H. D. JAMES.

CONTROL SWITCH AND SYSTEM.

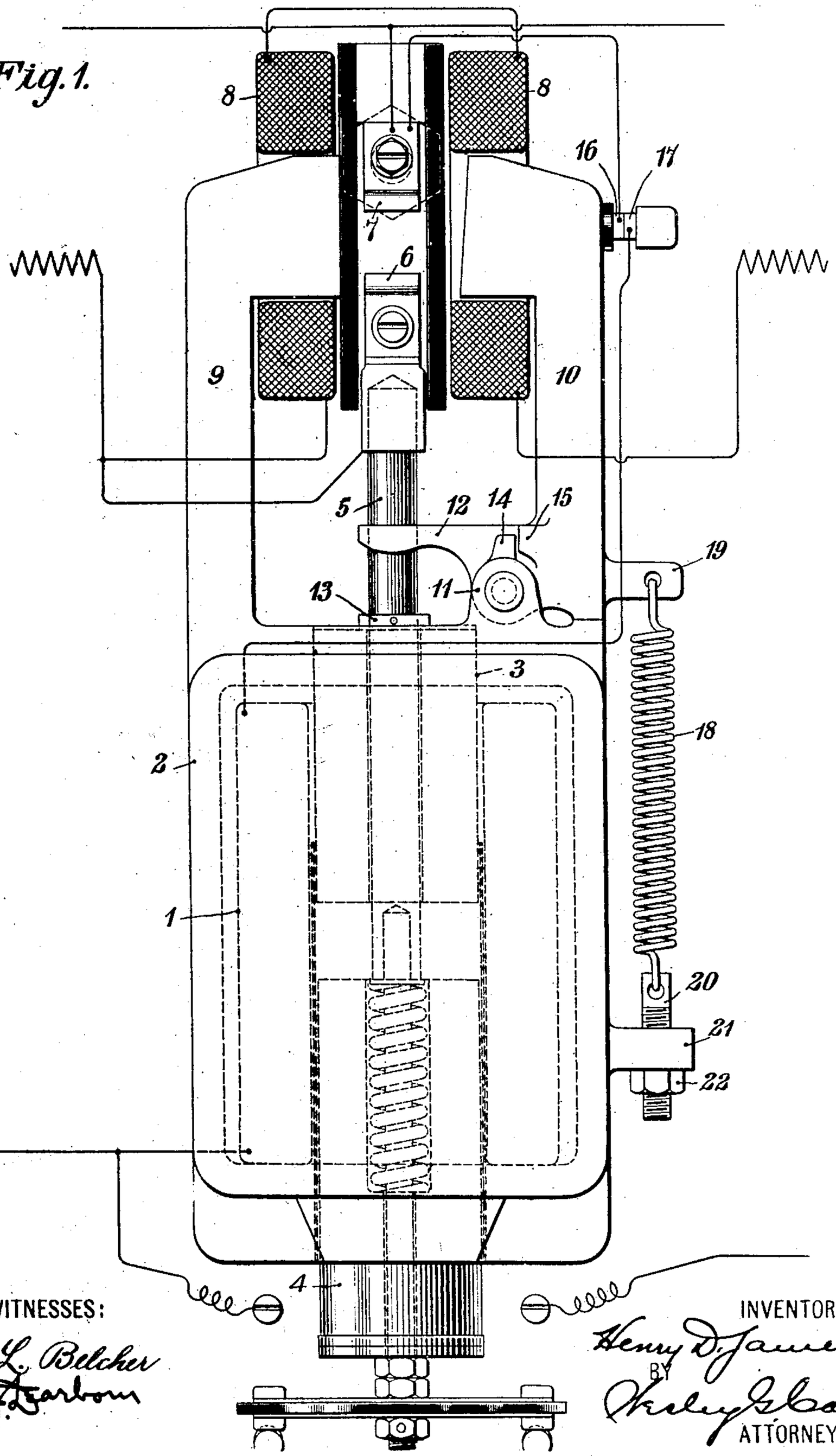
APPLICATION FILED DEC. 14, 1908.

931,126.

Patented Aug. 17, 1909.

2 SHEETS—SHEET 1.

Fig. 1.



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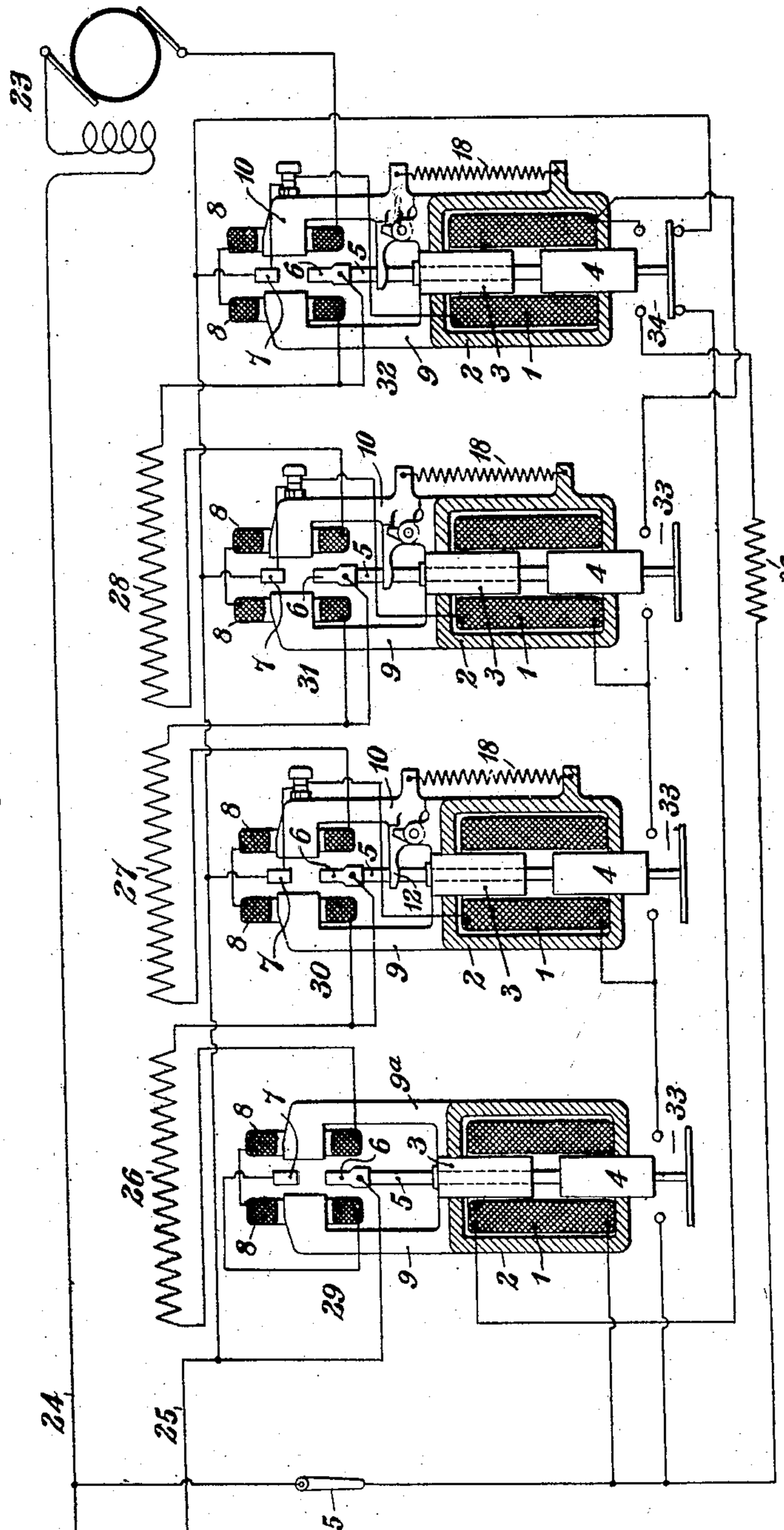
2 SHEETS—SHEET 2.

Fig. 2.



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CONTROL SWITCH AND SYSTEM.

No. 931,126. Specification of Letters Patent. Patented Aug. 17, 1909.

Application filed December 14, 1908. Serial No. 467,489.

To all whom it may concern:

Be it known that I, HENRY D. JAMES, a citizen of the United States, and a resident of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Control Switches and Systems, of which the following is a specification.

My invention relates to controlling switches and systems for electrical translating devices, and it has special reference to systems and switches which are utilized for so controlling electric motors that they may be started from rest and brought to operating speed automatically and under such conditions as to avoid injury to either the motor or the controlling apparatus.

My invention embodies a plurality of switches which are so connected together and to a plurality of resistance sections that they shall operate automatically to cut the resistance sections successively out of the motor circuit and be automatically delayed in operation sufficiently to avoid injury by reason of excessive currents in the motor circuit.

In the accompanying drawings, Figure 1 is a view, partially in elevation and partially in section, of a switch constructed in accordance with my invention, and Fig. 2 is a diagram of circuits in which a plurality of switches like that shown in Fig. 1 are illustrated partially in section and partially diagrammatically.

Each of the main switches of my system is provided with an operating coil 1 which is mounted in a frame 2 and with a stationary core portion 3, also mounted in said frame. The movable core portion 4 is provided with a rod 5 upon the upper end of which is mounted a contact terminal 6 which, when the movable core member is raised, engages a stationary contact terminal 7.

Two blow-out magnet coils 8 are mounted adjacent to and at opposite sides of the contact terminals 6 and 7, and two core members or armatures 9 and 10 are supported by the frame 2, the upper ends of which project into the respective coils 8. The armature or core member 9 may be immovable but the armature or member 10 is pivotally mounted in lugs 11 with which the frame 2 is provided, and it is also provided with an inwardly projecting arm 12 at its lower end which is bifurcated to embrace the rod 5 and is in such position as to be engaged by a collar 13 on said rod when the contact terminals 6 and 7 are in engagement, the armature or member 10 being thus held in its outermost position. One of the lugs 11 is provided with a stop piece 14 which is in position to be engaged by a lug or projection 15 on the armature or member 10 when the latter is moved inwardly upon its pivot by reason of the pull exerted upon it by the corresponding blow-out coil.

The outer side of the upper end of the armature or core member 10 is provided with a contact terminal piece 16 which engages a stationary contact terminal piece 17 when the armature or core member 10 is in its outermost position, and the said member is held in that position when the blow-out coil is deënergized, and when it is energized to less than a predetermined degree, by means of a coil-spring 18, the upper end of which is connected to a lug 19 on the armature or core member 10, and the lower end of which is connected to a screw-threaded rod 20 which projects through a lug 21 on the frame 2 and is provided with a nut 22 for the purpose of varying the tension of the spring 18 in accordance with the requirements of the service.

Referring now to Fig. 2 of the drawings, a motor 23 is supplied with energy from a suitable source through line conductors 24 and 25 and, for the purpose of varying the current supplied to the motor, three resistance sections 26, 27 and 28 are provided. For the purpose of controlling the motor 23 by cutting the resistance sections successively out of circuit, four main switches 29, 30, 31 and 32 are provided, each of switches 30, 31 and 32 being like that shown in Fig. 1, and switch 29 being of the same general character but having two stationary armatures or core members 9 and 9^a for the blow-out coils and having none of the accessory devices which are employed in connection with the movable core member 10. Each of the switches 29, 30 and 31 is provided with an auxiliary switch 33, which is closed when the main contact terminals are closed and the switch 32 is provided with a double auxiliary switch 34 which serves to close one auxiliary circuit when the main switch is closed and another auxiliary circuit when the main switch is open.

The operation of the switches and system

is as follows: In order to start the motor 23, a master switch 35 is closed, thus closing a circuit from the main line conductor 24 through the operating coil of switch 29 and the lower members of switch 34 to the line conductor 25. The operating coil of the switch 29, being thus energized, moves the contact terminals 6 and 7 into engagement and also closes the corresponding switch 33, thereby closing the circuit of the motor through all of the blow-out coils 8 and all of the resistance sections. The first rush of current through the blow-out coils is sufficient to move the armatures or core members 10 and thus separate the contact terminals 16 from the contact terminals 17 and, therefore, the switch 30 cannot be closed until the current falls to such value that the spring 18 may bring the contact terminals 16 and 17 again into engagement. When this engagement is effected, an auxiliary circuit is established through the switch 33 pertaining to switch 29, the operating coil of switch 30 and the contact terminals 16, 17 and 7 of this switch and the main switch 30 and its switch 33 will therefore be closed, thus cutting the resistance section 26 out of the motor circuit.

The operation of switch 31 will be delayed in the manner above set forth, by reason of the fact that the rush of current when the resistance section 26 is cut out will cause the blow-out magnet of switch 30 to separate the contact terminals 16 and 17 of this switch in the manner already described, and, when the current falls to normal value, this switch will operate in the manner just described. The same operation will be effected in connection with switch 32 except that, when this switch operates, it will close the upper member of the auxiliary switch 34 and open the lower member, thus including a resistance 36 in the auxiliary circuit which is maintained during the operation of the motor. As soon as any one of the main switches 30, 31 and 32 is closed, its arm 12 will be engaged by the collar 13 on the rod 5 and the movable core member 10 will thus be prevented from oscillating back and forth, as it would do under variations in current, provided it was free to move.

Variations in structural details and circuit connections which do not effect material changes in mode of operation or result are to be understood as within the scope of my invention.

I claim as my invention:

1. An automatic switch for electrical circuits comprising a stationary contact terminal, a movable contact terminal, an operating coil a blow-out coil and a movable armature or core for said blow-out coil having one contact terminal of an auxiliary switch and means for holding said armature or core member in position to keep said auxiliary switch closed while the main switch is closed.

2. In a switch for electrical circuits, the combination with stationary and movable contact terminals, of an operating coil, a blow-out coil, a spring-restrained movable armature or core member for said blow-out coil and means for holding said armature or core member in its spring-restrained position when the main switch is closed.

3. In a switch for electrical circuits, the combination with stationary and movable contact terminals, of an operating coil, a blow-out coil, a spring-restrained movable armature for said blow-out coil having one contact terminal of an auxiliary switch and an arm or projection adapted for engagement by a portion of the movable member of the main switch, when in its circuit-closing position, to lock said armature in its spring-restrained position.

4. In a motor-controlling system, the combination with a series of resistance sections, of a series of coöperating switches having blow-out coils permanently included in the motor circuit, movable armatures for the blow-out coils of all but one of said switches, each of which serves to delay the operation of the next switch in the series and means for locking each of said armatures when the corresponding main switch is closed.

In testimony whereof, I have hereunto subscribed my name this 23rd day of November, 1908.

HENRY D. JAMES.

Witnesses:
FRANK M. J. MURPHY,
BIRNEY HINES.