

L. A. TIRRILL.

SPEED LIMITING DEVICE FOR SERIES MOTORS.

(Application filed June 5, 1902.)

(No Model.)

Fig. 1.

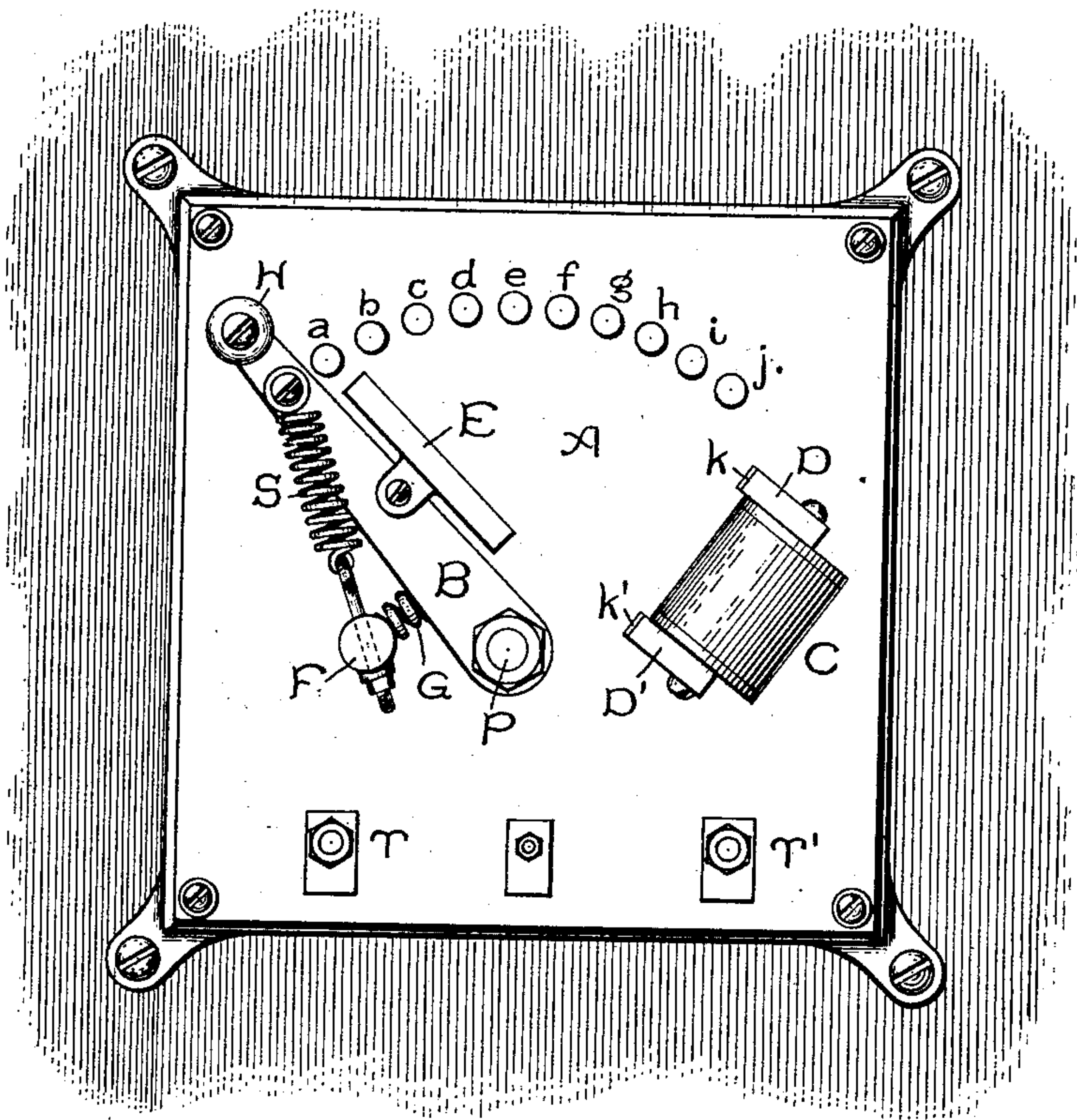
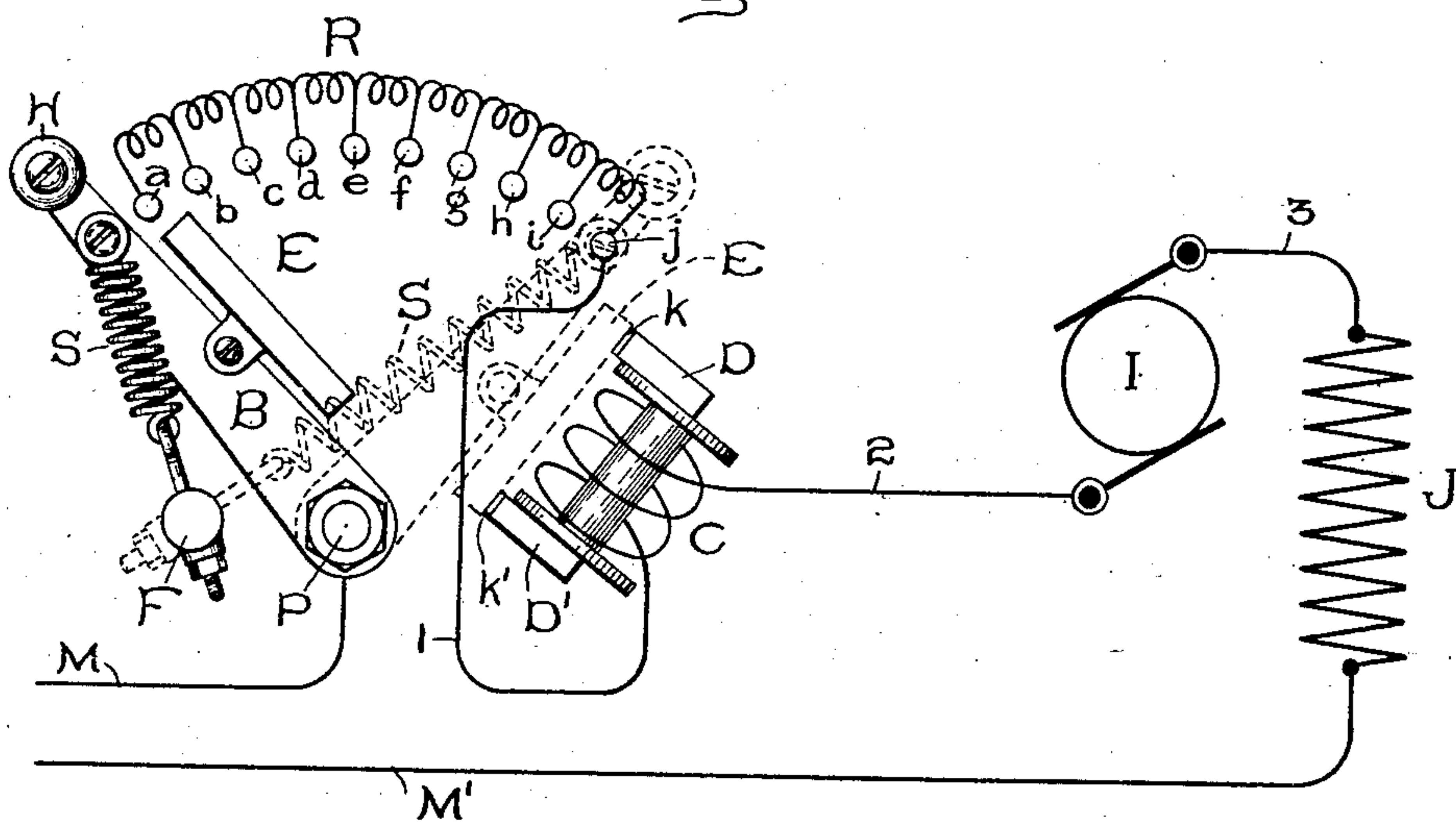


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

LEONARD A. TIRRILL, OF LYNN, MASSACHUSETTS, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

SPEED-LIMITING DEVICE FOR SERIES MOTORS.

SPECIFICATION forming part of Letters Patent No. 717,303, dated December 30, 1902.

Application filed June 5, 1902. Serial No. 110,322. (No model.)

To all whom it may concern:

Be it known that I, LEONARD A. TIRRILL, a citizen of the United States, residing at Lynn, county of Essex, State of Massachusetts, have invented certain new and useful Improvements in Speed-Limiting Devices for Series Motors, (Case No. 2,273,) of which the following is a specification.

This invention relates to the control of series motors, and has for its object the provision of means which will prevent the speed of such motors from exceeding a predetermined limit.

It is well known that the speed of a series motor running from a constant-potential circuit is dependent on the load of the motor and that the speed increases as the load decreases; but as the load decreases the current in the motor-circuit decreases and there is a certain value of this current corresponding to a given speed. I propose to take advantage of these conditions to impose a limitation on the speed of the motor by providing means for reducing the voltage impressed upon the motor whenever the current flowing in the motor-circuit reaches or falls below a certain value. To this end I employ a coil connected in the motor-circuit, which operates by its magnetism to hold a starting-switch against an opposing means in such position that a certain voltage is impressed on the motor, and means tending to move the switch to a position in which the voltage is reduced or, if desirable, entirely removed. The strength with which the coil acts to retain the switch being dependent upon the current in the motor-circuit will when the current has fallen to a certain value, and therefore the motor has attained a certain speed, no longer be sufficient to retain the switch, which will then be moved in such manner as to reduce the impressed voltage, and thereby prevent a further increase of speed. This movement of the switch to reduce the voltage may be made to take place at a predetermined speed by providing a proper relative adjustment of the magnetic pull due to the coil and the means acting against it.

My invention may be conveniently used in connection with a controller, and I have there-

fore chosen to illustrate my invention in an application of this character.

In the accompanying drawings, Figure 1 is a top plan view of a well-known type of starting-rheostat to which my invention is applied. 55 Fig. 2 is a diagram of the electrical connections of a series motor and a starting-rheostat therefor to which my invention is applied.

Referring to Figs. 1 and 2, A is a plate of suitable insulating material secured to and forming the top of the rheostat. Mounted upon plate A are contacts *a j*, connected to resistance R, coil C, having pole-pieces D and D', to the faces of which are secured non-magnetizable pieces *k* and *k'*, designed to prevent freezing of armature E to the pole-pieces, terminals T and T', and pivotal support P for contact-arm B. To arm B is secured armature E, operating-handle H, and one end of spring S. Spring S has its other end adjustably secured to pivotal support F, mounted upon plate A, and is adjusted with relation to the magnetic pull of coil C so that arm B will be moved to the "off" position when the motor attains a predetermined speed. 75 It is to be noted that spring S performs two functions—i. e., that of providing an opposing means to the magnetism of coil C, besides furnishing automatic means for returning arm B to the off position. The latter means 80 is not my invention and may be an entirely separate device from that which is used to secure the release of the contact-arm at the proper time. It is old in the art to provide means for automatically returning contact-arms to the off position upon their release. 85 I have therefore in some of the appended claims considered spring S as furnishing solely an opposing means to magnetism of coil C, which will secure the release of the contact-arm when the motor has attained or exceeded a predetermined speed. Spring G is designed to form a cushion for arm B when it is thrown to the off position. 95

Referring now especially to Fig. 2, I is the armature, and J the field, of a series motor, M and M' being supply-mains. The contact-arm B is shown as being in the off position, and circuit through the motor is broken. If now contact-arm B be moved upon con- 100

tact *a*, circuit may be traced from supply-main *M* through contact-arm *B*, resistance *R*, conductor 1, coil *C*, conductor 2, armature *I*, conductor 3, and field *J* to main conductor *M'*.

5 As the contact-arm is moved toward the right the circuit remains the same, except that less and less portions of resistance *R* are included in the circuit until arm *B* reaches the "running" position, where it rests upon contact *j*,
10 as shown by the dotted lines of Fig. 2, and the resistance is entirely cut out of circuit, leaving armature *I* and field *J* in series between the supply-mains *M* and *M'*. The armature *E* is now in contact with faces *k* and
15 *k'* of pole-pieces *D* and *D'*, and being retained by the magnetism of coil *C* maintains arm *B* in contact with contact *j* against the tension of spring *S* so long as the current in the motor-circuit, and therefore in coil *C*, exceeds a
20 certain minimum value, which value corresponds to the predetermined maximum speed of the motor. If the motor reaches or exceeds this speed, and the current therefore reaches or falls below the value correspond-
25 ing to it, the coil *C* no longer has sufficient magnetism to retain armature *E* against the force of spring *S*, which thereupon moves arm *B* to the off position, thereby removing voltage from the motor.

30 I have illustrated my invention in what I consider one of its most useful applications; but as it may be embodied in a variety of structures I do not wish to be limited to that shown in the drawings.

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

1. The combination of a series motor, a controlling-switch therefor, a coil in circuit with said motor and operating to maintain said
40 switch in its "running" position, and means opposing the magnetism of said coil, the magnetism of said coil and said opposing means being so relatively adjusted as to release the
45 speed of the motor reaches or exceeds a predetermined limit.

2. The combination of a series motor, a starting-switch therefor constructed and arranged to vary the voltage impressed on the
50 motor-terminals, a coil in circuit with said motor and operating to maintain said switch in a position to impress full voltage on the motor and means opposing said coil, the mag-

netism of said coil and said opposing means being so relatively adjusted as to release the
55 movable member of the control-switch whenever the speed of the motor reaches or exceeds a predetermined limit.

3. The combination of a series motor, a circuit-closer therefor, a coil in circuit with said
60 motor tending to hold said circuit-closer in position to admit current to said motor, and means, tending to move said circuit-closer to open the motor-circuit, so adjusted with relation to said coil that said circuit-closer will
65 be opened when said motor has attained or exceeded a predetermined speed.

4. The combination of a series motor, a circuit-closer therefor, a coil in circuit with said
70 motor tending to hold said circuit-closer in position to admit current to said motor, and a spring, tending to move said circuit-closer to open the motor-circuit, so adjusted with relation to said coil that said circuit-closer will
75 be opened when said motor has attained or exceeded a predetermined speed.

5. The combination of a series motor, a controller therefor, a coil in circuit with said
80 motor tending to hold said controller in the "running" position, and means, tending to move said controller to the "off" position, so adjusted with relation to said coil that said controller will be moved to the "off" position
85 when said motor attains or exceeds a predetermined speed.

6. The combination of a series motor, a starting resistance therefor, contacts for said
90 resistance, a contact-arm movable over said contacts, an armature secured to said contact-arm, a coil in circuit with said motor, pole-pieces energized by said coil and adapted to magnetically retain said armature so
95 that said contact-arm is in the position where said resistance is cut out of circuit, and a spring, tending to move said contact-arm to the "off" position, so adjusted with relation to said coil that said contact-arm will be
moved to the "off" position when said motor attains or exceeds a predetermined speed.

In witness whereof I have hereunto set my
hand this 3d day of June, 1902.

LEONARD A. TIRRILL.

Witnesses:

DUGALD MCK. MCKILLOP,
HENRY O. WESTENDARP.