

F. G. PECK.
CONTROLLING MEANS FOR ELECTRIC MOTORS.
APPLICATION FILED SEPT. 25, 1916.

1,293,532.

Patented Feb. 4, 1919.
2 SHEETS—SHEET 1.

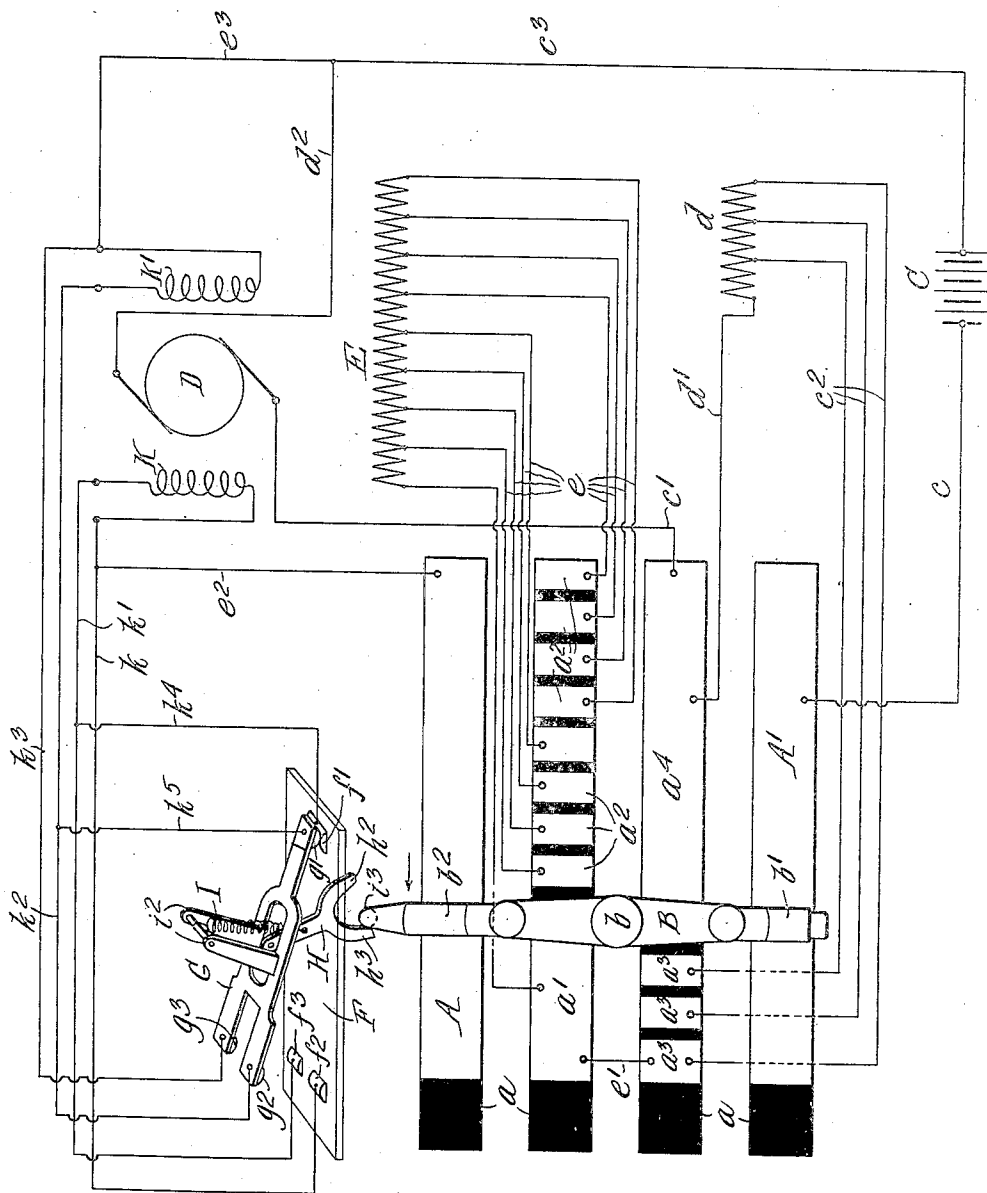


Fig. 1.

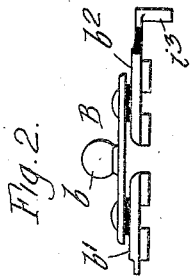


Fig. 2.

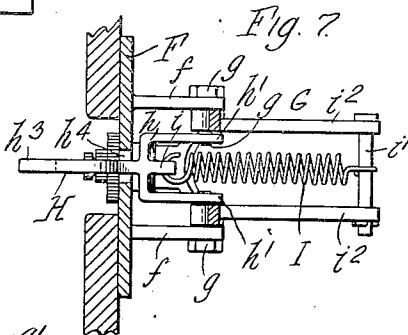
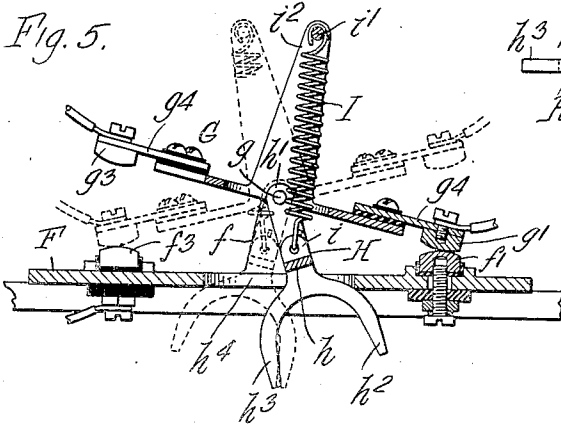
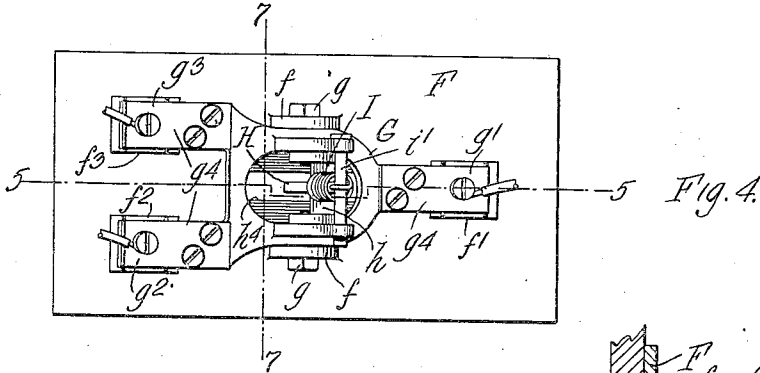
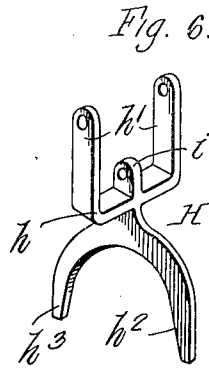
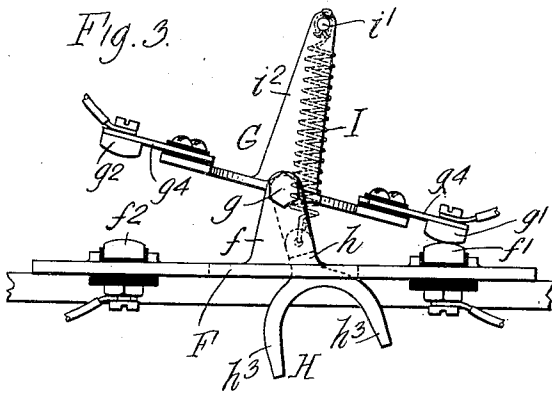
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UNITED STATES PATENT OFFICE.

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CONTROLLING MEANS FOR ELECTRIC MOTORS.

1,293,532.

Specification of Letters Patent.

Patented Feb. 4, 1919.

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To all whom it may concern:

Be it known that I, FREDERICK G. PECK, a subject of the King of Great Britain, residing at Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and useful Improvement in Controlling Means for Electric Motors, of which the following is a specification.

This invention relates to controlling means for electric motors, and more particularly to means for changing the field circuit of a motor so as to increase or decrease the field strength.

The objects of the invention are to produce controlling means of this kind of improved construction in which the field current of a motor is controlled by means of a snap switch actuated by a part of the controller; also to provide a snap switch of improved construction which is particularly adapted to be used in connection with a controller or the like for controlling the motor field current.

In the accompanying drawings:

Figure 1 shows diagrammatically a motor controller and the circuits controlled thereby, and a snap switch embodying the invention arranged in operative relation to the controller.

Fig. 2 is a detached view of the movable member of the motor controller.

Fig. 3 is a side elevation of the snap switch detached from the controller.

Fig. 4 is a top plan view thereof.

Fig. 5 is a sectional elevation on line 5-5, Fig. 4, showing the parts of the switch in different positions.

Fig. 6 is a detached perspective view of the actuating member of the switch.

Fig. 7 is a sectional end elevation on line 7-7, Fig. 4.

The motor controller as shown diagrammatically in Fig. 1 includes a contact strip A which is adapted to be connected with a contact strip a' or any one of a plurality of contacts or short strips a^2 , a contact strip A' , which is adapted to be connected with any one of a plurality of contacts or short strips a^3 or with a contact strip a^4 , and a contact member B which, in the construction shown, is adapted to be moved lengthwise of the contact strips for connecting the strips A A' with the contacts a' a^2 and a^3 a^4 respectively. a represents insulated

plates or segments with which the movable contact member may be placed into engagement for interrupting the supply of current to the motor.

The movable contact member B, as shown, consists of a handle portion b on which are mounted two connectors or bridge members b' b^2 insulated from the handle b . The connector b^2 is adapted to connect the contact strip A with the strip or piece a' or with the contacts a^2 , and the connector b' is adapted to connect the contact strip A' with the contacts a^3 and the contact strip a^4 . All of these parts may be of any usual or suitable construction and of themselves constitute no part of this invention.

The contact strip A' is connected by means of a conductor c with any suitable source of power, such, for example, as a storage battery C, and the contact strip a^4 is connected by means of a conductor c' to the armature D of the motor. The contacts a^3 are connected by means of conductors c^2 to a suitable armature resistance d which is connected by means of a conductor d' to the contact strip a^4 . Consequently as the connector b' of the movable contact member moves from left to right in Fig. 1, the full armature resistance d is first placed in series with the circuit connecting the motor armature with the source of power, and as the movable member of the controller moves to the right this resistance is gradually decreased until the connector b' connects the contact strips A' a^4 , which short circuits the armature resistance. The other terminal of the armature is connected by means of conductors d^2 and c^3 to the source of power C.

The contacts a^2 are connected by means of conductors e with a group of resistance units E, and the contact plate or strip a' is connected by means of a conductor e' with one of the contacts a^3 , through which current passes from the battery when the contacts a^3 or the contact strip a^4 are connected with the contact strip A' by means of the connector b' . A conductor e^2 connects the contact strip a with the motor fields, and a conductor e^3 connects the fields with the conductor c^3 leading to the battery. By means of this arrangement, when the movable contact member B is moved to the right from the insulating plates a , the contact plate or strip a' is connected with the

contact strip A, so that no resistance is inserted into the field circuit. When the movable contact member connects the first of the contacts a^2 with the contact strip A, a small resistance is inserted into the field circuit, which resistance is increased as the movable contact member is moved to the right. Any other connections or circuits between the parts of the controller and the motor, battery and resistance devices may be employed.

In order to obtain a still greater variation in the speed of the motor, means are provided for connecting the coils of the field circuit either in series or in parallel. In changing from the series connection to the parallel connection, or vice versa, while the armature is connected with the source of current supply, it is desirable that this change should be instantaneous so that the field circuit is not interrupted for any appreciable length of time while current is flowing through the armature. In order to accomplish this result a snap switch is provided which is actuated by the movable member of the controller in such a manner that the field coils of the motor will be connected in parallel when the motor is starting or operating at a slow speed and will be connected in series when the controller is set to operate the motor at higher speeds. This snap switch is preferably constructed as follows:

F represents the base on which the parts of the switch are mounted, and G represents a movable switch member which, in the construction shown, is preferably mounted at g on extensions or upright posts f of the base. The movable switch member G is provided at one end with a single contact g' suitably insulated from the switch member, and at its other end with two contacts g^2 g^3 , which also are mounted on and insulated from the movable switch member G. The movable contact g' is adapted to engage with a fixed contact f' mounted on and insulated from the base F when the movable switch member is in the position shown in Fig. 3 and in full lines in Fig. 5, and the movable contacts g^2 g^3 are adapted to engage with fixed contacts f^2 f^3 , also mounted on and insulated from the base F when the switch member is in the position shown in dotted lines in Fig. 5. The contacts g' g^2 and g^3 are preferably mounted on strips g^4 of spring metal or resilient material which are secured on the movable switch member and which yieldingly press the contacts of the movable switch member into engagement with the fixed contacts of the base of the switch.

In order to move the switch member G rapidly from one position to another, a switch actuating member H is preferably provided which, in the construction shown,

comprises an intermediate or body portion h having upwardly extending arms h' h' which are pivoted at their upper ends at g on the posts f of the base of the switch, and downwardly extending arms h^2 h^3 which extend through a slot h^4 in the base into a position to be engaged by a part of the movable member of the controller, the ends of the slot limiting the movement of the switch actuating member. The switch actuating member H is connected with the movable switch member by means of a coil spring I secured at its lower end to a lug i on the body portion of the switch actuating member, and at its upper end to a pin or connecting member i' secured to upwardly extending arms i^2 of the movable switch member. When the switch actuating member is moved from one end of the slot to the other end, the spring I is moved past the dead center position, which is at the pivot point g , and thus snaps the movable switch member quickly from one position to another, causing only a momentary break in the field circuit. In order to move the switch actuating member from one position to the other, the movable member B of the controller is provided with an extension or lug i^3 which is adapted to engage the arm h^2 when the movable member is moved to the right in Fig. 1 to throw the switch into position to connect the motor fields in series, and to engage the arm h^3 when moved to the left in Fig. 1 to throw the switch into the other position in which the motor fields are connected in parallel.

The connections between the terminals of the field controlling switch and the motor fields are preferably made as follows:

In the motor which is shown diagrammatically in Fig. 1, the field coils are divided into two sets, groups or coils K K' which may be either connected in series or in parallel by means of the field controlling switch. One terminal of the coil K is connected by means of a conductor k with the fixed contact f^2 and the other terminal of this coil is connected by means of a conductor k' to the fixed contact f^3 . The terminals of the other coil K' are connected by means of conductors k^2 k^3 respectively with the contacts g^2 g^3 of the movable switch member G. The conductor k' is connected by means of a conductor k^4 to the fixed contact f' of the switch and the movable contact g' is connected by means of a conductor k^5 to the conductor k^2 . Consequently when the switch is in the position indicated in Fig. 1, the two coils or groups of coils K K' of the motor field are in series, and when the switch is in the other position the two coils are connected in parallel. Other connections between the motor fields and the switch may be used if desired.

By means of the apparatus described a

considerable variation in speed of the motor can be obtained, since the motor when starting with the movable member of the controller in the first position has the coils or group of coils of the field circuit connected in parallel and a resistance is inserted in the armature circuit. When the movable controller handle has been moved to the right in Fig. 1, the fields are in series and the entire field resistance is in the field circuit, so that the motor runs at its maximum speed. In intermediate positions the speed of the motor can be regulated as desired. The apparatus is simple to operate since the coils are automatically placed into either the series or parallel position by means of the movable part of the controller, so that no adjustment or manipulation other than the movement of the controller itself is required. The apparatus is particularly desirable for use in connection with electric motor vehicles since it makes it possible to use a shunt motor, owing to the fact that by placing the motor fields in parallel a heavy starting torque may be produced. The apparatus may, however, be used for other purposes. The field changing switch is shown in the construction illustrated as applied to a shunt motor, but it will be understood that it is not intended to limit the use of this switch to shunt wound motors since the switch could perform the same function on series or compound wound motors.

I claim as my invention:

1. The combination with a source of electric power and a shunt-wound direct current electric motor having a field winding consisting of a plurality of coils, of a controller for supplying a gradually decreasing flow of current to the motor field, and a switch by means of which said fields are connected in parallel when the motor is starting and which is actuated by the controller before the current in the motor fields has reached its minimum strength for connecting said fields in series.

2. The combination with a source of electric power and a shunt-wound direct current electric motor having a field winding consisting of a plurality of coils, of a controller for regulating the flow of current to the motor field, a switch separate from said controller and by means of which said field coils are connected in parallel when the motor is being started, and a part on said controller adapted to actuate the switch for connecting the coils of the motor field in series before the current in the motor fields has reached its minimum strength.

3. The combination with a source of electric power and an electric motor having a field winding consisting of a plurality of coils, of a controller for regulating the flow of current to the motor field and having a

part which is movable in one direction to decrease the strength of the current flowing through said motor field, and a switch separate from said controller which is actuated by said movable part of the controller at an intermediate portion of its path of movement in a direction to decrease the field current, and which connects the coils of the motor field in series.

4. The combination with a source of electric power and an electric motor having a field winding consisting of a plurality of coils, of a controller for regulating the flow of current to the motor field and having a part which is movable in one direction to increase the strength of the current flowing through said motor field, and a switch which is actuated by a part of said controller when the same moves in a direction to increase the field current, to connect the coils of the motor field in parallel.

5. The combination with a source of electric power and an electric motor having a field winding consisting of a plurality of coils, of a controller for regulating the flow of current to the motor field, and a snap switch separate from said controller and actuated by the controller at an intermediate portion of its path of movement for connecting the field coils in series and in parallel.

6. The combination with a source of electric power and an electric motor having a field winding comprising a plurality of coils, of a motor controller for regulating the flow of current in the motor field and having a movable part, of a switch for connecting said field coils either in series or in parallel and arranged in a position to be engaged by said movable part as the same moves past said switch, said switch comprising a movable switch member, a switch actuating member adapted to be engaged by said movable part, and a connection between said switch actuating member and said movable member for causing said movable switch member to be quickly moved from one position to another after said switch actuating member has moved through a predetermined distance.

7. The combination with a source of electric power and an electric motor having a field winding consisting of a plurality of coils and an armature, of a controller for regulating the supply of current to said armature and said field coils, and a switch actuated by said controller when starting the motor for connecting the field coils in series after the supply of current to the armature has been brought to its maximum and before the supply of current to the field coils has been decreased.

8. The combination with a source of electric power and an electric motor having a field winding consisting of a plurality of coils and an armature, of a controller for reg-

ulating the supply of current to said armature and said field coils, said controller having resistance devices adapted to be inserted into the armature and field circuits, and a
5 switch actuated by said controller when starting the motor to connect the field coils in series after the resistance has been cut out of the armature circuit and before the re-

sistance has been inserted into the field circuit.

Witness my hand, this 20th day of September, 1916.

FREDERICK G. PECK.

Witnesses:

FRANK J. LITTLE,
JAMES B. WILSON.