No. 671,907. Patented Apr. 9, 1901.

F. B. DUNCAN.

CONTROLLER FOR MOTORS.

(Application filed July 9, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. 1.

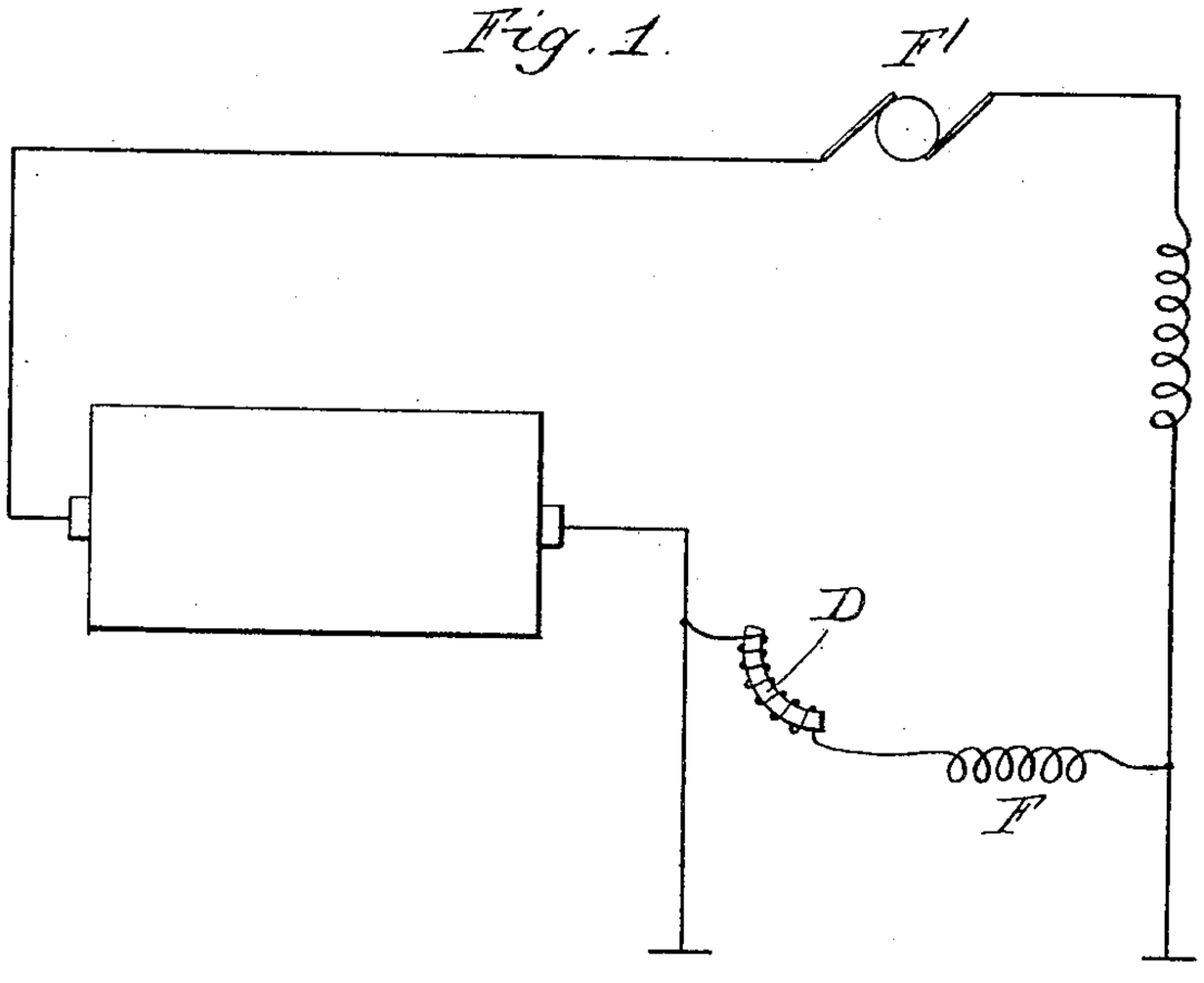
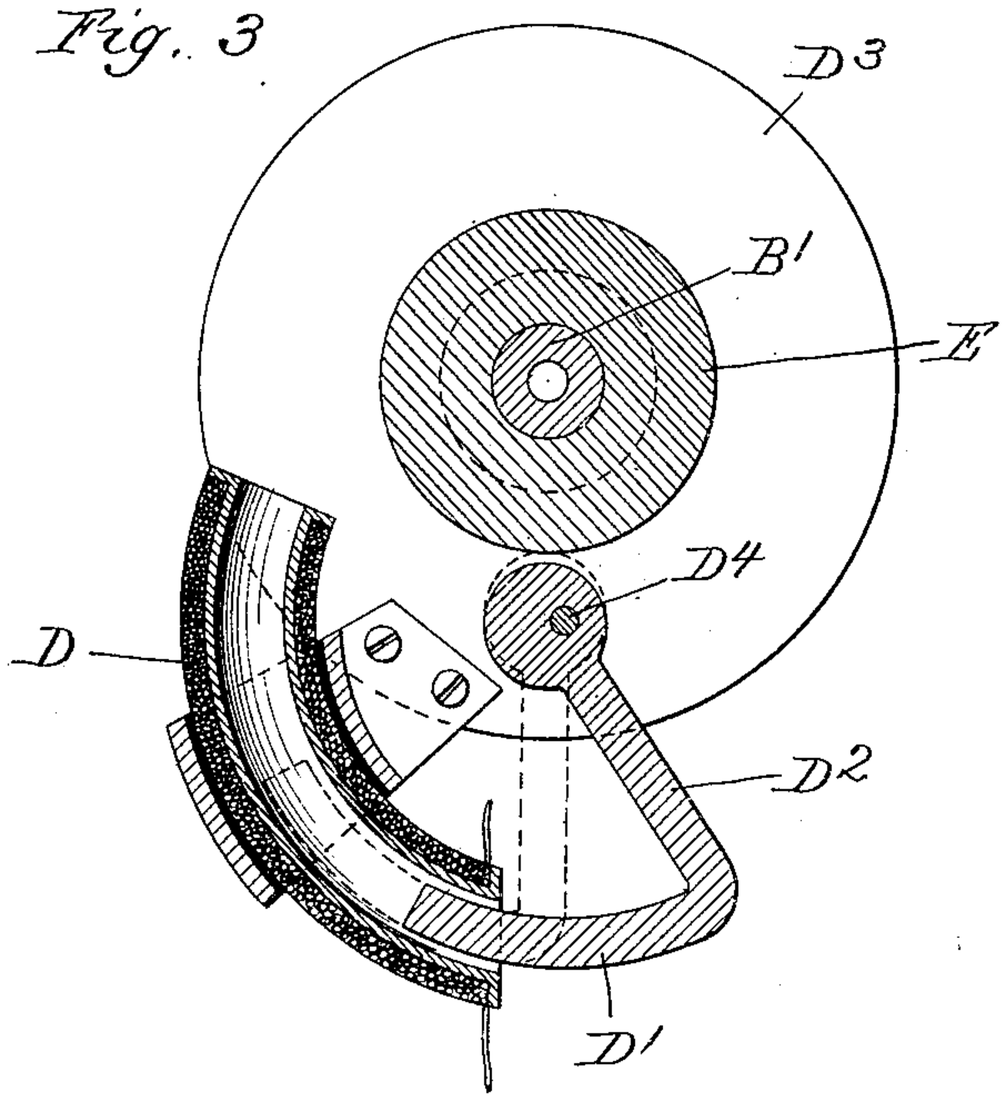


Fig. 3



Witnesses.

Edward F. Wray.

Howard L. Kraft.

Inventor.

Frederick B. Duncan

by Parker & Carter

his Att'ys.

No. 671,907. Patented Apr. 9, 1901.

F. B. DUNCAN.

CONTROLLER FOR MOTORS.

(Application filed July 9, 1900.)

(No Model.) 2 Sheets—Sheet 2.

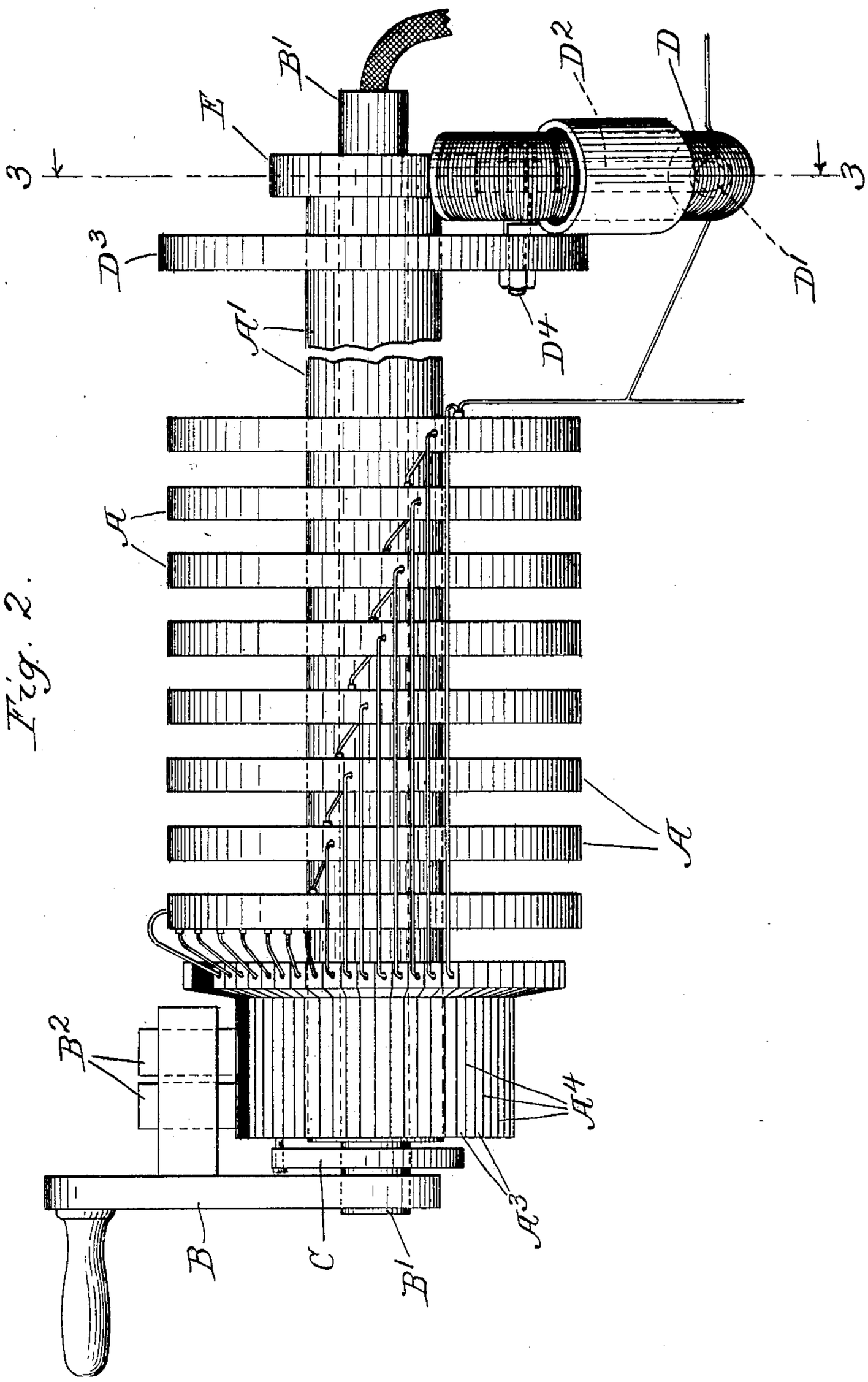


Fig. 2.

Witnesses.
Edward T. Wray.
Homer L. Kraft

Inventor.
Frederick B Duncan
by Parker & Carter
his Atty's.

UNITED STATES PATENT OFFICE.

FREDERICK B. DUNCAN, OF MADISON, WISCONSIN, ASSIGNOR TO NORTHERN ELECTRICAL MANUFACTURING COMPANY, OF SAME PLACE.

CONTROLLER FOR MOTORS.

SPECIFICATION forming part of Letters Patent No. 671,907, dated April 9, 1901.

Application filed July 9, 1900. Serial No. 22,920. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK B. DUNCAN, a subject of the Queen of Great Britain, residing at Madison, in the county of Dane and State of Wisconsin, have invented a certain new and useful Improvement in Controllers for Motors, of which the following is a specification.

My invention relates to controlling devices for electric motors and the like, and has for its object to provide a new and improved device of this description.

My invention is illustrated in the accompanying drawings, wherein—

Figure 1 is a diagrammatic view showing a device embodying my invention. Fig. 2 is an enlarged view showing the resistance-coils and the automatic releasing device. Fig. 3 is a section on line 3 3, Fig. 2.

Like letters refer to like parts throughout the several figures.

My invention relates particularly to a form of controlling device for motors in which the resistance is automatically manipulated to protect the motor when the current through the motor is broken or is decreased below a predetermined point.

Any suitable resistance may be used in connection with my invention. I have shown in Fig. 2 a particular construction of resistance. As herein shown, this resistance is made up of a series of coils A, mounted upon a suitable central support A′, the coils being divided into suitable sections, which are connected to a series of contacts A^3, arranged in a circle or the arc of a circle and separated by suitable insulating-pieces A^4. A controlling-arm B is associated with the series of contacts A^3 and is connected with a rotatably-mounted shaft B′, which passes through the support for the coils. One or more movable contacts or brushes B^2 are associated with the arm B, so as to be moved thereby around the contacts A^3. These brushes and the resistance-coils are suitably connected in circuit with the armature of the motor, so that as the brush is moved around the contacts A^3 the resistance in the circuit is varied. When the motor is started, substantially all of the resistance is in circuit, the resistance being cut out as the motor gains speed. Some suitable means is provided for preventing injury to the motor in case the circuit breaks or the motor is stopped for any other reason without moving the brushes B^2 back to their initial position. As herein shown, I accomplish this purpose by providing a suitable mechanism responsive to the variations in the current. The movable contacts or brushes in the device herein shown engage the outer face of the contacts A^3 in a line substantially parallel with the axis about which the controlling-arm turns, and the arrangement of the contacts permits a large number of such contacts to be used, thus giving the brushes a large range of movement. This device is used both as a starter and as a controller, and hence the mechanism for automatically manipulating the parts must be adapted to work when the controlling-arm is in various positions, and this adaptability must be through a comparatively large range. This feature presents difficulties not found in the ordinary controller; but these difficulties are entirely overcome by the device herein described.

Referring now to Figs. 2 and 3, I have illustrated one form of mechanism for automatically controlling the parts when the circuit varies in a predetermined manner. In this construction I provide a solenoid D, mounted in any desired manner in proper relation to the shaft B′. This solenoid is provided with a core D′, having the supporting part D^2. This supporting part may be integral with the core or attached thereto in any desired manner. Said supporting part D^2 is pivotally connected with a suitable bracket or support D^3 by means of a pin or the like D^4. This supporting part is provided with a binding or holding device, which is adapted to bind or hold the shaft B′ when in a predetermined position. Any desired construction for this purpose may be used, and, as herein shown, the end of the supporting part D^2 forms an eccentric, as shown in Fig. 3, and is adapted to engage the collar or engaging device E, mounted on the shaft B′. The parts are so arranged that when the current through the solenoid D ceases or falls below a predetermined strength the core is moved so as to move the eccentric and release the shaft B′. A suitable retracting device is as-

sociated with said shaft so as to move it to its initial position when released. This retracting device consists of the spring C, one end being connected with the shaft and the other with a fixed part. The solenoid D is connected in series with the shunt-winding F of the motor F'. (See Fig. 1.)

I have described a particular construction embodying my invention; but it is of course evident that the parts may be varied in form, construction, and arrangement and that some of the parts may be omitted and others used with parts not herein shown without departing from the spirit of my invention, and I do not limit myself to the construction shown.

The use and operation of my invention are as follows: When it is desired to start the motor, the circuit is closed and the controlling-arm B is moved so as to move the movable contacts or brushes along the contacts A^3. The amount of resistance in the armature-circuit is thus varied in the desired manner. When the motor is running, a current is flowing through the coil of the solenoid D, and the effect of this current is to draw the core D' of the solenoid inwardly. When this core is drawn inwardly, the parts are moved about the pin D^4 so as to force the eccentric against the collar E. The parts are so arranged that sufficient force is obtained when the core is in its attractive position to bind the shaft and prevent it from rotating. It can, however, be rotated by applying force to the controlling-arm B, but will be held in any desired position when the arm is released. It will thus be seen that the solenoid and associated parts do not affect the operator's control over the arm B and yet hold the parts in any desired position when the arm B is released. If now the current ceases or falls below a predetermined amount, the attractive force of the solenoid decreases and the core drops away, thus releasing the eccentric from the collar E. The retracting device then moves the controlling-arm back to its initial position, so that when the motor is again started a sufficient amount of resistance will be in the armature-circuit. It will thus be seen that the device acts automatically to protect the motor.

I claim—

1. A controlling device for motors, comprising a variable resistance, a controlling-arm therefor, a solenoid connected in circuit with the motor, a part controlled by said solenoid comprising an eccentric, an engaging part associated with the controlling-arm and adapted to be engaged by said eccentric when the current through the coil of the solenoid is normal, so as to hold said arm in any given position, and a retracting device for moving the arm to its initial position when the current through the solenoid falls below a predetermined amount.

2. A controlling device for motors, comprising a variable resistance, a controlling-arm therefor, a solenoid in circuit with the motor, a movably-mounted core therefor provided with an eccentric, an engaging device associated with said controlling-arm normally free to move with relation to said eccentric when no current is passing through the solenoid, the eccentric adapted to be moved so as to be forced against said engaging device when a normal current is passing through the solenoid and hold the arm in any given position, and a retracting device adapted to move said arm to its initial position when the current falls below a predetermined amount.

3. A controlling device for motors, comprising a variable resistance, a controlling-arm therefor, a solenoid adapted to be connected in circuit with the motor, a part controlled by said solenoid and adapted to engage said arm or some part associated therewith, when the solenoid is properly energized, and hold said arm in any desired position.

4. A controlling device for motors, comprising a variable resistance, a controlling-arm therefor, an engaging part associated with said controlling-arm, a solenoid responsive to variations in the circuit and provided with a core having attached thereto a part adapted, when the solenoid is properly energized, to engage said engaging part and hold it in any desired position.

5. A controlling device for motors, comprising a variable resistance, a controlling-arm therefor, a solenoid responsive to variations in the current, a movably-mounted core therefor provided with an engaging part, an engaging part associated with the controlling-arm, the two parts adapted to be brought into engagement when the core is attracted by the solenoid and adapted to become disengaged when the current through the solenoid falls below a predetermined point.

6. A controlling device for motors, comprising a variable resistance, a controlling-arm therefor, a curved solenoid connected with some part of the motor-circuit, a core therefor having an angular part projecting therefrom, said angular part mounted upon a pivot, so that the core is free to move, an engaging device associated with the controlling-arm and opposed to the angular part projecting from the core, said angular part adapted to engage said engaging device when the core is attracted, so as to hold said arm in any desired position, and a retracting device adapted to move the arm to its initial position when the current through the solenoid falls below a predetermined point.

FREDERICK B. DUNCAN.

Witnesses:
A. P. WARNER,
A. J. BUENZLI.