H. V. S. TAYLOR.

STARTING SYSTEM FOR AUTOMOBILES.

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1,403,356. Patented Jan. 10, 1922.

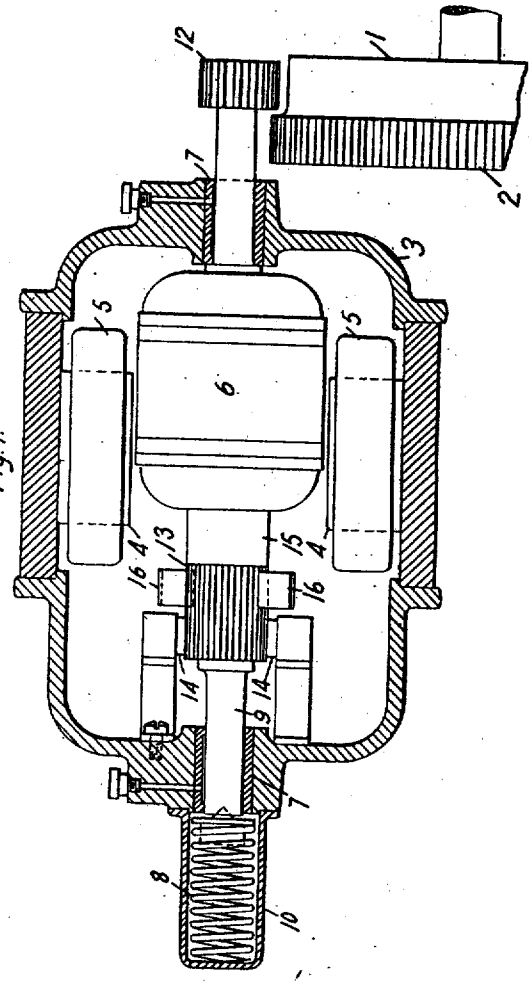

Fig. 1.

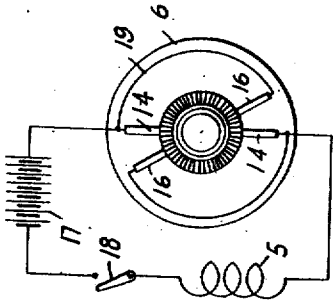

Fig. 2.

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STARTING SYSTEM FOR AUTOMOBILES.

1,403,356. Specification of Letters Patent. Patented Jan. 10, 1922.

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To all whom it may concern:

Be it known that I, HORACE V. S. TAYLOR, a citizen of the United States, and a resident of Pittsburgh, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Starting Systems for Automobiles, of which the following is a specification.

My invention relates to starting systems for automobiles and particularly to such systems as embody dynamo-electric machines having reciprocating armatures for controlling the operative connection of said dynamo-electric machines to the shafts of internal-combustion engines.

My invention has for its object to provide a simple arrangement whereby the armature of a dynamo-electric machine may be reciprocated longitudinally with a strong force while little or no torque is effective to rotate the armature.

Starting motors have been provided with normally displaced armatures, but the systems embodying such arrangements possess a number of disadvantages. It has, heretofore, been necessary to employ manually operable switching mechanisms of a somewhat complicated nature either for temporarily shunting the motor circuit or for controlling the resistor that is in circuit with it. Such an arrangement is necessary because, in the displaced position of the armature, the torque is sufficiently high to rotate the armature at a comparatively high rate of speed before the gear wheels are completely meshed.

It is also difficult to effect the meshing of the gear wheels when there is considerable lateral pressure between the coacting teeth. When little or no torque is effective to rotate the armature during its longitudinal movement, the gear wheels will be readily meshed because there is little or no lateral pressure between their respective teeth to retard their relative slidable movements.

I provide an electric motor having an armature that is normally displaced longitudinally. In the displaced position of the armature, the greater portion of the armature windings are shunted by means of auxiliary commutator brushes which are electrically connected to the main or working brushes and are angularly displaced therefrom. When the armature is shifted to its central position, the auxiliary brushes engage an insulating sleeve to open the shunt circuit. Full torque is then effective to rotate the armature to crank the engine.

In the accompanying drawings, Fig. 1 is a view, partially in elevation and partially in section, of a portion of an engine fly wheel with my invention applied thereto. Fig. 2 is a diagrammatic view of circuits and apparatus embodying my invention.

Referring particularly to Fig. 1, an engine fly wheel 1, only a portion of which is shown, is provided with gear teeth 2. An electric motor 3, which is adapted to be operatively connected to the fly wheel 1, comprises field-magnet poles 4, series field-magnet windings 5 and an armature 6 that is arranged for longitudinal movement in bearings 7. A spring 8, which is interposed between one end of the armature shaft 9 and an extended portion 10 of the motor casing, tends to maintain the armature in a displaced position relatively to the field-magnet frame, as illustrated. The armature shaft 9 is provided with a pinion 12 which coacts with the gear teeth 2 to operatively connect the motor to the engine shaft.

A commutator cylinder 13, which is of such length that the main brushes 14 are in engagement with it throughout the longitudinal movements of the armature, is in axial alinement with a sleeve 15 of insulating material. A pair of auxiliary brushes 16, which are in engagement with the commutator cylinder when the armature is in its displaced position, are both axially and angularly displaced from the main brushes 14 to which they are electrically connected in pairs.

Reference may now be had to Fig. 2, in which the circuits and apparatus employed in connection wth my invention are digrammatically illustrated. The motor is supplied with current from a storage battery 17. The motor circuit is controlled by a manually operable switch 18 which may be located at any suitable or convenient part of the ve-

hicle. It will be noted that each of the main brushes 14 is connected to one of the auxiliary brushes 16 in such manner as to shunt the greater portion of the coils of the armature winding.

If the main and the auxiliary brushes were in axial alinement, the armature windings would be entirely short circuited and no torque would be effective to rotate the armature in its displaced position. This condition is not desirable, however, because a slight rotation of the armature while the engagement of the gear wheels is being effected, operates to facilitate their meshing. It will be obvious that the torque effective to rotate the armature when the coacting gear wheels are initially engaged may be arranged by adjusting the relative angular positions of the main and auxiliary brushes

It may be assumed that the several parts are in their respective illustrated positions, with the pinion 12 out of engagement with the gear teeth 2. To start the engine, the switch 18 is closed to complete the motor circuit which extends from the battery 17 through that portion of the armature windings that corresponds to the angle between each of the main brushes 14 and the adjacent auxiliary brush 16, series field windings 5 and switch 18, to the battery.

Because of the low resistance of the circuit, a heavy current traverses the motor windings, and the field-magnet poles exert a strong magnetic force to shift the armature 6 to its central position and thereby effect the meshing of the pinion 12 with the gear teeth 2. When the motor circuit is initially closed, little or no torque is effective to rotate the armature because the greater portion of the armature winding is shunted, as has been previously described.

As the armature 6 returns to its central position, the insulating sleeve 15 registers with the brushes 16. When the armature is in its central position, and the pinion 12 is completely meshed with the gear teeth 2, the auxiliary brushes 16 are entirely disconnected from the commutator cylinder 13. Full torque is then effective to rotate the armature, and the fly wheel 2 is rotated to crank the engine.

When the engine starts under its own power, the switch 18 is released by the operator to open the motor circuit. The armature 6 will then be returned to its displaced position by the spring 8 which has been under compression, and the pinion 12 will be disengaged from the gear teeth 2. The commutator cylinder 13, the insulating sleeve 15 and the brushes 14 and 16 will then occupy their respective illustrated positions in readiness for the succeeding starting operation.

It will be understood that the number of field magnet poles shown and described is illustrative only and that a motor having any convenient number of poles may be employed. The number of main and auxiliary brushes and their relative positions may be arranged in accordance with the conditions which it is desired to produce. Other changes may be made within the scope of the appended claims without departing from the spirit of my invention.

I claim as my invention:

1. In a starting system, the combination with an electric motor having a longitudinally shiftable armature, of means controlled in accordance with the position of said armature for shunting a portion of the armature windings.

2. In a starting system, the combination with an electric motor having a longitudinally shiftable armature, of means for shunting a portion of the armature windings when the armature is in a displaced position and for removing the shunt circuit when the armature is in its operative position.

3. In a starting system, the combination with an electric motor having a longitudinally shiftable armature, of a commutator cylinder, main and auxiliary brushes coacting therewith, means for electrically connecting corresponding pairs of said brushes to shunt a portion of the armature windings when the armature is in its displaced position, and means for removing the shunt circuit when the armature is in its operative position.

4. In a starting system, the combination with an engine member, and an electric motor having an armature that is longitudinally shiftable from a central position to effect an operative connection to said engine member, of a commutator cylinder, electrically connected main and auxiliary commutator brushes coacting with said commutator cylinder when the armature is in its displaced position, and an insulating member for coacting with said auxiliary brushes when the armature is in its central position.

5. In a starting mechanism, the combination with an electric motor having a longitudinally shiftable armature, and a commutator cylinder, of means coacting with said commutator cylinder and controlled in accordance with the position of said armature for shunting a portion of the armature winding when the motor circuit is initially closed.

6. In a starting mechanism, the combination with an electric motor having a normally displaced and longitudinally shiftable armature, of means controlled in accordance with the position of said armature for controlling a shunt circuit for a portion of the armature winding.

7. In a starting mechanism for automobiles, the combination with an electric motor having a frame, field magnets supported therein, and an axially shiftable armature normally displaced with respect to a plane extending transversely of the motor axis and centrally of the field magnets, means for shunting a portion of the armature winding and means operable by the axial movement of said armature for rendering said shunting means inoperative.

In testimony whereof, I have hereunto subscribed my name this 29th day of May, 1915.

HORACE V. S. TAYLOR.