor be temporarily reduced by an overload after having safely reached full speed. Without this magnet an overload would have a tendency to replace part of the resistance in
35 circuit, which would of course still further reduce the speed and negate the usefulness of the apparatus.

The invention is illustrated in the accompanying drawings, in which—

40 Figure 1 is a top view showing the revoluble head carrying the resistance-coils and also showing the base or feet. Fig. 2 is a cross-section showing all parts of the rheostat. Fig. 3 is a bottom or reverse side view of the
45 revoluble head, showing the switch-lever and magnet.

The letter A designates the metal base of the machine, which may be made in any preferred form. It has a central bearing *b*, in
50 which turns the hub *c* of the revoluble head

D. The wires *e e'* of the motor-circuit connect with the base. The inlet-wire *e* connects directly with the metal base; but the outlet-wire *e'* is attached to a bolt *f*, which is electrically disconnected from the base by insulation
55 *f'*. The continuity of this circuit through the revoluble head of the rheostat will be hereinafter described.

The revoluble head D is a metal plate, preferably circular, with the said hub *c* on one side. 60 A pulley *g* is secured on the other side to a central boss *g'* and is to be connected by a belt with the motor which is to be started and causes the head D to rotate. One surface of the head is provided with resistance-coils *h'* 65 *h² h³*, preferably placed in concentric circles and in concentric grooves *i*. At one side a depression or cut-away *j* is made across all the grooves, and the several resistance-coils terminate in this depression, and also the 70 wire of one coil crosses over to the coil next within. At this depression *j* and within it is a sheet *k* of insulating material, and on the opposite side of the head is a similar sheet *k'* of insulating material, and a series of contact-plates *l' l² l³ l⁴* are exposed on one side 75 of the head and rest against the insulating-plate *k'*, and each plate has a bolt which passes through said sheet, through a slot or hole in the metal of the head, and through 80 the other insulating-sheet *k*, and nuts *l⁵* are on said bolts within the depression or cut-away *j*. One end of the outer coil *h'* is attached to the bolt of the first contact-plate *l'*, and the terminal end of this first coil at the said depression crosses over to the bolt of the next 85 inner (or second) contact-plate *l²*. The second coil *h²* commences at this bolt, and its terminal end crosses over to the bolt of the third contact-plate *l³*. The third coil *h³* commences 90 at the last-named bolt, and its terminal end crosses over to the bolt of the fourth contact-plate *l⁴*. A switch-arm *m* has one end pivoted to a pin *n* on the head. This arm *m* is of suitable metal and thin, so as to act as a 95 spring and insure complete contact on each of the several contact-plates *l' l²*, &c., which latter are arranged in an arc described from the pivot-pin *n*. A lever *P* is also pivoted to the pin *n*, and this lever and the switch-arm 100

m are suitably united, so that both swing alike on the pivot. A spring *p* is on the head and acts on the lever and causes its free end when the head is not revolving to take position near the center hub *c*. In this position of the lever *P* the switch-arm *m* will be on the plate *l'*, establishing the circuit where the resistance is greatest. When the head *D* revolves rapidly enough to bring into play centrifugal force, the free end of the lever *P* will by such force be moved against the tension of the spring *p* toward the circumference or rim of the head, and this movement of the lever will swing the switch-arm *m* over the contact-plates until it rests on the plate *l'*, establishing the circuit where the resistance is the lowest, and while the motor is running the circuit will be maintained at this point.

An electromagnet *Q* is secured on the same side of the head as the lever *P* and is in such position that when centrifugal force has swung said lever outward to the limit of its movement a prong *r* on the end of the lever will contact with a stop-lug *s* on the magnet, as shown in Fig. 3. The magnet is included in the circuit, and consequently is energized whenever the motor is running or the head *D* is revolving. The magnet, therefore, will by its holding influence on the prong *r* of the lever serve to keep said lever from swinging back to the center when the speed of rotation temporarily slacks, as would be the case should the motor be subjected to an overload.

The center of the head *D* is bored out and has a conducting-pin *t* extending through it, and the pin is electrically disconnected from the head by insulation *u*. This insulation is in the form of a tube or bushing with a flange at one end and an insulating-washer *u'* at the other end. The pin *t* has at one end head and at the washer end a nut *t'*.

The insulated bolt *f*, to which is attached the outlet-wire *e'*, has a spring-arm *f'*, which projects toward and makes contact with the nut end of the said conducting-pin *t*.

The wire *e'* of the circuit connects with the bolt of the fourth contact-plate *l'*, then extends around one side of the hub *c* to the magnet *Q*, and then from the magnet extends to the head of the conducting-pin *t*, passing through a hole *v* in the head.

A suitable counterpoising-weight *w* is attached to the head near its rim at a point diametrically opposite the lever *P*. This weight insures that the head will be properly balanced when the said lever is at its outmost position.

In operating the rheostat the electric current passes from the wire *e* to the base of the machine, thence to the hub *c* of the revolvable head and to the pivot-pin *n*. At first—that is, when starting—the current will pass through all the resistance-coils *h'*, &c., but as the head speeds up and centrifugal force begins to act on the lever *P* the switch-arm *m* will begin to move over the contact-plates *l'*, &c., and by cutting out one coil after

the other will gradually reduce the resistance until all the coils are cut out. When the lever *P* is in contact with the stop-lug on the magnet, the arm *m* will be on the last contact-plate *l'*, the point of lowest resistance, and then the current will flow from the pivot-pin *n* to the plate *l'*, thence by wire *e'* to the magnet, then to the conducting-pin, to the arm *f'*, bolt *f*, and to wire *e*.

It is obvious that my combination, as broadly conceived by me, includes a switch-arm that gradually cuts out resistance by the action of centrifugal force and a magnet to retain the switch-arm at its full-movement position whether the magnet is or is not carried by a revoluble head; also, it is not necessary that the retaining-magnet should be an electromagnet. Obviously a switch-arm which gradually cuts out resistance may be retained at its full-movement position by a permanent magnet as well as an electromagnet.

Having thus described my invention, what I claim is—

1. In a rheostat the combination of a revoluble head; a resistance mounted on the head; a switch-arm engaging the resistance; and a centrifugally-operated lever mounted on the revoluble head and connected with the switch-arm, whereby centrifugal force is utilized to gradually reduce the resistance when the current is turned on.

2. A rheostat for automatically removing resistance in starting electric motors, having in combination a revoluble head; a resistance carried by said revoluble head; and means controlled by centrifugal force developed by the rotation of said head, for gradually removing the resistance.

3. In a resistance-controlling device for electric motors, the combination of a revoluble head; resistance-coils arranged in circles on said head; a pivoted switch-arm also on the head; and a centrifugally-operated lever connected with the switch-arm.

4. In a resistance-controlling device for electric motors, the combination of a revoluble head; resistance-coils arranged in circles on said head; a pivoted switch-arm also on the head; a centrifugally-operated lever connected with the switch-arm; and a spring acting on said lever to cause its free end, when the head is not revolving, to take position toward the center of the head and restore the switch-arm to the position of greatest resistance.

5. In a resistance-controlling device, the combination of a revoluble head; a resistance mounted on said head; means controlled by centrifugal force developed by the rotation of said head for gradually removing the resistance; and a magnet carried by the head, and coacting with said means for removing the resistance, to prevent the restoration of the resistance should the speed of the motor be reduced by an overload.

6. In a resistance-controlling device, the

combination of a revoluble head; a resistance mounted on said head; a centrifugally-operated switch-arm engaging the resistance; and an electromagnet carried by the revoluble head and serving to retain the switch-arm at its full-movement position.

7. In a resistance-controlling device, the combination of a revoluble head; a resistance mounted on said head; a centrifugally-operated switch-arm engaging the resistance; a magnet carried by the revoluble head and serving to retain the switch-arm at its full-movement position while the head revolves; and a spring acting on said switch-arm to re-

store it to the position of greatest resistance 15 when the head ceases to revolve.

8. In a centrifugal resistance-controlling device, the combination of a switch-arm to gradually cut out resistance; a revoluble head which develops centrifugal force that operates the switch-arm; and a magnet to retain the switch-arm at its full-movement position. 20

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

GEORGE H. WHITTINGHAM.

Witnesses:

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CHAS. B. MANN.